

**ГЕРБЕРТ  
УЭЛЛС**

THE WORLD  
SET FREE

Herbert George Wells

**The World Set Free**

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# Содержание

PREFACE	5
PRELUDE	7
CHAPTER THE FIRST	16
Конец ознакомительного фрагмента.	27

# H. G. Wells

## The World Set Free

### PREFACE

THE WORLD SET FREE was written in 1913 and published early in 1914, and it is the latest of a series of three fantasias of possibility, stories which all turn on the possible developments in the future of some contemporary force or group of forces. The World Set Free was written under the immediate shadow of the Great War. Every intelligent person in the world felt that disaster was impending and knew no way of averting it, but few of us realised in the earlier half of 1914 how near the crash was to us. The reader will be amused to find that here it is put off until the year 1956. He may naturally want to know the reason for what will seem now a quite extraordinary delay. As a prophet, the author must confess he has always been inclined to be rather a slow prophet. The war aeroplane in the world of reality, for example, beat the forecast in *Anticipations* by about twenty years or so. I suppose a desire not to shock the sceptical reader's sense of use and wont and perhaps a less creditable disposition to hedge, have something to do with this dating forward of one's main events, but in the particular case of *The World Set Free* there was, I think, another motive in holding the Great War back, and that was to allow the chemist to get well forward with his discovery of the release of atomic energy. 1956 – or for that matter 2056 – may be none too late for that crowning revolution in human potentialities. And apart from this procrastination of over forty years, the guess at the opening phase of the war was fairly lucky; the forecast of an alliance of the Central Empires, the opening campaign through the Netherlands, and the despatch of the British Expeditionary Force were all justified before the book had been published six months. And the opening section of Chapter the Second remains now, after the reality has happened, a fairly adequate diagnosis of the essentials of the matter. One happy hit (in Chapter the Second, Section 2), on which the writer may congratulate himself, is the forecast that under modern conditions it would be quite impossible for any great general to emerge to supremacy and concentrate the enthusiasm of the armies of either side. There could be no Alexanders or Napoleons. And we soon heard the scientific corps muttering, 'These old fools,' exactly as it is here foretold.

These, however, are small details, and the misses in the story far outnumber the hits. It is the main thesis which is still of interest now; the thesis that because of the development of scientific knowledge, separate sovereign states and separate sovereign empires are no longer possible in the world, that to attempt to keep on with the old system is to heap disaster upon disaster for mankind and perhaps to destroy our race altogether. The remaining interest of this book now is the sustained validity of this thesis and the discussion of the possible ending of war on the earth. I have supposed a sort of epidemic of sanity to break out among the rulers of states and the leaders of mankind. I have represented the native common sense of the French mind and of the English mind – for manifestly King Egbert is meant to be 'God's Englishman' – leading mankind towards a bold and resolute effort of salvage and reconstruction. Instead of which, as the school book footnotes say, compare to-day's newspaper. Instead of a frank and honourable gathering of leading men, Englishman meeting German and Frenchman Russian, brothers in their offences and in their disaster, upon the hills of Brissago, beheld in Geneva at the other end of Switzerland a poor little League of (Allied) Nations (excluding the United States, Russia, and most of the 'subject peoples' of the world), meeting obscurely amidst a world-wide disregard to make impotent gestures at the leading problems of the debacle. Either the disaster has not been vast enough yet or it has not been swift enough to inflict the necessary moral shock and achieve the necessary moral revulsion. Just as the world of 1913 was used to an increasing prosperity and thought that increase would go on for ever, so now it would seem the world

is growing accustomed to a steady glide towards social disintegration, and thinks that that too can go on continually and never come to a final bump. So soon do use and wont establish themselves, and the most flaming and thunderous of lessons pale into disregard.

The question whether a Leblanc is still possible, the question whether it is still possible to bring about an outbreak of creative sanity in mankind, to avert this steady glide to destruction, is now one of the most urgent in the world. It is clear that the writer is temperamentally disposed to hope that there is such a possibility. But he has to confess that he sees few signs of any such breadth of understanding and steadfastness of will as an effectual effort to turn the rush of human affairs demands. The inertia of dead ideas and old institutions carries us on towards the rapids. Only in one direction is there any plain recognition of the idea of a human commonweal as something overriding any national and patriotic consideration, and that is in the working class movement throughout the world. And labour internationalism is closely bound up with conceptions of a profound social revolution. If world peace is to be attained through labour internationalism, it will have to be attained at the price of the completest social and economic reconstruction and by passing through a phase of revolution that will certainly be violent, that may be very bloody, which may be prolonged through a long period, and may in the end fail to achieve anything but social destruction. Nevertheless, the fact remains that it is in the labour class, and the labour class alone, that any conception of a world rule and a world peace has so far appeared. The dream of *The World Set Free*, a dream of highly educated and highly favoured leading and ruling men, voluntarily setting themselves to the task of reshaping the world, has thus far remained a dream.

H. G. WELLS. EASTON GLEBE, DUNMOW, 1921.

## PRELUDE

### THE SUN SNARERS

#### Section I

THE history of mankind is the history of the attainment of external power. Man is the tool-using, fire-making animal. From the outset of his terrestrial career we find him supplementing the natural strength and bodily weapons of a beast by the heat of burning and the rough implement of stone. So he passed beyond the ape. From that he expands. Presently he added to himself the power of the horse and the ox, he borrowed the carrying strength of water and the driving force of the wind, he quickened his fire by blowing, and his simple tools, pointed first with copper and then with iron, increased and varied and became more elaborate and efficient. He sheltered his heat in houses and made his way easier by paths and roads. He complicated his social relationships and increased his efficiency by the division of labour. He began to store up knowledge. Contrivance followed contrivance, each making it possible for a man to do more. Always down the lengthening record, save for a set-back ever and again, he is doing more... A quarter of a million years ago the utmost man was a savage, a being scarcely articulate, sheltering in holes in the rocks, armed with a rough-hewn flint or a fire-pointed stick, naked, living in small family groups, killed by some younger man so soon as his first virile activity declined. Over most of the great wildernesses of earth you would have sought him in vain; only in a few temperate and sub-tropical river valleys would you have found the squatting lairs of his little herds, a male, a few females, a child or so.

He knew no future then, no kind of life except the life he led. He fled the cave-bear over the rocks full of iron ore and the promise of sword and spear; he froze to death upon a ledge of coal; he drank water muddy with the clay that would one day make cups of porcelain; he chewed the ear of wild wheat he had plucked and gazed with a dim speculation in his eyes at the birds that soared beyond his reach. Or suddenly he became aware of the scent of another male and rose up roaring, his roars the formless precursors of moral admonitions. For he was a great individualist, that original, he suffered none other than himself.

So through the long generations, this heavy precursor, this ancestor of all of us, fought and bred and perished, changing almost imperceptibly.

Yet he changed. That keen chisel of necessity which sharpened the tiger's claw age by age and fined down the clumsy Orchippus to the swift grace of the horse, was at work upon him – is at work upon him still. The clumsier and more stupidly fierce among him were killed soonest and oftenest; the finer hand, the quicker eye, the bigger brain, the better balanced body prevailed; age by age, the implements were a little better made, the man a little more delicately adjusted to his possibilities. He became more social; his herd grew larger; no longer did each man kill or drive out his growing sons; a system of taboos made them tolerable to him, and they revered him alive and soon even after he was dead, and were his allies against the beasts and the rest of mankind. (But they were forbidden to touch the women of the tribe, they had to go out and capture women for themselves, and each son fled from his stepmother and hid from her lest the anger of the Old Man should be roused. All the world over, even to this day, these ancient inevitable taboos can be traced.) And now instead of caves came huts and hovels, and the fire was better tended and there were wrappings and garments; and so aided, the creature spread into colder climates, carrying food with him, storing food – until sometimes the neglected grass-seed sprouted again and gave a first hint of agriculture.

And already there were the beginnings of leisure and thought.

Man began to think. There were times when he was fed, when his lusts and his fears were all appeased, when the sun shone upon the squatting-place and dim stirrings of speculation lit his eyes. He scratched upon a bone and found resemblance and pursued it and began pictorial art, moulded the soft, warm clay of the river brink between his fingers, and found a pleasure in its patternings and repetitions, shaped it into the form of vessels, and found that it would hold water. He watched the streaming river, and wondered from what bountiful breast this incessant water came; he blinked at the sun and dreamt that perhaps he might snare it and spear it as it went down to its resting-place amidst the distant hills. Then he was roused to convey to his brother that once indeed he had done so – at least that some one had done so – he mixed that perhaps with another dream almost as daring, that one day a mammoth had been beset; and therewith began fiction – pointing a way to achievement – and the august prophetic procession of tales.

For scores and hundreds of centuries, for myriads of generations that life of our fathers went on. From the beginning to the ripening of that phase of human life, from the first clumsy eolith of rudely chipped flint to the first implements of polished stone, was two or three thousand centuries, ten or fifteen thousand generations. So slowly, by human standards, did humanity gather itself together out of the dim intimations of the beast. And that first glimmering of speculation, that first story of achievement, that story-teller bright-eyed and flushed under his matted hair, gesticulating to his gaping, incredulous listener, gripping his wrist to keep him attentive, was the most marvellous beginning this world has ever seen. It doomed the mammoths, and it began the setting of that snare that shall catch the sun.

## Section 2

That dream was but a moment in a man's life, whose proper business it seemed was to get food and kill his fellows and beget after the manner of all that belongs to the fellowship of the beasts. About him, hidden from him by the thinnest of veils, were the untouched sources of Power, whose magnitude we scarcely do more than suspect even to-day, Power that could make his every conceivable dream come real. But the feet of the race were in the way of it, though he died blindly unknowing.

At last, in the generous levels of warm river valleys, where food is abundant and life very easy, the emerging human overcoming his earlier jealousies, becoming, as necessity persecuted him less urgently, more social and tolerant and amenable, achieved a larger community. There began a division of labour, certain of the older men specialised in knowledge and direction, a strong man took the fatherly leadership in war, and priest and king began to develop their roles in the opening drama of man's history. The priest's solicitude was seed-time and harvest and fertility, and the king ruled peace and war. In a hundred river valleys about the warm, temperate zone of the earth there were already towns and temples, a score of thousand years ago. They flourished unrecorded, ignoring the past and unsuspecting of the future, for as yet writing had still to begin.

Very slowly did man increase his demand upon the illimitable wealth of Power that offered itself on every hand to him. He tamed certain animals, he developed his primordially haphazard agriculture into a ritual, he added first one metal to his resources and then another, until he had copper and tin and iron and lead and gold and silver to supplement his stone, he hewed and carved wood, made pottery, paddled down his river until he came to the sea, discovered the wheel and made the first roads. But his chief activity for a hundred centuries and more, was the subjugation of himself and others to larger and larger societies. The history of man is not simply the conquest of external power; it is first the conquest of those distrusts and fiercenesses, that self-concentration and intensity of animalism, that tie his hands from taking his inheritance. The ape in us still resents association. From the dawn of the age of polished stone to the achievement of the Peace of the World, man's dealings were chiefly with himself and his fellow man, trading, bargaining, law-making, propitiating, enslaving, conquering, exterminating, and every little increment in Power, he turned at once and always turns to the purposes

of this confused elaborate struggle to socialise. To incorporate and comprehend his fellow men into a community of purpose became the last and greatest of his instincts. Already before the last polished phase of the stone age was over he had become a political animal. He made astonishingly far-reaching discoveries within himself, first of counting and then of writing and making records, and with that his town communities began to stretch out to dominion; in the valleys of the Nile, the Euphrates, and the great Chinese rivers, the first empires and the first written laws had their beginnings. Men specialised for fighting and rule as soldiers and knights. Later, as ships grew seaworthy, the Mediterranean which had been a barrier became a highway, and at last out of a tangle of pirate polities came the great struggle of Carthage and Rome. The history of Europe is the history of the victory and breaking up of the Roman Empire. Every ascendant monarch in Europe up to the last, aped Caesar and called himself Kaiser or Tsar or Emperor or Kasir-i-Hind. Measured by the duration of human life it is a vast space of time between that first dynasty in Egypt and the coming of the aeroplane, but by the scale that looks back to the makers of the eoliths, it is all of it a story of yesterday.

Now during this period of two hundred centuries or more, this period of the warring states, while men's minds were chiefly preoccupied by politics and mutual aggression, their progress in the acquirement of external Power was slow – rapid in comparison with the progress of the old stone age, but slow in comparison with this new age of systematic discovery in which we live. They did not very greatly alter the weapons and tactics of warfare, the methods of agriculture, seamanship, their knowledge of the habitable globe, or the devices and utensils of domestic life between the days of the early Egyptians and the days when Christopher Columbus was a child. Of course, there were inventions and changes, but there were also retrogressions; things were found out and then forgotten again; it was, on the whole, a progress, but it contained no steps; the peasant life was the same, there were already priests and lawyers and town craftsmen and territorial lords and rulers, doctors, wise women, soldiers and sailors in Egypt and China and Assyria and south-eastern Europe at the beginning of that period, and they were doing much the same things and living much the same life as they were in Europe in A.D. 1500. The English excavators of the year A.D. 1900 could delve into the remains of Babylon and Egypt and disinter legal documents, domestic accounts, and family correspondence that they could read with the completest sympathy. There were great religious and moral changes throughout the period, empires and republics replaced one another, Italy tried a vast experiment in slavery, and indeed slavery was tried again and again and failed and failed and was still to be tested again and rejected again in the New World; Christianity and Mohammedanism swept away a thousand more specialised cults, but essentially these were progressive adaptations of mankind to material conditions that must have seemed fixed for ever. The idea of revolutionary changes in the material conditions of life would have been entirely strange to human thought through all that time.

Yet the dreamer, the story-teller, was there still, waiting for his opportunity amidst the busy preoccupations, the comings and goings, the wars and processions, the castle building and cathedral building, the arts and loves, the small diplomacies and incurable feuds, the crusades and trading journeys of the middle ages. He no longer speculated with the untrammelled freedom of the stone-age savage; authoritative explanations of everything barred his path; but he speculated with a better brain, sat idle and gazed at circling stars in the sky and mused upon the coin and crystal in his hand. Whenever there was a certain leisure for thought throughout these times, then men were to be found dissatisfied with the appearances of things, dissatisfied with the assurances of orthodox belief, uneasy with a sense of unread symbols in the world about them, questioning the finality of scholastic wisdom. Through all the ages of history there were men to whom this whisper had come of hidden things about them. They could no longer lead ordinary lives nor content themselves with the common things of this world once they had heard this voice. And mostly they believed not only that all this world was as it were a painted curtain before things unguessed at, but that these secrets were Power. Hitherto Power had come to men by chance, but now there were these seekers seeking, seeking among rare and curious and perplexing objects, sometimes finding some odd utilisable thing, sometimes deceiving

themselves with fancied discovery, sometimes pretending to find. The world of every day laughed at these eccentric beings, or found them annoying and ill-treated them, or was seized with fear and made saints and sorcerers and warlocks of them, or with covetousness and entertained them hopefully; but for the greater part heeded them not at all. Yet they were of the blood of him who had first dreamt of attacking the mammoth; every one of them was of his blood and descent; and the thing they sought, all unwittingly, was the snare that will some day catch the sun.

### Section 3

Such a man was that Leonardo da Vinci, who went about the court of Sforza in Milan in a state of dignified abstraction. His common-place books are full of prophetic subtlety and ingenious anticipations of the methods of the early aviators. Durer was his parallel and Roger Bacon – whom the Franciscans silenced – of his kindred. Such a man again in an earlier city was Hero of Alexandria, who knew of the power of steam nineteen hundred years before it was first brought into use. And earlier still was Archimedes of Syracuse, and still earlier the legendary Daedalus of Cnossos. All up and down the record of history whenever there was a little leisure from war and brutality the seekers appeared. And half the alchemists were of their tribe.

When Roger Bacon blew up his first batch of gunpowder one might have supposed that men would have gone at once to the explosive engine. But they could see nothing of the sort. They were not yet beginning to think of seeing things; their metallurgy was all too poor to make such engines even had they thought of them. For a time they could not make instruments sound enough to stand this new force even for so rough a purpose as hurling a missile. Their first guns had barrels of coopered timber, and the world waited for more than five hundred years before the explosive engine came.

Even when the seekers found, it was at first a long journey before the world could use their findings for any but the roughest, most obvious purposes. If man in general was not still as absolutely blind to the unconquered energies about him as his paleolithic precursor, he was at best purblind.

### Section 4

The latent energy of coal and the power of steam waited long on the verge of discovery, before they began to influence human lives.

There were no doubt many such devices as Hero's toys devised and forgotten, time after time, in courts and palaces, but it needed that coal should be mined and burning with plenty of iron at hand before it dawned upon men that here was something more than a curiosity. And it is to be remarked that the first recorded suggestion for the use of steam was in war; there is an Elizabethan pamphlet in which it is proposed to fire shot out of corked iron bottles full of heated water. The mining of coal for fuel, the smelting of iron upon a larger scale than men had ever done before, the steam pumping engine, the steam-engine and the steam-boat, followed one another in an order that had a kind of logical necessity. It is the most interesting and instructive chapter in the history of the human intelligence, the history of steam from its beginning as a fact in human consciousness to the perfection of the great turbine engines that preceded the utilisation of intra-molecular power. Nearly every human being must have seen steam, seen it incuriously for many thousands of years; the women in particular were always heating water, boiling it, seeing it boil away, seeing the lids of vessels dance with its fury; millions of people at different times must have watched steam pitching rocks out of volcanoes like cricket balls and blowing pumice into foam, and yet you may search the whole human record through, letters, books, inscriptions, pictures, for any glimmer of a realisation that here was force, here was strength to borrow and use... Then suddenly man woke up to it, the railways spread like a network over the globe, the ever enlarging iron steamships began their staggering fight against wind and wave.

Steam was the first-comer in the new powers, it was the beginning of the Age of Energy that was to close the long history of the Warring States.

But for a long time men did not realise the importance of this novelty. They would not recognise, they were not able to recognise that anything fundamental had happened to their immemorial necessities. They called the steam-engine the 'iron horse' and pretended that they had made the most partial of substitutions. Steam machinery and factory production were visibly revolutionising the conditions of industrial production, population was streaming steadily in from the country-side and concentrating in hitherto unthought-of masses about a few city centres, food was coming to them over enormous distances upon a scale that made the one sole precedent, the corn ships of imperial Rome, a petty incident; and a huge migration of peoples between Europe and Western Asia and America was in Progress, and – nobody seems to have realised that something new had come into human life, a strange swirl different altogether from any previous circling and mutation, a swirl like the swirl when at last the lock gates begin to open after a long phase of accumulating water and eddying inactivity...

The sober Englishman at the close of the nineteenth century could sit at his breakfast-table, decide between tea from Ceylon or coffee from Brazil, devour an egg from France with some Danish ham, or eat a New Zealand chop, wind up his breakfast with a West Indian banana, glance at the latest telegrams from all the world, scrutinise the prices current of his geographically distributed investments in South Africa, Japan, and Egypt, and tell the two children he had begotten (in the place of his father's eight) that he thought the world changed very little. They must play cricket, keep their hair cut, go to the old school he had gone to, shirk the lessons he had shirked, learn a few scraps of Horace and Virgil and Homer for the confusion of cads, and all would be well with them...

## Section 5

Electricity, though it was perhaps the earlier of the two to be studied, invaded the common life of men a few decades after the exploitation of steam. To electricity also, in spite of its provocative nearness all about him, mankind had been utterly blind for incalculable ages. Could anything be more emphatic than the appeal of electricity for attention? It thundered at man's ears, it signalled to him in blinding flashes, occasionally it killed him, and he could not see it as a thing that concerned him enough to merit study. It came into the house with the cat on any dry day and crackled insinuatingly whenever he stroked her fur. It rotted his metals when he put them together... There is no single record that any one questioned why the cat's fur crackles or why hair is so unruly to brush on a frosty day, before the sixteenth century. For endless years man seems to have done his very successful best not to think about it at all; until this new spirit of the Seeker turned itself to these things.

How often things must have been seen and dismissed as unimportant, before the speculative eye and the moment of vision came! It was Gilbert, Queen Elizabeth's court physician, who first puzzled his brains with rubbed amber and bits of glass and silk and shellac, and so began the quickening of the human mind to the existence of this universal presence. And even then the science of electricity remained a mere little group of curious facts for nearly two hundred years, connected perhaps with magnetism – a mere guess that – perhaps with the lightning. Frogs' legs must have hung by copper hooks from iron railings and twitched upon countless occasions before Galvani saw them. Except for the lightning conductor, it was 250 years after Gilbert before electricity stepped out of the cabinet of scientific curiosities into the life of the common man... Then suddenly, in the half-century between 1880 and 1930, it ousted the steam-engine and took over traction, it ousted every other form of household heating, abolished distance with the perfected wireless telephone and the telephotograph...

## Section 6

And there was an extraordinary mental resistance to discovery and invention for at least a hundred years after the scientific revolution had begun. Each new thing made its way into practice against a scepticism that amounted at times to hostility. One writer upon these subjects gives a funny little domestic conversation that happened, he says, in the year 1898, within ten years, that is to say, of the time when the first aviators were fairly on the wing. He tells us how he sat at his desk in his study and conversed with his little boy.

His little boy was in profound trouble. He felt he had to speak very seriously to his father, and as he was a kindly little boy he did not want to do it too harshly.

This is what happened.

‘I wish, Daddy,’ he said, coming to his point, ‘that you wouldn’t write all this stuff about flying. The chaps rot me.’

‘Yes!’ said his father.

‘And old Broomie, the Head I mean, he rots me. Everybody rots me.’

‘But there is going to be flying – quite soon.’

The little boy was too well bred to say what he thought of that. ‘Anyhow,’ he said, ‘I wish you wouldn’t write about it.’

‘You’ll fly – lots of times – before you die,’ the father assured him.

The little boy looked unhappy.

The father hesitated. Then he opened a drawer and took out a blurred and under-developed photograph. ‘Come and look at this,’ he said.

The little boy came round to him. The photograph showed a stream and a meadow beyond, and some trees, and in the air a black, pencil-like object with flat wings on either side of it. It was the first record of the first apparatus heavier than air that ever maintained itself in the air by mechanical force. Across the margin was written: ‘Here we go up, up, up – from S. P. Langley, Smithsonian Institution, Washington.’

The father watched the effect of this reassuring document upon his son. ‘Well?’ he said.

‘That,’ said the schoolboy, after reflection, ‘is only a model.’

‘Model to-day, man to-morrow.’

The boy seemed divided in his allegiance. Then he decided for what he believed quite firmly to be omniscience. ‘But old Broomie,’ he said, ‘he told all the boys in his class only yesterday, “no man will ever fly.” No one, he says, who has ever shot grouse or pheasants on the wing would ever believe anything of the sort...’

Yet that boy lived to fly across the Atlantic and edit his father’s reminiscences.

## Section 7

At the close of the nineteenth century as a multitude of passages in the literature of that time witness, it was thought that the fact that man had at last had successful and profitable dealings with the steam that scalded him and the electricity that flashed and banged about the sky at him, was an amazing and perhaps a culminating exercise of his intelligence and his intellectual courage. The air of ‘Nunc Dimittis’ sounds in some of these writings. ‘The great things are discovered,’ wrote Gerald Brown in his summary of the nineteenth century. ‘For us there remains little but the working out of detail.’ The spirit of the seeker was still rare in the world; education was unskilled, unstimulating, scholarly, and but little valued, and few people even then could have realised that Science was still but the flimsiest of trial sketches and discovery scarcely beginning. No one seems to have been afraid of science and its possibilities. Yet now where there had been but a score or so of seekers, there were

many thousands, and for one needle of speculation that had been probing the curtain of appearances in 1800, there were now hundreds. And already Chemistry, which had been content with her atoms and molecules for the better part of a century, was preparing herself for that vast next stride that was to revolutionise the whole life of man from top to bottom.

One realises how crude was the science of that time when one considers the case of the composition of air. This was determined by that strange genius and recluse, that man of mystery, that disembowelled intelligence, Henry Cavendish, towards the end of the eighteenth century. So far as he was concerned the work was admirably done. He separated all the known ingredients of the air with a precision altogether remarkable; he even put it upon record that he had some doubt about the purity of the nitrogen. For more than a hundred years his determination was repeated by chemists all the world over, his apparatus was treasured in London, he became, as they used to say, 'classic,' and always, at every one of the innumerable repetitions of his experiment, that sly element argon was hiding among the nitrogen (and with a little helium and traces of other substances, and indeed all the hints that might have led to the new departures of the twentieth-century chemistry), and every time it slipped unobserved through the professorial fingers that repeated his procedure.

Is it any wonder then with this margin of inaccuracy, that up to the very dawn of the twentieth-century scientific discovery was still rather a procession of happy accidents than an orderly conquest of nature?

Yet the spirit of seeking was spreading steadily through the world. Even the schoolmaster could not check it. For the mere handful who grew up to feel wonder and curiosity about the secrets of nature in the nineteenth century, there were now, at the beginning of the twentieth, myriads escaping from the limitations of intellectual routine and the habitual life, in Europe, in America, North and South, in Japan, in China, and all about the world.

It was in 1910 that the parents of young Holsten, who was to be called by a whole generation of scientific men, 'the greatest of European chemists,' were staying in a villa near Santo Domenico, between Fiesole and Florence. He was then only fifteen, but he was already distinguished as a mathematician and possessed by a savage appetite to understand. He had been particularly attracted by the mystery of phosphorescence and its apparent unrelatedness to every other source of light. He was to tell afterwards in his reminiscences how he watched the fireflies drifting and glowing among the dark trees in the garden of the villa under the warm blue night sky of Italy; how he caught and kept them in cages, dissected them, first studying the general anatomy of insects very elaborately, and how he began to experiment with the effect of various gases and varying temperature upon their light. Then the chance present of a little scientific toy invented by Sir William Crookes, a toy called the spintharoscope, on which radium particles impinge upon sulphide of zinc and make it luminous, induced him to associate the two sets of phenomena. It was a happy association for his inquiries. It was a rare and fortunate thing, too, that any one with the mathematical gift should have been taken by these curiosities.

## Section 8

And while the boy Holsten was mooning over his fireflies at Fiesole, a certain professor of physics named Rufus was giving a course of afternoon lectures upon Radium and Radio-Activity in Edinburgh. They were lectures that had attracted a very considerable amount of attention. He gave them in a small lecture-theatre that had become more and more congested as his course proceeded. At his concluding discussion it was crowded right up to the ceiling at the back, and there people were standing, standing without any sense of fatigue, so fascinating did they find his suggestions. One youngster in particular, a chuckle-headed, scrub-haired lad from the Highlands, sat hugging his knee with great sand-red hands and drinking in every word, eyes aglow, cheeks flushed, and ears burning.

‘And so,’ said the professor, ‘we see that this Radium, which seemed at first a fantastic exception, a mad inversion of all that was most established and fundamental in the constitution of matter, is really at one with the rest of the elements. It does noticeably and forcibly what probably all the other elements are doing with an imperceptible slowness. It is like the single voice crying aloud that betrays the silent breathing multitude in the darkness. Radium is an element that is breaking up and flying to pieces. But perhaps all elements are doing that at less perceptible rates. Uranium certainly is; thorium – the stuff of this incandescent gas mantle – certainly is; actinium. I feel that we are but beginning the list. And we know now that the atom, that once we thought hard and impenetrable, and indivisible and final and – lifeless – lifeless, is really a reservoir of immense energy. That is the most wonderful thing about all this work. A little while ago we thought of the atoms as we thought of bricks, as solid building material, as substantial matter, as unit masses of lifeless stuff, and behold! these bricks are boxes, treasure boxes, boxes full of the intensest force. This little bottle contains about a pint of uranium oxide; that is to say, about fourteen ounces of the element uranium. It is worth about a pound. And in this bottle, ladies and gentlemen, in the atoms in this bottle there slumbers at least as much energy as we could get by burning a hundred and sixty tons of coal. If at a word, in one instant I could suddenly release that energy here and now it would blow us and everything about us to fragments; if I could turn it into the machinery that lights this city, it could keep Edinburgh brightly lit for a week. But at present no man knows, no man has an inkling of how this little lump of stuff can be made to hasten the release of its store. It does release it, as a burn trickles. Slowly the uranium changes into radium, the radium changes into a gas called the radium emanation, and that again to what we call radium A, and so the process goes on, giving out energy at every stage, until at last we reach the last stage of all, which is, so far as we can tell at present, lead. But we cannot hasten it.’

‘I take ye, man,’ whispered the chuckle-headed lad, with his red hands tightening like a vice upon his knee. ‘I take ye, man. Go on! Oh, go on!’

The professor went on after a little pause. ‘Why is the change gradual?’ he asked. ‘Why does only a minute fraction of the radium disintegrate in any particular second? Why does it dole itself out so slowly and so exactly? Why does not all the uranium change to radium and all the radium change to the next lowest thing at once? Why this decay by dribblets; why not a decay en masse?.. Suppose presently we find it is possible to quicken that decay?’

The chuckle-headed lad nodded rapidly. The wonderful inevitable idea was coming. He drew his knee up towards his chin and swayed in his seat with excitement. ‘Why not?’ he echoed, ‘why not?’

The professor lifted his forefinger.

‘Given that knowledge,’ he said, ‘mark what we should be able to do! We should not only be able to use this uranium and thorium; not only should we have a source of power so potent that a man might carry in his hand the energy to light a city for a year, fight a fleet of battleships, or drive one of our giant liners across the Atlantic; but we should also have a clue that would enable us at last to quicken the process of disintegration in all the other elements, where decay is still so slow as to escape our finest measurements. Every scrap of solid matter in the world would become an available reservoir of concentrated force. Do you realise, ladies and gentlemen, what these things would mean for us?’

The scrub head nodded. ‘Oh! go on. Go on.’

‘It would mean a change in human conditions that I can only compare to the discovery of fire, that first discovery that lifted man above the brute. We stand to-day towards radio-activity as our ancestor stood towards fire before he had learnt to make it. He knew it then only as a strange thing utterly beyond his control, a flare on the crest of the volcano, a red destruction that poured through the forest. So it is that we know radio-activity to-day. This – this is the dawn of a new day in human living. At the climax of that civilisation which had its beginning in the hammered flint and the fire-stick of the savage, just when it is becoming apparent that our ever-increasing needs cannot be borne indefinitely by our present sources of energy, we discover suddenly the possibility of an entirely new

civilisation. The energy we need for our very existence, and with which Nature supplies us still so grudgingly, is in reality locked up in inconceivable quantities all about us. We cannot pick that lock at present, but – ’

He paused. His voice sank so that everybody strained a little to hear him.

‘ – we will.’

He put up that lean finger again, his solitary gesture.

‘And then,’ he said...

‘Then that perpetual struggle for existence, that perpetual struggle to live on the bare surplus of Nature’s energies will cease to be the lot of Man. Man will step from the pinnacle of this civilisation to the beginning of the next. I have no eloquence, ladies and gentlemen, to express the vision of man’s material destiny that opens out before me. I see the desert continents transformed, the poles no longer wildernesses of ice, the whole world once more Eden. I see the power of man reach out among the stars...’

He stopped abruptly with a catching of the breath that many an actor or orator might have envied.

The lecture was over, the audience hung silent for a few seconds, sighed, became audible, stirred, fluttered, prepared for dispersal. More light was turned on and what had been a dim mass of figures became a bright confusion of movement. Some of the people signalled to friends, some crowded down towards the platform to examine the lecturer’s apparatus and make notes of his diagrams. But the chuckle-headed lad with the scrub hair wanted no such detailed frittering away of the thoughts that had inspired him. He wanted to be alone with them; he elbowed his way out almost fiercely, he made himself as angular and bony as a cow, fearing lest some one should speak to him, lest some one should invade his glowing sphere of enthusiasm.

He went through the streets with a rapt face, like a saint who sees visions. He had arms disproportionately long, and ridiculous big feet.

He must get alone, get somewhere high out of all this crowding of commonness, of everyday life.

He made his way to the top of Arthur’s Seat, and there he sat for a long time in the golden evening sunshine, still, except that ever and again he whispered to himself some precious phrase that had stuck in his mind.

‘If,’ he whispered, ‘if only we could pick that lock...’

The sun was sinking over the distant hills. Already it was shorn of its beams, a globe of ruddy gold, hanging over the great banks of cloud that would presently engulf it.

‘Eh!’ said the youngster. ‘Eh!’

He seemed to wake up at last out of his entrancement, and the red sun was there before his eyes. He stared at it, at first without intelligence, and then with a gathering recognition. Into his mind came a strange echo of that ancestral fancy, that fancy of a Stone Age savage, dead and scattered bones among the drift two hundred thousand years ago.

‘Ye auld thing,’ he said – and his eyes were shining, and he made a kind of grabbing gesture with his hand; ‘ye auld red thing... We’ll have ye YET.’

## CHAPTER THE FIRST

# THE NEW SOURCE OF ENERGY

### Section I

The problem which was already being mooted by such scientific men as Ramsay, Rutherford, and Soddy, in the very beginning of the twentieth century, the problem of inducing radio-activity in the heavier elements and so tapping the internal energy of atoms, was solved by a wonderful combination of induction, intuition, and luck by Holsten so soon as the year 1933. From the first detection of radio-activity to its first subjugation to human purpose measured little more than a quarter of a century. For twenty years after that, indeed, minor difficulties prevented any striking practical application of his success, but the essential thing was done, this new boundary in the march of human progress was crossed, in that year. He set up atomic disintegration in a minute particle of bismuth; it exploded with great violence into a heavy gas of extreme radio-activity, which disintegrated in its turn in the course of seven days, and it was only after another year's work that he was able to show practically that the last result of this rapid release of energy was gold. But the thing was done – at the cost of a blistered chest and an injured finger, and from the moment when the invisible speck of bismuth flashed into riving and rending energy, Holsten knew that he had opened a way for mankind, however narrow and dark it might still be, to worlds of limitless power. He recorded as much in the strange diary biography he left the world, a diary that was up to that particular moment a mass of speculations and calculations, and which suddenly became for a space an amazingly minute and human record of sensations and emotions that all humanity might understand.

He gives, in broken phrases and often single words, it is true, but none the less vividly for that, a record of the twenty-four hours following the demonstration of the correctness of his intricate tracery of computations and guesses. 'I thought I should not sleep,' he writes – the words he omitted are supplied in brackets – (on account of) 'pain in (the) hand and chest and (the) wonder of what I had done... Slept like a child.'

He felt strange and disconcerted the next morning; he had nothing to do, he was living alone in apartments in Bloomsbury, and he decided to go up to Hampstead Heath, which he had known when he was a little boy as a breezy playground. He went up by the underground tube that was then the recognised means of travel from one part of London to another, and walked up Heath Street from the tube station to the open heath. He found it a gully of planks and scaffoldings between the hoardings of house-wreckers. The spirit of the times had seized upon that narrow, steep, and winding thoroughfare, and was in the act of making it commodious and interesting, according to the remarkable ideals of Neo-Georgian aestheticism. Such is the illogical quality of humanity that Holsten, fresh from work that was like a petard under the seat of current civilisation, saw these changes with regret. He had come up Heath Street perhaps a thousand times, had known the windows of all the little shops, spent hours in the vanished cinematograph theatre, and marvelled at the high-flung early Georgian houses upon the westward bank of that old gully of a thoroughfare; he felt strange with all these familiar things gone. He escaped at last with a feeling of relief from this choked alley of trenches and holes and cranes, and emerged upon the old familiar scene about the White Stone Pond. That, at least, was very much as it used to be.

There were still the fine old red-brick houses to left and right of him; the reservoir had been improved by a portico of marble, the white-fronted inn with the clustering flowers above its portico still stood out at the angle of the ways, and the blue view to Harrow Hill and Harrow spire, a view of hills and trees and shining waters and wind-driven cloud shadows, was like the opening of a great

window to the ascending Londoner. All that was very reassuring. There was the same strolling crowd, the same perpetual miracle of motors dodging through it harmlessly, escaping headlong into the country from the Sabbatical stuffiness behind and below them. There was a band still, a women's suffrage meeting – for the suffrage women had won their way back to the tolerance, a trifle derisive, of the populace again – socialist orators, politicians, a band, and the same wild uproar of dogs, frantic with the gladness of their one blessed weekly release from the back yard and the chain. And away along the road to the Spaniards strolled a vast multitude, saying, as ever, that the view of London was exceptionally clear that day.

Young Holsten's face was white. He walked with that uneasy affectation of ease that marks an overstrained nervous system and an under-exercised body. He hesitated at the White Stone Pond whether to go to the left of it or the right, and again at the fork of the roads. He kept shifting his stick in his hand, and every now and then he would get in the way of people on the footpath or be jostled by them because of the uncertainty of his movements. He felt, he confesses, 'inadequate to ordinary existence.' He seemed to himself to be something inhuman and mischievous. All the people about him looked fairly prosperous, fairly happy, fairly well adapted to the lives they had to lead – a week of work and a Sunday of best clothes and mild promenading – and he had launched something that would disorganise the entire fabric that held their contentments and ambitions and satisfactions together. 'Felt like an imbecile who has presented a box full of loaded revolvers to a Creche,' he notes.

He met a man named Lawson, an old school-fellow, of whom history now knows only that he was red-faced and had a terrier. He and Holsten walked together and Holsten was sufficiently pale and jumpy for Lawson to tell him he overworked and needed a holiday. They sat down at a little table outside the County Council house of Golders Hill Park and sent one of the waiters to the Bull and Bush for a couple of bottles of beer, no doubt at Lawson's suggestion. The beer warmed Holsten's rather dehumanised system. He began to tell Lawson as clearly as he could to what his great discovery amounted. Lawson feigned attention, but indeed he had neither the knowledge nor the imagination to understand. 'In the end, before many years are out, this must eventually change war, transit, lighting, building, and every sort of manufacture, even agriculture, every material human concern –'

Then Holsten stopped short. Lawson had leapt to his feet. 'Damn that dog!' cried Lawson. 'Look at it now. Hi! Here! Phewoo – phewoo phewoo! Come HERE, Bobs! Come HERE!'

The young scientific man, with his bandaged hand, sat at the green table, too tired to convey the wonder of the thing he had sought so long, his friend whistled and bawled for his dog, and the Sunday people drifted about them through the spring sunshine. For a moment or so Holsten stared at Lawson in astonishment, for he had been too intent upon what he had been saying to realise how little Lawson had attended.

Then he remarked, 'WELL!' and smiled faintly, and – finished the tankard of beer before him.

Lawson sat down again. 'One must look after one's dog,' he said, with a note of apology. 'What was it you were telling me?'

## Section 2

In the evening Holsten went out again. He walked to Saint Paul's Cathedral, and stood for a time near the door listening to the evening service. The candles upon the altar reminded him in some odd way of the fireflies at Fiesole. Then he walked back through the evening lights to Westminster. He was oppressed, he was indeed scared, by his sense of the immense consequences of his discovery. He had a vague idea that night that he ought not to publish his results, that they were premature, that some secret association of wise men should take care of his work and hand it on from generation to generation until the world was riper for its practical application. He felt that nobody in all the thousands of people he passed had really awakened to the fact of change, they trusted the world for

what it was, not to alter too rapidly, to respect their trusts, their assurances, their habits, their little accustomed traffics and hard-won positions.

He went into those little gardens beneath the over-hanging, brightly-lit masses of the Savoy Hotel and the Hotel Cecil. He sat down on a seat and became aware of the talk of the two people next to him. It was the talk of a young couple evidently on the eve of marriage. The man was congratulating himself on having regular employment at last; 'they like me,' he said, 'and I like the job. If I work up – in'r dozen years or so I ought to be gettin' somethin' pretty comfortable. That's the plain sense of it, Hetty. There ain't no reason whatsoever why we shouldn't get along very decently – very decently indeed.'

The desire for little successes amidst conditions securely fixed! So it struck upon Holsten's mind. He added in his diary, 'I had a sense of all this globe as that...'

By that phrase he meant a kind of clairvoyant vision of this populated world as a whole, of all its cities and towns and villages, its high roads and the inns beside them, its gardens and farms and upland pastures, its boatmen and sailors, its ships coming along the great circles of the ocean, its time-tables and appointments and payments and dues as it were one unified and progressive spectacle. Sometimes such visions came to him; his mind, accustomed to great generalisations and yet acutely sensitive to detail, saw things far more comprehensively than the minds of most of his contemporaries. Usually the teeming sphere moved on to its predestined ends and circled with a stately swiftness on its path about the sun. Usually it was all a living progress that altered under his regard. But now fatigue a little deadened him to that incessancy of life, it seemed now just an eternal circling. He lapsed to the commoner persuasion of the great fixities and recurrences of the human routine. The remoter past of wandering savagery, the inevitable changes of to-morrow were veiled, and he saw only day and night, seed-time and harvest, loving and begetting, births and deaths, walks in the summer sunlight and tales by the winter fireside, the ancient sequence of hope and acts and age perennially renewed, eddying on for ever and ever, save that now the impious hand of research was raised to overthrow this drowsy, gently humming, habitual, sunlit spinning-top of man's existence...

For a time he forgot wars and crimes and hates and persecutions, famine and pestilence, the cruelties of beasts, weariness and the bitter wind, failure and insufficiency and retrocession. He saw all mankind in terms of the humble Sunday couple upon the seat beside him, who schemed their inglorious outlook and improbable contentments. 'I had a sense of all this globe as that.'

His intelligence struggled against this mood and struggled for a time in vain. He reassured himself against the invasion of this disconcerting idea that he was something strange and inhuman, a loose wanderer from the flock returning with evil gifts from his sustained unnatural excursions amidst the darknesses and phosphorescences beneath the fair surfaces of life. Man had not been always thus; the instincts and desires of the little home, the little plot, was not all his nature; also he was an adventurer, an experimenter, an unresting curiosity, an insatiable desire. For a few thousand generations indeed he had tilled the earth and followed the seasons, saying his prayers, grinding his corn and trampling the October winepress, yet not for so long but that he was still full of restless stirrings.

'If there have been home and routine and the field,' thought Holsten, 'there have also been wonder and the sea.'

He turned his head and looked up over the back of the seat at the great hotels above him, full of softly shaded lights and the glow and colour and stir of feasting. Might his gift to mankind mean simply more of that?.

He got up and walked out of the garden, surveyed a passing tram-car, laden with warm light, against the deep blues of evening, dripping and trailing long skirts of shining reflection; he crossed the Embankment and stood for a time watching the dark river and turning ever and again to the lit buildings and bridges. His mind began to scheme conceivable replacements of all those clustering arrangements...

‘It has begun,’ he writes in the diary in which these things are recorded. ‘It is not for me to reach out to consequences I cannot foresee. I am a part, not a whole; I am a little instrument in the armoury of Change. If I were to burn all these papers, before a score of years had passed, some other man would be doing this..

### Section 3

Holsten, before he died, was destined to see atomic energy dominating every other source of power, but for some years yet a vast network of difficulties in detail and application kept the new discovery from any effective invasion of ordinary life. The path from the laboratory to the workshop is sometimes a tortuous one; electro-magnetic radiations were known and demonstrated for twenty years before Marconi made them practically available, and in the same way it was twenty years before induced radio-activity could be brought to practical utilisation. The thing, of course, was discussed very much, more perhaps at the time of its discovery than during the interval of technical adaptation, but with very little realisation of the huge economic revolution that impended. What chiefly impressed the journalists of 1933 was the production of gold from bismuth and the realisation albeit upon unprofitable lines of the alchemist’s dreams; there was a considerable amount of discussion and expectation in that more intelligent section of the educated publics of the various civilised countries which followed scientific development; but for the most part the world went about its business – as the inhabitants of those Swiss villages which live under the perpetual threat of overhanging rocks and mountains go about their business – just as though the possible was impossible, as though the inevitable was postponed for ever because it was delayed.

It was in 1953 that the first Holsten-Roberts engine brought induced radio-activity into the sphere of industrial production, and its first general use was to replace the steam-engine in electrical generating stations. Hard upon the appearance of this came the Dass-Tata engine – the invention of two among the brilliant galaxy of Bengali inventors the modernisation of Indian thought was producing at this time – which was used chiefly for automobiles, aeroplanes, waterplanes, and such-like, mobile purposes. The American Kemp engine, differing widely in principle but equally practicable, and the Krupp-Erlanger came hard upon the heels of this, and by the autumn of 1954 a gigantic replacement of industrial methods and machinery was in progress all about the habitable globe. Small wonder was this when the cost, even of these earliest and clumsiest of atomic engines, is compared with that of the power they superseded. Allowing for lubrication the Dass-Tata engine, once it was started cost a penny to run thirty-seven miles, and added only nine and quarter pounds to the weight of the carriage it drove. It made the heavy alcohol-driven automobile of the time ridiculous in appearance as well as preposterously costly. For many years the price of coal and every form of liquid fuel had been clambering to levels that made even the revival of the draft horse seem a practicable possibility, and now with the abrupt relaxation of this stringency, the change in appearance of the traffic upon the world’s roads was instantaneous. In three years the frightful armoured monsters that had hooted and smoked and thundered about the world for four awful decades were swept away to the dealers in old metal, and the highways thronged with light and clean and shimmering shapes of silvered steel. At the same time a new impetus was given to aviation by the relatively enormous power for weight of the atomic engine, it was at last possible to add Redmayne’s ingenious helicopter ascent and descent engine to the vertical propeller that had hitherto been the sole driving force of the aeroplane without overweighting the machine, and men found themselves possessed of an instrument of flight that could hover or ascend or descend vertically and gently as well as rush wildly through the air. The last dread of flying vanished. As the journalists of the time phrased it, this was the epoch of the Leap into the Air. The new atomic aeroplane became indeed a mania; every one of means was frantic to possess a thing so controllable, so secure and so free from the dust and danger of the road,

and in France alone in the year 1943 thirty thousand of these new aeroplanes were manufactured and licensed, and soared humming softly into the sky.

And with an equal speed atomic engines of various types invaded industrialism. The railways paid enormous premiums for priority in the delivery of atomic traction engines, atomic smelting was embarked upon so eagerly as to lead to a number of disastrous explosions due to inexperienced handling of the new power, and the revolutionary cheapening of both materials and electricity made the entire reconstruction of domestic buildings a matter merely dependent upon a reorganisation of the methods of the builder and the house-furnisher. Viewed from the side of the new power and from the point of view of those who financed and manufactured the new engines and material it required the age of the Leap into the Air was one of astonishing prosperity. Patent-holding companies were presently paying dividends of five or six hundred per cent. and enormous fortunes were made and fantastic wages earned by all who were concerned in the new developments. This prosperity was not a little enhanced by the fact that in both the Dass-Tata and Holsten-Roberts engines one of the recoverable waste products was gold – the former disintegrated dust of bismuth and the latter dust of lead – and that this new supply of gold led quite naturally to a rise in prices throughout the world.

This spectacle of feverish enterprise was productivity, this crowding flight of happy and fortunate rich people – every great city was as if a crawling ant-hill had suddenly taken wing – was the bright side of the opening phase of the new epoch in human history. Beneath that brightness was a gathering darkness, a deepening dismay. If there was a vast development of production there was also a huge destruction of values. These glaring factories working night and day, these glittering new vehicles swinging noiselessly along the roads, these flights of dragon-flies that swooped and soared and circled in the air, were indeed no more than the brightnesses of lamps and fires that gleam out when the world sinks towards twilight and the night. Between these high lights accumulated disaster, social catastrophe. The coal mines were manifestly doomed to closure at no very distant date, the vast amount of capital invested in oil was becoming unsaleable, millions of coal miners, steel workers upon the old lines, vast swarms of unskilled or under-skilled labourers in innumerable occupations, were being flung out of employment by the superior efficiency of the new machinery, the rapid fall in the cost of transit was destroying high land values at every centre of population, the value of existing house property had become problematical, gold was undergoing headlong depreciation, all the securities upon which the credit of the world rested were slipping and sliding, banks were tottering, the stock exchanges were scenes of feverish panic; – this was the reverse of the spectacle, these were the black and monstrous under-consequences of the Leap into the Air.

There is a story of a demented London stockbroker running out into Threadneedle Street and tearing off his clothes as he ran. ‘The Steel Trust is scrapping the whole of its plant,’ he shouted. ‘The State Railways are going to scrap all their engines. Everything’s going to be scrapped – everything. Come and scrap the mint, you fellows, come and scrap the mint!’

In the year 1955 the suicide rate for the United States of America quadrupled any previous record. There was an enormous increase also in violent crime throughout the world. The thing had come upon an unprepared humanity; it seemed as though human society was to be smashed by its own magnificent gains.

For there had been no foresight of these things. There had been no attempt anywhere even to compute the probable dislocations this flood of inexpensive energy would produce in human affairs. The world in these days was not really governed at all, in the sense in which government came to be understood in subsequent years. Government was a treaty, not a design; it was forensic, conservative, disputatious, unseeing, unthinking, uncreative; throughout the world, except where the vestiges of absolutism still sheltered the court favourite and the trusted servant, it was in the hands of the predominant caste of lawyers, who had an enormous advantage in being the only trained caste. Their professional education and every circumstance in the manipulation of the fantastically naive electoral methods by which they clambered to power, conspired to keep them contemptuous of facts,

conscientiously unimaginative, alert to claim and seize advantages and suspicious of every generosity. Government was an obstructive business of energetic factions, progress went on outside of and in spite of public activities, and legislation was the last crippling recognition of needs so clamorous and imperative and facts so aggressively established as to invade even the dingy seclusions of the judges and threaten the very existence of the otherwise inattentive political machine.

The world was so little governed that with the very coming of plenty, in the full tide of an incalculable abundance, when everything necessary to satisfy human needs and everything necessary to realise such will and purpose as existed then in human hearts was already at hand, one has still to tell of hardship, famine, anger, confusion, conflict, and incoherent suffering. There was no scheme for the distribution of this vast new wealth that had come at last within the reach of men; there was no clear conception that any such distribution was possible. As one attempts a comprehensive view of those opening years of the new age, as one measures it against the latent achievement that later years have demonstrated, one begins to measure the blindness, the narrowness, the insensate unimaginative individualism of the pre-atomic time. Under this tremendous dawn of power and freedom, under a sky ablaze with promise, in the very presence of science standing like some bountiful goddess over all the squat darkneses of human life, holding patiently in her strong arms, until men chose to take them, security, plenty, the solution of riddles, the key of the bravest adventures, in her very presence, and with the earnest of her gifts in court, the world was to witness such things as the squalid spectacle of the Dass-Tata patent litigation.

There in a stuffy court in London, a grimy oblong box of a room, during the exceptional heat of the May of 1956, the leading counsel of the day argued and shouted over a miserable little matter of more royalties or less and whether the Dass-Tata company might not bar the Holsten-Roberts' methods of utilising the new power. The Dass-Tata people were indeed making a strenuous attempt to secure a world monopoly in atomic engineering. The judge, after the manner of those times, sat raised above the court, wearing a preposterous gown and a foolish huge wig, the counsel also wore dirty-looking little wigs and queer black gowns over their usual costume, wigs and gowns that were held to be necessary to their pleading, and upon unclean wooden benches stirred and whispered artful-looking solicitors, busily scribbling reporters, the parties to the case, expert witnesses, interested people, and a jostling confusion of subpoenaed persons, briefless young barristers (forming a style on the most esteemed and truculent examples) and casual eccentric spectators who preferred this pit of iniquity to the free sunlight outside. Every one was damply hot, the examining King's Counsel wiped the perspiration from his huge, clean-shaven upper lip; and into this atmosphere of grasping contention and human exhalations the daylight filtered through a window that was manifestly dirty. The jury sat in a double pew to the left of the judge, looking as uncomfortable as frogs that have fallen into an ash-pit, and in the witness-box lied the would-be omnivorous Dass, under cross-examination...

Holsten had always been accustomed to publish his results so soon as they appeared to him to be sufficiently advanced to furnish a basis for further work, and to that confiding disposition and one happy flash of adaptive invention the alert Dass owed his claim...

But indeed a vast multitude of such sharp people were clutching, patenting, pre-empting, monopolising this or that feature of the new development, seeking to subdue this gigantic winged power to the purposes of their little lusts and avarice. That trial is just one of innumerable disputes of the same kind. For a time the face of the world festered with patent legislation. It chanced, however, to have one oddly dramatic feature in the fact that Holsten, after being kept waiting about the court for two days as a beggar might have waited at a rich man's door, after being bullied by ushers and watched by policemen, was called as a witness, rather severely handled by counsel, and told not to 'quibble' by the judge when he was trying to be absolutely explicit.

The judge scratched his nose with a quill pen, and sneered at Holsten's astonishment round the corner of his monstrous wig. Holsten was a great man, was he? Well, in a law-court great men were put in their places.

‘We want to know has the plaintiff added anything to this or hasn’t he?’ said the judge, ‘we don’t want to have your views whether Sir Philip Dass’s improvements were merely superficial adaptations or whether they were implicit in your paper. No doubt – after the manner of inventors – you think most things that were ever likely to be discovered are implicit in your papers. No doubt also you think too that most subsequent additions and modifications are merely superficial. Inventors have a way of thinking that. The law isn’t concerned with that sort of thing. The law has nothing to do with the vanity of inventors. The law is concerned with the question whether these patent rights have the novelty the plaintiff claims for them. What that admission may or may not stop, and all these other things you are saying in your overflowing zeal to answer more than the questions addressed to you – none of these things have anything whatever to do with the case in hand. It is a matter of constant astonishment to me in this court to see how you scientific men, with all your extraordinary claims to precision and veracity, wander and wander so soon as you get into the witness-box. I know no more unsatisfactory class of witness. The plain and simple question is, has Sir Philip Dass made any real addition to existing knowledge and methods in this matter or has he not? We don’t want to know whether they were large or small additions nor what the consequences of your admission may be. That you will leave to us.’

Holsten was silent.

‘Surely?’ said the judge, almost pityingly.

‘No, he hasn’t,’ said Holsten, perceiving that for once in his life he must disregard infinitesimals.

‘Ah!’ said the judge, ‘now why couldn’t you say that when counsel put the question?’

An entry in Holsten’s diary-autobiography, dated five days later, runs: ‘Still amazed. The law is the most dangerous thing in this country. It is hundreds of years old. It hasn’t an idea. The oldest of old bottles and this new wine, the most explosive wine. Something will overtake them.’

#### Section 4

There was a certain truth in Holsten’s assertion that the law was ‘hundreds of years old.’ It was, in relation to current thought and widely accepted ideas, an archaic thing. While almost all the material and methods of life had been changing rapidly and were now changing still more rapidly, the law-courts and the legislatures of the world were struggling desperately to meet modern demands with devices and procedures, conceptions of rights and property and authority and obligation that dated from the rude compromises of relatively barbaric times. The horse-hair wigs and antic dresses of the British judges, their musty courts and overbearing manners, were indeed only the outward and visible intimations of profounder anachronisms. The legal and political organisation of the earth in the middle twentieth century was indeed everywhere like a complicated garment, outworn yet strong, that now fettered the governing body that once it had protected.

Yet that same spirit of free-thinking and outspoken publication that in the field of natural science had been the beginning of the conquest of nature, was at work throughout all the eighteenth and nineteenth centuries preparing the spirit of the new world within the degenerating body of the old. The idea of a greater subordination of individual interests and established institutions to the collective future, is traceable more and more clearly in the literature of those times, and movement after movement fretted itself away in criticism of and opposition to first this aspect and then that of the legal, social, and political order. Already in the early nineteenth century Shelley, with no scrap of alternative, is denouncing the established rulers of the world as Anarchs, and the entire system of ideas and suggestions that was known as Socialism, and more particularly its international side, feeble as it was in creative proposals or any method of transition, still witnesses to the growth of a conception of a modernised system of inter-relationships that should supplant the existing tangle of proprietary legal ideas.

The word 'Sociology' was invented by Herbert Spencer, a popular writer upon philosophical subjects, who flourished about the middle of the nineteenth century, but the idea of a state, planned as an electric-traction system is planned, without reference to pre-existing apparatus, upon scientific lines, did not take a very strong hold upon the popular imagination of the world until the twentieth century. Then, the growing impatience of the American people with the monstrous and socially paralysing party systems that had sprung out of their absurd electoral arrangements, led to the appearance of what came to be called the 'Modern State' movement, and a galaxy of brilliant writers, in America, Europe, and the East, stirred up the world to the thought of bolder rearrangements of social interaction, property, employment, education, and government, than had ever been contemplated before. No doubt these Modern State ideas were very largely the reflection upon social and political thought of the vast revolution in material things that had been in progress for two hundred years, but for a long time they seemed to be having no more influence upon existing institutions than the writings of Rousseau and Voltaire seemed to have had at the time of the death of the latter. They were fermenting in men's minds, and it needed only just such social and political stresses as the coming of the atomic mechanisms brought about, to thrust them forward abruptly into crude and startling realisation.

## Section 5

Frederick Barnet's *Wander Jahre* is one of those autobiographical novels that were popular throughout the third and fourth decades of the twentieth century. It was published in 1970, and one must understand *Wander Jahre* rather in a spiritual and intellectual than in a literal sense. It is indeed an allusive title, carrying the world back to the *Wilhelm Meister* of Goethe, a century and a half earlier.

Its author, Frederick Barnet, gives a minute and curious history of his life and ideas between his nineteenth and his twenty-third birthdays. He was neither a very original nor a very brilliant man, but he had a trick of circumstantial writing; and though no authentic portrait was to survive for the information of posterity, he betrays by a score of casual phrases that he was short, sturdy, inclined to be plump, with a 'rather blobby' face, and full, rather projecting blue eyes. He belonged until the financial debacle of 1956 to the class of fairly prosperous people, he was a student in London, he aeroplaned to Italy and then had a pedestrian tour from Genoa to Rome, crossed in the air to Greece and Egypt, and came back over the Balkans and Germany. His family fortunes, which were largely invested in bank shares, coal mines, and house property, were destroyed. Reduced to penury, he sought to earn a living. He suffered great hardship, and was then caught up by the war and had a year of soldiering, first as an officer in the English infantry and then in the army of pacification. His book tells all these things so simply and at the same time so explicitly, that it remains, as it were, an eye by which future generations may have at least one man's vision of the years of the Great Change.

And he was, he tells us, a 'Modern State' man 'by instinct' from the beginning. He breathed in these ideas in the class rooms and laboratories of the Carnegie Foundation school that rose, a long and delicately beautiful facade, along the South Bank of the Thames opposite the ancient dignity of Somerset House. Such thought was interwoven with the very fabric of that pioneer school in the educational renaissance in England. After the customary exchange years in Heidelberg and Paris, he went into the classical school of London University. The older so-called 'classical' education of the British pedagogues, probably the most paralysing, ineffective, and foolish routine that ever wasted human life, had already been swept out of this great institution in favour of modern methods; and he learnt Greek and Latin as well as he had learnt German, Spanish, and French, so that he wrote and spoke them freely, and used them with an unconscious ease in his study of the foundation civilisations of the European system to which they were the key. (This change was still so recent that he mentions an encounter in Rome with an 'Oxford don' who 'spoke Latin with a Wiltshire accent and manifest

discomfort, wrote Greek letters with his tongue out, and seemed to think a Greek sentence a charm when it was a quotation and an impropriety when it wasn't.)

Barnet saw the last days of the coal-steam engines upon the English railways and the gradual cleansing of the London atmosphere as the smoke-creating sea-coal fires gave place to electric heating. The building of laboratories at Kensington was still in progress, and he took part in the students' riots that delayed the removal of the Albert Memorial. He carried a banner with 'We like Funny Statuary' on one side, and on the other 'Seats and Canopies for Statues, Why should our Great Departed Stand in the Rain?' He learnt the rather athletic aviation of those days at the University grounds at Sydenham, and he was fined for flying over the new prison for political libellers at Wormwood Scrubs, 'in a manner calculated to exhilarate the prisoners while at exercise.' That was the time of the attempted suppression of any criticism of the public judicature and the place was crowded with journalists who had ventured to call attention to the dementia of Chief Justice Abrahams. Barnet was not a very good aviator, he confesses he was always a little afraid of his machine – there was excellent reason for every one to be afraid of those clumsy early types – and he never attempted steep descents or very high flying. He also, he records, owned one of those oil-driven motor-bicycles whose clumsy complexity and extravagant filthiness still astonish the visitors to the museum of machinery at South Kensington. He mentions running over a dog and complains of the ruinous price of 'spatchcocks' in Surrey. 'Spatchcocks,' it seems, was a slang term for crushed hens.

He passed the examinations necessary to reduce his military service to a minimum, and his want of any special scientific or technical qualification and a certain precocious corpulence that handicapped his aviation indicated the infantry of the line as his sphere of training. That was the most generalised form of soldiering. The development of the theory of war had been for some decades but little assisted by any practical experience. What fighting had occurred in recent years, had been fighting in minor or uncivilised states, with peasant or barbaric soldiers and with but a small equipment of modern contrivances, and the great powers of the world were content for the most part to maintain armies that sustained in their broader organisation the traditions of the European wars of thirty and forty years before. There was the infantry arm to which Barnet belonged and which was supposed to fight on foot with a rifle and be the main portion of the army. There were cavalry forces (horse soldiers), having a ratio to the infantry that had been determined by the experiences of the Franco-German war in 1871. There was also artillery, and for some unexplained reason much of this was still drawn by horses; though there were also in all the European armies a small number of motor-guns with wheels so constructed that they could go over broken ground. In addition there were large developments of the engineering arm, concerned with motor transport, motor-bicycle scouting, aviation, and the like.

No first-class intelligence had been sought to specialise in and work out the problem of warfare with the new appliances and under modern conditions, but a succession of able jurists, Lord Haldane, Chief Justice Briggs, and that very able King's Counsel, Philbrick, had reconstructed the army frequently and thoroughly and placed it at last, with the adoption of national service, upon a footing that would have seemed very imposing to the public of 1900. At any moment the British Empire could now put a million and a quarter of arguable soldiers upon the board of Welt-Politik. The traditions of Japan and the Central European armies were more princely and less forensic; the Chinese still refused resolutely to become a military power, and maintained a small standing army upon the American model that was said, so far as it went, to be highly efficient, and Russia, secured by a stringent administration against internal criticism, had scarcely altered the design of a uniform or the organisation of a battery since the opening decades of the century. Barnet's opinion of his military training was manifestly a poor one, his Modern State ideas disposed him to regard it as a bore, and his common sense condemned it as useless. Moreover, his habit of body made him peculiarly sensitive to the fatigues and hardships of service.

‘For three days in succession we turned out before dawn and – for no earthly reason – without breakfast,’ he relates. ‘I suppose that is to show us that when the Day comes the first thing will be to get us thoroughly uncomfortable and rotten. We then proceeded to Kriegspiel, according to the mysterious ideas of those in authority over us. On the last day we spent three hours under a hot if early sun getting over eight miles of country to a point we could have reached in a motor omnibus in nine minutes and a half – I did it the next day in that – and then we made a massed attack upon entrenchments that could have shot us all about three times over if only the umpires had let them. Then came a little bayonet exercise, but I doubt if I am sufficiently a barbarian to stick this long knife into anything living. Anyhow in this battle I shouldn’t have had a chance. Assuming that by some miracle I hadn’t been shot three times over, I was far too hot and blown when I got up to the entrenchments even to lift my beastly rifle. It was those others would have begun the sticking...’

‘For a time we were watched by two hostile aeroplanes; then our own came up and asked them not to, and – the practice of aerial warfare still being unknown – they very politely desisted and went away and did dives and circles of the most charming description over the Fox Hills.’

All Barnet’s accounts of his military training were written in the same half-contemptuous, half-protesting tone. He was of opinion that his chances of participating in any real warfare were very slight, and that, if after all he should participate, it was bound to be so entirely different from these peace manoeuvres that his only course as a rational man would be to keep as observantly out of danger as he could until he had learnt the tricks and possibilities of the new conditions. He states this quite frankly. Never was a man more free from sham heroics.

## Section 6

Barnet welcomed the appearance of the atomic engine with the zest of masculine youth in all fresh machinery, and it is evident that for some time he failed to connect the rush of wonderful new possibilities with the financial troubles of his family. ‘I knew my father was worried,’ he admits. That cast the smallest of shadows upon his delighted departure for Italy and Greece and Egypt with three congenial companions in one of the new atomic models. They flew over the Channel Isles and Touraine, he mentions, and circled about Mont Blanc – ‘These new helicopters, we found,’ he notes, ‘had abolished all the danger and strain of sudden drops to which the old-time aeroplanes were liable’ – and then he went on by way of Pisa, Paestum, Ghirgenti, and Athens, to visit the pyramids by moonlight, flying thither from Cairo, and to follow the Nile up to Khartum. Even by later standards, it must have been a very gleeful holiday for a young man, and it made the tragedy of his next experiences all the darker. A week after his return his father, who was a widower, announced himself ruined, and committed suicide by means of an unscheduled opiate.

At one blow Barnet found himself flung out of the possessing, spending, enjoying class to which he belonged, penniless and with no calling by which he could earn a living. He tried teaching and some journalism, but in a little while he found himself on the underside of a world in which he had always reckoned to live in the sunshine. For innumerable men such an experience has meant mental and spiritual destruction, but Barnet, in spite of his bodily gravitation towards comfort, showed himself when put to the test, of the more valiant modern quality. He was saturated with the creative stoicism of the heroic times that were already dawning, and he took his difficulties and discomforts stoutly as his appointed material, and turned them to expression.

Indeed, in his book, he thanks fortune for them. ‘I might have lived and died,’ he says, ‘in that neat fool’s paradise of secure lavishness above there. I might never have realised the gathering wrath and sorrow of the ousted and exasperated masses. In the days of my own prosperity things had seemed to me to be very well arranged.’ Now from his new point of view he was to find they were not arranged at all; that government was a compromise of aggressions and powers and lassitudes, and

law a convention between interests, and that the poor and the weak, though they had many negligent masters, had few friends.

‘I had thought things were looked after,’ he wrote. ‘It was with a kind of amazement that I tramped the roads and starved – and found that no one in particular cared.’

He was turned out of his lodging in a backward part of London.

‘It was with difficulty I persuaded my landlady – she was a needy widow, poor soul, and I was already in her debt – to keep an old box for me in which I had locked a few letters, keepsakes, and the like. She lived in great fear of the Public Health and Morality Inspectors, because she was sometimes too poor to pay the customary tip to them, but at last she consented to put it in a dark tiled place under the stairs, and then I went forth into the world – to seek first the luck of a meal and then shelter.’

He wandered down into the thronging gayer parts of London, in which a year or so ago he had been numbered among the spenders.

London, under the Visible Smoke Law, by which any production of visible smoke with or without excuse was punishable by a fine, had already ceased to be the sombre smoke-darkened city of the Victorian time; it had been, and indeed was, constantly being rebuilt, and its main streets were already beginning to take on those characteristics that distinguished them throughout the latter half of the twentieth century. The insanitary horse and the plebeian bicycle had been banished from the roadway, which was now of a resilient, glass-like surface, spotlessly clean; and the foot passenger was restricted to a narrow vestige of the ancient footpath on either side of the track and forbidden at the risk of a fine, if he survived, to cross the roadway. People descended from their automobiles upon this pavement and went through the lower shops to the lifts and stairs to the new ways for pedestrians, the Rows, that ran along the front of the houses at the level of the first story, and, being joined by frequent bridges, gave the newer parts of London a curiously Venetian appearance. In some streets there were upper and even third-story Rows. For most of the day and all night the shop windows were lit by electric light, and many establishments had made, as it were, canals of public footpaths through their premises in order to increase their window space.

Barnet made his way along this night-scene rather apprehensively since the police had power to challenge and demand the Labour Card of any indigent-looking person, and if the record failed to show he was in employment, dismiss him to the traffic pavement below.

But there was still enough of his former gentility about Barnet’s appearance and bearing to protect him from this; the police, too, had other things to think of that night, and he was permitted to reach the galleries about Leicester Square – that great focus of London life and pleasure.

He gives a vivid description of the scene that evening. In the centre was a garden raised on arches lit by festoons of lights and connected with the Rows by eight graceful bridges, beneath which hummed the interlacing streams of motor traffic, pulsating as the current alternated between east and west and north and south. Above rose great frontages of intricate rather than beautiful reinforced porcelain, studded with lights, barred by bold illuminated advertisements, and glowing with reflections. There were the two historical music halls of this place, the Shakespeare Memorial Theatre, in which the municipal players revolved perpetually through the cycle of Shakespeare’s plays, and four other great houses of refreshment and entertainment whose pinnacles streamed up into the blue obscurity of the night. The south side of the square was in dark contrast to the others; it was still being rebuilt, and a lattice of steel bars surmounted by the frozen gestures of monstrous cranes rose over the excavated sites of vanished Victorian buildings.

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