

**Anticipations**

**By**

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## ANTICIPATIONS

I

### LOCOMOTION IN THE TWENTIETH CENTURY

It is proposed in this book to present in as orderly an arrangement as the necessarily diffused nature of the subject admits, certain speculations about the trend of present forces, speculations which, taken all together, will build up an imperfect and very hypothetical, but sincerely intended forecast of the way things will probably go in this new century.[1] Necessarily diffidence will be one of the graces of the performance. Hitherto such forecasts have been presented almost invariably in the form of fiction, and commonly the provocation of the satirical opportunity has been too much for the writer;[2] the narrative form becomes more and more of a nuisance as the speculative inductions become sincerer, and here it will be abandoned altogether in favour of a texture of frank inquiries and arranged considerations. Our utmost aim is a rough sketch of the coming time, a prospectus, as it were, of the joint undertaking of mankind in facing these impending years. The reader is a prospective shareholder--he and his heirs--though whether he will find this anticipatory balance-sheet to his belief or

liking is another matter.

For reasons that will develop themselves more clearly as these papers unfold, it is extremely convenient to begin with a speculation upon the probable developments and changes of the means of land locomotion during the coming decades. No one who has studied the civil history of the nineteenth century will deny how far-reaching the consequences of changes in transit may be, and no one who has studied the military performances of General Buller and General De Wet but will see that upon transport, upon locomotion, may also hang the most momentous issues of politics and war. The growth of our great cities, the rapid populating of America, the entry of China into the field of European politics are, for example, quite obviously and directly consequences of new methods of locomotion. And while so much hangs upon the development of these methods, that development is, on the other hand, a process comparatively independent, now at any rate, of most of the other great movements affected by it. It depends upon a sequence of ideas arising, and of experiments made, and upon laws of political economy, almost as inevitable as natural laws. Such great issues, supposing them to be possible, as the return of Western Europe to the Roman communion, the overthrow of the British Empire by Germany, or the inundation of Europe by the "Yellow Peril," might conceivably affect such details, let us say, as door-handles and ventilators or mileage of line, but would probably leave the essential features of the evolution of locomotion untouched. The evolution of locomotion has a purely historical relation to the Western European peoples. It is no longer dependent upon them,

or exclusively in their hands. The Malay nowadays sets out upon his pilgrimage to Mecca in an excursion steamship of iron, and the immemorial Hindoo goes a-shopping in a train, and in Japan and Australasia and America, there are plentiful hands and minds to take up the process now, even should the European let it fall.

The beginning of this twentieth century happens to coincide with a very interesting phase in that great development of means of land transit that has been the distinctive feature (speaking materially) of the nineteenth century. The nineteenth century, when it takes its place with the other centuries in the chronological charts of the future, will, if it needs a symbol, almost inevitably have as that symbol a steam engine running upon a railway. This period covers the first experiments, the first great developments, and the complete elaboration of that mode of transit, and the determination of nearly all the broad features of this century's history may be traced directly or indirectly to that process. And since an interesting light is thrown upon the new phases in land locomotion that are now beginning, it will be well to begin this forecast with a retrospect, and to revise very shortly the history of the addition of steam travel to the resources of mankind.

A curious and profitable question arises at once. How is it that the steam locomotive appeared at the time it did, and not earlier in the history of the world?

Because it was not invented. But why was it not invented? Not for want

of a crowning intellect, for none of the many minds concerned in the development strikes one--as the mind of Newton, Shakespeare, or Darwin strikes one--as being that of an unprecedented man. It is not that the need for the railway and steam engine had only just arisen, and--to use one of the most egregiously wrong and misleading phrases that ever dropped from the lips of man--the demand created the supply; it was quite the other way about. There was really no urgent demand for such things at the time; the current needs of the European world seem to have been fairly well served by coach and diligence in 1800, and, on the other hand, every administrator of intelligence in the Roman and Chinese empires must have felt an urgent need for more rapid methods of transit than those at his disposal. Nor was the development of the steam locomotive the result of any sudden discovery of steam. Steam, and something of the mechanical possibilities of steam, had been known for two thousand years; it had been used for pumping water, opening doors, and working toys, before the Christian era. It may be urged that this advance was the outcome of that new and more systematic handling of knowledge initiated by Lord Bacon and sustained by the Royal Society; but this does not appear to have been the case, though no doubt the new habits of mind that spread outward from that centre played their part. The men whose names are cardinal in the history of this development invented, for the most part, in a quite empirical way, and Trevithick's engine was running along its rails and Evan's boat was walloping up the Hudson a quarter of a century before Carnot expounded his general proposition. There were no such deductions from principles to application as occur in the story of electricity to justify our

attribution of the steam engine to the scientific impulse. Nor does this particular invention seem to have been directly due to the new possibilities of reducing, shaping, and casting iron, afforded by the substitution of coal for wood in iron works; through the greater temperature afforded by a coal fire. In China coal has been used in the reduction of iron for many centuries. No doubt these new facilities did greatly help the steam engine in its invasion of the field of common life, but quite certainly they were not sufficient to set it going. It was, indeed, not one cause, but a very complex and unprecedented series of causes, that set the steam locomotive going. It was indirectly, and in another way, that the introduction of coal became the decisive factor. One peculiar condition of its production in England seems to have supplied just one ingredient that had been missing for two thousand years in the group of conditions that were necessary before the steam locomotive could appear.

This missing ingredient was a demand for some comparatively simple, profitable machine, upon which the elementary principles of steam utilization could be worked out. If one studies Stephenson's "Rocket" in detail, as one realizes its profound complexity, one begins to understand how impossible it would have been for that structure to have come into existence *de novo*, however urgently the world had need of it. But it happened that the coal needed to replace the dwindling forests of this small and exceptionally rain-saturated country occurs in low hollow basins overlying clay, and not, as in China and the Alleghanies for example, on high-lying outcrops, that can be worked as

chalk is worked in England. From this fact it followed that some quite unprecedented pumping appliances became necessary, and the thoughts of practical men were turned thereby to the long-neglected possibilities of steam. Wind was extremely inconvenient for the purpose of pumping, because in these latitudes it is inconstant: it was costly, too, because at any time the labourers might be obliged to sit at the pit's mouth for weeks together, whistling for a gale or waiting for the water to be got under again. But steam had already been used for pumping upon one or two estates in England--rather as a toy than in earnest--before the middle of the seventeenth century, and the attempt to employ it was so obvious as to be practically unavoidable.[3] The water trickling into the coal measures[4] acted, therefore, like water trickling upon chemicals that have long been mixed together dry and inert. Immediately the latent reactions were set going. Savery, Newcomen, a host of other workers, culminating in Watt, working always by steps that were at least so nearly obvious as to give rise again and again to simultaneous discoveries, changed this toy of steam into a real, a commercial thing, developed a trade in pumping engines, created foundries and a new art of engineering, and almost unconscious of what they were doing, made the steam locomotive a well-nigh unavoidable consequence. At last, after a century of improvement on pumping engines, there remained nothing but the very obvious stage of getting the engine that had been developed on wheels and out upon the ways of the world.

Ever and again during the eighteenth century an engine would be put upon the roads and pronounced a failure--one monstrous Palæoferric creature



was visible on a French high road as early as 1769--but by the dawn of the nineteenth century the problem had very nearly got itself solved. By 1804 Trevithick had a steam locomotive indisputably in motion and almost financially possible, and from his hands it puffed its way, slowly at first, and then, under Stephenson, faster and faster, to a transitory empire over the earth. It was a steam locomotive--but for all that it was primarily a steam engine for pumping adapted to a new end; it was a steam engine whose ancestral stage had developed under conditions that were by no means exacting in the matter of weight. And from that fact followed a consequence that has hampered railway travel and transport very greatly, and that is tolerated nowadays only through a belief in its practical necessity. The steam locomotive was all too huge and heavy for the high road--it had to be put upon rails. And so clearly linked are steam engines and railways in our minds that, in common language now, the latter implies the former. But indeed it is the result of accidental impediments, of avoidable difficulties that we travel to-day on rails.

Railway travelling is at best a compromise. The quite conceivable ideal of locomotive convenience, so far as travellers are concerned, is surely a highly mobile conveyance capable of travelling easily and swiftly to any desired point, traversing, at a reasonably controlled pace, the ordinary roads and streets, and having access for higher rates of speed and long-distance travelling to specialized ways restricted to swift traffic, and possibly furnished with guide-rails. For the collection and delivery of all sorts of perishable goods also the same system is

obviously altogether superior to the existing methods. Moreover, such a system would admit of that secular progress in engines and vehicles that the stereotyped conditions of the railway have almost completely arrested, because it would allow almost any new pattern to be put at once upon the ways without interference with the established traffic. Had such an ideal been kept in view from the first the traveller would now be able to get through his long-distance journeys at a pace of from seventy miles or more an hour without changing, and without any of the trouble, waiting, expense, and delay that arises between the household or hotel and the actual rail. It was an ideal that must have been at least possible to an intelligent person fifty years ago, and, had it been resolutely pursued, the world, instead of fumbling from compromise to compromise as it always has done and as it will do very probably for many centuries yet, might have been provided to-day, not only with an infinitely more practicable method of communication, but with one capable of a steady and continual evolution from year to year.

But there was a more obvious path of development and one immediately cheaper, and along that path went short-sighted Nineteenth Century Progress, quite heedless of the possibility of ending in a cul-de-sac. The first locomotives, apart from the heavy tradition of their ancestry, were, like all experimental machinery, needlessly clumsy and heavy, and their inventors, being men of insufficient faith, instead of working for lightness and smoothness of motion, took the easier course of placing them upon the tramways that were already in existence--chiefly for the transit of heavy goods over soft roads. And from that followed a very

interesting and curious result.

These tram-lines very naturally had exactly the width of an ordinary cart, a width prescribed by the strength of one horse. Few people saw in the locomotive anything but a cheap substitute for horseflesh, or found anything incongruous in letting the dimensions of a horse determine the dimensions of an engine. It mattered nothing that from the first the passenger was ridiculously cramped, hampered, and crowded in the carriage. He had always been cramped in a coach, and it would have seemed "Utopian"--a very dreadful thing indeed to our grandparents--to propose travel without cramping. By mere inertia the horse-cart gauge, the 4 ft. 8½ in. gauge, nemine contradicente, established itself in the world, and now everywhere the train is dwarfed to a scale that limits alike its comfort, power, and speed. Before every engine, as it were, trots the ghost of a superseded horse, refuses most resolutely to trot faster than fifty miles an hour, and shies and threatens catastrophe at every point and curve. That fifty miles an hour, most authorities are agreed, is the limit of our speed for land travel, so far as existing conditions go.[5] Only a revolutionary reconstruction of the railways or the development of some new competing method of land travel can carry us beyond that.

People of to-day take the railways for granted as they take sea and sky; they were born in a railway world, and they expect to die in one. But if only they will strip from their eyes the most blinding of all influences, acquiescence in the familiar, they will see clearly enough

that this vast and elaborate railway system of ours, by which the whole world is linked together, is really only a vast system of trains of horse-waggons and coaches drawn along rails by pumping-engines upon wheels. Is that, in spite of its present vast extension, likely to remain the predominant method of land locomotion--even for so short a period as the next hundred years?

Now, so much capital is represented by the existing type of railways, and they have so firm an establishment in the acquiescence of men, that it is very doubtful if the railways will ever attempt any very fundamental change in the direction of greater speed or facility, unless they are first exposed to the pressure of our second alternative, competition, and we may very well go on to inquire how long will it be before that second alternative comes into operation--if ever it is to do so.

Let us consider what other possibilities seem to offer themselves. Let us revert to the ideal we have already laid down, and consider what hopes and obstacles to its attainment there seem to be. The abounding presence of numerous experimental motors to-day is so stimulating to the imagination, there are so many stimulated persons at work upon them, that it is difficult to believe the obvious impossibility of most of them--their convulsiveness, clumsiness, and, in many cases, exasperating trail of stench will not be rapidly fined away.[6] I do not think that it is asking too much of the reader's faith in progress to assume that so far as a light powerful engine goes, comparatively noiseless,

smooth-running, not obnoxious to sensitive nostrils, and altogether suitable for high road traffic, the problem will very speedily be solved. And upon that assumption, in what direction are these new motor vehicles likely to develop? how will they react upon the railways? and where finally will they take us?

At present they seem to promise developments upon three distinct and definite lines.

There will, first of all, be the motor truck for heavy traffic. Already such trucks are in evidence distributing goods and parcels of various sorts. And sooner or later, no doubt, the numerous advantages of such an arrangement will lead to the organization of large carrier companies, using such motor trucks to carry goods in bulk or parcels on the high roads. Such companies will be in an exceptionally favourable position to organize storage and repair for the motors of the general public on profitable terms, and possibly to co-operate in various ways with the manufactures of special types of motor machines.

In the next place, and parallel with the motor truck, there will develop the hired or privately owned motor carriage. This, for all except the longest journeys, will add a fine sense of personal independence to all the small conveniences of first-class railway travel. It will be capable of a day's journey of three hundred miles or more, long before the developments to be presently foreshadowed arrive. One will change nothing--unless it is the driver--from stage to stage. One will be free

to dine where one chooses, hurry when one chooses, travel asleep or awake, stop and pick flowers, turn over in bed of a morning and tell the carriage to wait--unless, which is highly probable, one sleeps aboard.[7]...

And thirdly there will be the motor omnibus, attacking or developing out of the horse omnibus companies and the suburban lines. All this seems fairly safe prophesying.

And these things, which are quite obviously coming even now, will be working out their many structural problems when the next phase in their development begins. The motor omnibus companies competing against the suburban railways will find themselves hampered in the speed of their longer runs by the slower horse traffic on their routes, and they will attempt to secure, and, it may be, after tough legislative struggles, will secure the power to form private roads of a new sort, upon which their vehicles will be free to travel up to the limit of their very highest possible speed. It is along the line of such private tracks and roads that the forces of change will certainly tend to travel, and along which I am absolutely convinced they will travel. This segregation of motor traffic is probably a matter that may begin even in the present decade.

Once this process of segregation from the high road of the horse and pedestrian sets in, it will probably go on rapidly. It may spread out from short omnibus routes, much as the London Metropolitan Railway

system has spread. The motor carrier companies, competing in speed of delivery with the quickened railways, will conceivably co-operate with the long-distance omnibus and the hired carriage companies in the formation of trunk lines. Almost insensibly, certain highly profitable longer routes will be joined up--the London to Brighton, for example, in England. And the quiet English citizen will, no doubt, while these things are still quite exceptional and experimental in his lagging land, read one day with surprise in the violently illustrated popular magazines of 1910, that there are now so many thousand miles of these roads already established in America and Germany and elsewhere. And thereupon, after some patriotic meditations, he may pull himself together.

We may even hazard some details about these special roads. For example, they will be very different from macadamized roads; they will be used only by soft-tired conveyances; the battering horseshoes, the perpetual filth of horse traffic, and the clumsy wheels of laden carts will never wear them. It may be that they will have a surface like that of some cycle-racing tracks, though since they will be open to wind and weather, it is perhaps more probable they will be made of very good asphalt sloped to drain, and still more probable that they will be of some quite new substance altogether--whether hard or resilient is beyond my foretelling. They will have to be very wide--they will be just as wide as the courage of their promoters goes--and if the first made are too narrow there will be no question of gauge to limit the later ones. Their traffic in opposite directions will probably be strictly separated, and

it will no doubt habitually disregard complicated and fussy regulations imposed under the initiative of the Railway Interest by such official bodies as the Board of Trade. The promoters will doubtless take a hint from suburban railway traffic and from the current difficulty of the Metropolitan police, and where their ways branch the streams of traffic will not cross at a level but by bridges. It is easily conceivable that once these tracks are in existence, cyclists and motors other than those of the constructing companies will be able to make use of them. And, moreover, once they exist it will be possible to experiment with vehicles of a size and power quite beyond the dimensions prescribed by our ordinary roads--roads whose width has been entirely determined by the size of a cart a horse can pull.[8]

Countless modifying influences will, of course, come into operation. For example, it has been assumed, perhaps rashly, that the railway influence will certainly remain jealous and hostile to these growths: that what may be called the "Bicycle Ticket Policy" will be pursued throughout. Assuredly there will be fights of a very complicated sort at first, but once one of these specialized lines is in operation, it may be that some at least of the railway companies will hasten to replace their flanged rolling stock by carriages with rubber tyres, remove their rails, broaden their cuttings and embankments, raise their bridges, and take to the new ways of traffic. Or they may find it answer to cut fares, widen their gauges, reduce their gradients, modify their points and curves, and woo the passenger back with carriages beautifully hung and sumptuously furnished, and all the convenience and luxury of a club. Few



people would mind being an hour or so longer going to Paris from London, if the railway travelling was neither rickety, cramped, nor tedious. One could be patient enough if one was neither being jarred, deafened, cut into slices by draughts, and continually more densely caked in a filthy dust of coal; if one could write smoothly and easily at a steady table, read papers, have one's hair cut, and dine in comfort[9]--none of which things are possible at present, and none of which require any new inventions, any revolutionary contrivances, or indeed anything but an intelligent application of existing resources and known principles. Our rage for fast trains, so far as long-distance travel is concerned, is largely a passion to end the extreme discomfort involved. It is in the daily journey, on the suburban train, that daily tax of time, that speed is in itself so eminently desirable, and it is just here that the conditions of railway travel most hopelessly fail. It must always be remembered that the railway train, as against the motor, has the advantage that its wholesale traction reduces the prime cost by demanding only one engine for a great number of coaches. This will not serve the first-class long-distance passenger, but it may the third. Against that economy one must balance the necessary delay of a relatively infrequent service, which latter item becomes relatively greater and greater in proportion to the former, the briefer the journey to be made.

And it may be that many railways, which are neither capable of modification into suburban motor tracks, nor of development into luxurious through routes, will find, in spite of the loss of many

elements of their old activity, that there is still a profit to be made from a certain section of the heavy goods traffic, and from cheap excursions. These are forms of work for which railways seem to be particularly adapted, and which the diversion of a great portion of their passenger traffic would enable them to conduct even more efficiently. It is difficult to imagine, for example, how any sort of road-car organization could beat the railways at the business of distributing coal and timber and similar goods, which are taken in bulk directly from the pit or wharf to local centres of distribution.

It must always be remembered that at the worst the defeat of such a great organization as the railway system does not involve its disappearance until a long period has elapsed. It means at first no more than a period of modification and differentiation. Before extinction can happen a certain amount of wealth in railway property must absolutely disappear. Though under the stress of successful competition the capital value of the railways may conceivably fall, and continue to fall, towards the marine store prices, fares and freights pursue the sweated working expenses to the vanishing point, and the land occupied sink to the level of not very eligible building sites: yet the railways will, nevertheless, continue in operation until these downward limits are positively attained.

An imagination prone to the picturesque insists at this stage upon a vision of the latter days of one of the less happily situated lines.

Along a weedy embankment there pants and clangs a patched and tarnished

engine, its paint blistered, its parts leprously dull. It is driven by an aged and sweated driver, and the burning garbage of its furnace distils a choking reek into the air. A huge train of urban dust trucks bangs and clatters behind it, en route to that sequestered dumping ground where rubbish is burnt to some industrial end. But that is a lapse into the merely just possible, and at most a local tragedy. Almost certainly the existing lines of railway will develop and differentiate, some in one direction and some in another, according to the nature of the pressure upon them. Almost all will probably be still in existence and in divers ways busy, spite of the swarming new highways I have ventured to foreshadow, a hundred years from now.

In fact, we have to contemplate, not so much a supersession of the railways as a modification and specialization of them in various directions, and the enormous development beside them of competing and supplementary methods. And step by step with these developments will come a very considerable acceleration of the ferry traffic of the narrow seas through such improvements as the introduction of turbine engines. So far as the high road and the longer journeys go this is the extent of our prophecy.[10]

But in the discussion of all questions of land locomotion one must come at last to the knots of the network, to the central portions of the towns, the dense, vast towns of our time, with their high ground values and their narrow, already almost impassable, streets. I hope at a later stage to give some reasons for anticipating that the centripetal

pressure of the congested towns of our epoch may ultimately be very greatly relieved, but for the next few decades at least the usage of existing conditions will prevail, and in every town there is a certain nucleus of offices, hotels, and shops upon which the centrifugal forces I anticipate will certainly not operate. At present the streets of many larger towns, and especially of such old-established towns as London, whose central portions have the narrowest arteries, present a quite unprecedented state of congestion. When the Green of some future History of the English People comes to review our times, he will, from his standpoint of comfort and convenience, find the present streets of London quite or even more incredibly unpleasant than are the filthy kennels, the mudholes and darkness of the streets of the seventeenth century to our enlightened minds. He will echo our question, "Why did people stand it?" He will be struck first of all by the omnipresence of mud, filthy mud, churned up by hoofs and wheels under the inclement skies, and perpetually defiled and added to by innumerable horses. Imagine his description of a young lady crossing the road at the Marble Arch in London, on a wet November afternoon, "breathless, foul-footed, splashed by a passing hansom from head to foot, happy that she has reached the further pavement alive at the mere cost of her ruined clothes."... "Just where the bicycle might have served its most useful purpose," he will write, "in affording a healthy daily ride to the innumerable clerks and such-like sedentary toilers of the central region, it was rendered impossible by the danger of side-slip in this vast ferocious traffic." And, indeed, to my mind at least, this last is the crowning absurdity of the present state of affairs, that the clerk

and the shop hand, classes of people positively starved of exercise, should be obliged to spend yearly the price of a bicycle upon a season-ticket, because of the quite unendurable inconvenience and danger of urban cycling.

Now, in what direction will matters move? The first and most obvious thing to do, the thing that in many cases is being attempted and in a futile, insufficient way getting itself done, the thing that I do not for one moment regard as the final remedy, is the remedy of the architect and builder--profitable enough to them, anyhow--to widen the streets and to cut "new arteries." Now, every new artery means a series of new whirlpools of traffic, such as the pensive Londoner may study for himself at the intersection of Shaftesbury Avenue with Oxford Street, and unless colossal--or inconveniently steep--crossing-bridges are made, the wider the affluent arteries the more terrible the battle of the traffic. Imagine Regent's Circus on the scale of the Place de la Concorde. And there is the value of the ground to consider; with every increment of width the value of the dwindling remainder in the meshes of the network of roads will rise, until to pave the widened streets with gold will be a mere trifling addition to the cost of their "improvement."

There is, however, quite another direction in which the congestion may find relief, and that is in the "regulation" of the traffic. This has already begun in London in an attack on the crawling cab and in the new bye-laws of the London County Council, whereby certain specified forms

of heavy traffic are prohibited the use of the streets between ten and seven. These things may be the first beginning of a process of restriction that may go far. Many people living at the present time, who have grown up amidst the exceptional and possibly very transient characteristics of this time, will be disposed to regard the traffic in the streets of our great cities as a part of the natural order of things, and as unavoidable as the throng upon the pavement. But indeed the presence of all the chief constituents of this vehicular torrent--the cabs and hansoms, the vans, the omnibuses--everything, indeed, except the few private carriages--are as novel, as distinctively things of the nineteenth century, as the railway train and the needle telegraph. The streets of the great towns of antiquity, the streets of the great towns of the East, the streets of all the mediæval towns, were not intended for any sort of wheeled traffic at all--were designed primarily and chiefly for pedestrians. So it would be, I suppose, in any one's ideal city. Surely Town, in theory at least, is a place one walks about as one walks about a house and garden, dressed with a certain ceremonious elaboration, safe from mud and the hardship and defilement of foul weather, buying, meeting, dining, studying, carousing, seeing the play. It is the growth in size of the city that has necessitated the growth of this coarser traffic that has made "Town" at last so utterly detestable.

But if one reflects, it becomes clear that, save for the vans of goods, this moving tide of wheeled masses is still essentially a stream of urban pedestrians, pedestrians who, by reason of the distances they have

to go, have had to jump on 'buses and take cabs--in a word, to bring in the high road to their aid. And the vehicular traffic of the street is essentially the high road traffic very roughly adapted to the new needs. The cab is a simple development of the carriage, the omnibus of the coach, and the supplementary traffic of the underground and electric railways is a by no means brilliantly imagined adaptation of the long-route railway. These are all still new things, experimental to the highest degree, changing and bound to change much more, in the period of specialization that is now beginning.

Now, the first most probable development is a change in the omnibus and the omnibus railway. A point quite as important with these means of transit as actual speed of movement is frequency: time is wasted abundantly and most vexatiously at present in waiting and in accommodating one's arrangements to infrequent times of call and departure. The more frequent a local service, the more it comes to be relied upon. Another point--and one in which the omnibus has a great advantage over the railway--is that it should be possible to get on and off at any point, or at as many points on the route as possible. But this means a high proportion of stoppages, and this is destructive to speed. There is, however, one conceivable means of transit that is not simply frequent but continuous, that may be joined or left at any point without a stoppage, that could be adapted to many existing streets at the level or quite easily sunken in tunnels, or elevated above the street level,[11] and that means of transit is the moving platform, whose possibilities have been exhibited to all the world in a sort of

mean caricature at the Paris Exhibition. Let us imagine the inner circle of the district railway adapted to this conception. I will presume that the Parisian "rolling platform" is familiar to the reader. The district railway tunnel is, I imagine, about twenty-four feet wide. If we suppose the space given to six platforms of three feet wide and one (the most rapid) of six feet, and if we suppose each platform to be going four miles an hour faster than its slower fellow (a velocity the Paris experiment has shown to be perfectly comfortable and safe), we should have the upper platform running round the circle at a pace of twenty-eight miles an hour. If, further, we adopt an ingenious suggestion of Professor Perry's, and imagine the descent to the line made down a very slowly rotating staircase at the centre of a big rotating wheel-shaped platform, against a portion of whose rim the slowest platform runs in a curve, one could very easily add a speed of six or eight miles an hour more, and to that the man in a hurry would be able to add his own four miles an hour by walking in the direction of motion. If the reader is a traveller, and if he will imagine that black and sulphurous tunnel, swept and garnished, lit and sweet, with a train much faster than the existing underground trains perpetually ready to go off with him and never crowded--if he will further imagine this train a platform set with comfortable seats and neat bookstalls and so forth, he will get an inkling in just one detail of what he perhaps misses by living now instead of thirty or forty years ahead.

I have supposed the replacement to occur in the case of the London Inner Circle Railway, because there the necessary tunnel already exists to



help the imagination of the English reader, but that the specific replacement will occur is rendered improbable by the fact that the circle is for much of its circumference entangled with other lines of communication--the North-Western Railway, for example. As a matter of fact, as the American reader at least will promptly see, the much more practicable thing is that upper footpath, with these moving platforms beside it, running out over the street after the manner of the viaduct of an elevated railroad. But in some cases, at any rate, the demonstrated cheapness and practicability of tunnels at a considerable depth will come into play.

Will this diversion of the vast omnibus traffic of to-day into the air and underground, together with the segregation of van traffic to specific routes and times, be the only change in the streets of the new century? It may be a shock, perhaps, to some minds, but I must confess I do not see what is to prevent the process of elimination that is beginning now with the heavy vans spreading until it covers all horse traffic, and with the disappearance of horse hoofs and the necessary filth of horses, the road surface may be made a very different thing from what it is at present, better drained and admirably adapted for the soft-tired hackney vehicles and the torrent of cyclists. Moreover, there will be little to prevent a widening of the existing side walks, and the protection of the passengers from rain and hot sun by awnings, or such arcades as distinguish Turin, or Sir F. Bramwell's upper footpaths on the model of the Chester rows. Moreover, there is no reason but the existing filth why the roadways should not have translucent velaria to

pull over in bright sunshine and wet weather. It would probably need less labour to manipulate such contrivances than is required at present for the constant conflict with slush and dust. Now, of course, we tolerate the rain, because it facilitates a sort of cleaning process....

Enough of this present speculation. I have indicated now the general lines of the roads and streets and ways and underways of the Twentieth Century. But at present they stand vacant in our prophecy, not only awaiting the human interests--the characters and occupations, and clothing of the throng of our children and our children's children that flows along them, but also the decorations our children's children's taste will dictate, the advertisements their eyes will tolerate, the shops in which they will buy. To all that we shall finally come, and even in the next chapter I hope it will be made more evident how conveniently these later and more intimate matters follow, instead of preceding, these present mechanical considerations. And of the beliefs and hopes, the thought and language, the further prospects of this multitude as yet unborn--of these things also we shall make at last certain hazardous guesses. But at first I would submit to those who may find the "machinery in motion" excessive in this chapter, we must have the background and fittings--the scene before the play.[12]

#### FOOTNOTES:

[1] In the earlier papers, of which this is the first, attention will be given to the probable development of the civilized community in general.

Afterwards these generalizations will be modified in accordance with certain broad differences of race, custom, and religion.

[2] Of quite serious forecasts and inductions of things to come, the number is very small indeed; a suggestion or so of Mr. Herbert Spencer's, Mr. Kidd's *Social Evolution*, some hints from Mr. Archdall Reid, some political forecasts, German for the most part (Hartmann's *Earth in the Twentieth Century*, e.g.), some incidental forecasts by Professor Langley (*Century Magazine*, December, 1884, e.g.), and such isolated computations as Professor Crookes' wheat warning, and the various estimates of our coal supply, make almost a complete bibliography. Of fiction, of course, there is abundance: *Stories of the Year 2000*, and *Battles of Dorking*, and the like--I learn from Mr. Peddie, the bibliographer, over one hundred pamphlets and books of that description. But from its very nature, and I am writing with the intimacy of one who has tried, fiction can never be satisfactory in this application. Fiction is necessarily concrete and definite; it permits of no open alternatives; its aim of illusion prevents a proper amplitude of demonstration, and modern prophecy should be, one submits, a branch of speculation, and should follow with all decorum the scientific method. The very form of fiction carries with it something of disavowal; indeed, very much of the *Fiction of the Future* pretty frankly abandons the prophetic altogether, and becomes polemical, cautionary, or idealistic, and a mere footnote and commentary to our present discontents.

[3] It might have been used in the same way in Italy in the first

century, had not the grandiose taste for aqueducts prevailed.

[4] And also into the Cornwall mines, be it noted.

[5] It might be worse. If the biggest horses had been Shetland ponies, we should be travelling now in railway carriages to hold two each side at a maximum speed of perhaps twenty miles an hour. There is hardly any reason, beyond this tradition of the horse, why the railway carriage should not be even nine or ten feet wide, the width, that is, of the smallest room in which people can live in comfort, hung on such springs and wheels as would effectually destroy all vibration, and furnished with all the equipment of comfortable chambers.

[6] Explosives as a motive power were first attempted by Huyghens and one or two others in the seventeenth century, and, just as with the turbine type of apparatus, it was probably the impetus given to the development of steam by the convenient collocation of coal and water and the need of an engine, that arrested the advance of this parallel inquiry until our own time. Explosive engines, in which gas and petroleum are employed, are now abundant, but for all that we can regard the explosive engine as still in its experimental stages. So far, research in explosives has been directed chiefly to the possibilities of higher and still higher explosives for use in war, the neglect of the mechanical application of this class of substance being largely due to the fact, that chemists are not as a rule engineers, nor engineers chemists. But an easily portable substance, the decomposition of which

would evolve energy, or--what is, from the practical point of view, much the same thing--an easily portable substance, which could be decomposed electrically by wind or water power, and which would then recombine and supply force, either in intermittent thrusts at a piston, or as an electric current, would be infinitely more convenient for all locomotive purposes than the cumbersome bunkers and boilers required by steam. The presumption is altogether in favour of the possibility of such substances. Their advent will be the beginning of the end for steam traction on land and of the steam ship at sea: the end indeed of the Age of Coal and Steam. And even with regard to steam there may be a curious change of method before the end. It is beginning to appear that, after all, the piston and cylinder type of engine is, for locomotive purposes--on water at least, if not on land--by no means the most perfect. Another, and fundamentally different type, the turbine type, in which the impulse of the steam spins a wheel instead of shoving a piston, would appear to be altogether better than the adapted pumping engine, at any rate, for the purposes of steam navigation. Hero, of Alexandria, describes an elementary form of such an engine, and the early experimenters of the seventeenth century tried and abandoned the rotary principle. It was not adapted to pumping, and pumping was the only application that then offered sufficient immediate encouragement to persistence. The thing marked time for quite two centuries and a half, therefore, while the piston engines perfected themselves; and only in the eighties did the requirements of the dynamo-electric machine open a "practicable" way of advance. The motors of the dynamo-electric machine in the nineteenth century, in fact, played exactly the rôle of the

pumping engine in the eighteenth, and by 1894 so many difficulties of detail had been settled, that a syndicate of capitalists and scientific men could face the construction of an experimental ship. This ship, the Turbinia, after a considerable amount of trial and modification, attained the unprecedented speed of 34½ knots an hour, and His Majesty's navy has possessed, in the Turbinia's younger and greater sister, the Viper, now unhappily lost, a torpedo-destroyer capable of 41 miles an hour. There can be little doubt that the sea speeds of 50 and even 60 miles an hour will be attained within the next few years. But I do not think that these developments will do more than delay the advent of the "explosive" or "storage of force" engine.

[7] The historian of the future, writing about the nineteenth century, will, I sometimes fancy, find a new meaning in a familiar phrase. It is the custom to call this the most "Democratic" age the world has ever seen, and most of us are beguiled by the etymological contrast, and the memory of certain legislative revolutions, to oppose one form of stupidity prevailing to another, and to fancy we mean the opposite to an "Aristocratic" period. But indeed we do not. So far as that political point goes, the Chinaman has always been infinitely more democratic than the European. But the world, by a series of gradations into error, has come to use "Democratic" as a substitute for "Wholesale," and as an opposite to "Individual," without realizing the shifted application at all. Thereby old "Aristocracy," the organization of society for the glory and preservation of the Select Dull, gets to a flavour even of freedom. When the historian of the future speaks of the past century as

a Democratic century, he will have in mind, more than anything else, the unprecedented fact that we seemed to do everything in heaps--we read in epidemics; clothed ourselves, all over the world, in identical fashions; built and furnished our houses in stereo designs; and travelled--that naturally most individual proceeding--in bales. To make the railway train a perfect symbol of our times, it should be presented as uncomfortably full in the third class--a few passengers standing--and everybody reading the current number either of the Daily Mail, Pearson's Weekly, Answers, Tit Bits, or whatever Greatest Novel of the Century happened to be going.... But, as I hope to make clearer in my later papers, this "Democracy," or Wholesale method of living, like the railways, is transient--a first makeshift development of a great and finally (to me at least) quite hopeful social reorganization.

[8] So we begin to see the possibility of laying that phantom horse that haunts the railways to this day so disastrously.

[9] A correspondent, Mr. Rudolf Cyrian, writes to correct me here, and I cannot do better, I think, than thank him and quote what he says. "It is hardly right to state that fifty miles an hour 'is the limit of our speed for land travel, so far as existing conditions go.' As far as English traffic is concerned, the statement is approximately correct. In the United States, however, there are several trains running now which average over considerable distances more than sixty miles an hour, stoppages included, nor is there much reason why this should not be considerably increased. What especially hampers the development of

railways in England--as compared with other countries--is the fact that the rolling-stock templet is too small. Hence carriages in England have to be narrower and lower than carriages in the United States, although both run on the same standard gauge (4 feet 8½ inches). The result is that several things which you describe as not possible at present, such as to 'write smoothly and easily at a steady table, read papers, have one's hair cut, and dine in comfort,' are not only feasible, but actually attained on some of the good American trains. For instance, on the present Empire State Express, running between New York and Buffalo, or on the present Pennsylvania, Limited, running between New York and Chicago, and on others. With the Pennsylvania, Limited, travel stenographers and typewriters, whose services are placed at the disposal of passengers free of charge. But the train on which there is the least vibration of any is probably the new Empire State Express, and on this it is certainly possible to write smoothly and easily at a steady table."

[10] Since this appeared in the Fortnightly Review I have had the pleasure of reading 'Twentieth Century Inventions,' by Mr. George Sutherland, and I find very much else of interest bearing on these questions--the happy suggestion (for the ferry transits, at any rate) of a rail along the sea bottom, which would serve as a guide to swift submarine vessels, out of reach of all that superficial "motion" that is so distressing, and of all possibilities of collision.

[11] To the level of such upper story pavements as Sir F. Bramwell has



proposed for the new Holborn to Strand Street, for example.

[12] I have said nothing in this chapter, devoted to locomotion, of the coming invention of flying. This is from no disbelief in its final practicability, nor from any disregard of the new influences it will bring to bear upon mankind. But I do not think it at all probable that aeronautics will ever come into play as a serious modification of transport and communication--the main question here under consideration. Man is not, for example, an albatross, but a land biped, with a considerable disposition towards being made sick and giddy by unusual motions, and however he soars he must come to earth to live. We must build our picture of the future from the ground upward; of flying--in its place.