THE ROAD

by

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AUTHOR'S INTRODUCTION

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WE are arrived at a chief turning-point in the history of the English highway. New instruments of locomotion, a greater volume of traffic, a greater weight in loads, and vastly increased rapidity in road travel have between them brought us to an issue: either some very considerable and immediate change in the character of the Road, or a serious and increasing handicap in our rivalry with other nations through the strain and expense of an out-worn system.

The moment therefore calls for some examination of the Road, its theory and history. That need has prompted me to write this essay; but I must say at the outset that I approach my task with no expert qualification. My only equipment for the general sketch I intend is historical reading and the experience acquired in the writing of certain monographs upon the topography *of the Road in the past. I can do no more than suggest lines of thought which, if they lead to practice, need a detailed science I do not possess.*

The Road is one of the great fundamental institutions of mankind. We forget this because we take it for granted. It seems to be so necessary and natural a part of all human life that we forget that it ever had an origin or development, or that it is as much the creation of man as the city and the laws. Not only is the Road one of the great human institutions because it is fundamental to social existence, but also because its varied effect appears in every department of the State. It is the Road which determines the sites of many cities and the growth and nourishment of all. It is the Road which controls the development of strategics and fixes the sites of battles. It is the Road that gives its framework to all economic development. It is the Road which is the channel of all trade and, what is more important, of all ideas. In its most humble function it is a necessary guide without which progress from place to place would be a ceaseless experiment; it is a sustenance without which organized society would be impossible; thus, and with those other characters I have mentioned, the Road moves and controls all history.

A road system, once established, develops at its points of concentration the nerve centres of the society it serves; and we remark that the material

rise and decline of a state are better measured by the condition of its communications—that is, of its roads—than by any other criterion.

The construction, the trace, and the whole character of the Road change with new social needs and habits, with the facilities of natural science, their rise and decline. But this perpetual change, which affects the Road as it does architecture and every other work of man, is specially marked by certain critical phases, one of which, as I said at the opening of this, we have now entered. There are moments in the history of the Road in any society where the whole use of it, the construction of it, and its character have to be transformed. One such moment, for instance, was when the wheeled vehicle first appeared: another when there first appeared large organized armies. It occurred whenever some new method of progression succeeded the old. It occurred at similar critical turning-points in the history of the Road not only when any of these things arose, but also when they declined or disappeared. The appearance of great cities, their sudden expansion or their decay, or the new needs of a new type of commerce—and its disappearance—bring a whole road system to one of these revolutionary points. We have had (as I shall develop in more detail) five *great moments of this kind in the history of the English road system: the moment when the British trackway was superseded by the Roman military road; the moment when the latter declined in the Dark Ages; the moment when the mediaeval system of local roads grew up on the basis of the old Roman trunk roads and around them; the moment when this in its turn declined in the later sixteenth and seventeenth centuries; and the re-casting of the road system by the turnpikes of the eighteenth and early nineteenth centuries. To-day the sixth great change is upon us.*

It is incumbent upon us then to-day to get ourselves clear upon the theory and the history of the Road, and I propose in this essay to take them in two sections: first, the Road in general; next, that special institution, the English Road.

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THE ROAD

§I

THE ROAD IN GENERAL

CHAPTER I

THE ORIGIN OF ROADS

How Did the Road Come Into Existence: The Experimental or the Scientific Method: The Haphazard Road: The Case for Design in Road Construction.

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IN order to understand any matter, especially if we have to understand it for a practical end, we must begin by the theory of the thing: we must begin by thinking out why and how it has come into existence, what its function is, and how best it can fulfil that function. Next we must note its effect, once it is formed, and the results of the fulfilment of its function.

What then, to begin with, is the origin of the Road? Why did this human institution come into existence, and how does it tend to develop? How may it best be designed to fulfil its function?

When we have decided that we can go on to the next point, which is: how does the Road, once formed, react upon its environment; what physical and (much more important) political results flow from its existence?

The answer to the first question, "How did that human institution, the Road, come into existence, and why?" is simple, and will be given in much the same terms by anyone to whom it is addressed. The Road is an instrument to facilitate the movement of man between two points upon the earth's surface.

If the surface of the earth were uniform in quality and in gradient—that is, if it were of the same stuff everywhere, of the same degree of moisture everywhere, and everywhere level—the Road between any two points would clearly be a straight line (to be accurate, the arc of a great circle) joining those two points. For when we say that the Road exists "in order to facilitate" travel over the surface of the earth from one point to another the word "facilitate" includes, of course, rapidity in progression, and the straight line is the shortest line between any two points.

But the surface of the earth is highly diversified in quality as in gradient. Therefore the *trajectory* or *course* of the Road is not in practice,

and should not be in theory, a straight line from point to point. That straight line has to be modified if we are to give to the Road an ultimate form such that it shall best serve its end; and when we come to look into the problem we shall see that it is one of very great complexity indeed. That is where the study of the theory even in its most elementary form becomes of such value to the execution in practice. We discover by studying the theory of the Road how many and how varied are the elements of the formula we have to establish. We become prepared in that study for the discovery, in each new particular problem, of any number of novel modifications not present in problems previously attacked.

So true is this that the whole history of progress in road-making is a history of discovering methods for dealing with obstacles either novel in character or only appreciated after lengthy use. Let us begin at the beginning, with the very elements of the affair.

The first element in the theory of the Road may be put thus: *To find a formula of minimum expense in energy for communication between two given geographical points under given conditions of travel and carriage.*

The diversity of geographical circumstance moulds the formula into its final shape through balanced modifications of the direct line.

The most obvious modifications to a direct trajectory arise from the two primary circumstances of surface and gradient. It is easier to go over one kind of soil than another; easier to go over one kind of surface in summer and another in winter; easier to go over one kind of surface in wet, and another in dry weather; easier to go over one kind of surface with a heavy load and another with a light load; over one with sumpter animals, over another on wheels, and so on.

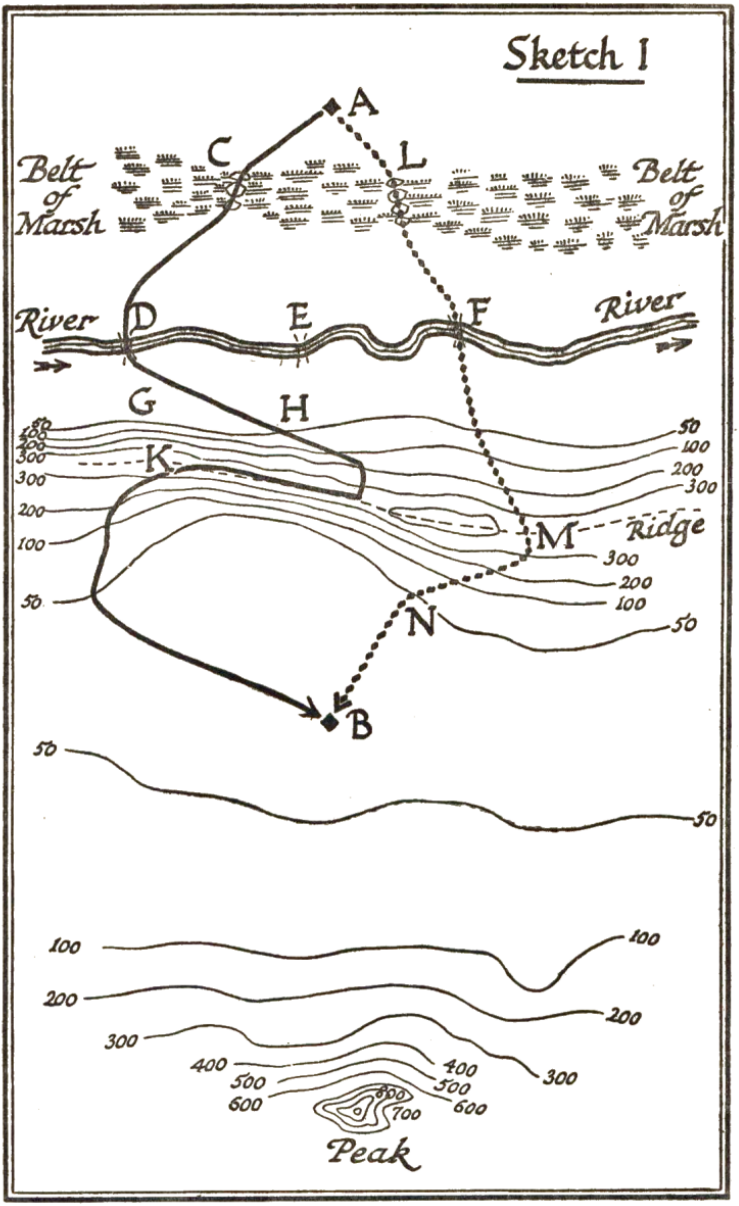
Again, it is for all kinds of travel easier to go upon the flat than uphill, and this element of gradient is much more complicated than at first it would appear. Thus travel of one kind—travel on foot, for instance—can take a sharp gradient for the sake of a short trajectory more easily than can traffic with burdens; and traffic with burdens carried by animals can take a sharper gradient with advantage than can wheeled traffic; and wheeled traffic differs according to the character of the vehicle in this respect.

Again, a road of diverse use must strike a compromise in its formula between the various needs subserved. If the great bulk of its use is to provide for rapid military advance by marches, you must sacrifice to shortness some of the easier gradients which would be demanded for traffic mainly civilian, yet if of three main users even the least important is incapable of more than a given gradient, your formula can never exceed

that gradient, and so forth. So we have even in this simplest and most primary of all analyses of the Road considerable elements of complexity appearing.

As the study progresses an indefinite series of further complexities arises, and one soon reaches that *crux* in the theory of the Road which has led to so much discussion and which some still call unsolved: whether the formula of the Road is best left to the unconscious or half-conscious action of experiment, which in time should lead to an exact minimum of expense in energy, or whether it is best to arrive at it by a fully conscious, exact, and (as we say to-day) "scientific" examination of all the conditions and a deliberate and immediate conclusion upon them.

Should the road *grow* or should it be *planned*? The discussion is not idle. The clash of opinion upon it is at the root of the contrast between national systems, and a right answer will make all the difference between success and failure in our approach to a new road system such as is now upon us.



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I maintain that of the two theories the second is just: that a gradual experimental growth in its roads, a method coincident with local caprice, burdens with imperfect communication the society adopting it; that conscious design is essential to efficiency. And this I propose to illustrate

by a single example. Take two points A and B, such that a line joining them must lead across a marsh, a river, and a range of hills. Let some primitive wanderer make his way from A to B, knowing, when he is at A, the direction of B by, let us say, a distant peak overtopping the range between. That primitive wanderer would first of all skirt about the marsh and, finding its narrowest place at C, would set to work and make his causeway there. Having crossed it, he would come to the river. He must either swim or ford it. Supposing him to prefer, through the necessity of a pack or what not, to ford it, he casts about for a ford. He finds one at D, and perhaps he also, if he takes time to look about him, finds another deeper one at E and another at F, but as his causeway is near D he takes that ford.

Then he has to make for the hills. We will suppose that the peak directing him from beyond B is still visible. He takes his new direction from it and looks towards the base of the hills at G. There, in the direct line to the peak, the contours are so steep that the trouble of getting up would more than counterbalance the shortness of the cut. He casts about for a better chance, and at last finds a gradient just worth his while at H. He climbs up that; but though the gradient is easy on the A side at H on the far side it is very difficult, so he turns along the ridge to K, where he finds an easier down gradient: a spur leads him on by its gentle slope, and from the bottom of the spur he makes straight for B, which is now right in front of him and plain sailing.

Now, look at that track as established by our primitive wanderer and see how lengthy and inconvenient it is, how ill fulfilling the object of the traveller compared with what would have been established by even a moderately intelligent and cursory survey of the ground as a whole and the making of a plan. To begin with, it would have paid our traveller to take a little more trouble in crossing the rather wider gap in the marsh at L and the rather deeper ford at F, because he would have gained very much in time and space with comparatively slight extra effort had he surveyed the whole ground and thought things out. He was only led on to the ford at D because it was suggested by the crossing of the marsh at C. The first opportunity made the second. But to continue the plan: F is nearly opposite the easier up gradients of the hills, but, having surveyed that bad steep on the far side, he slightly modifies his road, crossing the ridge at M behind a summit which hid this way from the first traveller. Then he goes down the practicable, though steep, slope at N, and so reaches B. The first road produced haphazard by successive chances gives the lengthy and roundabout trajectory A—C, D, H, K—B. The second, with very little extra labour, gives him the far shorter and better trajectory A—L, F, M, N—B.

We see from this elementary example how the thinking out of the theory of the Road is of advantage in practice. It may be urged that the discovery of advantages as time goes on gradually improves the Road, and in this way half-conscious development will always give you the best road in the long run without studying its theory. But history is against that view. Europe is full of roads thus established haphazard, confirming themselves by use and by expenditure, and for centuries neglecting opportunities which would have been present to the eye of the most cursory and moderately intelligent survey.

This conflict of principle between *growth* and *design* in the creation of the Road is at the root of half our modern crises in road-making. The real issue is between those who would gradually add to or develop from custom and those who would radically impose new plans, and on a right decision the economic future of this country may well depend.

When we come to consider even the first of succeeding modifications we see still more clearly the complexity of any road-formulæ and the corresponding advantage of plan over habit. The marsh, the river, and the hill are but the beginning of the affair. There is a modification due to the fact that the marsh may not be permanent, nor the depth of the river; that the Road may be of special use at moments when the river is shallow or flooded, when the marsh is dry or, exceptionally, impassable. There is the modification of surface. Clay, for instance, is fairly good going in dry weather, but the worst in wet. There is the modification due to vegetation: the balancing of the effort involved in going round a dense scrub against that of cutting through it and of maintaining the cutting when it is established. There is the modification introduced by the instruments and science available for construction and for cutting. In one stage of development it will pay to take a road by a bridge across a deep river where in earlier stages of development it would have been necessary to seek a ford. In one stage of development it would pay to make a cutting through a scar too steep to climb where, in a lower civilization, it would have paid to go round it. The whole formula increases in complexity the more we examine it. It is a formula for the discovery of a minimum of effort. But in the establishment of that minimum you have to consider not only a very great number of factors, but the respective value of each to the whole, and your success in establishing the Road depends upon the accuracy of your judgment both as to the presence and as to the comparative value of all those factors.

CHAPTER II

THE CROSSING OF MARSH AND WATER

Physical Factors Modifying the Formula of the Road: Marsh as the Chief Obstacle to Travel: The Political Results of Marshes: The Crossing of Water Courses: The Origin of the Bridge: The Effect of Bridges upon Roads: The Creation of a Nodal Point: The Function of the Nodal Point in History.

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SO much for the first principle of all: that the Road, like all other human institutions, is best made with brains, and for that second immensely valuable, but too often forgotten, political principle: that if you begin by making your thing wrong it is likely to take root and to remain wrong.

A catalogue of the more important physical factors modifying the formula of the Road (I will come to the political and economic in a moment) is as follows:

> *Marsh to be traversed; water courses to be traversed; differences of surface other than marsh and water courses; gradients to be dealt with; the obstacle of vegetation to be dealt with.*

To these five one may add a factor common to all, and to the making of every road, even in its most primitive stages: (6) the proximity of material (meaning by "proximity" the congeries of all the factors which make for the cheapness of material, for the advantage of using it in a particular place).

Let us take these physical points in their order.

* * * *

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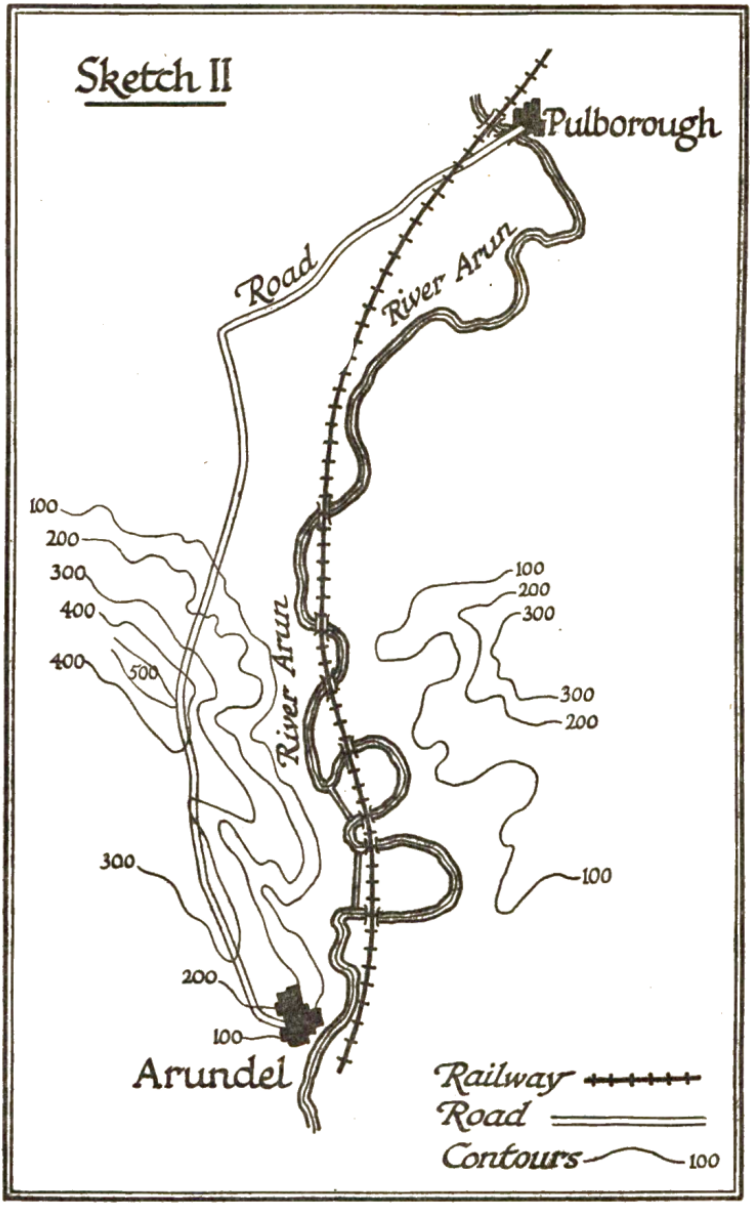
MARSH. It is not always appreciated that the chief obstacle to travel from the beginning of time has been and still remains marsh, which may be defined as soil too sodden for travel, as distinguished from the lands which are boggy in wet weather but passable. Marsh is less striking to the

eye, especially to the modern eye, than a stretch of water, much less striking than the apparent obstacle of the sea, or of a bold hill range: it is nevertheless the chief problem presented to the making of a road, because of all natural obstacles *it is the only one wholly untraversable by unaided man*. Man unaided can climb hills, swim water, work his way through dense undergrowth. But marsh is *impassable* to him: it is the great original obstacle to progress. If this has not been recognized in the past, and is still little recognized, it is not only because marsh is less striking to the eye than water or hills, but still more because, the original roads established by man in forming his cities, markets, and all the rest of it, being compelled to avoid marsh, we do not often come across the problem even to-day. Partly, also, because very extensive marsh is a rare phenomenon, especially in Western Europe.

But if we look at the map and at history we shall see what that obstacle means. It was marsh which cut off Lancashire from the South of England, and left Lancashire the stronghold of old institutions, especially after the Reformation. It was the marsh of the Lower Thames estuary, now upon the right, now upon the left bank of the river, which forbade a crossing below London. It was marsh which protected the growth of Venice at the earliest and most dangerous moment of its existence. It was marsh which cut off the Western (Polish) civilization from the Eastern (Russian) civilization, and was the main geographical cause of that sharp division in culture which has affected the whole of later European history. We may say that the Russian Orthodox Church and the last Revolution would neither have been, save for the Pinsk Marshes. To take lesser examples, we can see to-day the way in which even our modern ways avoid marsh. The large district of Gargano in Southern Italy has remained largely isolated through marsh upon its flanks.



You may see all over Europe, and even in this well-drained country, primitive roads deflected through marsh as they are not by any other obstacle, and this deflection stamps our road system to this day, in spite of our enormously increased opportunities of road construction. We shall see on a later page the way in which marsh deflected in the dark ages Roman roads at the river crossings in this island.

If a special example be required of a road having grown up and remained on an uneconomic trajectory on account of marsh moulding its earlier history, one of the best in England is that of the Arundel road south of Pulborough. Seawards from Pulborough (a landing and crossing-place on the upper River Arun of great antiquity) the next considerable inhabited spot was the port and fortified spur of Arundel. The distance as the crow flies is a short day's march or less, some ten miles. Now, the road could have been taken in a fairly direct line and everywhere upon the level had it not been for marsh. The marshes bordering the Arun prevented such a construction in early times: the road had to keep to a high, dry bank, then to climb right up to the top of the Downs and fall again upon Arundel. So it remained—having taken root—through all the advances in science: so it still stands to-day. The railway takes the obvious line, but the road, established centuries ago, remains on its former trajectory, climbs up many hundreds of feet, and then drops down again to Arundel, involving in the short distance of ten miles gradients of one in eight and heavy hill-climbing over more than half the distance. A neighbouring example of the extreme importance of *the first experiment* in the history of a road is seen at Bramber, in the next valley eastward. There a similar situation—the approach landwards from the port of Shoreham—avoids the hills, because at some unknown but very early period a causeway was built at Bramber to negotiate the marsh; and that was because the isolated hill at Bramber afforded such a good opportunity of fortification and blocking the pass that a road was bound to reach it, and even under primitive conditions men were at the labour of making an embankment.

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WATER COURSES. The crossing of water courses does not seem to have been originally *in the main* a search for a ford. It seems to have been rather a search for *good taking-off places upon either side, however deep the water in between*. The ford was used, of course, wherever it could be, and in it also the hardness of the passage under water was of even more importance than the depth of water: below, say, 4 feet. But the point to note is that often, and probably in the majority of cases, man in the early times took his short cut across water either by swimming or by taking advantage of floating material, and was much more concerned with the hard bank upon either side than with the depth of the stream.

If you take such a very old road as that of the primitive British trackway whose two branches, from Stonehenge and Winchester, unite in what is called the "Pilgrim's Way" and make for the Straits of Dover, you

find this trackway crossing the Mole, the Wey, and the Medway, as also the Darenth, at places where the obvious consideration has been a dry approach upon either side, and not the local shallowness of the stream. (We must remember in this connection that the word "ford" is used at plenty of places where the stream is too deep for crossing on foot: it means simply "a going." A false etymology here has misled many historians.) Of more importance to the first makers of the Road than the depth of a water course was its swiftness. We have in this country few examples of swift streams of any magnitude, and none of the streams so swift as to be impassable or passable with great difficulty, but where such examples occur abroad, it is easy to see what a boundary and obstacle a rapid current afforded. It works in all manner of ways to the disadvantage of travel, it makes both swimming and ferrying more difficult (or impossible), it makes bridging either more difficult or (in early times) impossible, it usually connotes great differences of level, sudden floods, etc., and it also usually connotes changes and variety of currents, as well as the destruction of the banks.

At an early stage in the development of the Road came the use of the bridge, and with the bridge the original chief consideration—a dry approach from either side—was emphasized. It is true that fords were bridged as roads developed, but the bridging of a ford is not the normal origin of the bridge. The normal origin of the bridge, if we judge by any one of the original great roads of Europe, is the replacing of a ferry. Men took the obstacle of a river (on account of its length) as something hardly to be turned, save perhaps in its higher reaches. They made straight for it, seeking only firm ground from which to embark and disembark, and established a boat crossing. To *this* rather than to the ford the bridge succeeded. They bridged it with increasing success as their material science increased in power, and you may see all over Europe the great bridges thrown, not where the river was shallowest nor where it was easiest to traverse for any other reason, but chiefly where the main road led. In other words, the bridge is a function of the Road rather than the Road of the bridge.

Two outstanding examples of this in Europe are London Bridge, perhaps prehistoric, certainly not much less than two thousand years old, and the bridge at Cologne, to which one might add the bridge at Rouen and the bridges of the Island of Paris, which we know to be more than two thousand years old. But it must be remembered that the bridging of a river, even in primitive times, was the next easiest thing to a ferry, and in some circumstances easier even than a ferry. A bridge need not be built of piles.

It may be built of boats, and in principle, even over a broad stream, once you could build a boat bridge at all you could build it of almost indefinite length. What would militate against the effort to make a pile bridge were depth and rapidity of stream, but even these, unless the rapidity were very great indeed, did not prevent the throwing of a bridge of boats.

The bridge as an element in the Road plays a very large part which needs some detailed examination: it develops a whole series of results. The object of a bridge is to give *continuity* and *security* to travel across an obstacle of depth: usually an obstacle of running water, sometimes a dry ravine. *It is but rarely that a bridge is essential to the mere trajectory of a road.* In much the greater number of cases its function can be supplied, though far less perfectly, by a ferry, or a ford, or a graded way down into and up from a depression. What the bridge does is to permit of continued traffic, especially continued wheeled traffic, across such obstacles without delay and without trans-shipment, and at the same time to add, up to a maximum of weight, to security; for it is obviously an instrument more secure than the ferry or the ford, especially for heavy weights.

But the bridge has always represented a special economic effort, greater yard for yard than that of the average of the road of which it was a part; and that is why you almost always find it the mark of civilization. A primitive culture can exist for centuries without bridges. The proportion of bridge-building effort to road-building effort varies very much with the physical science of various times. It is less to-day, and was less in Roman times, than in primitive times and in the Middle Ages, because we, like the Roman engineers, expend a far greater economic effort upon the average of the Road, so that the comparative cost of the bridge is less. In primitive times the bridge was something of a feat, its construction as measured in effort was equivalent to many miles of road, its builder a public benefactor, and its building an event of note. This is so true that in some languages which have come down but little changed from primitive times the word for "bridge" is found to be a foreign word, as though the institution were not sufficiently common before the advent of some civilized conqueror to have acquired a special name; and in all primitive societies the bridge is rare.

This comparatively high cost of the bridge has had certain effects on the history and in the appearance of our roads which are worth noting. In the first place, the bridge tends to be a "gut." When the throwing of a bridge was equivalent in expense to several miles of the existing road it was a great saving to make it narrow: only one vehicle to pass at a time,

with side refuges at the piles when the passage of two vehicles in opposing directions was unavoidable.

Again, bridges tended, especially in times of low economic development, to introduce a sudden high gradient. The elliptical arch was, if not unknown, at any rate very rare before the Renaissance, and where the plain semi-circular arch alone was used a flat bridge involved, if the crossing were of any width, a great number of piles, and therefore an added expense. The difficulty was met in the majority of cases by lessening the number of piles, especially towards the centre, where there was a greater depth, consequently increasing the span there, and consequently, in a semi-circular arch, increasing its height correspondingly. The result was that the bridge introduced a sudden hillock into the Road, and that feature you find all over Western Europe up to quite modern times, with many survivals remaining, especially in Spain. In some of the very early bridges in the poorer districts, or on the less used roads, the exaggeration is fantastic. I know of one over the Gallego, near Huesca, where the pitch is so sleep that it balks a car.

There were particular structures—that of London is an example in point—where the disadvantage of a gradient was avoided at great expense because a mass of traffic and merchandise made it worth while. London Bridge was carried on a great number of arches precisely in order to avoid this element of gradient. A side-effect of this was the blocking of the stream and great difficulty for boats in “shooting” the arches on a tide; but this drawback to river traffic was thought worth while as the price of a level road.

Another reason which often led to the expensive flat stone bridge was its replacing an old wooden pile bridge. The wooden pile bridge had no cause for creating a gradient. On the whole it was cheaper to keep it exactly level, and as low as possible consistent with the rise of the water. Where such a structure had preceded a stone bridge the habit of a level road was continued, even at the expense of many piles and arches.

A third effect of the bridge upon the Road, also due to its comparative expense, was the convergence of roads towards bridges, established or even only planned. You will perpetually find up and down Europe the approaches to a town from two or more directions merged into a common road just at the entry to a bridge, in order to save the expense of two crossings, though at an extra expense of space and time; thus, Abbeville, Caen (a very striking example, with *three* converging roads on each side of the bridge), London—the chief example in Europe—Saragossa, with the

two main roads from south and west converging on its bridge—all "gather" roads after this fashion.

But the effects of the bridge upon the mere trajectory of a road, upon its surface and contour, were far less than were its political and military effects. Though land armies were always tied to roads more or less, it was possible to leave the road for short distances under stress or for the sake of strategy. Cavalry continually did so for great stretches, and infantry could do so occasionally. But a bridge acted like a magnet. The defence of a bridge was the defence of a point which an army in force was always compelled to use, and the term "bridge head"—that is, the holding of the space on the *further* side of the bridge, thus commanding the passage—is an example of its permanent military function.

A bridge was, for the same reason, a natural place of toll. Merchandise had to use it, and the same requirement of continual repair which often entailed a permanent post at a bridge gave the opportunity for using that post for the raising of taxation. All through the end of the Roman Empire and the Dark and Middle Ages this function of the bridge is most prominent.

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But most important of all the effects of the bridge is its creation of a *nodal point*, that is, a knot or crossing of ways. The bridge effects this in two fashions: firstly by that tendency to a convergence of roads upon the bridge which I have just noted, and secondly, and much more important, by the transverse of the bridge and the river. A river is also a high road if it is in any way navigable. Therefore, wherever a land road crosses a river and establishes a bridge you get a crossways of communications. At such a point, where many avenues of approach meet, and whence opportunities of travel to different places radiate, you have what is called in political geography a Nodal Point.

Icknield Street in
the Oxfordshire Chilterns

Now, the nodal point is of such importance that it merits particular attention. The nodal point, especially if it is established by a bridge, has two great functions in history. It determines the strategy of campaigns (and alters even the tactics of actions), it determines the growth of towns. It has been said that London was made by its bridge. Whether there was a settlement (there probably was) upon the gravelly hill which approached the river from the north, before any bridge was thrown across the tidal

Thames, we do not know; but it is certain that the throwing of this bridge gave London its opportunity for development, and what is true of London is true of Paris, of Rouen, of Maestricht, of Cologne, and of twenty other great urban centres in our civilization. Strategically, a commander holding a nodal point retains the opportunity of moving along any one of many lines of movement, and at the same time denies the opportunity of junction to his enemies. To put it in its simplest form, a commander holding a nodal point and concentrated there can prevent the concentration of two fractions of his enemy along any two roads radiating from that nodal point. He can himself march up each of these consecutively and defeat the two fractions of his enemy in detail. That is the simplest possible case, and it can be developed into any amount of detail and intricacy.

The bridge is the point where the commerce up and down stream crosses the road-commerce transversely to the river-commerce, and the nodal point of the bridge establishes a market. But that nodal point has other characters even more important to civilian life. It creates a point of *trans-shipment*, where goods must be transferred from the water vehicle to the land vehicle. In their transference you have the political opportunity of examination and toll, and, if necessary, interception; and you also have, of course, the whole of the middleman business of dealing with and passing through the goods—you have the depot and the warehousing and all the adjuncts of a built-up commercial centre and a market.

But the bridge as a nodal point has yet another occasional function which has marked all history. That function it exercises when it is the lowest bridge upon a great navigable river. Such a bridge—the bridge of Rome for instance, the bridge of London, the bridge of Gloucester, the bridge of Newcastle, etc.—has been the making of inland ports. It must be remembered that before the advent of the railway, or at any rate before the organization of rapid and easy road travel, it was to the interest of sea-borne trade to penetrate into the heart of the country as far as possible. You avoided the cost of trans-shipment, and you had a much cheaper means of conveyance than anything that went by land. But the first permanent bridge across a waterway blocked the further progress up-stream of sea-borne traffic. Therefore there was a tendency to keep this first bridge well up-stream. Further, whenever it was made, it tended to create a glut of traffic at this point of section. The cargoes from the sea came here and could go no further, and this last function of the bridge is perhaps of all its historical functions the most important. Even where a river is very rapid, as the Tiber, the first bridge has some effect. Where it is tidal it is, of course, as in the cases we have just quoted, of the greatest

effect, and usually on the great tidal waterways the first bridge will be found not indeed at the limit of the tide, for there the water would be too shallow, but in the last reaches. There are cases (Rochester is one) where the road has proved more important than the stream, where a bridge was imposed very low down in the tideway, but it has there fulfilled the same function of creating a market and a town. There are cases (Antwerp, Bordeaux, and Philadelphia are examples) where a secure harbour and good wharfage made the inland market and town in the absence of such an obstacle as the first bridge; but in the greater number of navigable rivers, even in so narrow a stream as that of Seville, the bridge makes the port and the town, as one can see by adding to the examples already given Nantes, Montreuil, Glasgow, etc.

There is a little note on the crossing of water courses which is curious and interesting in the history of roads. Since the crossing is always an effort, or, in economic terms, an expense, to be avoided as much as possible, the Road naturally avoids a *double crossing*, but, on the other hand, an island is a stronghold, and even a peninsula where two rivers meet is a potential stronghold. Therefore you have in the history of all early European roads a sort of dilemma, the first travellers debating, as it were, whether the occasion were sufficiently important to warrant the double crossing of the stream. At Reading, Lyons, Melun, notably at Paris, and in dozens of other places, the presence of the stronghold made it worth while for the Road to visit the place in spite of the double crossing, whether to an island or to the meeting of two streams. But in much the majority of cases the Road was deflected from its simplest line to a point below the meeting of two streams so as to avoid the double effort, and the occasion explains many a deflection which otherwise would seem to have no reason.

CHAPTER III

PASSABILITY

The Choice of Soils: Following the Gravel or the Chalk: Conditions in the South and East: The Obstacle of Gradient: The Early Vogue of Steep Gradients "The Other Side of the Hill": The Modern Importance of Gradient: Passes or Gaps in Hill Country.

i

TO the next physical factor modifying the formula of the Road we have given the name: DIFFERENCES OF SURFACE OTHER THAN MARSH AND WATER COURSES. The differences of surface other than marsh or water courses affect the trajectory of a road in several ways: first and originally in its passability to human travel on foot or with beasts of burden, or later with wheeled vehicles, and here the two factors were hardness and evenness. But there was a great contrast in the obstacles of the North and the South of our civilization. In the North, and especially in England, damp was the enemy. For a trajectory to be used in all seasons and in all weather sand and chalk at once suggested themselves. Clay can be used only in the dry season. The various soils determined the first trackway and impose themselves visibly upon the map of our oldest roads.

For instance, the road down the upper Wey to Farnham is, in its oldest form, a deliberate picking out of long gravelly stretches in the bed of the valley. On a geological map you can trace this road picking its way from gravel patch to gravel patch almost as a man crosses a stream by stepping stones. It leaps, as it were, from one gravelly stretch to another, and in each keeps to the gravel as long as it can. For the same reason a primitive road will follow the South, or sunny, side of a wood or of a ridge of land, so that the surface may dry as soon as possible after rain.

When the use of artificial material for the surface of the track became common this question of quality of soil was somewhat modified, but its essential was retained; for what made bad going (in the North, and particularly in Britain) being heavy soil, that same kind of land, which interfered with foot or pack-horse travel, swallowed up material. It was a less grave inconvenience than in the times before artificial material was used, but it was still an inconvenience expressed in the shape of expense;

and nearly all the original trackways continued to take account of this factor long after the use of artificial material had been introduced. The earliest of all, of course, follow the dry ridges, and in particular the chalk.

One may say, with slight exaggeration, that the chalk was the essential factor in the building up of British communications before the Roman civilization came. If you take a geological map of England you may see the great chalk ridges radiating in a sort of whorl from a centre in Salisbury Plain, and providing dry going to the Channel, the Straits of Dover, and across the Thames valley at Streatley right on to Norfolk.

Another example of a road taking advantage of dryness of surface is the straight line leading to Lincoln northwards, everywhere following that peculiar isolated ridge, with low-lying ground upon the left and marsh upon the right. Another very striking one is the Hog's Back, where from one low-lying point to another (Guildford to Farnham) the primitive track deliberately rises and follows the summit of a high hill between rather than the wetter ground upon the slopes, though here there is an alternative upon the southern, or sunny, slope where the trackway leads through to St. Catherine's Chapel. This is a modern example of the way in which a primitive track imposes itself upon posterity. To this day your motorist climbs up that roof of a house out of Guildford and goes down the steep on to Farnham because countless generations ago his ancestor could only be certain upon that height of dry ground.

In the South (which does not concern this essay) the great obstacle in the way of soil is not marsh, but sand. That is something of which we have here no experience, but the tracks of nearly all Western Islam are dependent upon it. Drift sand is not so impassable as marsh by any means, but it is terrible going. North and South of Atlas the knowledge of how this kind of soil may be avoided is half the business of establishing a primitive road.

An interesting case of surface (but one which is rarely met with in this country) common in dry countries where the rare rainfall is sudden and intense, and where temporary water courses carve out the friable soil, is the inconvenience due to what are called in some parts of the East "nullahs"—that is, the dry beds of such water courses or the sudden depressions made by what were formerly water courses now dried up through a change of climate. The banks of these are often so steep and their depth so considerable that the making of a plain, straight trajectory across such a country would, even under modern conditions, not be worth the labour expended. It would mean continual bridging, or continual

embankment. One of the effects of this type of surface is the inordinate winding of all the roads, and even, alternatively, the absence of roads perpendicular to the fall of the land, and the establishment of communications along the line of fall rather than across it. One can see this very conspicuously in Morocco, where there are whole districts, a couple of days' march across, the trails of which are determined by this accident. A special example of the same kind of thing is to be found in any hill range where a number of narrow spurs project towards the plain. The Road hardly ever runs parallel to the range across these spurs. It nearly always runs down the valleys or along the plain at their foot, and that although there be, as there usually are, in each valley centres of population which need to be linked up with the neighbouring parallel valleys.

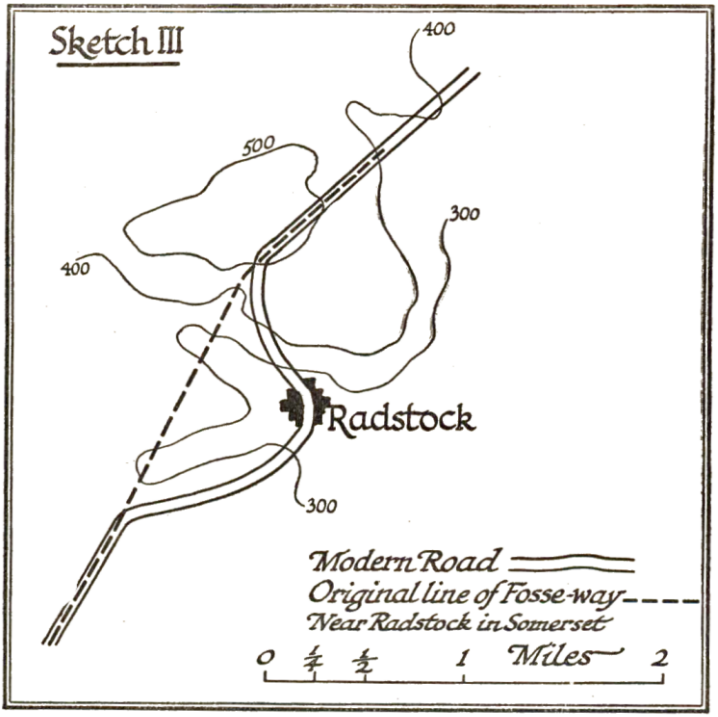
ii

GRADIENTS. The obstacle of gradient the "minimum of vertical effort" is the most evident of all the factors which modify the trajectory of a road; yet it is, upon the whole, the most complex. To determine the minimum of effort you have to find a formula consisting of many factors, some of which I have already enumerated in the opening words of this essay. In the first place, you have to consider the *average* nature of the travel to be served. The Road used by men on foot without burdens, by men on foot with burdens, by pack animals, by wheeled vehicles, etc., must conform itself, on the whole, to the *least* gradient useful to those who travel by it, but that "on the whole" least gradient is a factor by no means easy to determine. It depends not only upon the nature of the instruments of travel, but upon habit, upon vigour, and to some extent upon surface. It depends also on the proportionate use of the Road. You cannot sacrifice ninety-nine travellers to the special weakness of one.

There is also the question of durability. A primitive road, taking a very steep gradient, will be more durable than one taking a lesser gradient round the slopes of a hill and subject to falls from above and to degradation down the slope below; it will need less upkeep, for it is always shorter—and this last consideration explains what would otherwise be inexplicable: the extraordinarily steep gradients which primitive roads and even the roads of a high civilization will take.

One of the best examples of this in England is the behaviour of the Fosse Way in the neighbourhood of Radstock in Somerset. Here the original road was presumably a prehistoric track, but we know that it was carefully remodelled by the high Roman civilization. It must have been used for the great mass of travel during four hundred years from the first

occupation of the West of England by the Romans about A.D. 50 to the breakdown about 450, and right on into the Dark Ages—that is, for not less than one thousand years. During the first half of this time (and especially during the first third) it had to carry the travel of a very full, well-developed, and complex society to one of the most important centres of its wealth, the town of Bath. Yet the road goes up the most astonishing gradients.



Somehow or other, these gradients were normally used—but it is a puzzle to say how. The modern road has frankly abandoned the effort, and takes a long sweep round both sides of the valley at a gradient of about 1 in 12. Even so, it is quite steep enough for our modern methods of travel.

The question of gradient is complicated again, by another variable which makes the solution of the problem much more intricate than the discovery of minimum effort upon a particular gradient. You have to consider not only the uphill or downhill upon a given slope, but the type of further uphill and downhill to which your road, once established on that slope, is leading you. It is not enough to determine your best formula under such and such conditions of travel for overcoming one side of the

obstacle. You have also to ask yourself whether, having got your best uphill road, you may not have led the traveller to an impossible position on the further side. Extreme cases of this one often sees in the Jura range, where the hills are shaped like waves in a storm: a steep escarpment upon the eastern side, very difficult to go up or down, and an easy slope upon the western. Here you have to balance the advantage of your gradient upon the one side with the advantage of the gradient that you will find upon the other, and, of course, to direct your line principally with a view to travel on the more difficult steeper side. That is why you often find yourself following in the Jura a road which goes up the easy western side by an apparently over-steep trajectory: you wonder why the road does not take some obviously easier line which lies below you. The reason you only discover upon reaching the summit and seeing the precipitous escarpment overhanging the eastern valley—your road has made for some exceptional advantage down this cliff, some cleft, which an easier advance from the west would not have hit. A balance has to be struck between the advantage of gradients on both sides of the hill, save in the rare cases where a range (such as the Vosges) is symmetrical and gives you equal gradients upon either slope.

That balance is always a matter of careful calculation. Where it has been brought to a fine art is, of course, in surveying for a modern railroad, for there the slightest differences of gradient make such a vast difference in the expense of working that the discovery of a true minimum over an obstacle of hill country is of the first importance.

iii

There is hardly any factor in connection with the theory of the road which needs more material modification as civilization changes than this factor of gradient. The sharpest contrast in the whole of history is that which I have just mentioned: that of the railroads. Men suddenly found themselves possessed of a new instrument which enormously multiplied their power on the flat and yet was quite incapable of anything like the old gradients. Going level or on very slight gradients it could give them travel far more rapid and inexpensive than any that had been known before, but one in fifty bothered it badly, one in thirty was wholly unnatural, and the existing gradients of one in ten, eight, six, were out of the question. Further, the least inclination increased all difficulties, and the addition of inclination produced these difficulties in more than a geometrical progression. The result was the revolution whose effects we see about us everywhere: the tunnel, the cutting, the embankment.

To-day, a couple of generations after that revolution, there comes the new problem of the internal combustion engine, where the gradient again appears in a new light.

The motor takes gradients far steeper than the rail. Its difficulties are not increased in the same ratio. But it cannot always deal with the horse road. Lynton and Lynmouth and their Devonshire valley form perhaps the best example of this in Great Britain. You have here terrible gradients which were just possible for the horse vehicle and are hardly possible for the motor vehicle, and you have the new road round by Watersmeet attempting partially, but not entirely, to solve the problem.

A special case in this general category of gradients, and one much more complex than appears at first sight, is the case of the pass, or gap. Men have always naturally made for any notch in a line of hills to save themselves the effort of higher climbing. It began with foot travel, and has continued right on throughout the history of the Road. In high mountains provided with low passes the use of a saddle in the range was obvious and often necessary; but there were disadvantages even in that apparently unexceptionable rule. One was the question just dealt with of the double slope: the consideration of the other side—the most obvious pass from the one side did not necessarily lead to the best descent upon the other.

Another was the conformation of many ranges, which is such that the approach to the ridge is much steeper at the *summit* of a "col" or pass than it is by tracks to one side.

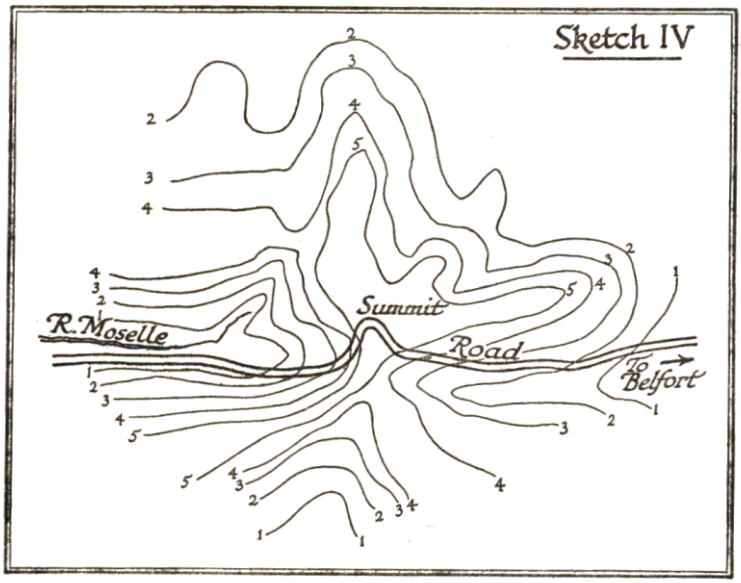
This is a paradox which people living in easy hill-lands have difficulty in appreciating. The Alps especially show roads which puzzle us (who are of a gentler landscape) when we follow them: yet the principle is simple and dependent upon the geological formation of most *new* mountain ranges, which present a hard core, forming their central ridge. The softer ground wears away on either side of the valley: the ridge remains. The effect is that a *direct* approach to the notch in the range would give impossible gradients in the last few hundred yards, and therefore the road must gradually curve round by a side of the valley.

A third exceptional case is that of trajectories where the minimum of effort is only to be found by going *right over the very summit of the highest hill in your neighbourhood*. Lastly, there is the curious case of a pass where it is to the advantage of the road to *avoid* the lowest passage of the range and to take a line to one side above it.

As examples of these last two paradoxical points I may quote the pass of Sallent in the Pyrenees and the exceedingly important road from the

valley of the Moselle to the valley of Belfort in the Vosges.

In the case of the pass of Sallent there was an obvious notch in the range, which was used from the very earliest times till just the other day. It was through this that the armies of the Moors poured in the eighth century for their attempted conquest of Europe, when they invaded France and nearly reached the Loire. So late as within living memory it was the regular track from the valley of the Gallego to that of Gabas. Now, the modern road, after careful survey, has been constructed to cross the mountain summit somewhat to the west, and a good three hundred feet higher than the old pass. Why was this? It was because the notch of Sallent had a very steep approach in the last few hundred yards upon either side, and the minimum of effort, at any rate for wheeled vehicles of the modern type, was found in taking a lesser gradient to one side, although it involved a much higher climb. The case of the road from the Moselle valley to Belfort in the Vosges is even more remarkable, for one would have said at first asking that no such case could exist: one would have said that a minimum of effort could never be reached by going over the *very highest summit* in your neighbourhood, but it is so when you deal with what I will call a "star" mountain, as will be seen at once from the following elements.



Here the contours are such that had the road deflected to the west or the east in order to avoid the highest summit, it would have been

compelled either to a very long detour (involving in any case *nearly* as high a climb) or to a series of steep and profound ups and downs over the spurs of the mountain. The line taken from the Moselle to Belfort on the other side goes within a few feet of the highest point on the hill, and is yet the line of least effort from one point to the other. It is an excellent example of the way in which the formula of *minimum effort*, when it is thought out, may be quite different from what mere habit would have produced.

CHAPTER IV

THE OBSTACLE OF VEGETATION

The Special Expenditure due to Forest: Roads which Skirt Woodlands: Roads which have been Deflected by Forest: Proximity of Material as a Final Main Cause Modifying the Trajectory of a Road: Cost of Transporting Material and its Effects in Ancient and Modern Times.

i

THE obstacle of vegetation, which is our next cause modifying the trajectory of a road, is two-fold. There is the obstacle presented by forests or permanent vegetation (which includes in some climates very high grasses) and the obstacle presented by intermittent growths. We are not, in this country and in modern times, well acquainted with the obstacle of vegetation to a road and with the modification of trajectory which it imposes. We have no *large* forests left: we have, in common with all Northern Europe, no exuberance of growth. The dense population and very high road mileage of modern England have put this factor in the development of communication out of sight, and it is so unrecognized that the mention of it here may seem superfluous. But it is still a grave element in the calculation of a road even in the European world, and a graver one in the new countries. And it has had its part in framing our own system in its earlier stages. In damp tropical countries it is all important, and even in temperate climates where large forests exist it has its place.

(a) *Forest.* Two special expenditures attach to this obstacle: First the effort of clearing a way, second the effort of maintenance, and particularly through the effect of wood upon surface. The effort of clearing, always an expense, made the forest in very early times an insuperable obstacle to any great or considerable road. The forest had tracks, but the main road was compelled to skirt the denser woodland, or at the least to take a tortuous trajectory for the advantage of natural clearings. With the development of civilization that difficulty disappeared, and it disappeared early, although I can call to mind no broad primitive track through any dense woodland. The Roman roads hewed their way through forests where it was necessary, and found in the value of the timber felled an economic compensation for the effort made. But even with them, and even with modern roads, it

remains true that the forest governs and modifies road construction. There is case after case where a Roman road, and even a modern road, will skirt a forest rather than be at the effort of overcoming the obstacle: for instance, the case of the forest of Mormal in Northern France. Here the main Roman road from the centre of Northern Gaul to the crossings of the Rhine cuts along the edge of the great wood like a knife, with no growth on its western side. Further, cause and effect reacting on one another, the lack of roads preventing clearing, and the lack of clearing keeping down habitation and so ways, there is no great forest possessing a system of roads anywhere in Europe. All considerable stretches of woodland, where agriculture or other economic effort has not cleared them, have a minimum of roadway.

In our northern climate, the larger stuff once felled, upkeep is not a grave economic matter. The use of artificial material, which comes in at the very first stages of road-making, renders the problem here even less important. But in other climates, and particularly in the tropics, it becomes the dominating factor. There are whole districts—as, for instance, on the Amazon basin, or, again, in Central and West Africa—where the problem of communication consists not in the cutting of the original track, expensive as that is, but in its maintenance; and in the greater part of those districts even modern civilization, with its immense material advantages, and with its strong economic inducement to the transport of tropical material, has been unable or unwilling to make and maintain forest roads, at any rate for ordinary wheeled traffic.

With the railways it is otherwise. The economic effort required for the construction of the track is such that the added expense of clearing the forest is a much smaller fraction of the whole, and the type of bed which has to be established for the track partially solves (but only partially) the question of upkeep. Even the railway can be overcome by the vigour of tropical vegetation, but it has a better economic basis in the densely wooded country than has the Road.

One of the most curious facts in the history of roads due to the obstacle of wood is the deflection of the Roman Road through this cause after the decline of civilization. One can find many instances of this even in England, light as is the afforesting of this country, and small as are the districts affected. Thus the Great North Road making for Stamford is a broad, unmistakable way raised high above the neighbouring country, and looking like some great double rampart, from the crossing of the Welland for miles to the north and west. It approaches a small patch of wood on a hill and disappears. It remains lost for a mile after its destruction by the

wood, and is not found again in anything like its earlier sharpness of outline till Stamford is reached. That is because the upkeep through the wood became too difficult in the Dark Ages, and men turned the obstacle by developing a new road round it. Another very clear example is to be found on the Stane Street north of Eartham, where the great *Nore Wood* through which the Roman road was driven usurped it in later times, overgrew it, and deflected the modern road round by Duncton Hill. We have here probably not so much a case of keeping down the new growth as of the wetness of the track when artificial material ceased to be used, and of the difficult going thus made between the trees. The occasional fall of trees across the road left unremoved, and the danger in such times from any close cover must not be neglected. But, whatever the cause, woodland perpetually deflects a Roman road after the breakdown of the old civilization. It deflects it almost as often as does the marsh of a river valley.

(b) The obstacle to the making of a road due to intermittent vegetation is one which plays no part in our system, and is unknown to our climatic conditions. Nor is it of any great effect save in a few special highly characterized regions of the world. The track, once established, can commonly keep down even the riot of spring vegetation in open land. Such exceptions as there are, due to the exceptional development of grasses, affect no part of the world where communications need high development. The factor exists, but needs no more than a mention.

ii

The last main cause modifying the trajectory of a road is the relative proximity of material for its construction, using the word “proximity” in the wider sense to include all economic effort: what to-day we call the “cheapness” of the material.

Even in the very simplest and most primitive form of roadwork material enters. There is always the necessity of hardening some bit of soft ground or of smoothing some bit of unevenness, and from the beginning of travel you have had the transportation of material to the established road for the improvement of its surface, for the bridging of its water obstacles or flooring of fords, for the making of its causeways over marshes.

In what may be called the middle period of road construction—that is, in periods of high civilisation, but civilisation not provided with modern instruments—the immediate neighbourhood of material introduced a considerable modifying factor into the trajectory of a road. This was often

masked, from the fact that the same soil which provided good going and therefore developed early tracks usually also provided, in the nature of things, good material for hardening the surface, for the building of causeways, and even for the throwing of bridges. It was also masked by the fact that the bridge, if it were to be built of wood, could get its material from a considerable distance, as the river was its avenue of supply. But though transport of material has gone through a revolution in the last hundred years, and material for road-making is now brought half across the world (*e.g.* Colonial wood pavement), yet the way neighbourhood of material tells can still be seen everywhere upon the road map of Europe. Thus the absence of main roads in the Fens for centuries was not only due to the necessity of continual artificial work, embankments, and bridges (this would not have deterred the Roman road-makers nor the great effort of the early Middle Ages from attempting a full network of roads). It was rather due to the absence of hard material. And you have the same phenomenon in the Landes of South-western France, where to this day only one great road serves an immense district whose loose and sandy soil fails to provide a cheap and sufficient material. The traveller in Holland notices the same thing: here are roads ultimately depending upon brick paving and narrow, where, had there been abundant material available, they would have been broad, for they had to carry a great deal of traffic. The alternative water traffic by their side was largely developed by the difficulty of making the road.

The Romans fought this difficulty with singular tenacity. They made all their great public constructions to last, as it were, for ever; and they made their roads with such a strong political and military object that they would not be deterred save, as in the Fenlands, by the gravest difficulties in the obtaining of material. Thus in such of their roads as start anywhere near a sea-beach of shingle you will find them using that material up-country for miles, and they will make deep foundations for roads that have to cross clay, using, sometimes, hard stone brought over a couple of hundreds of miles of sea and some thirty of land travel. It is a difficulty which has not disappeared to-day. It has been very greatly lessened by modern means of transport, but it still appears. We see it throughout modern Europe: for instance, in the varying surfaces of the different soils. The ideal surface of broken granite is not nearly universal even in England, as one would think modern transport would have made it long ago, over such a small area with such masses of granite close at hand and accessible by sea. The relative cost of transport still makes diversity of surface the rule. One can make a sort of economic barometer based on the

use of granite. It extends farther and farther from the sources of supply as public wealth expands, and recedes towards them as public wealth diminishes. We have a first-class example of this in the case of flint versus granite. Flint has its advantages over all other material in hardening a roadway. It is at once hard and easily broken: it is superficial, and therefore cheap: it is abundant in supply in the districts where it is used. On the other hand, it has the gravest possible disadvantage for modern motor traffic, which is its effect upon the tyres indispensable to that traffic. One could draw a graph, I think, to cover the last ten years showing the fluctuations of this material and granite upon the main roads of Southern England, and the curve would follow the opportunities of supply and of public expenditure as affected by the Great War.

CHAPTER V

POLITICAL INFLUENCES

The Factor of Cost Resulting in the "Strangling of Communication": Congestion which Leads to Decay: A Great Modern Problem: The Compulsory Acquisition of Land: Old Roads Serving New Objects.

i

SO far we have been considering the material conditions of the Road: the physical circumstances which determine its trajectory. But these alone do not completely account for its trace in practice or theory. There is another category affecting this, the political or moral category: the various effects of society in modifying what, but for them, would be the formula of least effort. These political causes of modification are of less effect than the physical, but they merit a brief mention.

The political factors modifying the trajectory of a road (that is, the factors due to man's social action and not to material causes alone) are three in number. Firstly, the factor of cost—which is, the economic tendency to avoid as far as possible the destruction of old economic values in the making of a road; secondly, legal restraints against the Road's following its line of least resistance; and thirdly, the presence of a variety of objects to be served, which variety again interferes with the simple rule of finding the trajectory of minimum effort.

The first of these political factors, the factor of cost, you find even in the primitive road, which avoids the cultivable land if it can, or crosses it at the narrowest point available, and you find it at the other end of the scale in our complicated modern world, where the Road tends to avoid the destruction of economic values in highly concentrated town life and thus keeps narrow when it is established, and also fails to develop new communications. The effect of this political restraint is constant throughout history, great in all periods, but increasing cumulatively with the increase of wealth and the economic development of society. There follows from this a most interesting historical phenomenon, which I shall deal with at greater length in my second section—"The English Road"—because it would appear to be upon the point of recurring in this island.

That phenomenon is the "strangling of communications" in the old age of a wealthy state from the very effect of its wealth. It is a paradox of profound effect which you get over and over again in the history of great mercantile cities: their wealth—which should be their best advantage in developing and changing communication—crystallizes them. Their ways are laid out for a particular phase of traffic. The land on either side of the streets becomes enormously valuable. The traffic changes in character. New ways are demanded by the new conditions, but they are not built because the compensation required for disturbance terrifies the reformer. There follows a phase during which you have heavy congestion of traffic, and then, unless reform comes in time, a succeeding phase of decay.

It is very rare in the history of great urban centres to find the problem tackled at the right moment and solved: to find governors of sufficient daring to take the economic plunge. The Government of Napoleon III did so to some extent in the case of modern Paris (though it left a great number of congested streets unrelieved), and there are not a few modern Italian towns where similar action has had its effect: for instance, Bari. But the general rule in history is that a city having reached its highest point of wealth becomes congested, refuses to accept its only remedy, and passes on from congestion to decay.

How strong the influence is you may observe in one particular historical example where its influence is more clearly discovered than in any other—that is, the example of the City of London after the Great Fire of 1666.

Here was the finest opportunity for rebuilding that ever a Government had. It might have done what was done at Turin and laid out a new city altogether. Two men of genius, Sir William Temple and Sir Christopher Wren, produced magnificent plans with broad ways, round places for the crossings, and a carefully thought-out scheme of transverse streets. Vested interest and economic peril proved too strong for them. The city was rebuilt on its old lines with narrow lanes and alleys, courts, tortuous trace, the mark of all which it carries to-day.

There is a good side to this, of course. No one can regret the conservation of tradition. Everyone who knew the old Paris mourned for the antiquity which was swept away under Napoleon III, and even in our slight changes in modern London we are shocked at the desecration they involve. I confess that I myself have never got over the loss of Temple Bar, though I only knew it as a child. If this were the main motive at work one would criticize less strongly the hesitation to make our town streets

meet the modern great change. But it is *not* the main motive. The main motive is a blunder in the science of economics. It is the idea that the destruction of a number of imaginary economic values ("imaginary" because they form no part of the total real wealth of the State), to wit, the urban site values, is in some way an expenditure of real wealth. So far is this from being the case that there is perhaps no example in all history of a congested street-system being reformed without the wealth of the city increasing after the change.

Of the minor political questions which confront us to-day in England this stands in the first rank. If we do not reform our main roads we shall handicap ourselves against our competitors, but if we do not broaden and change our town streets we may rapidly strangle and atrophy our most vital centres of commerce.

ii

The effect of the second point, legal restraint in modifying the line of least resistance, will be found under two forms: the first is negative; the lack of public powers of coercion for the acquirement of land by which a road should pass. The second is positive; legal restraint against the road through ownership or privilege.

This political factor in the modification of roads, the negative and positive effect of legal restraint, works in an opposite fashion to that we have just examined. The older, the wealthier, the more complex a civilization the *less* this modifying factor is present. Thus in England for many centuries we had no compulsory power in the hands of public authority for the making of a new road. Such powers are, as we shall see when we come to the story of the English Road, a comparatively modern development. On this account the Road was, until modern legislation brought in a new system, compelled to follow existing established ways. It could not even be broadened, let alone a new trajectory enforced; and the only compulsory powers in the hands of the authorities were those permitting the levying of labour, and later of money, for repair.

The same is true of the second form of legal restraint, though in lesser degree. Privilege (such as the deflection of an old line of road by Act of Parliament in order, for instance, to add to the privacy of a park—there were not a few examples of this some generations ago) and the positive legal restraint imposed by existing right of ownership obviously decay *pari passu* with the development of public powers for driving new roads or broadening existing ones.

The third political factor modifying the trajectory of roads is that of a variety of objects imposed upon communications by varied social uses. As society grows more complex and at the same time wealthier, as new centres of population arise, new forms of travel and new needs to be satisfied by travel, the simple formula of the line of least effort from one point to another suffers increasing modification. You have to consider not only the line of least effort between two terminals, but the due weight to be given to intervening points which do not lie precisely upon that line. As a rule, of course, these new centres exercise their pressure or attraction automatically, and you get a deflection arising not from plan but from gradual necessity. The same thing happens with new needs (as, commerce replacing arms), but it is curious to note how slowly the modification takes place.

We have a good example of this along the south-eastern coast of England. Our ancestors felt no attraction for living in the neighbourhood of the sea. To use the shore as a recreation and the sea air as a remedy is quite a modern idea. The result is that all the old roads connected with the sea as a terminal ran perpendicularly to the coast, uniting a port to the inland country. There is not a main road in England over one hundred years old and leading from the sea which does not start from a port. For good communication connecting up a line of ports laterally there was little need. The result is that to this day, when the south coast has become one long line of great watering-places, many of which are fully developed modern towns on a very large scale, there is still no complete lateral communication. Many of the port bridges, as I point out elsewhere in this essay, are but recently established, many sections of the line are served by imperfect, ill-kept pieces of road; in one or two places it fails altogether (as round Selsey), while in others it is built up (as at Romney Marsh) of patchwork—old lanes running criss-cross to each other haphazard to make the modern line.

CHAPTER VI

THE REACTION OF THE ROAD

The Physical Effects of Roads: The Way in which the Road Compels Communication to follow it: The Formation of Urban Centres and the Urban Habit: The Spread of Ideas by Means of Roads: History Deflected by the Deflection of the Road: The Example of Shrewsbury and Chester: Towns which are Maintained by Roads: The Road in Military History: Results of the Decay of Roads: The Road as a Boundary

i

SO far we have considered the origin and development of the Road: that is, the effect of its environment upon the Road. We must turn, in conclusion, to the converse aspect, which may be called "The Reaction of the Road"—that is, the effect of the Road upon its environment. A road once formed immediately begins to affect in some degree the physical circumstances surrounding it, and in a very much greater degree the human relations which it subserves.

The physical effects of the Road are few and may be briefly mentioned. They are all connected with the action of water, save for very rare instances where a particular cutting has precipitated a landslide and one or two other exceptions of the sort. The effect of the made road upon physical circumstances is, in fact, dependent upon the conflict with precipitation in which it is engaged.

It is a general rule in all man's economic activity that the human effort is at odds with the general tendency of nature. Nature perpetually tends to reassert herself, and to undo what man has done in her despite. The Road is no exception to this rule, and the particular way in which it works you can see by examining typical cases. One of these we shall come across more particularly later on when we discuss the Roman roads of Britain, but it may be worth while to give its general character here.

The Road, finding a small stream, crosses it by a culvert: the Road, finding a ravine with too sharp a gradient on either side, traverses it by an embankment; and then, even if there is no stream at the bottom of the ravine, it leaves a culvert or other drain for the water accumulated after rainfall to soak through. Now, when human effort slackens and the upkeep

of a road is no longer sufficient the culvert gets blocked and the Road begins to act as a dam. The lake so formed will in time destroy the obstacle, but before this the Road will change the countryside by the creation of such a lake succeeded by permanent marsh. To-day the phenomenon passes unnoticed because we are still living in a high civilization. But it has affected history strongly in the past. Whenever civilization breaks down you begin to get a series of marshes, with all their accompaniments of fever and the rest growing up along the roads. The greatest examples of the growth of marsh during the Dark Ages were found in Italy, but there are countless examples of the same thing all over the north and west of the Roman Empire, and this spreading of marsh (due also to other causes, such as the abandonment of drains in the fens and the breakdown of locks and sluices on river ways) is largely caused by the special action of the Road.

The same thing on a lesser scale is to be seen where a bridge falls out of repair. The ruins will often half-block the current and make an overflow on either side, where, if the land is flat, a wide belt of marsh spreads and the approaches are ruined; so that what was a point of special opportunity for, becomes a point of special obstacle to, communication.

ii

On the political side—that is, in relation to its human service—the reactions of the Road are exceedingly important, and they are not always as clearly noticed as they might be. There is a whole group of historical social phenomena which could be connected under the one heading of the "attraction" of the Road, meaning by the word "attraction" the way in which the Road compels communication to follow it once it is established. This attraction produces a quantity of effects countering or crossing general economic tendencies, and it acts in countless ways.

One interesting aspect of this is the draining of population down on to the Road. When a map is drawn up showing the density of population we see upon it separate areas of density, sometimes far apart, and between them areas marked by lesser density or even void. But if one should make an accurate population map of any one moment, plotting down every individual upon it, you would not get this effect of isolated dense districts; you would not get the effect of an archipelago, but of a network; for upon the communications between these districts would be marked a dense chain of units in progress from the one to the other: and one would at once grasp how permanent lesser nuclei arise between the two terminal towns. This aspect of the Road suggests a far more important one. The Road—in

the sense of a means of communication—in proportion to its excellence differentiates human society

(*a*) Into areas of density and void;

(*b*) Into the urban political habit and the agricultural political habit.

This is a very important reaction of the Road, which must be allowed for in every historical and contemporary problem.

Granted an urban centre, with its special opportunities for inter-communication between human beings, for experiment and for what may be called "the cross-fertilization of knowledge," the growth of such a centre is, of course, dependent upon many things: its economic basis, either as a market or as the capital of a productive area, or, more commonly, as both; the physical surroundings which may, as in the case of Genoa or Venice for instance, strictly limit that growth, etc. But among the causes affecting it, and chief among them, is the Road: the degree of excellence in communication.

The growth of a town is a direct function of this, the most conspicuous example, of course, in the whole of history being the immense growth of London following on the supplementing of the old roads by the railway.

In direct connection with this you have a mass of subsidiary effects, all of the highest importance to the State. The Road having caused the growth of the city, after a certain point a high differentiation arises between urban and rural life. The differentiation may become so great that you arrive at a clash of fundamental interests in which one of the two is defeated. You certainly have had that in modern England during the last two generations. The towns became so much the more important part of English life that the agricultural life was entirely sacrificed to them—and the Road was the ultimate cause. Again, you get the curious development of what may be called "reserve" towns: towns like Brighton and Blackpool, which are the playgrounds of the greater cities at a distance; the large urban centre breeds, as it were, a lesser one after its own pattern. You have got in modern times that further curious reaction due to growing excellence of communications—that is, due to the growth of the Road—the *pulse* of the great modern city. Crowds of human beings pour out of Victoria or Liverpool Street into London and pour back from London in the evening. The station of St. Lazare in Paris is, in Europe, the most striking visual evidence of this strange modern development, great floods of human beings cascading into the city at the opening day and ebbing back at its close.

At bottom, like so many other human arrangements, this "pulse" is a negation of its own principles—a sub-conscious effect which a fully thought-out plan could have avoided. There is no true economic basis for it, or, at any rate, not for the most of it.

There will always be advantages, of course, in the central point, and always some tendency in men to seek that central point in order to enjoy those advantages. Ten men may desire to seek daily the central point which has only habitation-room for one, and that will lead to the "pulse" of which I speak. But the necessity for seeking it daily is already very largely an artificial necessity and is becoming more and more artificial every day. The same work can be done perfectly well at a distance as is now done in centres, and in a roundabout way that truth is impressing itself through an economic effect. The rents become so high in the crowded centre that whole groups of activities which do not really need a central position tend to disperse themselves to the outer boundaries. The printing trade, in those branches which are not hurried (the printing of books, for instance), is a good example of this.

When men debate the probable future of our great cities they often omit one very likely development, which is the creation of a number of suburban centres which, if the material side of our civilization declines, will become independent towns and the probable decay of the central nucleus out of which they all grow. It is a speculation worth examining.

iii

The reaction of the Road upon society, its political reaction, has many other departments. For instance, in the communication of ideas the trace of a road will give you the advance of some religious development otherwise inexplicable. I have pointed out through more than one historical allusion in other work how the spread of the Christian religion may be directly followed along the trace of the chief Roman roads, and especially of the great trunk road of the Empire running from Egypt to the Wall in Northumberland. You have only to make a list of names standing on that trunk road to show that it corresponds to a list of dates and names in the story of the conversion of Europe—Alexandria, Jerusalem, Damascus, Antioch, Tarsus, Ephesus, Athens, Brindisi, Naples, Rome, Lyons, Autun, Canterbury, London, St. Albans.

Again, a road which for some reason has become established along an artificial line, a line not directly dictated by the formula of minimum effort, will "canalize" traffic, so that, even when an alternative and better way has been provided, institutions and towns and all that goes for human

activity will have taken root along the old way and all history will be deflected by the deflection of the Road.

We have a very interesting example of this here in England in the case of the great road to the north-west. In the earliest times Chester was the one terminal and London the other. Chester was the port for Ireland, and, because it was much easier going along the coast than over the mountains, Chester was also the base point of departure for the penetration of North Wales. Chester was also the great garrison whence troops could be detached for the Lancashire plain and for the western end of the Wall. Nevertheless, Chester, though it maintained for centuries its inevitable importance, had a rival in the Roman town of Uriconium, under the Wrekin: one of the very few Roman towns which have disappeared—though it has its modern counterpart in Shrewsbury. The campaigns against the Welsh were based for hundreds of years as much on this middle section of Shrewsbury as on the northern one of Chester. Finally, when modern engineering made possible a direct trajectory through the mountains, this middle Shrewsbury section fixed the Holyhead road, which would otherwise have gone round by Chester. The main railway system to the north-west, as we know, has been compelled to follow the coast, and but for the deflection of the ancient road round by Shrewsbury that road would have done exactly what the modern railway does.

Now, why was there this strange bend westward and southward towards Shrewsbury in the road making ultimately for Chester? It was because, when the Roman Empire was at the height of its material power, when things were working best and public works were most energetically created and maintained, *the Romans had not fully conquered the North*.

Therefore their chief trouble with the Welsh mountaineers during that earlier moment was with those of the Central mountains rather than of the North. They had, it is true, established their garrison in Chester. But in making their first great trunk road they had been compelled to choose a more southern terminal, hence what is still called the Watling Street curls round by Penkridge (a Roman name descended from the Roman place-name of the Itinerary) and then makes westward. Later, when the conquest was more complete, a branch was thrown out from Shrewsbury northward to Chester. Long after a short cut was driven from Penkridge to Chester direct. We have grounds for belief that this last road was of later and inferior work, because, though the traces of it survive, the main work has almost wholly disappeared.

It stands to reason that the original trackway before the Romans came would have run pretty directly from London to Chester without going round by the Shrewsbury district; and, indeed, the course to which all the first part of the Watling Street points is evidence of that. When the Roman military engineers began their thorough rebuilding of the roads (in the most permanent fashion in the world) they were at first confined to the southern plain, in which alone they felt secure, and hence was that deflection round westward towards Shrewsbury created which has affected the whole of English history.

You may next observe the Road producing the economic effect of maintaining towns, and especially ports. A road being driven from an existing port to some inland terminus and the port later becoming less and less useful, either through the building of ships too deep for it or silting up or what not, the mere existence of the Road tends to make men cling to the port in spite of its disadvantages. They will, as a rule, from the effect of custom and of vested interest, from the attraction of the points already established on the Road, expend in the maintenance of the port more energy than would have been required to build an alternative road to some new and better port. The effect of this is very marked in Northern France. Boulogne was not only the great Roman port of the channel because it stood in the Narrows; it was also of such importance because it was in antiquity a very broad, secure, land-locked estuary, stretching over what is now all dry land up above the town three miles towards Pont-de-Briques. Centuries ago the harbour silted up, and if it had been left alone it would be hardly serviceable at all. But every effort has been made to maintain that point. Boulogne harbour has been steadily maintained artificially for centuries because the road led to it and needed it, and the alternative use of the far superior estuary of the Seine, with the corresponding growth of Havre, only came quite late in history.

The Road has the same canalizing effect where it overcomes an obstacle such as a broad river, or a mountain chain, or a belt of dense woodland. For instance, the fertile lowland fringe of South Wales and the corresponding fertile land to the east of the Severn were connected, when primitive methods alone could be used, by the bridge at Gloucester, high up the river. The lower reaches were too much for the earlier engineers, especially in the face of such a tide as runs on them. As a result the whole of that line of communications remained for 2000 years highly deflected, and only quite recently has there been some attempt at the more natural line by the piercing of the Severn tunnel.

This effect of the Road in canalizing human effort is specially marked in the case of armies. The saying "an army is tied to the road" is a truth which historians should always keep in mind. There have been great cavalry raids in history—not often of permanent effect—which marched on a broad front, almost free of roads, and dependent only upon a sufficiency of forage. They have come from the grazing grounds of Asia, as a rule, and swept over the plains of Eastern Europe; but the organized and disciplined forces which have moulded history have always of necessity followed the Road. An army is not an island. It is an organism connected by a stalk with its base and dependent on this stalk for its feeding and equipment, its passing back of its prisoners and its wounded, and all its life. All these depend upon the Road. There are even cases in history—more numerous than one might imagine—where the first creation of the Road has been due to military action *alone*. I believe that the United States show examples of this, especially along the border between the northern and southern states east of the Mississippi. Certainly Europe shows them in striking fashion: it was a military necessity which made the great roads linking up the stations on the Rhine with the towns of Gaul and the rest of the Empire; it was a military necessity which made the regular roads over the Alpine passes. You can hardly say that there was a *commercial* necessity for the great trunk road which struck the Rhine at Cologne, and which there later created the first bridge across the river. The country beyond was barbarous, and though a large number of Roman merchants penetrated it and a corresponding amount of trade was done, the main necessity for Cologne was a military necessity. Military necessity which drove the great road from the heart of Northern France to this isolated point and so opened up the wild wooded region in between.

iv

The negative effect of the Road, the effect of its breakdown, especially at the bridges and in the causeways over marshy land, is equally indisputable in human relations. We have the typical case of Sussex remaining heathen for one hundred years after the conversion of its neighbours, because the main road from the north with its causeway everywhere crossing the clay and piercing the scrub of the weald fell into decay, and because the bridge at Alfoldean broke down. It is most significant that the great battle of Ockley was fought north of this break in communications. The Danes, marching from London against the English army, could get down as far south as this, and the English army coming up from Hampshire could intercept them as far south as this, but all the

Danish attack on Sussex, such as it was (and it was very slight), came from the sea.

Another very conspicuous example of the breakdown of the Road and of the political effect thereof is the chaos you get in the Balkan peninsula after the decay of the great Roman trunk roads. If the Greek Church is to-day separate from the Latin Church to the west it is due not only to the obstacle of the Pinsk Marshes in the north, but to the gradual decline in the south of the main artery between Durazzo and Constantinople. For centuries old and new Rome communicated by the great trunk road down to Brundusium and then across the narrow sea to Dyracchium and Byzantium. When that traffic began to be interrupted the contrast between the east and the west was founded and increased.

A last minor effect of the Road upon human society is the use of the Road as a *boundary*. That is a use, of course, which hardly ever develops in a high civilization. On the contrary, a road of its nature should run *transverse* to boundaries. It is built to unite towns the territories of which have boundaries naturally perpendicular to the Road. The road from Canterbury to London, for instance (the first great main road in this island), is transverse to the Darent frontier, and all the great roads from the French-speaking to the German-speaking country on this side of the Rhine are transverse to the language boundary. It is in the very function of a road to be thus transverse to political limits. But with the decay of civilization the remains of a great, well-built road lend themselves at once to the idea of a boundary. Men need something to which they can perpetually refer which will be a permanent mark and which will be indisputable. A river is thus often so chosen; sometimes, but much more rarely, a range of hills, especially where the crest is particularly steep and marked. But the Road, when the use of documents declines and when record is with difficulty maintained—the Road, especially if it has been built to endure, comes in to fulfil this artificial function. Here in England we have more examples of this than in any other part of Europe. Very often you can recover a Roman road first by noting on the map the parish boundaries running on straight lines, which are the prolongation one of the other, and the survival of a Roman road used in the Dark Ages to define a parochial limit. The Road is thus also used as a boundary not only for parishes but for states, not only for states but for realms. The Roman road to the north-west of London was part of the great boundary established between Wessex and the Danish territories of the north and east. One could quote hundreds of cases with a little research, but best of all perhaps is that of the boundary of Westminster, which dates from the heart of the Dark Ages. The northern

limit of the manor was fixed by the great Roman military road which to this day survives and is the boundary of Hyde Park on the north.

THE ROAD

§ II

THE ENGLISH ROAD

CHAPTER VII

THE ROAD IN HISTORY

Through the Dim Ages: The Characteristics of the English Road: Absence of Plan: A Local instead of a National System Leading to the Present Crisis.

i

THE general theory of the Road having been discussed, we may next turn to the particular case of The English Road, my second and concluding section. The English Road has, as we shall see, highly-marked characteristics of its own which are of immediate concern to us at this revolutionary moment in the economic history of the State.

The fortunes of the English Road followed, of course, the story of all the other main English institutions in their outline. Just as you had the pre-Roman barbaric period, then the Roman period, then the Dark Ages in the general history of the State, so you had the British trackway, the Roman Road, and the continued use during the continued decline of the latter as material civilization fell away after the fifth century. The spring of the Middle Ages gave you the renaissance of the Road. The Black Death, which is the watershed of the Middle Ages, breaks the history of the Road just as it breaks the history of the language. French dies out: all England is speaking English in the generation after the Black Death, and there is a great change throughout society. That change is marked on the roads by a considerable decline in travel, coupled with the use of better means of transport—a paradox to which our times are not accustomed. But you get a good deal of that in the Middle Ages. You have, for instance, a decline of wealth in the monasteries, and yet more detailed building in the monasteries; a bad decline in manuscript writing, both with regard to accuracy and legibility, and yet an increase in the amount written. So far as we can judge from our very imperfect evidence, after the Black Death (the middle of the fourteenth century) the volume of traffic upon the roads of England tends to get less, and perhaps the surface also deteriorates, though that is more doubtful.

The Reformation, and especially the dissolution of the monasteries, is the next great date. The violent revolution imposed A.D. 1536-40 on every

department of the national life affects the roads as it affects all else. In general, the Reformation, especially through the dissolution of the monasteries, had the following economic effects upon England:

(1) Customary economic action tended to be replaced, after the change, by competitive economic action;

(2) Corporate action tended to be replaced by individual action;

(3) The principal land-owning class—the squires—became much wealthier than they had been in proportion to the rest of the community.

The accommodation of these three main economic facts had the general result of substituting more and more statutory duties in local affairs for customary duties, and it affected the roads thus: where the local community had, in a customary fashion, kept up the local road as part of the old social habit the new lay owner refused. He was averse to the outlay, the Crown had less control over him, and as he was running the whole thing on an idea of profit and loss every outlay was cut by him as much as possible.

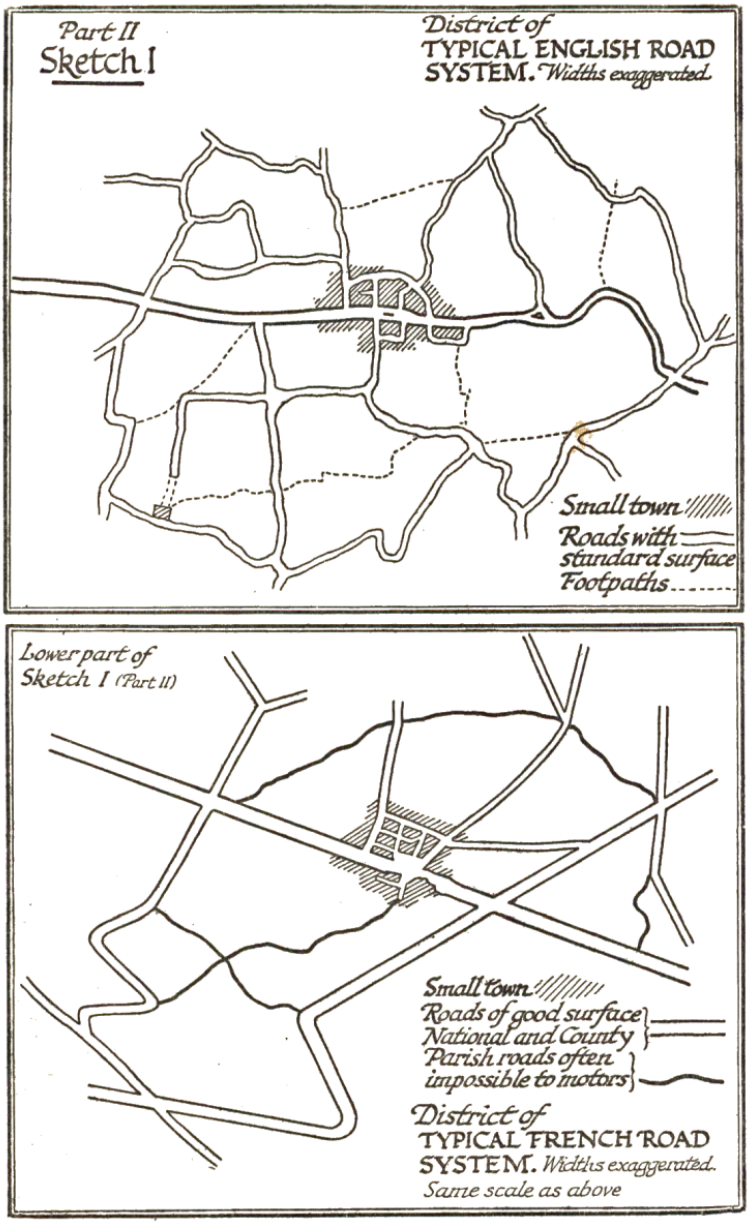
There was at the same time a revolution in agriculture, a falling off of population, the throwing together of small holdings, the growth of grazing, and the decline of tillage.

You consequently get, through the common action of all these influences combined, in the middle of the Reformation period the first interference of the central Government by direct statute in the making and conservation of the English road system. This famous piece of legislation (2 and 3 Philip and Mary, Cap. VIII) is familiar to all who deal with the law and history of the highway. It governed the constitution and maintenance of English roads right down to the great modern change in the same which falls under the general term “turnpike.” These are the main stages in the story of the Road in this island up to the present moment, when, apparently, another stage has opened.

We have for these seven chapters very different information: on the first nothing but conjecture, on the second a considerable body of evidence, on the third again conjecture, and on the fourth conjecture, though conjecture filled in from the indirect evidence of historical event. For the second mediaeval period we have even less evidence than for the first. Our knowledge begins to grow after the increase of wheeled traffic, and with the early eighteenth century becomes for the first time full and detailed.

We will now follow this development.

The English Road has a character of its own which clearly differentiates it from the other road systems of Western Europe. So sharp is the distinction that, since modern travel recovered the use of the road through petrol traffic, the new type of road he discovers is, after the language, the most striking novelty affecting the foreigner on his arrival.



Abroad, the French model—recovered from the Roman tradition, remodelled in the late seventeenth century, and vastly developed in the nineteenth—has impressed itself everywhere: the Road is there built up on a framework of very broad, straight main ways, carefully graded, proceeding everywhere upon one plan. These are connected by a

subsidiary net of country ways less direct and less broad, but all carefully planned and graded, and these in turn by local lanes of all surfaces and gradients and gauges, dependent upon parish rates and betraying by their irregularity their independence of the national system.

Typical English Lane

Here the scheme is contradicted at every point. A long stretch dead straight is very rare: when it is found it is due to some accident of local choice. The surface differs not as between the main road and local road, but indiscriminately: a small parish way will often have a better surface than the main road it joins. The gauge is haphazard: the main road between the capital and some great port will go through the most surprising changes in breadth, here appearing as the narrow high street of a suburb, and there, a few miles on, spreading to 50 feet upon an open heath, then again turning abruptly round the sharp right-angle corners and between the irregular frontages of a village. The English roads are far more numerous, the mileage of good road surface to the hundred square miles far greater, than abroad. Yet not one of them is planned throughout. They all twist, the lesser ones winding perpetually and usually without any reason of their own, compelled to such anomalies by the custom of older paths, by enclosures, by encroachments. For the most part these roads, from the most important to the least, are “blind,” that is, bounded by obstacles which mask the approach of corners and conceal the country on either side: a very pronounced national characteristic, due mainly to the

use of hedges upon the more fertile land. The grading is never continuous—the main roads in which this feature has been most thoroughly looked to yet have astonishing exceptions of 1 in 9, 1 in 8. The bridges are of varying strength, half of them bearing warnings that they are dangerous to heavy vehicles.

When we seek the origin of this strange mixture of serviceable and unserviceable in the English road system we discover it in the political history of the country. The English hedged roads yield their more pleasing landscape, they have more length to the square mile than those abroad, they are haphazard in gauge and gradient (only half planned), they have such excellent surface (and that independently of their importance), such a strange assortment of bridges, such abrupt and blind corners—all because the Road, like every other institution, is a function of society, and because English society proceeded on special political lines of its own after the Reformation.

Like the road systems of every other country, that of England arose from the great Roman military ways. It went through exactly the same phases of decline as those of the neighbouring Continent, it had the same new development in the Middle Ages, it ran through open fields mainly. A man put down on an English road of Henry VIII or Elizabeth's day would have marked no great distinction between its character and those of a Flanders or a Breton or a Provençal road, or the roads of the Rhine.

But with the seventeenth century the profound change which had worked for a hundred years throughout all English life appeared in the Road. The monarchy fell. A national road system became impossible. The local landlords took command of society. The *local* road was the only basis for development. Commons were enclosed, co-operative village farming gradually disappeared, the hedges everywhere increased in number, cutting up the old open fields. Any extension of communication could only come through the linking up of tortuous village ways.

Then came the industrial revolution, the exploitation of better surface through the turnpike, the epoch of Telford and Macadam. Lastly, the huge increase of the great towns in the middle and later nineteenth century, the coming of the internal combustion engine, and the present crisis. For we have come to a crisis to-day in the history of the English Road. It must be changed—or supplemented—under peril of such congestion as will strangle travel and interchange: that is the interest of the subject to-day.

I propose, therefore, in what follows to consider, first, how this particular character in the English Road developed: what were the

agencies which gradually made it so different from the road of the neighbouring Continent: next, to sketch very briefly and only in its bare outline the history of the English Road, and to conclude with an examination of the reforms which we should undertake and the crisis in travel and the use of the Road which has led to that duty.

CHAPTER VIII

THE "BLINDNESS" OF ENGLISH ROADS

The Two Causes Governing the Development of English Roads—Waterways and Domestic Peace: The Relation of the English Road to Military Strategy.

i

OF many of the features of the English Road we can determine the origins at once, for they are of common knowledge. The "blindness" of the English Road is due to the enclosures and the consequent increase in hedges since the seventeenth century, coupled, as I have said, with the dying out of "champion" or "co-operative" open-field farming. It is in part due, also, to that which has also been alluded to and has affected the English Road in all its aspects (surface, variation of gauge and gradient, tortuousness, etc.), the government of the squires following on the defeat of the monarchy nearly three hundred years ago. I shall touch on this again when I come to the history of the English Road.

But, apart from these obvious and well-known causes, two causes much less familiar—and yet of the first importance—two causes peculiar to this island in all Europe, have governed its development: waterways and domestic peace.

The English road system has been so powerfully affected by these two agencies—the one physical, the other political—as to have become wholly differentiated by them from the systems of the Western Continent. The natural feature then is *the omnipresence of waterways* throughout the island; and the political feature is domestic peace—that is *the absence since the modern development of roads began (during the last 250 years) of strategical necessities on a large scale*.

ii

I will take these two things in their order.

The way in which the whole history of England has been modified by the presence of water is a topographical point of capital importance to the understanding of the national life. There is no other large island in the

world which has rivers in anything like the same proportion as we have, either in number or in disposition. Most of the large islands have no navigable rivers at all. Sicily has none, Iceland has none, nor Crete, nor Cyprus, nor Sardinia, nor Corsica. Not only have we a host of navigable rivers, but they are so disposed that they penetrate the very heart of the country. The Trent, for instance, is the most arresting thing upon the map. It looks almost as though it had been specially designed to make the inmost heart of England penetrable to commerce and travel in the east. The Thames, in the same way, goes right into the heart of southern central England; and even the Severn, the rapidity of which has militated against its modern use, had a considerable use in the past and was an artery in the Middle Ages, even for upward traffic, to the neighbourhood of Wenlock Edge.

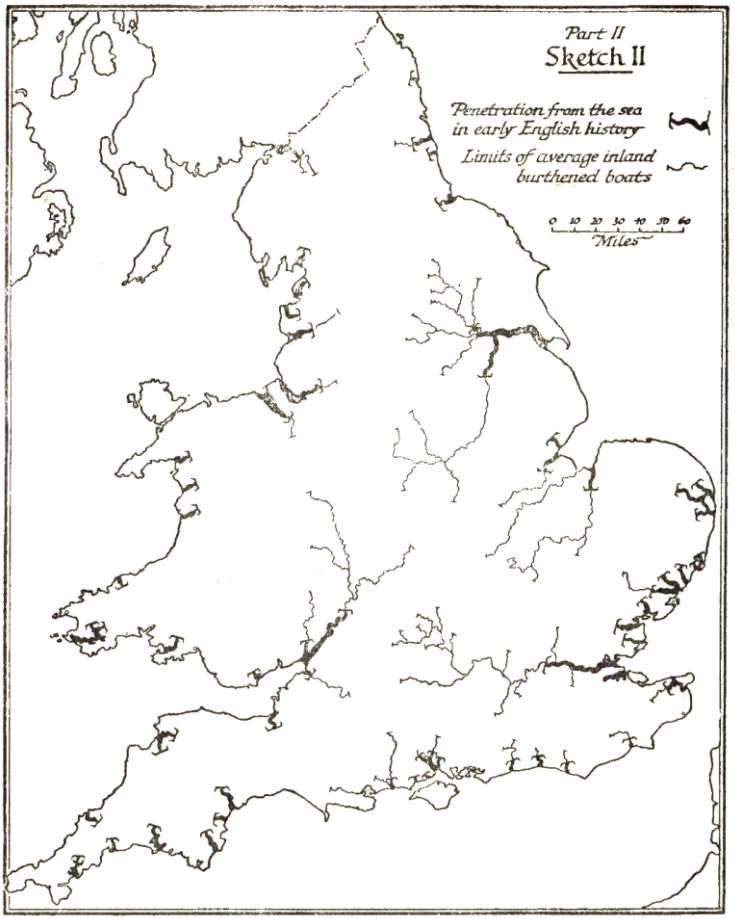
The great rivers alone, however, do not account for the most of this character. It is the mass of small but navigable streams, both tributary to the main systems and isolated along the coast, which have so profoundly affected our history. If you take one of those outline maps of England with the waterways only marked, such as are sold for use in schools, and plot out the highest point upon a stream to which a fairly loaded boat can penetrate, you will be astonished to find how small a central area is left out. One might say that the whole of England, outside the hill country of the Pennines, the Lakes, and the border, is so penetrated by water carriage that if there were no roads at all its life could, under primitive conditions, be carried on by waterways alone.

Now this universal presence of waterways, which meant every opportunity for internal traffic and also for approach from outside the island, has had two effects upon the Road. First, it has made for *diversion* —that is, for the modification of the English Road from a direct to an indirect and sinuous line. Secondly, it has *interrupted* what would otherwise be main lines of travel in the necessity under which men found themselves of turning aside for the lowest bridge upon each stream.

As to the first of these points, it will at once be observed that unless you have some strong compelling motive for driving a simple straight line you will, in a country of many rivers, avoid such a scheme and seek for the cheapest crossing of each water. You must seek a ford, or narrow, or a place with specially hard banks, and not merely take haphazard that part of the stream which lies on your direct line, and seeing that such numerous waterways involve also long numerous flats along the streams, valley floors subject to flood or formed of boggy soil, the tendency to diversion

in a road system under such conditions is intensified by the marshes which abound in a country so watered.

If you look at the Roman road system you will see how, for the considerations which I will deal with later, it usually, if not always, neglects special opportunities and takes the water as it comes, preferring an expensive straight line to a cheaper winding line; but everything done since the Roman road system has been affected by the perpetual consideration of the easiest river crossings inland, while the same influence has deflected the road round the greater estuaries and ports.



The lowest bridge over a river is a point of transformation. It stops traffic from the sea going any higher. But to carry on your journey from the sea as far as possible is obviously an economic advantage, especially in early days of expensive and slow road traffic. Therefore a nation

dealing with the sea and largely living through sea-trade casts its first bridge *as far up-stream as possible*, and that is exactly what you find upon all the rivers of England for centuries. Even to this day the tendency to build bridges lower down than the old first bridge is checked, in spite of the very strong motive we have in the development of the railway system. Take a map (Sketch II), and look round the coast and see how true this is.

The lowest old bridge of the Tyne was at Newcastle; of the Trent, I believe, at Gainsborough; of the Thames, of course, right up inland at London; of the Stour, at Canterbury; of the Sussex Ouse, at Lewes; of the Arun, at Arundel; of the Exe, at Exeter. The deep arms of Plymouth Sound were unbridged until the railway came; so Fowey river and the Fal, unbridged to this day; the Severn is not bridged at all till Gloucester, nor was the Dee till Chester.

Now this had the effect everywhere of checking a direct road system and deflecting the ways everywhere to suit the convenience of the ports. And there again we find, for reasons which will be given in a moment, the Roman roads directly crossing estuaries, but every subsequent road system going round them. Take two examples. The Roman road to the north, which runs all along the ridge of Lincolnshire, strikes the Humber where that stream is from 2000 to 3000 yards wide, crosses by a ferry, and continues on the far side.

The Roman road system of Kent did the same thing over the Wansum when that stream was—as Rice Holmes has proved—a broad estuary 3000 yards across, with Richborough as an island in its midst. The Roman road from Dover and the one from Canterbury met at a point opposite Richborough, whence a ferry took people across to Richborough.

Again, the Roman road to the lead mines of the Mendips ends at the wide mouth of the Severn, and is carried on again on the far Welsh side. But every road system since has gone right round by Gloucester, and the inconvenient effects of this, as road travel develops and water carriage declines, are very noticeable to-day. In all that southern coast of Devon between Lyme Regis and the Exe, if you want to get round to the maritime south-western bulge of the county you must make an elbow through Exeter. Similarly the Sussex coast, now so crowded, has only been linked up quite recently by bridges: the one at Shoreham was built within living memory, the swing bridge at Littlehampton is an affair of the last few years, as also the swing bridge at Newhaven of this generation. For 1500 years no one could proceed along that coast continuously from, say, Portsmouth by Littlehampton, Shoreham, Seaford (later Newhaven),

Hastings, Rye, without turning inland to cross at Arundel, at Bramber, at Lewes, at Robertsbridge. One of the subsidiary effects of this interruption was the comparative ease with which the coast could be attacked from the sea, for the difficulty of rapid concentration upon any one point, in the lack of lateral communication, handicapped the defending force by land. All through mediaeval history the Sussex coast was raided from the sea. So much for the effect of waterways, the main physical cause of diversion in the English Road.

iii

The political cause of diversion has been, as I say, the negative effect of an absence of grand strategy in modern times. There has been no grand strategy in this country since the Romans, because there has been no fighting of a highly-organized type within the island during the whole of its post-Roman history. There was a great deal of barbaric fighting in the Dark Ages, and a great deal of feudal fighting in the Middle Ages. Even in the beginning of modern organized warfare you had (on a very small scale, it is true) the civil wars.

But since then—that is, during the whole of the period in which modern road systems have developed (1660 onwards)—there has been no necessity for strategical considerations to affect the English road system at all, and, therefore, no political force strong enough to compel direct roads was present in opposition to the strong economic motive for diversion.

The result is an anomaly that might well become serious if we had to depend upon our road system under the threat of invasion. Look, for instance, at the two great handicaps, the Humber and the Thames. A force standing up to meet a threatened landing which might be directed against Kent or against East Anglia would be divided into two sections, deprived of road communication save round through London. During the War a temporary bridge was thrown across the Thames (in the neighbourhood of Tilbury, if I remember aright), but, of course, with a gate for traffic. In normal times you could not have such a thing. The water traffic is too great and too confused. But what you could have would be a tunnel, and though the necessity for it may never arise it is also true that should it arise we shall bitterly regret not having driven that tunnel. The same remark applies with even greater force to the Humber. An attempted landing on the north-east coast of England, threatening alternatively the Lincolnshire and Yorkshire coasts, would find the defending force cut in two, and were the strategics of this position to become acute we should regret the lack of

a road tunnel under the Humber, just as we should regret the lack of a road tunnel under the Thames.

The third principal case, that of the Severn, is partially met by a railway tunnel—the Severn Tunnel, far below Gloucester. A road tunnel would hardly suggest itself here. There is not a sufficient "potential" for it on either side of the stream. But here again it might well happen that under the particular circumstances of war we should regret the absence of it.

This negative factor, the absence of a strategic "driving motive," has also left the windings of the internal road system at the mercy of the easiest crossings of the rivers, and we see how different the thing would have been under a strategic scheme. Consider the Roman contrast. The Roman roads of Britain were principally military. The whole scheme of Roman government was military, and the life of all that civilization was founded on the army. With the marching of men rapidly and easily from place to place as the main motive of the builders, the roads follow those great straight lines which, while duly seeking a formula of minimum effort, never sacrificed to it directness of plan. As we have seen, even at the great estuaries Roman engineers preferred a supplementary ferry to continue the road rather than deflecting it round by the first bridge.

In this connection, however—that of estuaries—there is one case which is puzzling: the case of the Thames. An explanation can, I think, be found, though at first it looks anomalous. The Romans dealt with the estuary of the Severn and of the Humber by ferries; they dealt by long bridges with lesser obstacles. In the same fashion they carried the north road over the Trent by a direct line without deflection for a special crossing. They carried it across the Tyne at deep water approached steeply. They carried it across the Thames at Staines with a sole regard to the direction of their road and without considering special opportunities of crossing. They did the same at Dorchester; and instances could be multiplied all over the kingdom. But apparently they did not attempt to attack the Thames estuary.

When one considers the nature of the early fighting during the first conquest of the island by the Romans this is astonishing. All the campaigns began in Kent, and the more serious of them were carried on into East Anglia. The great rising under Nero was an East Anglian rising, and the Roman armies beaten there had to be rapidly reinforced from Kent. For 400 years troops poured in, under any special emergency, from Dover, came up through Kent, and any immediate necessity of reaching a

point east of London necessitated a detour by London Bridge: though time might be vital, the deflection was suffered.

Why did the Romans not solve the difficulty and establish at least a ferry across the lower Thames? Of course, they may have done so. You can never argue from the absence of traces to-day that a Roman road did not exist, for it is astonishing how thoroughly time eliminates such things. There are whole great towns like Aquilea and Hippo of which not even the foundations remain to-day. Even in England, where Roman survival is most marked, two towns, Silchester and Uriconium, have gone save for a few ruins; and there are great stretches of Roman road in every country of Western Europe which have mysteriously and wholly disappeared without leaving a trace of the tremendous work undertaken to build them; for instance, the miles after Epsom racecourse. Still, it does look as though no direct Roman line connected Canterbury, for instance, with Colchester. And I say again, how are we to account for it?

I think the explanation lies in the disposition of the marsh lands on the lower Thames. If you take the map of the Thames below the Isle of Dogs and mark upon it all that must have been primeval marsh (including much that is still marsh) you will see that wherever hard land is found upon one bank it is faced by extensive swamp upon the other. There was no good position for a permanent crossing even by ferry, and in the whole military history of England we only know one doubtful case in which a junction was effected from south to north, which is in the pursuit of the defeated British army by the Romans in A.D. 43 under Aulus Plautius. If, as is probable (though not certain), that battle took place at Rochester, then the pursuit was carried on by a direct crossing of the lower Thames; but with that exception I can call to mind no military action in the whole of our history where the lower Thames did not prove a permanent obstacle.

It is an amusing speculation to think what would have happened to the road system of England if strategic necessity had appeared again during the modern period. The thing is purely hypothetical, but I might make a few suggestions.

In the first place, we should certainly have had a road linking up the southern coast; next, we should certainly have had some form of continuous traffic over the lower Severn and the lower Thames and the Humber; next, without doubt, there would have been pierced a broad, continuous, and fairly direct road from the plain of Yorkshire to the plain of Lancashire across the Pennines; next, we should have had, of course, a broadening of all the ways leading to the main ports. That would have

been essential, and particularly to the ports of the Straits of Dover. But, as I have said, the whole thing is a dream, because not that strategic motive, but now a purely economic motive is compelling us to revise our system.

iv

Apart from these two main causes of waterways, and of the absence of strategic necessity causing the diversion of the English Road, and apart from all other causes of local government which have led to such extraordinary diversity, lack of regular gradient, lack of regular gauge, etc. (as distinguished from the road system under the monarchical and centralized governments of the Continent, and especially of France), we have certain other elements which have stamped the English Road with its particular character.

They may be briefly recapitulated without developing any one of them. We shall meet most of them again in the historical sketch of the English Road.

There is the dampness of the climate; there is the extraordinary diversity of soil within a comparatively small area, so that road-making material continually differs within a few miles—for England is, of all European countries, that in which there is crowded upon a small space the greatest, sharpest, and most frequent diversity of soil and landscape; there is the increasing density of population in modern times, which has had a profound effect upon our road system. There is the political factor of Parliament; for since the defeat of the monarchy in the seventeenth century no direct order could be immediately obeyed until there quite recently grew up the new powers of administration. Between, say, 1660 and the Premiership of the late Lord Salisbury we may say that any important public right, including the making of a new way and expropriation of land for it, fell under no immediate authority but had to be referred to the lengthy and expensive process of a Committee, called Parliamentary, through which the oligarchy of Great Britain worked.

All these things have affected the development of the English Road, but most of all, let it always be remembered, these two main causes, which have been, in my opinion, far too little recognized—the waterways, peculiar to this island, and the absence of modern strategic necessity, also peculiar to this island.

CHAPTER IX

FIVE STAGES

The "Potential" in Political Geography Examples: The Primitive Trackways: The Roman Road System: The Earlier Mediaeval Period: The Later Mediaeval Period: The Turnpike Era.

i

LET us next turn to a very rough sketch of the development of the history of the English Road: the stages through which its development has passed, measured, not from cause to effect, but in time.

Before turning to this I would first define the use of a certain word already used which will recur and may be unfamiliar to some of my readers. It is a word taken as a metaphor from physical science, and one of the utmost value in political geography. It is the word "potential."

We talk of the "potential" between two commercial centres, or between a capital and a port, or between a mineral producing region and an agricultural region, or between a region whence barbarians desire to invade fertile civilized land and the centre of the fertile civilized land which desires to defend itself, etc., etc., and our use of this word "potential" is drawn from the doctrine of physical science that energy in open shape, energy at work, is given its opportunity by the tendency of two points to establish a communication: the tendency of two separate situations to establish unity, the tendency of a hitherto "potential"—that is, only "possible," not yet "actual"—force to realize itself. For instance, you will have a highly charged electrical area tending to discharge itself by the line of best conduction. You will have a head of water creating a "potential": a reservoir a hundred feet above the valley has to be connected with the floor of the valley by a tube to turn the potential energy into actual energy and to drive a turbine.

Now, in the development of the road system we metaphorically use this word "potential" in just the same fashion. For instance: there was originally no bridge across a river because the people in the town on one side of it had no particular reason to cross to barren land upon the other. The town gradually developed into a holiday resort. The only place for a

good golf links was on the far side of the river, and visitors who lived in the town during their holidays wanted to go during part of the day to the golf links. A "potential" was established. Thus there has always been a most powerful "potential" between London and Dover, between the great commercial centre of the island and the port nearest to the Continent. That is a "potential" which has worked throughout the whole of English history. We can watch other potentials at work in different periods arising and dying out again. For instance, during the Norman and early Angevin period there was a very strong "potential" between the middle north coast of France and the coast of Sussex, with a corresponding development of traffic. The principal people in England were also great land owners and officials on the coast immediately opposite. That "potential" died down until the revival of modern steam traffic. Again, there is a "potential" to-day between any coal field and any centre of consumption of wealth distant from that coal field. So there is between any coal field and any great port. Again, you will have a strategic "potential." A particular point of no economic value may be of the utmost strategic value. The holding of it may make all the difference to the defenders of the frontiers, and in that case a "potential" exists which is the driving motive for a road between the capital and the point in question.

With this note in mind we can proceed to some sketch of the history of the English Road.

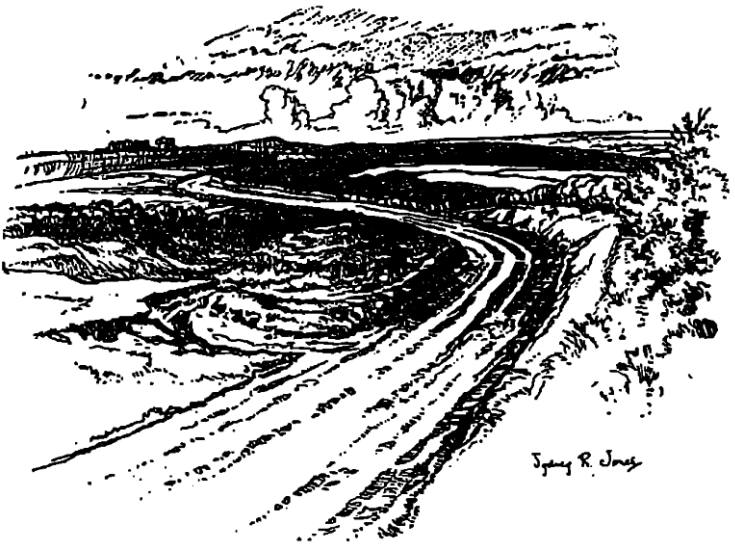
ii

The development of the English Road up to the present turning-point in its history, following, as we have seen, the political story of the island, falls into five divisions.

A.—First came the primitive trackways, the chief of which must have been artificially strengthened, and some of which may have been, in sections at least, true roads up to the Roman invasions.

B.—Next came the Roman road system, which was presumably developed in the second century of our era. This is the framework of all that followed. All our roads from that date (eighteen hundred years ago) to modern times have sprung from and have grown in connection with this original set plan or framework. That is true, no doubt, of all western countries, but it is especially true of England. The English road system is the product in every age of the great Roman scheme, the relics of which are more marked in England than they are anywhere else in the world.

This point is the master point of the whole story. It is a point upon which popular history has completely lost its way. Popular history represents the Roman occupation of this island as an accident, a sort of interlude between the native British period and a later and separate "English" period which arose upon the invasion of the country by German tribes from beyond the North Sea. That is not the history of England at all. The history of England is the history of a Roman province.



The Earliest Road

England began by being, like everything else in the North and West, barbaric. It was civilized from the Mediterranean and made a part of the Roman Empire—that is, of one common civilization—one great state stretching from the Grampians to the Euphrates, and from the Sahara to the North Sea. This civilizing imprint of the Roman Empire Britain has never lost.

Our civilization fell into decay, as did that of the whole of the rest of Europe. The decay was not due to the pirate raids from North Germany and Holland any more than it was due to the raids of the Scottish Highlanders, which were just as frequent and violent, or the raids of Irish pirates from the west, which were at one moment so severe as to put up a separate realm on the west coast of this island. The history of England is continuous, and its foundation, from which we get all our institutions, more than half our language, all our ideas and religion and the rest of it, is

in the 400 years of high civilization between the landing of the Roman armies and the breakdown of the imperial system in the West.

The Roman Road is the true and only root of the road system of Britain. All our local roads can be found developing slowly from the Roman roads of the district which had preceded them, and it is nearly always possible to trace the causes which led to each particular local system. In each you find the Roman Road is the backbone of the affair, and the later local roads existing only as developments of and changes from this basic Roman plan.

C.—The third division is one for which we have little direct, but plenty of indirect, evidence, and the remains of which are with us upon every side. It is the growth in the Early Middle Ages, presumably from about the Angevin period, of the mediaeval road system which was the deflection and extension of the old Roman road system. At the end of the Empire, during the Dark Ages (*i.e.* from the fifth to the eleventh century), though the Roman road system had remained the only available one, it had decayed, and numerous modifications of it had already appeared; but with the Early Middle Ages those modifications seem to have grown prodigiously, and the indirect network of local roads would then seem to have arisen.

D.—The fourth chapter is even more obscure. It is a partial decline, only affecting certain districts, and affecting some much more than others: a decline which corresponds more or less to the end of the sixteenth and the beginning of the seventeenth century. It went with the flooding of the fen lands, with the breakdown of central authority, the increase of local interests, and so on.

E.—The fifth chapter is the great revolution in road planning and construction which may be called the turnpike era: beginning early in the eighteenth century and flourishing at its close.

The turnpike system continued to develop with continual changes through three or four generations. It survived the competition of the railroads. It was vastly improved by the new local legislation of from forty to twenty years ago. It left us with the road system we now enjoy, which must, under the pressure of quite recent changes, be modified if our communications are to be saved, or, at any rate, to keep pace with the present conditions of travel.

CHAPTER X

THE TRACKWAYS

The Three Divisions of the British Pre-Roman Road System—The System of which Salisbury Plain was the "Hub": The System Connected with London: Cross-Country Communications—The Three Factors which Have Determined Travel in Britain.

i

THE origin of the trackways is, of course, unknown, and can only be guessed at by inference; but their character, and especially the geographical causes which determined their trace, we can establish on the largest lines with some accuracy.

We must not lose ourselves in that kind of speculation which has been so dear to the academies, and which is usually very futile. As to the order in which the development took place we have no evidence whatever: for instance, as to the date of the founding of London, or of its size before the Roman occupation; nor have we similar evidence with regard to any of the centres of England for the uniting of which roads would arise. But we have relics of the trackways before us. We have the geographical conditions almost unchanged, and we have the indication of Roman roads clearly based upon particular existing trackways, and therefore suggesting what the scheme was before the Roman engineers set to work.

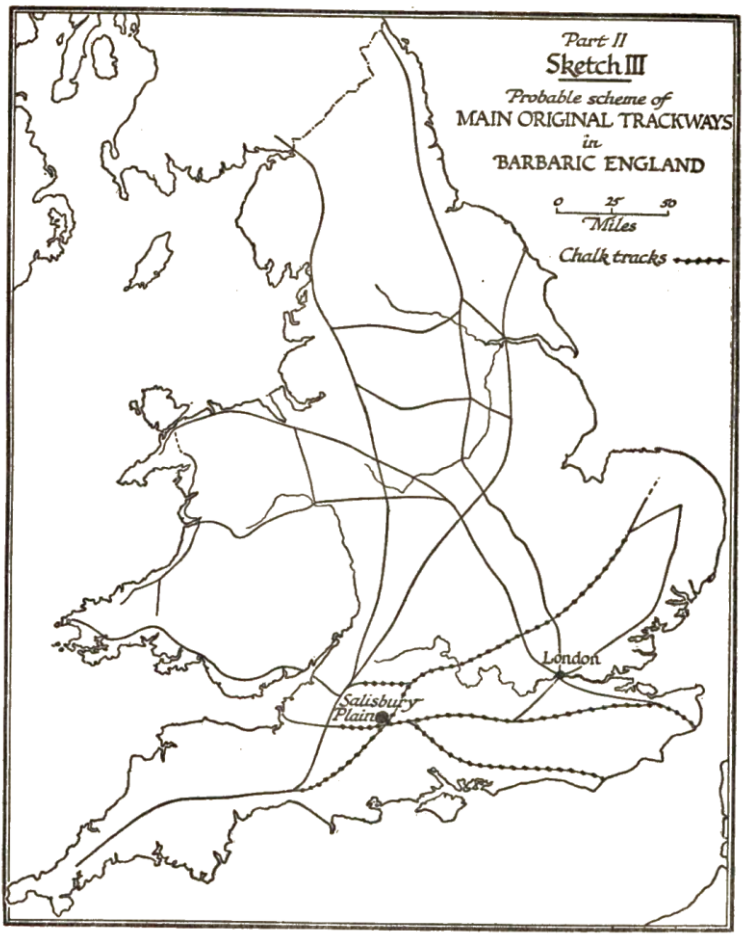
Roughly speaking, the British pre-Roman road system fell into three divisions.

There was, first of all, a division (possibly the earliest to develop of all) which had for its "hub" Salisbury Plain, and from that centre a whorl, rather than a wheel, of diverging approaches to the coast.

There was, secondly, the system turning upon the crossing of the Thames at London as a "hub." It is this second system which was so largely developed in the historical period and which still governs our main roads and railways to-day.

Thirdly, there was the series of cross-communications, of which the most important by far was the track leaving the Exe and making for the Humber.

The British trackways formed along these three systems discovered and used the best passages of the rivers, some of which the Romans changed, to which they added a certain number, but which, in the main, they retained. They also indicate, though less certainly, the town centres which have remained through the centuries the same, and they were also determined by the main centres of agricultural population and, to a much less extent, by the presence of mines.



The system of which Salisbury Plain appears to have been the "hub" we presume to be the earliest because it was dependent almost entirely upon surface: good going over dry land. It is to be presumed that the earliest system would be that prevalent when men were less able to give artificial aid to the Road, to harden it, to construct causeways or approaches; when they were less able to drain marshes; when they had not

yet cleared forests. Now, of all the soils which make up the surface of Britain chalk is the best surface for this purpose. It has two characters which give it this character. In the first place, it is self-drained and always passable even in our wettest seasons; and, in the second place, it does not carry tangled undergrowth, and even its woods (which are not as a rule continuous) are commonly of beech—the easiest of all woods to pass through in travel, from the absence of scrub beneath the branches.

It so happens that the chalk is, in this country, distributed in great continuous lines and compact areas which lend themselves admirably to the development of an earlier track system. You can follow chalk with little interruption from the open central space, Salisbury Plain, south-eastward to the Channel, to the Dorset coast ("Dorset" from the country of the "Durotriges," a British tribe whose name survives in that of the modern county[1]), and the first in order of the tracks led there. The chalk could equally be followed to the neighbourhood of Southampton Water. A third line led along the confused Hampshire chalk to the definite ridge of the Sussex Downs, and so to the harbours of the Sussex coast and of Kent.

[1] Our shires were *probably* originally British, and later Roman, divisions.

The fourth, with some interruption, led along the north downs to Canterbury, whence tracks would radiate to the ports of Kent.

A fifth followed the Berkshire Downs and the Chilterns, and so led on to the Wash and earlier parts of the Norfolk coast, which have now apparently disappeared in erosion.

The sixth line led with more difficulty (and has been more obliterated by later Roman work) directly westward to the mines of the Mendips, and to the borders of the Severn estuary. It could not take advantage of the chalk beyond Wiltshire, but it had fairly dry going along the ridge of the Mendips.

The seventh, it must be presumed, though the traces are largely lost, used the height of the Cotswolds; but here the soil, being oolitic and not chalk, was much less favourable and the extension northward ceased earlier.

This system, then, we regard as the earliest of all.

The second system, as I have said, seems to have been connected with London, but here the later track of the Roman engineers and the continuous development of nearly twenty centuries has left us little to go on save conjecture. There are points in that conjecture, however, which are fairly certain. But there seems to have been, from the earliest time, communication between north and south on the lowest crossing of the Thames. Now, the lowest permanent crossing of the Thames, even before a bridge, was in the neighbourhood of London.

The crossing of a river is determined by the hardness of the land upon either bank, as we have seen, more than by any other factor. The lower Thames everywhere had extensive marshes either upon one side or the other, and usually upon both. At Grays, Tilbury, Erith, etc., the hard ground approached right up to one bank, but was always countered by extensive marshes on the other, or by marsh behind gravel, forming a sort of island of hard land which could not be used for continuous travel.

The first good crossing-place was at Lambeth, and it is generally assumed that the earliest of all the tracks took the stream here, for the alignment of the main approach from Kent through Canterbury, Rochester, and Shooters' Hill does not point at the centre of London, but at Lambeth. This, it is presumed, was the track followed by what is now Park Lane, and so ultimately north-westward by the Edgware Road and its continuations to Chester, with a branch thrown off through the pass between the marshes of the Mersey and the Pennine range in the district of Manchester, and so on through Lancashire. But at some very early stage there was established a crossing below Lambeth in the neighbourhood of London Bridge, even before that bridge came into existence. It is true that there is here a belt of marsh on the right bank, but the considerable gravelly hill on the left, or north, bank there would give an opportunity not to be lost. It had three great advantages: it was a large area of dry land for settlement; it had defences all round it—marshy land to the north, the Fleet to the west, the Lea to the east; it had a considerable area for the drawing up of boats, and a steep shore for wharfage. Under these conditions, whenever men could first construct a causeway it would have been worth while to have been at that labour across the Southwark marshes in order to establish a permanent crossing by ferry, and later by a bridge, upon the site of London Bridge. At any rate, from that centre—London Bridge—at some very early period you get trackways radiating.

There is the main one, in the first place, through Canterbury to Dover and the Kentish ports. Next, there is the eastern one to Colchester, along

which the chief Roman invasion marched to the capture of that town, which was the capital of the enemy.

WELSH SECTION, HOLYHEAD ROAD

iii

Next, we may presume (for evidence is lost, especially under the later Roman work) there was a track towards the centre of Norfolk. Next there was some great road going northward east of the Pennines, following the dry land which skirts the Fens and reaching the great fertile plain of York, and so on northward through Durham up to the crossings of the Tyne. Where this original main track went we cannot say. We know the trace of the Roman road which followed it. We may presume that the divagations and modifications of this road of the Dark Ages and the Middle Ages, which ultimately built up our main road to the north, reverted in some degree to the original track. But the whole thing is guess-work. One thing seems fairly certain: this eastern road to the north (the twin to the great north-western road by Chester to Lancashire) must have split about half way to York, one branch making directly to the plain of York itself, the other obviously running along the inevitable ridge which points right north through Lincolnshire to the Humber. There is here no bridge possible. It is not too broad for a ferry. But though the Roman road, superseding the earlier trackway, went on northward, it is a fair guess that the original trackway stopped at the river.

Of cross roads we have fragments, of course, in the Pennines, but we know nothing of their history. It is clear that the main cross communications between the peopled area of the Yorkshire Plain and that of the Lancashire Plain must have gone over by Shipley—the obvious gap in the chain. But more we cannot tell. That is the natural way, and there was, so to speak, no avoiding it. What was mainly used further south we cannot tell. It was a tangled land. There is no clear and certain trace of cross communications which must have existed across the Midlands south of Trent. We do not know what great patches of wood may here have determined the windings of an original road. There are no serious obstacles (it is high land and dry, with no marshes or large water courses), but there was less reason for continual traffic here from east to west than there was for traffic from north to south; therefore there was less "potential" than was created by the traffic on cross communications further south.

The original system of tracks radiating from Salisbury Plain was simple. They led, in radiating lines straight and curved, directly to the lower Thames, to the ports of the Channel, to the southern estuaries, to the north-east—that is, to the Wash—and to the north direct by the Cotswolds. But true cross communication was lacking to this set, and was provided by the great road from the Exe to the Humber, which still survives in the form of the Fosse Way. It runs throughout the whole of our history, from very long before the first records nearly to the present day, and is to-day traceable throughout, and used in many places as a hard road. This main track was one of the dominant factors in the character of English travel. It has decayed under modern conditions because its "potential" has gone. There is no driving power to-day urging travel from south-west to north-east, and it is only in partial experiments and the linking up of separate lines that even our railway system serves that end. But before modern times the Fosse Way played a very great part. For some reason there was a perpetual necessity for passing from the south-west—Devon and Dorset—to the north-east coast. Two permanent potentials, that between north and south and that between east and west, help to explain the Fosse Way.

England has always tended to fall into two cross divisions—a northern and a southern one, separated at first by climate (the northern more rude, the southern more gentle), then by agricultural conditions, the northern far less peopled, the southern more peopled and more wealthy; and to an eastern and western division separated by type of landscape, to some extent by climate, always to some extent by soil, difference in race, emphasized whenever an invasion came from the Welsh lands on the one

side or from the North Sea on the other. The Fosse Way broke both those cross divisions and was a sort of "reinforcement" (as they say in modern concrete), taking the strain of cross tension across the island.

iv

In this short sketch of what were in some cases certainly, in others only presumably, the original British main tracks we have to note three factors which have always determined travel in Britain: the centres of internal economic production, the ports, and the Channel crossings.

Before the modern industrial system the economic centres of production were the wheat lands, and these were the open land of which Winchester was the centre, the Dorchester centre, Somerset, certain separate centres in the Midlands (separated by great woods which have disappeared and their exact site not certain), the Cheshire Plain, the Lancashire Plain, the great Yorkshire Plain, and last, and most important of all, East Anglia—the central Eastern plain (Essex in particular) was the granary of the early time in England. Tracks connected all these places: they also connected the centres of population with the ports. Every one of the tracks makes ultimately from port to port. You have a connection through London (earlier perhaps, as we have seen, through Lambeth) between the port of Kent and the north-western ports (of which Chester is the great original example and Liverpool the modern); between the north-eastern ports of the Humber and the Tyne, and the south-western ports at Southampton Water and Poole (which was of great early importance, and whence we shall find a Roman road starting). Further west the mouth of the Exe was a more important approach to Britain in the past than it is now. You have also the estuary of the Severn, ill provided with natural harbours but forming in its upper reaches a harbour of its own, with the peculiar advantage of the lower Avon, with a secure pool at Bristol approached by the curious and exceptional gorge at Clifton.

Lastly, you have the great port formed by the crossing-place at London, made, as we have seen, by the tendency of early travel, right up to the appearance of railways, to penetrate a country as far as possible by its waterways and to carry cargoes well inland, because water carriage was so much cheaper than land transport.

The third factor—that of river crossing—also has its effect, though a lesser one, upon the trace of the old British ways. If, for instance, you carry along any one of the tracks which follow the chalk you will see how carefully the water crossings were picked. It is the characteristic of chalk that the rivers lie transverse to it, cutting gorges through the hills, and each

of these crossing places was chosen where hard land approached from either side. The chalk (and the sand associated with it) provides at certain points in the valleys twin spurs approaching the water on either side; hence you have the track along the north downs crossing the Wey at St. Catherine's Chapel (and alternatively by Guildford); and, again, the Mole at Pixham, near Dorking, and the Medway at Snodland (with an alternative at Rochester). The southern track along the Hampshire and Sussex Downs takes the Arun at a similar advantage and opportunity at Houghton, and alternatively at Arundel. It takes the Adur at Bramber, the Ouse at Lewes.

This vague sketch of the old trackways is all that we can lay down so far as their main lines are concerned, and it is very imperfect, but we must bear it in mind in order to understand the Roman system, which was largely based upon those trackways and which superseded them.

There was one kind of soil, and one only, which could compete with the chalk as good going for primitive travel, and that was sand. Had we sand in continuous lines in Britain it would have given a dry passage for the trackways, and here and there advantage is taken of it by such trackways. But sand, in point of fact, is not to be found in these continuous lines. It comes in patches, and hence we cannot talk of any one of the great trackways as dependent upon a sandy soil. The chief exception that I can call to mind in this respect is the run of the old Pilgrims' Way—a prehistoric track from the neighbourhood of Farnham to the crossing of the Mole, near Dorking. Though chalk lay on the main direction, it seems to have preferred the southern dry sand to the chalk immediately north of it, and it keeps to the sand until the cessation of that formation a short distance west of the Mole. There is here a curious piece of political geology which has been, I think, of great effect upon the history of England. Had the ridges of sand through the weald of Sussex been *continuous*, the weald would have been developed early. Its iron industry would have furnished a basis for export, and it would have become one of the centres of population. There are ridges of sand which you can trace all the way through the weald from close by the Hampshire chalk in the neighbourhood of Midhurst right away to the valley of the Rother. But they are not continuous, and the interruptions are formed of deep clay, impossible to pass in winter. The result of that lack of continuity has been that no such track ever developed through the weald of Sussex. Sussex, therefore, owing to the stiff clay of its weald, remained cut off from the rest of England, and that throughout all the Dark Ages. It falls out of the national history. Indeed, the linking up of Sussex with the north was only effected by the Romans at the cost of great labour through the artificial

causeway of the Stane Street between Chichester and London; and after the breakdown of western civilization in the fifth century there was no regular approach to the southern coast from the Thames valley in a direct line. The traffic either went westward down towards Southampton, Hampshire, Dorset, and Devon or eastward to the Straits of Dover. The Norman Conquest and the rule of the Angevins restored Sussex to something of its rightful place in English communications because the coast of that county lay immediately opposite the centre of the foreign region which then governed England, but the interlude was not lengthy. In the later Middle Ages and on to quite modern times (to the middle of the eighteenth century) the interruption due to the clay made itself felt again, and only the railway and great increase of population have been able between them to restore direct and frequent communication between the Thames valley and this part of the southern coast.

CHAPTER XI

THE MAKING OF THE ROMAN ROAD

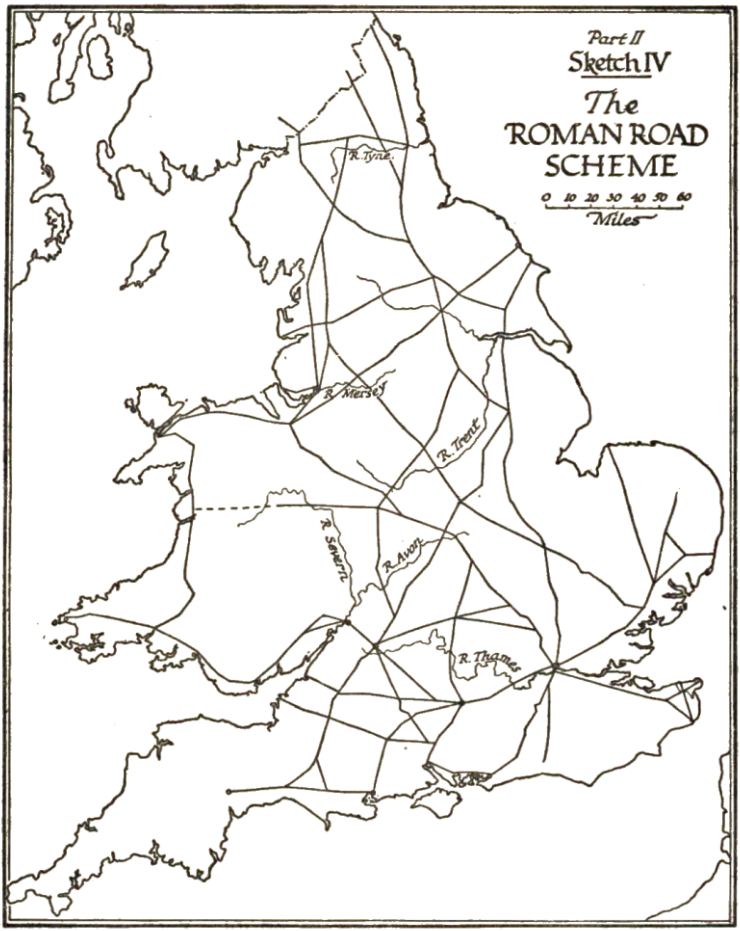
The Great Initiative: The Mark of the Roman Military Engineer: The Theory and Practice of the Straight Line: Modifications of the Straight Line: How it was Carried Out: The Method of Odds and Evens.

i

THE making of the great Roman roads was the one great initiative in the story of English communications: it originated all that followed, and there was no new real development, no essentially new departure between the planning of that military scheme and the coming of the railway. It can only be compared to what the future may have to show if we find ourselves able to reform our roads as they should be reformed for the new conditions of modern travel, and even this change would not be anything like as great as the change made by the throwing of those great highways to stand for ever across a country which had hitherto been half barbarous.

The Roman Road had a structure and character of its own which it has retained to the present day, so that even where it was only the straightening and the strengthening of an old trackway upon which it was founded it would follow the mark of the Roman engineers throughout all that remained of its course. It was essentially a piece of *building*, and in this the Roman Road differed from every other form of communication before the modern railways. It had to be of this kind on account of two things which the Roman military engineers particularly desired to serve, both of them connected with the military character of the west. First, they wanted a platform, raised, as a rule, above the surrounding country, so that troops passing along it should be the less liable to attack: so that a view could be had from it over the immediate surroundings, which were cleared: and so that any sudden stroke against a marching column could be checked. The raising of the way had other objects, of course—it kept the surface dry, for instance—but the main object was that of security upon the march, and the same object was one of the reasons for making the roads as a rule in straight lengths or limbs, sometimes two, three, or even four days' march in extent. A road was planned without windings, so as to

be safer from ambush and surprise, and where it had coupled to its straightness its elevation above the surrounding country the chance of ambush or surprise was almost eliminated.



But the habit the Roman military engineers had of driving their roads in these great straight limbs, which are still so clearly marked, served many other purposes besides this military one of which I speak. It has been condemned as a waste of effort, for it is clear that a winding road, avoiding steep gradients and turning difficulties of marsh or wood, requires less effort to construct, mile for mile, than an artificially straight one; and that even when you have allowed for the extra length of a winding road, the formula of least effort will never give you a long straight. But your straight road has *the great advantage of rapid planning*.

The Roman engineers, especially in the north—that is, in Belgium, Gaul, and in Britain—were working under campaign conditions, or in countries but recently occupied. They were under an imperative necessity of providing good communications as quickly as possible, and *for that object* the straight road was obviously the best. Once you had determined the two points which you had to join, you established a track between them and carried it over all but the worst obstacles, taking all but the worst gradients. If you met marsh, you built a causeway; whenever you came to a river crossing, you threw your bridge; when you came to a sharp, narrow ridge you made a cutting. All that meant labour, but as in any case you were intending to make a great built, constructed, raised structure along the whole trajectory the extra labour involved in a straight trace was not proportionally as heavy as it would be for one of our ephemeral modern roads. In other words, the Roman engineers set out upon a plan necessarily expensive. They set out to make a great public monument, as it were; and the extra expense of its straightness did not weigh in the bill.

ii

A modification of this tendency to straight lines is found proceeding from three causes. First, where and when an established track already existed and the Roman work was only required to harden and strengthen it. Even there the Roman engineers would straighten portions which were too winding to fit in their scheme. But, apparently, where the track was fully established they tolerated a good many curves, especially if their work came some time after the conquest, when the land was settled.

The second modification of the plan is to be found in hilly countries. In the mountains or very hilly regions the Roman engineers of necessity gave up the straight line, and as these regions were also the districts where on the heights large garrisons were least necessary they were the better able to abandon their general military plan.

If you look at a detailed map of the Roman road system in Gaul or Britain you will see how the moment it comes to a broken district the straight lines are replaced by a waving trace such as you would have in a modern English road. For instance, beyond the Fosse in Dorsetshire and Devon the Roman coast road is as winding as any modern road can be. The same is true of the crossings of the Apennines, and, of course, of the crossings of the Alps and the Pyrenees. It seems to be equally true of the Ardennes gorges, but the trace here is often so much obliterated that it is difficult to say exactly how the Romans dealt with that mixed problem of wood and ravine.

The third modification was that of gradient. The Roman Road would take a very steep gradient indeed; but there was a limit, and when the slope was too steep the road diverged or zig-zagged, or took a combe in a great curve, or swept round the base of a hill. We have examples of all these points upon the map of England, the best of which, I think, are the great sweep of the Stane Street on Bignor Hill in Sussex and the great loop round Down Barn, north of Andover, on the road from Winchester to Glo'ster.

The greatest ingenuity was shown by the planners of the Roman roads in the choice of trace. Granted that you were to make a trajectory of many days' march in large straight limbs, each limb had to be thought out very carefully, straight though it was, to yield something like a minimum of effort. You had to make your turning-points, or hinges, in the system at places where the straight lines joining them would cross water or hilly country to the best advantage, and it is astonishing with what skill these terminal points of the straight limbs were chosen. For instance, that one road of them all which has been most certainly of purely military use and designed to join Chichester with London (all of which I have worked out some years ago and on which I have written a monograph),[2] has its first bend from Chichester, just after the end of the first day's march at the crossing of the Arun on Burgh Hill. The angle of the bend is one of seventeen degrees, the direction is north by twenty-two degrees east. Now, this direction of the two limbs which join at Burgh Hill exactly secures two things essential to the minimum of effort. One plain straight from Chichester to Leith Hill would have involved heavy effort in gradients and water. This plan of two limbs meeting at the Arun crossing gives every advantage:

(1) It makes the road cross the intervening range of the downs just where, by a slight curve, a reasonable gradient can be used;

(2) It makes it cross water and marsh at the narrowest point between Hardham and Pulborough, and at the same time just avoids the double water crossing of the Arun and the Rother. It is true that there is here something of a coincidence, but it was plan and survey which discovered that coincidence.

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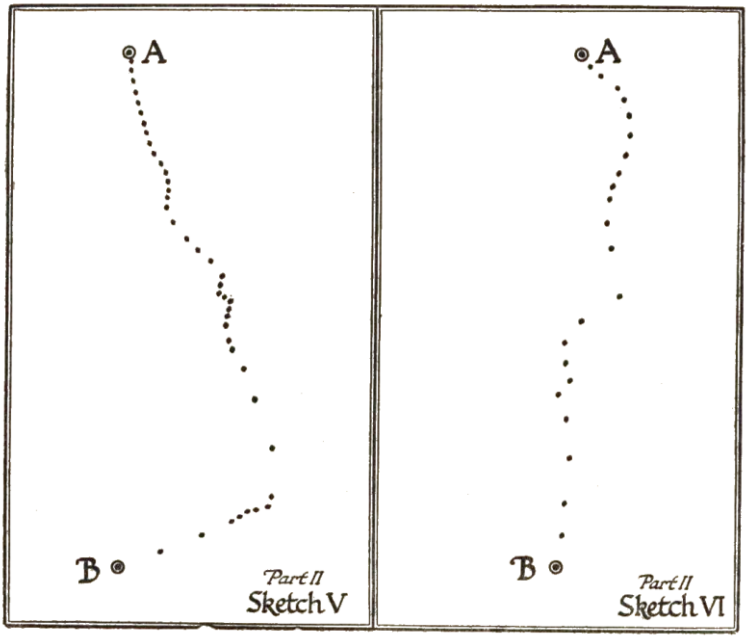
[2] *The Stane Street.* Constable and Co.

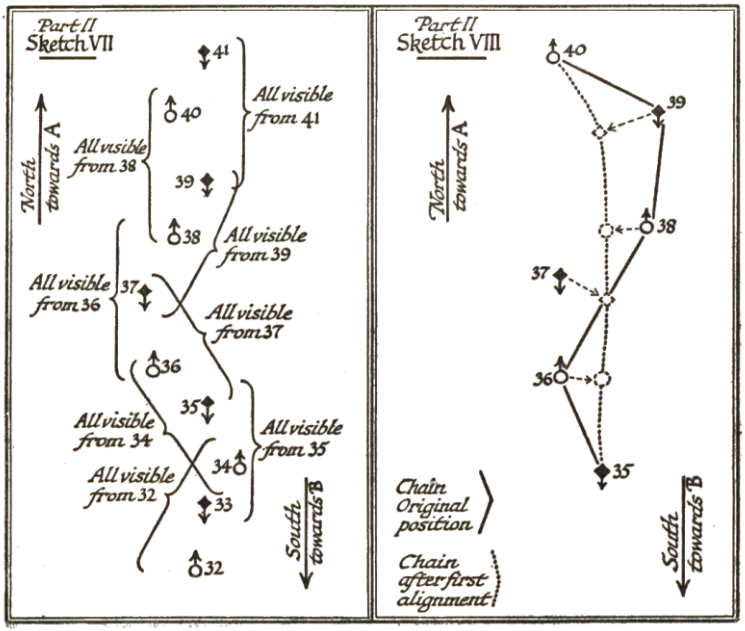
How were these great straight limbs plotted out? That is a question which has been fully debated but not yet settled. Where two ends of a trajectory were in sight one from the other the matter was simple enough; but what was the method used when the straight line exceeded the horizon: when it was carried on, for instance, for more than thirty miles, as is the case over and over again in the great north-eastern road from Paris to Cologne, and in the road from Amiens to Boulogne? What was the method when, even for lesser distances, one end of the trajectory could not be seen from the other on account of intervening hills, or where in flat land forests were sufficient to impede the view?

One theory has been that of smoke signals, a method which has been found of use, I believe, in barbarous countries in our own day. We must, I think, certainly reject it in such a climate as ours. Such signals could only here be used upon a few days in the year, specially picked, and the Roman engineers would not have depended upon the caprice of the weather. There has also been suggested (I adopted that suggestion myself in the monograph of which I have just spoken) the use of high movable platforms, but I now think that this also should be rejected on account of its clumsiness, and of the fact that in an uncleared country it would often be quite impractical. The most probable method was suggested to me by a correspondent some years ago, based upon his own experience in the planning of roads in new countries. It is the method of *odds and evens*, and requires some description with the aid of a simple plan.

Suppose that you have to construct a straight line from A to B, A and B not being visible one from the other, and the distance between them being considerable. If you have plenty of men with which to work (and the Roman military commanders did not lack these), you will proceed as follows: You send out your men from either end, in two chains as it were, each individual easily in sight of his next neighbour, but not nearer to him than is necessary for the observation of signals. These chains of men are either directed from the two ends of the line, or, if you can work only from one end, you send them out from that end, instructing the head of the chain when he comes in sight of the other end to work towards it and establish himself there. At the end of the process, whether you have been working with two lines approaching each other from either end and joining hands in the middle, or from one end only, you will end up with a line which will certainly not be straight—on the contrary, very irregular—but which will at least join your two goals. Probably, if you had been working from both ends, A and B, you would have something like sketch VI; while if you be working from one end only—A—the head of your column would probably

be widely out at the conclusion of your experiment. Your column would have to double back sharply on to its goal when at last it was caught sight of, and you will have some such trace as on sketch V.





At any rate, having established this rough winding line, you next make the men number themselves as a line does when it is dressing, by odds and evens, or by ones and twos, so that the first, third, fifth, seventh man, etc., counting from one end make one lot, or all the ones make one lot, if you are going by ones and twos—and the second, fourth, sixth, eighth man, and so on, make another lot. You bid one of these sets—say the odds—to face towards one goal—say B—and the other set to face towards the other goal—A. Lastly, you bid them space themselves out so that any individual of one set can at least clearly see his fellow in the same set along the direction to which he faces, and the man of the other set in between. For instance, No. 39, looking south towards B, must be able to see No. 37, who is facing the same way as he is, and must at the same time be able to see No. 38, who is facing towards him; similarly, No. 38 must be able to see No. 40 clearly, and No. 39 in between. It is clear that in thick, "blind" country (as, for instance, in woods or in tumbled land) your men will have to stand fairly close together. But in open country they can be at considerable distances—up to half a mile or more; so long as every unit can see the next unit of the same set clearly, and have his signals received by the unit of the other set in between, the conditions are satisfied. Your line being thus instructed (and, as anyone may discover in practice, it is not a very long business once the first rough chain has been established), *the numbers of each set signal to the intervening numbers of the other set alternatively to move to right or left* until a straight line is locally established.

For instance, in sketch VII you begin with the "evens," looking northward. No. 38, looking north towards No. 40, sees that No. 39 (who faces him, looking south) is somewhat too much to the east and does not stand properly between him and No. 40. He signals to No. 39 to move westward as along the dots until No. 39 is at a new position, shown by the dotted circle exactly between No. 38 and No. 40. Next, No. 36 signals to No. 37, who is too much to the west, until No. 37 is exactly between himself and No. 38. When this has been done all along the line by the evens the order is given to the odds to repeat the process from their new positions. No. 39, looking southward from his new position at the dotted circle, sees that No. 38 is too far to the east to be in perfect alignment with No. 39's next odd neighbour No. 37, at whom he is looking, southward. No. 39 signals, therefore, to No. 38, who is looking northward, to move westward, and No. 38 does so until the signal stops him, when he is just in line between the new positions of No. 39 and No. 37.

It will be evident that after this first stage of the process the original irregular line between A and B will have been much straightened. You have but to repeat the manœuvre half a dozen or a dozen times to get the whole body of men into a strictly straight line between the two extremities many miles apart, and that although those in the middle cannot see either extreme and neither extremity can see the other. In theory this method can be used for an indefinite extent of country. In practice it seems to have been used (if it were indeed that upon which the Roman engineers relied) for spaces sometimes as great as a three days' march, and quite often as great as one day's march or more.

iv

The scheme of Roman roads, following in the main these great straight limbs, covered the whole country, and was for the most part completed, we may presume, by the end of the second century.

It must not, of course, be imagined that these great military ways were the only means of communication in Roman times. Many historians have fallen into that grotesque error, with the result that history becomes meaningless to their readers. These great ways were only the main arteries, which were linked up in all the intervening spaces by a mass of local ways not specially constructed or engineered—most of them presumably aboriginal, and also maintained presumably by a local authority.

CHAPTER XII

THE DARK AGES

The Decline of the Roman Road: The Period at its Occurrence: Gaps: Roman Roads which Fell into Disuse: The Relationship of the Modern to the Roman System: Watling Street: Stane Street: The Short Cut Between Penkridge and Chester: Peddars Way: The coming of the New Civilization in the Twelfth Century.

i

THE next phase in the development of the English Road is the very gradual breakdown of the great Roman ways. The Dark Ages —that is, the 500 or 600 years between the fifth and the tenth or eleventh centuries—formed the period during which this process took place.

The Roman Road in England suffered the fate of all our ancient civilization. It very slowly declined and coarsened, but it remained the one necessary means of communication. We have no dates and no contemporary record after the fourth century for Britain, but we have the analogy of Northern France, in which we know that the upkeep and repair of the great Roman roads continued until well into the seventh century, and we have the evidence of the Roman roads as they now stand before us, with the result of their very gradual and only partial breakdown in a use of centuries. We have also the fact that much the most of the great battles took place on or near the Roman roads until the twelfth century, that most of the new great monastic and other houses were built near them, or on them, and that the ports most commonly used in the Dark Ages were nearly always ports with a Roman road serving them. We can thereby roughly judge (although we have no direct evidence) what happened to the system.

In the first place, the Roman Road was so solidly built that centuries of neglect did not entirely destroy its usefulness. Sections of each road disappeared: some from causes which are easily explicable, some under the most obscure conditions the causes of which it seems impossible to discover. Every great Roman road in Europe, and even those in Britain (which are better preserved than those in the most part of the Continent) shows these gaps. Sometimes a whole great section of road will almost

entirely disappear—more often it is a stretch of a few miles. Thus the whole of the short cut through Penkridge to Chester, which certainly existed and some elements of which can be reconstituted, has disappeared; so that most maps of Roman Britain erroneously mark the connection between London and Chester as going round by Shrewsbury. As an example of a short part utterly disappearing, one can take any one out of hundreds; the best example near London (typical of many others) is the gap in the Roman road between the Epsom racecourse and Merton. The road is evident as a clearly marked high embankment above the steep rise at Juniper Hill near the Dorking road to within a mile of Epsom racecourse. Then it suddenly ceases. There is no change in the soil. It is on chalk before and after its disappearance; and yet, just here, at about a mile from Epsom racecourse, it completely and totally disappears. There is no trace even of its foundation left from thence onwards northwards until you get to the site at Merton (which was slate land and almost certainly the last camp and halting-place on the road before London).

How the road crossed the marshes of the Wandle we can only conjecture, as we can only conjecture where it lay exactly between Epsom and those marshes. Why it should disappear in the marshes is evident enough. The causeway sank in. Why it should disappear under the plough to the south of the marshes, as Roman roads nearly always do on arable land, can also be explained. But why it should wholly disappear on the last mile or two of chalk is inexplicable. One theory put forward is that in the great wars of the Dark Ages portions of the road were deliberately destroyed to impede the progress of an enemy, just as a railway may be destroyed in modern warfare. But this theory will hardly hold water. The gaps that have disappeared thus, often come just where you have the best soil for marching independently of artifice, and where, therefore, an interruption of them would least incommode an advance. For instance, they are perpetually found on high chalk; and, further, the disappearance is hardly ever connected with a defensive position.

From the point of view of the development of the English road system much the most interesting point in the fate which befell the Roman roads is to be found at the crossings of rivers, especially of rivers which have marshy banks or flow through wood or sodden valleys. The neglected Roman embankment across the marsh fell out of use in the Dark Ages. Probably the bridge first broke down, and the barbarous time had not the energy or skill to repair it; then the mere process of time caused the swallowing up of the Roman viaduct, unrelieved by repair, in all marshy

land. It is difficult to affirm a negative, but I can recall not one example of a long Roman viaduct still wholly in use across such an approach to water.

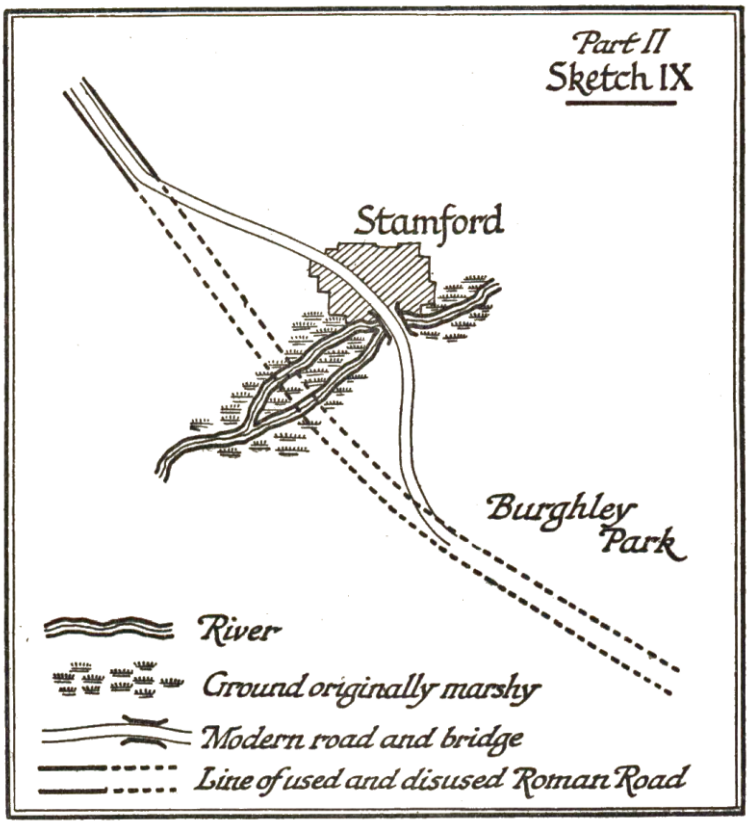
A Derelict Road
Scottish Highlands

What happened, then, in these sections was this. The bridge and the viaduct disappeared in the Dark Ages—that is, some time between the fourth and the eleventh centuries. Sometimes this gap led to the complete isolation of the district immediately concerned. The best example I know of this is the breakdown of the crossing of the Arun at Romans Wood, in the county of Sussex. There the Roman road was a hard causeway over very thick clay land, quite impassable for armies in winter, and rapidly overgrown by oak scrub and thorn when neglected. The result of the breaking down of the Roman bridge at the "Romans Wood" crossing was to isolate West Sussex. There was no other way from the north, for the clay and thorn scrub rapidly arose and obliterated the road. It was in use as far south from London as Ockley; but the breakdown of the bridge at Alfoldean broke the continuity further on, and that, I believe, is one of the reasons why Sussex was so isolated as only to be converted to the Christian religion a hundred years later than the rest of the country.

But to return to the behaviour of the Roman Road in the marshy approaches of a river. I say that the embankment having been swallowed up and the bridge broken, the men of the Dark Ages had to find for themselves some new way of crossing, and it is interesting to note that

they here fell back upon the primitive methods common before Roman civilization came. They abandoned the straight line and picked their way by the driest bits they could find, so that the new crossing of the marshy district grew up sinuous and haphazard. Later, when the new road system developed with the Middle Ages, this new road was often straightened and a new bridge thrown across the river upon its line; but, save for a very few exceptions, the Roman approach had disappeared.

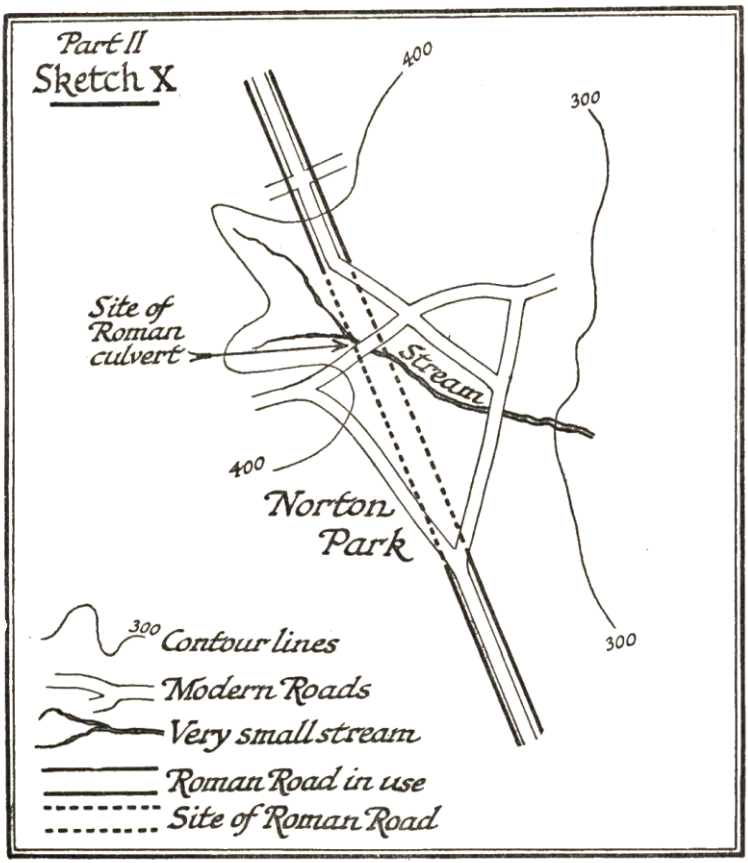
There are scores of examples of this up and down the country. The most prominent usually bear such names as Stamford, Stanford, Stafford, Stratford, Stretford, etc., all of which come either from the word "street" or the word "stone," coupled with the word "ford." They thus signify that in the valleys of the river the "going" or passage had been hardened artificially with stone derived from Roman work. A very good example of the way in which the newer track replaced the older one is to be found at Stamford, in Northamptonshire. The accompanying sketch shows the trace of the Roman road from its leaving Burghley Park to the old crossing of the river and beyond. There are still broken traces of the old embankment on the north side of the stream, but it is clear that this straight line across the marsh broke down, that a new way was picked out and slowly hardened, and a new bridge built to suit it. What the men of the Dark Ages did here was to keep to the drier patches to the east where a ford crossed the river, and then curve round again westward, again to join the road on the heights north of the river. This new passage took over the name of the "Stone" ford, where the old road had crossed. A bridge was thrown in due time across the new ford, and the town shifted towards the new bridge and acquired its new name from the crossing.



One form of the Roman Road, and one only—a very rare form—never disappears: it is the cutting through hard sand. Here and there in England—I know not how often, but I have myself found few traces of them; I should doubt if there were much more than a dozen—you get a clear cutting upon a Roman road serving no modern or useful purpose, and almost certainly dating from the construction of the way. There is the trace of the one at Ashurst, near my home—that with which I am most familiar and which I have measured most carefully. If the cutting be made in dry sandy soil of fair consistency and hardness, it can remain almost indefinitely with an unmistakable outline. There may naturally have been many other cuttings originally in softer or more yielding soils which have got filled up, but the only ones I know are through sand, which soil also tends to form those sharp ridges through which a cutting might suggest itself as more economical than a too steep gradient.

The Roman Road not only disappears through causes which I have called inexplicable and under the obvious influence of marsh or of cultivation, it also fell into disuse, even where it did not disappear, for reasons both explicable and inexplicable. There are causes where the falling into disuse is frankly not to be explained, though these I have found mainly upon the Continent. For instance, in the road from Rheims to Chalons you have the Roman road running almost parallel to the later road, the later trace having been made for no reason that we can discover —not serving any new towns or villages—a mere duplicate of the old way. But there are more cases where the disuse of a section of the Roman Road can clearly be explained by the need for visiting centres of population, production, and commerce. The Roman system for the serving of places off the main straight road was by side roads perpendicular to the main road. The relics of these you still see on many of the Continental roads—a direct perpendicular lane or avenue joining up the château and its dependencies or the neighbouring town with the main highway. When the Dark Ages came and the main roads degraded, the by-lanes and paths which had grown up as offshoots to them and which led to the estates and villages and towns and ports and quarries, etc., to one side or the other of the Road came to be used more frequently. The main travel between distant towns was less, the local travel grew more important in proportion. And as this development proceeded sections of the Roman Road tended to fall into disuse. The local roads would be maintained and the section of main road would be left unrepaired.

We have seen that the main cause of the breaking down of the Roman Road was marsh and the crossing of river valleys. Not only was this process true of natural marshes, especially at the sides of a river, it was true of a special case which is reproduced over and over again on the map of England, and for which I will take as a particular example a very fine case near Norton Park, in Northamptonshire.



Here the Watling Street, the great Roman road from London to the north-west, crossed the valley of an insignificant stream; there was no marsh originally, and there is none to-day. There was only a small running of water, over which a culvert was thrown. The stream ran under the main Roman embankment through this culvert. Now, when the Dark Ages came and the roads fell into disrepair the first things to go, naturally, were the culverts. They got blocked up. Once they got blocked up the water dammed up on the higher side and began to undermine the embankment. By the time this had made the road, though still standing, impassable, travel had found a new way, usually *down the stream* away from the mere thus formed. Further centuries and the recovery of civilization cleared the ground: the embankment either was washed away or swallowed up in the mere and its subsequent marsh, the stream resumed its original course, the dry ground reappeared, but the trace of the Roman road upon either side across the depression was lost for ever and there was substituted for it the

modern road, making a curve out of the direct line and only recovering it again after the obstacle had been passed.

iii

The gradual decay of the Roman Road in the Dark Ages was not everywhere the same, and the consequence is that the remaining fragments of Roman roads are connected in different ways with the modern road system which gradually grew out of them.

There are four types—overlapping, of course—of the fate attaching to the Roman roads of this country. They are, as I have said, the root of all our road system. All English roads subsequent to the period of the Roman occupation have grown out of the great network laid down for ever by the Roman engineers. But the fortune which the original road suffered, the way in which a modern system developed from it, were not uniform. There were four divergent developments, which ran thus:

(1) The Roman Road is preserved as a basis of the modern road, and remains a main artery: of this the great example is the Watling Street, in the first few days' marches north-west of London.

(2) The Roman Road remains clearly the basis of the system of local roads which developed from it, and, though disappearing in sections, is, upon the whole, preserved; of these the great example is the Stane Street road from Chichester to London.

(3) The Roman Road, having produced a system of local roads based upon it, has almost entirely disappeared and has left the local system alone to witness to its original importance, just as filigree work remains after you have melted away the core of wax upon which it was built. Examples of this are very difficult to discover, precisely because the original country has gone. But the process can be followed here and there by a careful examination, and I think that, upon the whole, the best example is that of the series of roads which grew up out of the short cut between Penkridge and Chester.

(4) The Roman Road remains, in some parts at least, but, its original purpose having been such that it was of no continual use in the Dark Ages, the local system of roads can only indirectly be referred to it. Of this the great example is the famous Peddars Way, running through East Anglia.

iv

(1) The preservation of the Watling Street as an example of a continuously used Roman road for several days' march north-west of

London is due to various causes.

In the first place, it was very little interrupted by marsh. It ran everywhere on dry land, and the main cause of breakdown—the swallowing up of a causeway after the destruction of its bridge—did not affect it. But this is the least of the causes which have preserved this piece of road.

Second, and more important, was the establishment along it of set stations which remained inhabited, and the chain of which was not interrupted by active warfare. Watling Street here presents very interesting evidence of what really happened during those early pirate raids which are generally, but erroneously, called the Anglo-Saxon Conquest. They did not so seriously disturb the life of the country as to break down this main artery of communication. It lies transverse to the raids, and yet it was maintained. And in this connection we must also note the continued importance of London.

Great Roman towns suffered, of course, from the pirate raids between (somewhat before) the year 500 and the year 600, as did all the rest of the island. They suffered not only from those raids of pirates across the North Sea, but also from the raids of pirates from Ireland, and also from the raids of Highlanders coming over the wall from the north. But though they suffered they kept their place in the national scheme. No province in the Roman Empire lost less of its town sites in the Dark Ages than did England. No part of Europe has so large a number of old towns based upon Roman foundations: and London was the chief of them all. London may have been disturbed by the raids—it probably was. There was probably a certain amount of looting from time to time, and a good deal of fighting outside its walls, but it always maintained its permanence, its character of being the economic centre of the island. It is particularly noticeable that every great Roman road out of London has remained intact, and Watling Street beyond others.

The third cause of survival was probably the excellence of the original construction, though here we must hesitate a little because we cannot but note that the Great North Road to York, which was quite as important and which was twin to the north-western road, has suffered very grievous modification indeed. But there can be no doubt that the construction of the Watling Street was very thorough, and that this expenditure of economic effort preserved it through the Dark Ages as much as anything did.

Oddly enough, what is in most cases the strongest motive of all for the preservation of a road was here entirely absent, and that is what I have

called the "potential" between the two terminals. When there is a long and continued motive for joining up two terminal points the Road has a cause of survival superior to any other. There was, and remains to this day, an extremely strong "potential" of this kind between the ports serving the Channel straits, with their nucleus at Canterbury, and the economic capital island at London. It therefore, as the Roman road between the one terminal and the other, remained permanent throughout the centuries, with the exception of the deflection towards the Thames which grew up in the Dark Ages to serve the landing places at Gravesend. But such a "potential" is entirely lacking for the north-western road communication—so far as we know—to go between London and Chester. The trade with Ireland ceased almost during the early Dark Ages. The north-western road led nowhere. If it was preserved, therefore, as it *has* been preserved, it must have been due to other causes which escape us. There it runs, however, still almost uninterruptedly used, from the Marble Arch in London to Oakengates in Shropshire, and in places still acts as part of the main artery leading from south-east to north-west.

v

(2) STANE STREET. The Stane Street (which I must be excused for quoting so continuously as I know it in great detail) is, I think, the leading example of a road still remaining for the most part and clearly showing how the later systems were built up upon a Roman backbone.

I will take the liberty of recapitulating here my argument, developed at greater length in my monograph on this Way. The original motive of the Stane Street was the connecting of the Chichester Harbours, and indirectly of Portsmouth Harbour, with London by a road which should overcome the difficulties of the Weald. The Weald is a mass of stiff clay, impassable to general traffic for six months of the year unless one uses artificial means. Left to itself it turns rapidly into a waste of oak and thorn scrub: save in the dry months, there is no going over it in its natural state for armies or bodies of wheeled vehicles. Its water courses are numerous, muddy, difficult of approach, and soft at bottom. It produces nothing save in moments of high civilization, when it can be heavily capitalized by draining and penetrated by expensive artificial communications. The supply of good water is rare and capricious. The Weald was, therefore, the great obstacle between the south coast and the Thames. Because it was such an obstacle the Romans drove their first great road from the main harbour of Portsmouth to the capital round westward by Winchester, Silchester, and Staines; but they needed a supplementary road, for two

reasons. First, they wanted a short cut to serve Portsmouth and the lesser inlets collectively called Chichester Harbours (Bosham appears to have been an official port throughout the Dark Ages); and, secondly, they wanted to be able to reach quickly for purposes of travel and commerce the very fertile sea plain of which Chichester is the capital. Therefore did they construct the most purely military and most direct of all the Roman roads in the island, the Stane Street. It ran from the east gate of Chichester in a direct line to the crossing of the Arun at Pulborough, with a camp at the end of this first day's march to defend it; thence it made in another great straight limb for the shoulder of Leith Hill, with a camp at the second crossing of the upper Arun at Romans Wood; thence by a series of much shorter limbs to the third camp at Dorking; thence over the Mole at Burford Bridge and over the Epsom Downs past the racecourse to the fourth camp at Merton, and thence to London Bridge—a five-march stage.

In the Dark Ages the Weald became impassable again, the causeway on the Arun marshes broke down and was swallowed up. The bridge at Alfoldean broke down, and Sussex was isolated from the north.

Further, with the absence of any exit for direct and rapid communication between Chichester and London the meaning went out of the road between Dorking and Merton. Merton was close enough to London to give the road vitality again, and between this and London it was never lost. It runs to this day, and is the main line of tramways upon which people still travel from Streatham and Balham to the Borough. It is only deflected at the end by the intricacies of the Southwark streets.

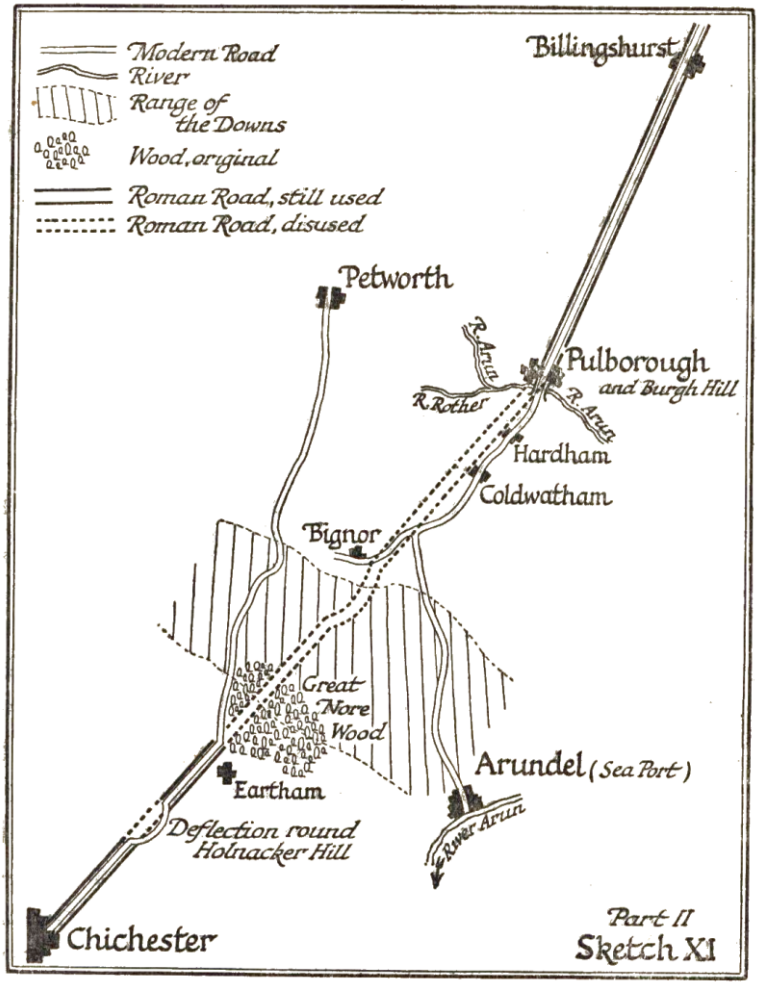
Now, if you look at the present scheme of roads surrounding this original Roman core they look at first as though they had no connection with it, but when you examine them in detail the way in which they grew up out of the Roman road is clear. Every deflection can be accounted for, and the development of the local systems from the original continuous backbone becomes evident.

First you have all Sussex south of Pulborough Marsh, and again south of Alfoldean Bridge, isolated.

What happens?

There remained no reason for using the Stane Street as a continuous line. It now led nowhere. When it meets with its first great obstacle going north, the woods near Eartham, it makes for the next centre of population —Petworth, where there was a fortified post going back to some very early time. The wood deflects the road towards Duncton Hill (I have quoted this example in my section on vegetation in the earlier part of this

essay). Beyond Petworth it had little function, so this first ten miles of the Stane Street becomes the parent of the local Chichester-Petworth road which grew up out of it, leaving a gap where the woods intervened. Next you must note the local roads beyond this gap. Pulborough Bridge probably survived, but the causeway could not be kept up, or was ill kept up. In its original line, when it served the camp at Hardham, it ran over a wide part of the marsh. In the Dark Ages men picked their way over the narrowest part of the marsh and then followed the hard bank above the Arun-flooded levels, linking up the villages as far as Bignor. But there the use of the road ended. The "potential" was from Pulborough to the nearest seaport, which was then Arundel. And all that the Roman road did in this section was to throw out this bow or curve of lateral road eastward between Pulborough and Bignor, the line of main local travel being diverted from Bury over Arundel Hill and so seaward.



In the section north of Pulborough the Roman road still served a few scattered homesteads in the Dark Ages up to Billingshurst at least, but again it led nowhere because the bridge at Romans Wood was broken down and the high weald beyond was a mass of scrub growing on stiff clay. The road petered out and began again with harder going near Ockley. But it was not used over the shoulder of Leith Hill, because that trace subserved no local use and yet compelled the traveller to steep gradients. Travel was deflected round the base of the hills to Dorking, linking up the more populated part where the water springs were. This new trace, growing up obviously out of the Roman road, opens up to the eastward for a mile or two of the way until it joins up in the heart of Dorking itself, where the third camp was, out of which the town of Dorking has grown,

and where in the churchyard the Roman road can still be traced passing through. From Dorking onwards one might have imagined that it would have survived all the way to London. Why did it not do so?

It was a matter of gradients and of centres of population. In the Dark Ages, when there was little necessity for making a direct line between Dorking and London—no continual marching of great Roman forces, no conveying of orders from a centralized government—men took the easier way. They abandoned the up-and-down of the spur of land lying immediately north of Dorking and went round by its base to save the trouble of the little climb. They used the Roman bridge (which apparently survived at Burford), but the very steep leap up on to the Epsom Downs they abandoned, especially as the further progress of the road over the chalk connected no centres of population. The way curled round by Michelham and Leatherhead and came round to Epsom—all places suitable for centres of population with low water levels and no heavy gradients in between. The Roman road on the high waterless chalk above was left abandoned.

Ermine Street near Royston

What happened between Epsom and Merton has been already described. There is only one divergence in this section, which is where the road of the Dark Ages deflected somewhat to the left and was used to avoid the low wet ground below Clapham Common. For the rest it maintained its use.

(3) The best example I know, as I have said, of a Roman road the evidences of which have nearly disappeared, but round which local roads have grown and which can still be identified as the core of these, is the short cut between Penkridge and Chester. It is very puzzling why the Roman road should here have disappeared. It is perhaps best to be explained by the continual fighting between the Eastern and the Western troops, which must have ravaged all that country between the first of the raids and the full conversion of England to civilization and the Christian religion which was the work of the seventh century.

But, whatever the cause or circumstances, the phenomenon is quite plain. The local roads developed for purely local purposes on either side of the original Roman line, and that line, since there is no longer required any continuous traffic along it, disappears.

vi

(4) Lastly, we have the Peddars Way. It has presented a very difficult problem to all historians, but I think a solution is to be guessed at, though not to be too strongly affirmed. The Peddars Way runs as a main artery right through Suffolk and Norfolk. Its origin was clearly Stratford St. Mary's, on the southern edge of Suffolk, and it was built to link up that water crossing with some harbour now disappeared on the Wash. Its use has dropped out; local roads are only concerned with it in a short section, and men argue thus: why was it ever made, and, if made, why did it fail as a means of communication? I think the answer is military. The Peddars Way never linked up any centres of population. It goes through land where men have never built cities or even large villages. But what it would do as a military road, what I think it was designed to do, was the holding of all that solid block of East Anglia which apparently exactly corresponds with the territory of the Iceni. For we must remember, as I have said above, that our county system is probably Roman in origin, and most of it corresponds to tribal divisions earlier even than the Roman administration. It is a point that has often been denied, but those who deny it fail to remark the analogy of the Continent, the evidence of Kent, Sussex, Dorsetshire, and Essex, apart from the striking list of that mass of counties which all centre round a Roman town or a town grown up as the suburb of a Roman town —Leicestershire, Worcestershire, Huntingdonshire, Gloucestershire, etc.

The Peddars Way cuts right across East Anglia through its very centre, so that a chain of stations along it commands the whole territory. It further divides that territory into two—a territory which was the scene of a great revolt in the beginning of the Roman occupation. It continued to subserve

a certain function to the very end, because from it as a base one can radiate to threatened points upon the coast when the pirate raids began in the middle of the Roman occupation.

When, in the Dark Ages, the whole island fell into districts, fighting one against the other, each with its local king, the whole a chaos and a welter, the Peddars Way entirely lost its meaning and value. There was no longer one government or one army. There was no need for the controlling of a subject populace, for the populace had ceased to be subject save to its local chiefs. Such few men as still came over the North Sea were not, until the Danish invasion, enemies, and as the Peddars Way served no line of villages or of towns it fell completely out of use.

There is one very curious puzzle about this famous road, and which has never been settled, and to which I offer no more than an attempt at solution. We are fairly certain that one of the great Roman stations for the repelling of raids lay at Brancaster, upon the Wash. Yet the Peddars Way does not make for Brancaster, but for a point about four miles to the east along the coast. Why is this? There has been suggested a ferry across the Wash, but that hypothesis cannot be entertained. The distance is one of eleven miles over very difficult water, and leading to no important district. We have, I think, the key to the position in the presence of a harbour which has been destroyed by erosion. All that coast has been modified perpetually during the last two thousand years through the vagaries of the sea. Of the great harbours of the Middle Ages, Dunwich to the south has disappeared, Orford is blocked and is decayed. Yarmouth, on the other hand, has grown up from a shingle bank into a town, and Breydon Water has changed from an estuary into a land-locked broad. I cannot doubt that there was some harbour at the end of the Peddars Way which the sea has destroyed. Brancaster, the military post, was established near it, but not actually within its confines, for some local reason, the character of which we have now lost. We must remember that Brancaster is a late fortification and the Peddars Way was settled before Brancaster came into being.

vii

We must imagine this process of gradual local development continuing uninterruptedly throughout the Dark Ages, the Roman roads serving local purposes gradually ceasing to have continuous use save for the Fosse Way, the Watling Street, and one or two of the other greater roads: the local ways, very ill maintained, growing up out of the Roman system. When the Dark Ages came to an end, and when the mediaeval civilization succeeded it—that is, in the five great centuries between the Conquest and the

Reformation—this new system of local ways was hardened and became the national system which we still inherit.

When I say the mediaeval system I mean the system which must have had its origin, or, at any rate, its mainspring, in the twelfth century, and which substituted for the use of the decayed Roman roads a competing system of roads no longer identical with them, though originally based upon them as a framework.

Here again we have no direct records, but we have indirect evidence sufficient for our purpose. The twelfth century was the moment when civilization was arising again everywhere throughout the west, and nowhere more strongly than Britain. That was true of the architecture and town life and education, and of letters, and, we may justly presume, of the road system as well.

Again, from that date onwards you begin to get sites unconnected with the old Roman road system, and their number increases rapidly as the Middle Ages advance. Again, we learn from any amount of evidence the comparative rapidity of travel after the Dark Ages, and that even over roads which certainly were not Roman. We can trace it in the marching of armies, the transport of grain and other provisions, and the travel of individuals.

We may take almost any district in England and discover for ourselves by a little study how the mediaeval road system, which continued to develop until the change in its use by the turnpike, grew up out of the Roman Road, and we can thus show how the Roman road system is at the foundation of all our English ways.

There was no regular plan or order in all this. Local usage, local necessity developed the tortuous network, and has left its stamp upon the face of England.

CHAPTER XIII

WHEELED TRAFFIC AND THE MODERN ROAD

The Transition from the Horse to the Vehicle: The Distinctive Mark of the Later Seventeenth Century: The Turnpike System and the Making of the Modern English Road: The Underlying Idea of the Turnpike and its Effects for Good and Ill: Its Decline and the First Emergence of the General National System in 1810: Thomas Telford and His Work: The Movement Connected with the Name of Macadam: The Coming of the Locomotive and its Results on Canals and Roads.

i

THE next great change came with the change in local government to which I have alluded. It gave us the first Acts of Parliament, taking the place of the old customary upkeep of the roads, but acting, oddly enough, at a period during which the road was declining everywhere. Even the civil wars did little to amend what had become a badly decayed scheme of communication.

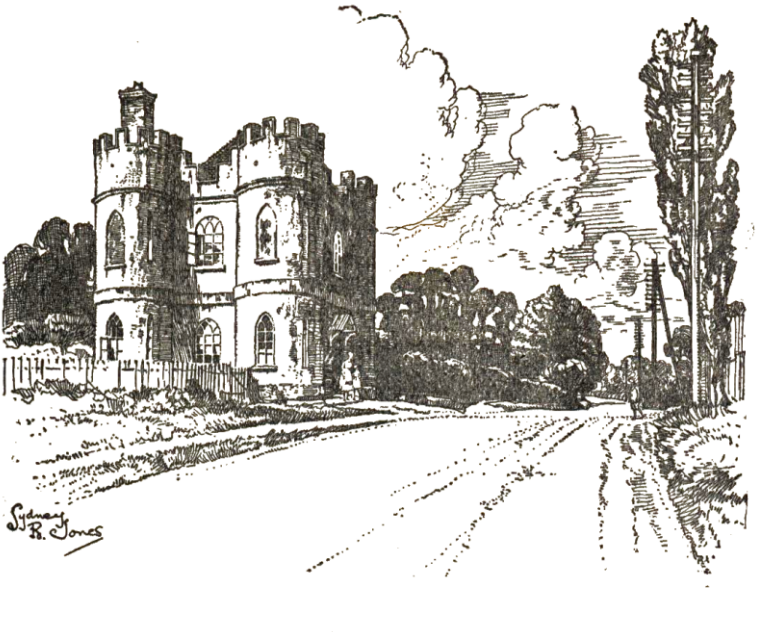
One of the reasons for this was that the great arm of the civil wars was the cavalry, and cavalry is not tied to roads as infantry is. Another and better reason was the comparatively small numbers engaged.

The civil wars loom large in our political history because they marked the destruction of the monarchy and the beginning of aristocratic government, but in military history they are no very great affair: a sort of local epilogue to the Thirty Years' War and the great religious struggle upon the Continent.

What *did* make a difference was the sudden increase of wheeled traffic with the end of the seventeenth century.

There has been a great deal of exaggeration in this matter. Sundry historians have written as though wheeled traffic were unknown until very modern times. That, of course, is nonsense. But the distinctive mark of the later seventeenth century and early eighteenth was the gradual substitution of ordinary passenger traffic by wheel instead of on horseback. The public vehicle comes in much at the same time as the private vehicle, developed by the new great landlord class for their convenience in their country rounds. As has been the case with the internal combustion engine in our own time, the instrument preceded the change in the road. As wheeled

traffic for passengers becomes more common you get increasing complaints on the condition of the roads and increasing motive for improving them, and out of that grows the *turnpike system*, which, with its later development, has carried us on to the present day.



TOLL HOUSE ON THE BATH ROAD

ii

THE TURNPIKE SYSTEM, by a process which originated in small beginnings and ended with a revolution in general communications, made the modern English Road.

It sprang from that character in the economic society of Britain (closely connected with the new aristocratic government of the seventeenth and eighteenth centuries) whereby, in the destruction of the monarchy, individual action became supreme.

The same force which had forbidden great national roads to rise, to wit, the absence of a central all-powerful authority (such as was the French monarchy just over the Channel, with its great roads planned and constructed throughout the whole realm on one model)—which had maintained local diversity and local usage and kept back the proper development of the road—made for a change which should be due to private enterprise.

We all know of what value this individualist and aristocratic economic system was to the expansion of English trade overseas, and how it is at the foundation of what is to-day called "the Empire." In domestic affairs it meant, of course, the sacrifice of the interests of the community to a comparatively small wealthy class, but that did not prevent this wealthy class from acting very efficiently under the opportunity for gain within its own sphere. The mass of Englishmen became, and have remained, impoverished, but the total wealth of the country and its population have vastly increased.

The idea of the turnpike was to give a small body of capitalists the right to exploit certain sections of road. They would improve the surface and broaden the gauge where necessary, etc., but they would put up gates where they could charge for the passage of all and sundry and thus earn the interest upon their money. They had also powers to borrow. They had certain powers for using the public rates, etc., and in general, through this system, the roads of the country were more and more given over to what we call to-day capitalist exploitation: for although very often the sections of road thus exploited were short they formed an interruption to general travel.

Popular resentment against such an innovation was, of course, bitter, especially when it extended to large areas. There were periods of riot in which the toll-gates were destroyed, and there was something like a little civil war in the matter in South Wales, but the interests of the wealthier class were supreme, the populace was suppressed, and the system continued. It also vastly extended.

While it had the social disadvantages just mentioned, it had the economic advantage of creating bit by bit longer and longer sections of really good road up and down the country. To the turnpike system we owe that development of the English roads which made English coaching and gave us, in the generation before and during the Napoleonic wars, on the whole, the best system of local communications in Europe, though we still grievously lacked *continuous* national communications between distant centres.

iii

The date to which must be referred the great change in this respect—the date from which we must count the growth of general national communications continuous throughout the island—is the year 1810. The turnpike system did indeed die slowly and only much later. It lingered on to well within living memory, and those who are curious to watch the rise

and decay of institutions may even argue that some relics of it remain among us still. But in practice 1810 is the date of the first experimental change which was ultimately to produce the road system of to-day.

If we consider the use and character of the Road, its texture and appearance, its effect upon the landscape, its connection with society as distinct from the legislation connected with it, 1810 is much more of a pivotal date than such dates as 1555 or 1822, which mark the political changes in the statutory powers of dealing with roads. Already stage coaches driven from the box, and every year increasing the rate of travel, had been upon the road for a generation—for twenty-six years; and already great lengths of turnpike trust roads had come to a sufficient excellence of surface to permit travel at an average rate over those branches of ten miles an hour. But, as I have said, there was not as yet *one continuous piece of road designed to connect two important termini, of equal value throughout, and ordered in all its length towards that one end of making equable and rapid transit possible between the two extremities*. That is the point. The thing had not existed in this island (save in the "four Regal Ways") since the breakdown of the Roman central government in the fifth century.

What happened in 1810, and what makes it such a memorable date, is the appointment, under the pressure of the Postmaster-General, of a stonemason who had risen to the practice of road engineering—Thomas Telford—to the overlooking of the Holyhead Road.

The initiative came from the Post Office Department: the administrative and engineering genius came from Telford. Incidentally, we should remark, as one of the innumerable examples of unforeseen and exceedingly important side developments in history, the fact that this great revolution in British roads ultimately derived from Pitt's Act of Union with Ireland, which was already nine years old. It was the necessity of communication between London and Holyhead, and especially of postal communication, which did the business.

Telford had been in the employment for some years past of the Highland Roads Commission. He had therefore proved his capacity, and from it he was appointed to a Government position in the re-establishment of the Holyhead Road after the affair had been examined by a Parliamentary Committee in this year (1810). It was not only Telford's skill, it was still more his energy and intense application to detail which wrought the change. His nominal masters were ten Commissioners and three Ministers at their head; his real chief was Parnell, later Lord

Congleton. But it was Telford, by his ceaseless travelling and investigation and overlooking of everything, who pushed the thing through.

The whole distance to be reorganized was one of 194 miles. Of this the larger part, 109 miles, fell under seventeen English Trusts; the remaining 85 miles were under six Welsh Trusts, the latter with far less local traffic to provide them with income, and, it would seem, also of less general efficiency.

Telford's task may be appreciated when we remember that the new policy gave him no direct statutory power to override trusts. Each one had to be argued with, bargained with, and persuaded. This at least was true of the English Trusts and the six Welsh Trusts. The Commissioners, or rather Telford and Parnell, despaired. The trusts controlled so very much the larger part of the trajectory that it was necessary in some way to dispose of them.

More than seven years passed before this could be done. But Parnell succeeded in persuading them, by industrious attendance before various meetings, to accept an Act of Parliament which cast them all into one body of fifteen, and they were, by statute, compelled to employ a professional civil engineer, who was, of course, Telford. The 85 remaining miles were taken over, scientifically divided into sections under assistant surveyors and foremen below them, and by 1830, after the labour of twenty years, the whole thing was done. A suspension bridge had been thrown over the Menai Straits, Holyhead Harbour had been improved. These, with the reconstruction of the road, had drawn from Parliament grants of three-quarters of a million. From that moment there existed at least one complete road in Britain, uniting two definite termini and everywhere making possible the rapid travel at the time. The tolls were, of course, maintained. Their cost was increased by one-half. The anomalies, complexities, and corruptions involved in the system were no more done away with on the Holyhead Road than on any other, except in so far as a closer supervision helped to alleviate things and in so far as amalgamation of trusts also helped. But, at any rate, there was at least one continuous and excellent road from the capital to a distant port, and we have the date 1830 for the completion of the great task which was begun in 1810.

iv

Contemporary with this first great complete model of a road in England went the movement connected with the name of Macadam. It was far less of a revolution than has since been represented. The Continent had made experiments similar to those of Macadam long before him, and what

he effected over here was no more than an improvement, for it was not wholly novel.

The real point of Macadam in our road history is his intense devotion to his task. He was one of those men who, having seen clearly a principle which others have also seen, and which, indeed, should be obvious, so emphasizes it and represents it that he brings it into practice where other men would have abandoned it. The obvious principle which Macadam grasped and reiterated to weariness was the principle that perpetual legislation and experiment in the type of vehicle best suited to a road was of less importance than the surface and weight-carrying capacity of the Road. Get the best road you can first, and after that discuss the traffic along it. In certain technical details posterity has criticized it—in its insufficient allowance of foundation, for instance; in its postulate that a well-drained natural surface was sufficient to bear anything in the way of road traction. Such criticism can only be conducted by experts, but it is certainly true that Macadam transformed the surface of the English Road, not perhaps by any special or novel conception of his own either in the material or in the sizes of that material; but rather in the unique insistence with which he carried on his whole task.

Just as the Post Office had been the Government department for using Telford, so the Board of Works was the Government department backing Macadam.

These two men between them, and these two departments between them, had remade the English Road, and the system was fairly launched towards such a change as would perhaps have given us a completely transformed road system, the value of which we should have appreciated when the new traffic of the internal combustion engine presented us with the problems of the present day.

For instance, Telford himself had suggested—and there was nearly achieved—a reformed stretch of the Great North Road between Peterborough and York on a straight line, avoiding the windings of the old trace, and twenty miles shorter: worthy to rank in every way with the great roads of the Continent. This, had it been realized, might well have proved only the first of a great number of similar constructions, until we should have had all the great centres of England united in the same fashion and a habit of broad, straight, and excellent roads established. Unfortunately, a great historical accident intervened to sidetrack the whole business. It was an example of the way in which the advantages of spontaneity and inventiveness, making normally for the benefit of the community as a

whole, will, if there is no central direction, do incidental hurt which has later to be repaired, if at all, at great expense of energy. The reason we have to-day the innumerable narrow winding roads of England, the lack of any general system, the absence of any system of good roads from London to the ports (to this day half the exits from London are blocked by absurd "bottle necks," the most notorious of which, of course, is that on the West road, which is now at last being remedied), is that the English genius produced the locomotive.

v

Stephenson's great revolution was begun in 1829. The great Holyhead Road was completed in 1830. The coincidence of dates is significant. England developed immediately an immense system of railways. Not only was she twenty years ahead of the rest of the world in the business, but she alone, for a long time, could produce railways. The railways on the Continent had to be built often by English engineers and always upon an English model. The transformation which this effected in the national life was so rapid that it warped judgment. Men began to talk as though the road would fall out of use. It was the same sort of exaggeration as led people about ten years ago to tell us that shortly horses would no longer be seen in the streets of London or even on the country roads.

The introduction of the railway had two deplorable effects upon the economic life of England, each of which was grave, and one of which we must, if we can, immediately remedy on peril of decline. Neither of them can be remedied save at a new expense of energy: (1) It killed the canals, (2) It killed all the schemes for widening, straightening, and rebuilding the national road system; while upon the Continent, and especially in France, the great broad, straight roads of the eighteenth century formed the model continuously applied, so that the most: recent examples to-day are in the same tradition as those of two hundred years ago and yet amply fulfil their function. Here the whole story of our roads from the middle and the end of the nineteenth century and on to the beginning of this century is the story of improving the surface while keeping to the old winding and narrowness. Here and there we have had extensions of space which create really new roads in the neighbourhood of towns, especially as exits from towns, but nowhere as yet have we a complete scheme for the remodelling of a road in the fashion whereby, a century ago the great Holyhead Road was remodelled.

CHAPTER XIV

THE FUTURE

A New Vehicle Compelling us to Make New Roads: Arterial Roads for the New Traffic: The Five Necessities of these Roads: Ways and Means: A National Fund: Taxation according to Fuel Used: The Question of the Land Contiguous to the New Roads.

i

WE have come to the point where some great initiative is imperatively needed for the re-establishment of communications corresponding to modern needs.

But while all feel this, no one as yet has, I believe, thought out the main elements of the scheme. We cannot remake all the ways of England, nor even change the main part of them to suit the new kind of traffic. We have been "taken aback," as they say in sailing, and "caught all standing." Our charming, narrow, hedged, tortuous lanes, our haphazard county communications, even our main ways, have suddenly proved grossly inapt to the new traffic; and our towns, unaffected by the great Continental movement (which I have heard called the "boulevard" movement) of the middle nineteenth century, are in the same case. If we cannot—and obviously we cannot—remodel the whole thing, what *can* we do?

So far as I can see, we can proceed upon certain main principles, with which I propose to conclude.

I distinguish between the problem of the street traffic in the towns, with which I am not concerned, and that of the main road. As it seems to me, what we need is, and that immediately, a certain number—quite a large number—of great arterial roads very broad and straight with a special surface, confined to motor traffic alone.

These, including circular ways round the towns to avoid the present unnecessary and congested passage through the towns, would act as ditches act in a fen. They would gather towards them the main streams of traffic, as such ditches gather towards them and drain the moisture of a fen. That having been done, the remaining difficulties upon the by-roads would be cut down to a quarter or less of their present evil.

I will develop this.

ii

It is clear that our new vehicle, the internal combustion engine, will compel us to new roads, just as the vehicular traffic for passengers at the beginning of the seventeenth century compelled the creation of the turnpike. Far-seeing men grasped this the moment that the internal combustion engine appeared in our lives. I have myself heard the details of an idea which very nearly materialized and which was on the point of becoming law—an experimental road to be driven from one great centre to another, to be reserved entirely to the new traffic and to be made specially for these new necessities. Private interest defeated the scheme, and in my opinion that defeat was a very bad thing for the general development of the country. But though the first attempt failed, the very fruitful and sensible idea underlying it is worth describing.

A very few great arterial roads joining up the main centres of population would have far more effect upon our present difficulties than their mere mileage would seem to warrant. There could be no question of stopping the new form of traffic upon the ordinary roads remaining, which in length might be twenty or fifty times those of the new roads. But it would be of such advantage for long-distance travel to use the great arteries that at the expenditure of greater mileage *you would find the new traffic seeking them at the nearest point upon one side and clinging to them for as long as possible*.

Suppose, for the sake of hypothesis, a simple case. Suppose a great arterial road to be built joining the heart of London and the heart of Birmingham in a straight line: it would pass just by Tring and Buckingham and then on through the gap between Leamington and Warwick. A man living at Windsor and desiring to reach Coventry, and using the new method of fast travel, would seek this main road at its nearest point and leave it again at the nearest point to his terminus. It would be a less picturesque, but a much safer and quicker way of doing his business. It would add a dozen miles to his total trajectory, but it would save a much more than corresponding amount of strain and expense of energy in following the series of narrow and winding roads most nearly connecting the two points. The same would be true of any other trajectory not directly served by the new roads. The advantage of safe and rapid travel on a first-class surface of very broad gauge, free of horses and pedestrians, would make people take a “Z” to include as much as possible of such a road rather than cling to the shorter line.

The final effect would be the relief of congestion upon the typically narrow winding roads which cover the surface of England. They would be relieved, in the case we have quoted, not only of the great mass of urban traffic between London and Birmingham; they would be also relieved of the very considerable local traffic—not entirely relieved, of course, but relieved in a proportion large enough to make a very sensible difference to modern communications.

Though the thing still remains pure theory and though the political and social obstacles to it are very serious indeed (any trajectory you name in this crowded island would destroy much which all our people—let alone the owners—love to preserve), yet it is worth while to analyse the conditions of such roads, because only thus can we establish the main rules which, under whatever modification, must ultimately govern the change that should come.

iii

We need five things:

(1) A very strong foundation, upon which depends—

(2) A permanently good surface;

(3) The avoidance of sudden curves (in which is included the avoidance of obstacles hiding the approaches to any curve);

(4) Great width;

(5) A fifth point, almost as important as these first four, the necessity for the providing of crossings. The great arterial road reserved to the internal combustion engine would be, for people who had to cross it, an obstacle a great deal worse than a railway. Our forefathers protected in all sorts of fashions the road crossing the railway at a level crossing—by insisting on gates and an attendant, by compelling the road, if possible, to pass above the railway upon a bridge, and so on. More attention was paid to this point in England than in any Continental country, and we benefit by the results of that care to-day. But the arterial road would be far more dangerous. It would have a continual stream of very rapid vehicles in both directions, and the scheme had better not be envisaged at all if the cost of providing for cross traffic is not faced. The problem is by no means an easy one. It means, necessarily, embankments for bridges, or tunnelling, at *every* crossing, and these will have to be more numerous than the road crossings: they will have to serve rights of way and private approaches as well. I think it will be found, when the scheme is first attempted, that this obstacle will prove the most serious of all.

It is for experts in the science (of which I know nothing, and allusion to which I have therefore kept carefully out of this essay) to decide what these details of surface, width, foundation, etc., mean in practice: their expense and character.

They know from experiments made what materials and foundation may be best, what minimum width suggests itself (I have occasionally heard the minimum width of 100 feet suggested); but whatever the detailed practice, when the experts set to work on the new motor roads it must be with these five main provisions before them. There are minor considerations. You have, with the new traffic, to consider a gradient somewhere between the old road gradient and the railway gradient. There, again, it is for experts to determine what the maximum useful gradient should be. The trouble in our present road system is that in any trajectory you will have one or two places where the new traffic is perilous. There are even exceptional points in England where it is almost prohibited by excessive gradients.

Another point in connection with such great arterial roads is the capital one of exit from the great urban centres. It is of little use to relieve traffic, to diminish the strain and expense of energy connected with it, and the peril, and all the rest of it, between two urban centres if the exit and entry from and into each are blocked.

Now, the trouble here is a purely economic trouble. Urban sites have a special value, even in the outskirts. They are not, as a rule, sites to which anyone is attached, but the cost of buying them up has made reformers hesitate to drive the arterial ways which are so urgently needed. Once your great road has reached the inner ring of a large town its traffic disperses and there is no need for continuing its dimensions. But the new system can be of no real service if, on the approach to a great town, we retain the narrows and guts which disfigure, for example, the western road out of London. It might even be said that from the political standpoint it would be better to begin with the assurance of good exits and entrances than with the planning of the Road as a whole.

At present we have, in the particular case of London, one, and only one, good entry. That is the entry from the north-west. All the others are hopelessly congested.

iv

There will occur in connection with all this discussion of the necessity for a modern change in the Road the point of ways and means. Somebody

must pay. How shall the payment be made? It has already become a matter of politics. Pretty well all that can be said upon it has been said, but as yet there is no agreement. I would maintain (very tentatively, hardly as more than a suggestion) that we shall never get a satisfactory settlement until we found ourselves upon three main principles:

(1) The making of a few great arteries, coupled with the making of proper exits from the great towns and of by-ways round the urban centres, is a national concern. You cannot, in the present state of society, regard it as local, nor even as chiefly concerning the direct users of the Road, for even these, who are apparently the people upon whom the burden should most justly fall, develop by their travel the district through which they pass.

I suggest, therefore, that you must start in this case with the fundamental principle of a national fund, and a national fund not proceeding from ear-marked receipts alone, but also drawn from general taxes.

(2) The second principle which I should suggest is that in so far as you tax travel for the purposes of this fund you should tax it not by any complicated combination of weight, power, fuel, and so forth, but through some one factor alone, otherwise you will be perpetually remodelling your scheme and as perpetually causing a grievance.

Now, the most obvious factor is fuel. One way and another, the fuel a man uses for his machine is the nearest test to the use he makes of the Road. A heavy weight needs more fuel, great speed and consequently greater wear and tear needs more fuel, and greater horse-power needs more fuel. The curves are, of course, not parallel. You can get equal speeds between heavy and light for nearly the same consumption of fuel. One type of machine will do more harm to the road surface for every gallon of fuel than another, and so on. But if you want to have easy revenue simplicity in taxation is vital: surely the taxation of fuel is the simplest and most direct method. It is easily collected. It does away with all chance of confusion. It can be imposed at source and in bulk, and it has that invaluable quality which has been often lost sight of in the last two generations: that it is paid gradually and at will and yet paid inevitably. So long, of course, as a false distinction is maintained between the commercial and the private use of vehicles you will have gross anomalies and injustice. To draw the line between economic waste in the use of the modern internal combustion engine and what is part of the general and normal life of the community is impossible. It would be better were the

distinction to be wholly removed. We do not ask a man who takes a ticket from Birmingham to London whether he is going for fun or folly, for business or necessity. Men pay the same price for the ticket whatever the motive of their journey. It is an absurd anomaly as things now stand that the man who travels in a little Ford car from one town to another with, say, two members of his family—and travels therefore much more cheaply than he could upon the railway—should pay the rent of a house for the privilege of having his car, while the heavy vehicle of a tradesman who is distributing advertising matter—sheer economic loss to the community—should tear up the road for nothing.

(3) The grant for the new roads should include the purchase, if not of a continuous belt along each side, at least of blocks of land, especially in the neighbourhood of existing communications, near railway stations, near villages or other centres now established, etc. The price to be determined by arbitration upon the old price basis before the scheme of the Road was developed. If this were done the great difficulty for *certain* purposes (not residential, but other) of using these sites would accrue to the public purse and would gradually relieve the cost of construction.

This project touches, of course, upon one of those political theories which have been debated, as have all political theories in our time, with too much violence and with too much generality. If it be contended that we here introduce the principle of the "single tax" and of the nationalization of land, I can only say that nothing is further either from my thoughts in this essay or from my general politics—as any number of my public pronouncements suffice to prove. But we have here a very special case. These new roads, if we drive them (as we ought to drive them soon) between the main points of the island, will, unless some such scheme is adopted, make a direct and immediate present of millions to the chance owners of land upon their trajectory. It would be a gross case of actual endowment at the expense of the community. Conversely, the reservation of land on either side of the way for the purpose of helping to pay for the new scheme would be of direct advantage to the community and of disadvantage to no one.

At any rate, just as we must soon have a reform of the road system or suffer decline in our communications and therefore in our national life, so we must soon settle a reform in the matter of road maintenance and road taxation. For the new main arteries that should be built we must depend upon the general resources of the community, while for special taxes upon traffic we must establish as soon as possible a simple and universal system.

I need not add, for it is obvious, that such a scheme of new roads would involve a certain amount of individual hardship. It is impossible to avoid that, but it is in the temper of this nation to compromise closely and in detail upon all such things. Nor need it be added that the scheme would have to proceed by trial and error, and could only be, at first, tentative and applied experimentally to one or two chosen trajectories. But I think that it is upon these lines that the problem can be solved.

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TRANSCRIBER NOTES

Misspelled words and printer errors have been corrected. Where multiple spellings occur, majority use has been employed.

Punctuation has been maintained except where obvious printer errors occur.

Some illustrations were moved to facilitate page layout.

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[The end of *The Road* by Hilaire Belloc]