GARET GARRETT

A TIME IS BORN

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To the theme of this book the author has drawn such material as he wanted from various uncollected essays; also from three books, entitled, The Blue Wound, (G. P. Putnam's Sons, 1921); Ouroboros, (E. P. Dutton & Co., 1926); and, The American Omen, (E. P. Dutton & Co., Inc. 1928). He is grateful to the publishers named.

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PREMISE

DURING AN INTERLUDE of twenty-one years between two global wars Heaven swung low and then high again.

When it was very low, seeming almost to touch the hill tops, the human race prepared to celebrate the death of poverty. In the whole world material well being advanced to an unexplored plane. If the contrasts that continued to exist were thought to be anywhere greater than before, that was an illusion owing to the fact that so much news of prosperity made people more conscious of disparities. Certainly in all civilized regions poor living was already better than good living had ever been for the fathers; and for those who had gained the heights there was mankind's first view of the Land of Immeasurable Plenty.

So far as they could see there was no longer any limit to the satisfaction of human wants. That was not all. A remorseless law was about to be repealed.

Hitherto it had been that the sum of man's satisfactions could be increased only by more labor, wherein he lost the pleasure of his possessions. Here at last was plenty without end *at a diminishing price.* The hours of labor were going to be shortened and the hours of leisure accordingly lengthened. And for this, thanks from economic man to no relenting deity. He had done it for himself, by knowledge, invention, method and machine power.

The American peak was the highest of all.

The Americans said: "Let this be named the New Era."

It turned out that the New Era was the New Babel.

It was as if again the people of the earth, all with one language, had said:

> *"Let us build us a city and a tower whose top may reach unto Heaven,"—*
>
> *And the Lord came down to see the city and the tower which the children of men builded. And the Lord said, "Behold, the people is one and they have all one language; and this they begin to do; and now nothing will be restrained from them which they have imagined to do. Go to, let us go down, and there confound their language, that they may not understand one another's speech."*

Certain it was that in the Great Depression understanding failed. People were no longer able to make meaning to one another in the one speech they had thought they had in common, namely, the language of economics.

And so they came to the crisis. The adjourned war was resumed on a scale much more grand and terrible; and it was so because meanwhile man had progressed in science.

Regard him, then, scientific man, turning his technics against himself: zooming out of the sky at the speed of sound to lay thunderbolts on his own precious towers, frantically pursuing in his laboratories the search for higher and yet higher explosives, beseeching his gods of research to reveal to him suddenly the ultimate secret of the atom, for if he had that he could make a bomb to blow a city into utter nothingness at one stroke. And although he should risk at the same time blowing himself off the earth or knocking the earth out of its orbit, still he would try it.

If the Lord had been wrecking his towers he could have understood it somewhat. The reasons he gave himself, concerning why he did it, made almost no sense at all.

Two great passions, one to build up and one to tear down, were locked in struggle. The compulsion to destroy was the necessity to create, and between their works was neither time nor space. The issue of this was a fact of inconceivable implications. A frenzy of destructive invention raised physical reality to the plane of phantasy. Thus, reality and phantasy became interchangeable, even as the Lord had feared,—

"And now nothing will be restrained from them which they have imagined to do."

Suppose it were true,—what man imagined that he could do. That would seem to be power in its last definition. You would have but one question left to ask: "What will he imagine to do?" Yet the frustration remained as it was. This was power over matter, not power over himself; and if you took him in that light he had come no way at all since he was scattered from his first tower.

But you cannot leave him there. Take him in the role of spectator and he is wonderful again.

By means of written history he had been able to see his past as drama and spectacle, but with his mind's eye only, standing outside the emotions that had controlled his behavior. If only he could see and hear his own history as it was taking place, then he would be inside of it. Did he expect to learn anything by this? Probably not. Yet in time for his second global war he had achieved that feat entirely.

By an art beyond magic, the scenes and movements of war were made visible, its uproar and voices were made audible, around the world with the speed of light. For an eye-witness account of battle in Europe or Africa before the dead were cold, one sitting at ease on the North American continent had only to flip the switch of a sound-box. To hear, instead, the groans of empire in mortal anguish or the insulting harangue of the enemy,

one had but to turn the knob slightly to right or left. To see the action by land and sea and air, and the towers falling down, one had only to go after dinner to the nearest moving picture house.

By a whimsical extension of the same art it was made possible to see, as if it were taking place, what more man imagined to do,—the future enacting itself before it had actually happened. Thus millions of people sat in movie theatres gazing with fascinated horror at what might have been a phantasy of the end of the world, in technicolor. Yet this was real, and real precisely because it was phantasy,—something man had imagined to do and could do because he had imagined it. How to do it was already known. All that would be now required to bring any phantasy to pass was the re-direction of a few million man-hours of labor.

And what was this?

It was how to make bombing more and more terrible until at last there would be no refuge, not even underground, for a self-accelerating rocket bomb could be made to pierce the earth and then explode at leisure, producing earthquake. There it was happening. By this technique, an enemy nation was not to be overcome, not to be conquered; it was only to be blown apart at the heart.

What was the use of it?

"The use of it," said these, "is to destroy those who would destroy us." And when these had destroyed those, what would be saved? Civilization would be saved.

It was possible of course that this would be the last phantasy of all, and one beyond technicolor. Certainly one not of this earth, looking on as from a window, unable to hear what people said they believed about it, might very well have thought: "But this is not war. It is deluge."

Deluge was God's weapon. Now man had got hold of it; man himself possessed the power to produce cataclysm. Moreover,

there was no reason to suppose this power would not increase in his hands, since it derived from technical and scientific knowledge, the body of which would probably go on growing by a law of its own. Its discoveries, at any rate, are irreversible events. Nothing is ever again as it was before.

What to do with such power? How to restrain or control it, since it was not confined to any one people? How to live with it at all?

These were questions no one could answer. The vague idea was that only the righteous should possess it, being able to trust themselves and forbid it to all others. Then should their children toil ceaselessly to support it,—the cost being very great,—or should the wicked who had last employed it for purposes of aggression be enslaved and made to pay tribute? How could either one way or the other be for very long?

Well, but for all of this, it was still the same self-contained earth, no bigger around the middle by so much as one inch, going no place, going no faster; and if there were more people upon it than ever before, with more dangerous knowledge among them, their simple motives had not changed in the least since their myth time.

What was the fighting for?

It was for advantage in the earth, one side to conquer it, the other to defend it.

We shall be understood by this to mean economic advantage. What we really mean is advantage in the division of human labor. For kings and princes, for the rich and the high caste, for the overlord people who rule and govern, there is no other.

Consider how it is that from a division of labor two problems immediately arise:

First, by what rule shall the product be divided?

Second, how shall the tasks be alloted?

Always there are preferred and less preferred tasks, and the

least preferred, though they may be essential, are the least rewarded. So it has been from the beginning. The power to allot the tasks is power to adjust the yoke; and this until now has been the ultimate political and economic power of the world. All empire has been founded upon it; empire unable to keep it has always crashed.

Why do we say, *until now*?

It is true that two global wars were but man's old, old way with the curse of toil; and yet it is possible to see that the kind of knowledge that made them so terrifying may be at the same time foreknowledge of a world to come in which it would be neither necessary nor profitable for one people to exploit the labor of another.

Neither of these wars was rational, the second far less than the first. For want of twentieth century machine technics and scientific knowledge, wars like these could not have occurred in the nineteenth century. That seems to be merely the statement of an obvious fact, and so it is. But look. For the same reason, that is to say, namely, for want of twentieth century machine technics and scientific means, war proceeding from the same motive in the nineteenth century, or in the eighteenth century, or at any time before, *was a rational enterprise.*

This is the premise to be explored. It is not a moral premise. It is scientific or nothing.

If it is sound,—if these two global wars were irrational in the present state of knowledge,—does it follow that they were without meaning at all? Was it all so senseless?

The answer is one we shall know later. Generations hence, provided we advance without looking back, we may understand that they were necessary,—that the first was the premature foreboding and the second the true birth agony of a world that could bring itself to pass only by an act of incomparable violence. In that case man would appear to have been the instrument, quite

unable to give an account of himself by reason alone. And it would not be the first time he had been saved by works he knew not the meaning of while doing them, even works of great destruction. Supposing this to be so there was much to be destroyed.

PART ONE

TOWERS

CHAPTER ONE

The Economic Story Begins

THE CURSE IN MYTH AND FACT.—ALL THINGS ARE FULL OF LABOR.—THE FIRST REVOLT.—CAIN BUILDS HIM A CITY.—EVERY CITY SINCE THEN A FORETHOUGHT OF ESCAPE.—WHY EVERY CITY IS VULNERABLE.—EXPERIMENTS.—FROM THE IDYLLIC LIFE THROUGH GRANDEUR TO PIRACY.

THE CURSE WAS in these words,

Cursed is the ground for thy sake . . .
In the sweat of thy face shalt thou eat bread.

and there the economic story begins.

To ask if it really happened is stupid. Always to this day man has behaved as if it did, not because he has wished to believe it but because it is true that "all things are full of labor."

Cain, the first to revolt, was a farmer. Abel, his brother went for sheep raising, probably because in that simple scheme livestock was the highest form of wealth. Thus began the division of labor.

When it came offering time Cain brought to the altar the fruits of the soil, but Abel brought the firstlings of the flock whereof the fat was sweet. The Lord despised Cain's offering and accepted Abel's. Whether Cain had worked harder than Abel, or only thought he had, it made him very angry that his labor was scorned, as if his had been the inferior task. He walked with Abel and slew him. Then, with a mark upon his face, he abandoned agriculture and went and built him a city. So towers began.

If Cain's city was the first, then the first one was as the last one is, even to this day,—a forethought of escape from the mere

despised forms of toil, by means of trade, invention, bauble making, cunning and magic. In Cain's city were artificers of brass and iron, masons and architects, harpists and witches and harlots and drones, the keepers of order and the givers of law,—and slaves.

Imagine bringing time back and unrolling it again, only much faster than its speed was, so that a year may be as one instant; and that with suitable optical power you are looking down on the plains of Mesopotamia as they were at first, and at what happened there before civilizations came to be lying ten deep in the dust, lost and forgotten.

What will you see?

Let it be a city beginning,—first the walls and gates, next a temple, then many little houses forming streets, all as you might see a spider casting its web. It is an immense labor. But the labor for a while is willing and voluntary, since it is preferred over peasant labor from which all of these have fled.

From all directions, converging upon the city, move thin, slow files of people driving flocks before them and bearing grain and oil. They are met at each of the four gates by traders who higgle with them shrewdly and invariably with one outcome. The food disappears within the walls and those who brought it return in the directions whence they came, with things in their hands that glitter in the sun.

Suddenly the watchers on the walls sound a shrill alarm. The gates are slammed. Out of the north comes a marauding horde. It surrounds the little city, batters at the gates, tries scaling the walls and desists on finding that method of attack too costly, then settles down in a circle and waits. The city is besieged. In a short time it surrenders. The invaders enter, joyously loot it, then disappear again toward the north, taking with them a number of men and women prisoners. These are slaves, the first of all labor-saving devices.

But even as you look, another city is rising, larger than the first, with towers on the walls and pleasure gardens inside and structures that are for neither habitation nor trade, being ornamental. The labor is no longer voluntary. The drudges are slaves. Kingship and stewardship and the relation of master and bondsman have been evolved. The curse of toil is thus heavier on many and lighter on few. Otherwise it is the same. What happened to the first city happens also to this one. There is a third city and then a fourth and a fifth, each successive one more magnificent, but all alike vulnerable to attack. All in the same way are besieged, and all of them fall.

Even then the weakness of a city was that its belly was not in its own keeping. It had to trade artifacts for food. Cut off from trade it had to surrender or starve. How ironic, therefore, that it has been always the way of a city to despise the labor of its food bringers.

Now if your time apparatus and your optical power will enable you to envision the whole Mediterranean World, and you look again, you will see many cities, some in the plains of Mesopotamia where the first one was, others against the horizon, one with a tower that touches the clouds. And wherever you look there is battle. Armies are continually issuing from the gates of the cities and falling upon one another in terrific combat. Where before it was only the pillaging horde out of the north that a city feared, now cities fear one another because it is the ambition of each one to conquer the others and lay them under tribute. The one that can do this may hope thereafter to live in luxury and itself be free.

Three combine against two, and three survive. Two combine against one, and two survive. Between these two the strife continues until only the one with the highest tower is left. What happens to it is not what you have been expecting. No marauding force from the north appears to besiege it. Instead, there is

civil strife within the walls, uglier than any combat that had taken place outside. In this struggle the poor kill the rich, and that city is consumed by itself. The tower burns and falls. Those of the inhabitants who have not perished in the fight flee in little groups, weeping and looking back.

After thousands of years it begins to be tiresome and you would be turning away but for something that seems at first not very exciting, only different and just beginning.

On a barren and rugged peninsula people seem to be existing idyllically, with a very minimum of irksome labor. In the hills are flocks, mainly goats; on the uplands figs, olives and grapes, and on the lowlands grain. The people are not all alike and yet they seem to be all of one character. The shepherds are men apart, practicing rites and mysteries peculiar to their superstitions, but even these have interests in common with all the rest. The tillers and vine growers are continually going up on the hills to converse with the shepherds, and the shepherds go down to the lowlands for supplies, news and social contact.

One important thing they have all in common is poverty. This is owing partly to the unexuberant nature of their environment, and partly to choice. They could produce much more if they were so minded, but no one is more industrious than his neighbor, the land is divided in small parcels equally, and they are all of one opinion concerning work,—that it is a necessary evil of existence, and the less of it the better beyond the point of bare livelihood.

And so they live most uncomfortably, in houses that are mean and cold and badly roofed. But their unpampered bodies are stout and durable and their souls are warm and spontaneous. This about their souls is known by their behavior. They love festival. They are continually leaving their fields and vineyards, men, women and children, to congregate in certain places where they sing and dance and invoke the deities. The young men en-

gage in athletic contests and feats of endurance, which are enormously popular. The old men gather and wrangle and make decisions touching the common welfare.

The family is the fundamental social unit; above this is the clan. Fierce disputes flare up between clans, generally over boundary lines, and these culminate regularly in combat with letting of blood: but this after all is not very bad because their fighting like everything else they do is filled with joyous spontaneity and serves to purge the spirit of venom, so that afterward they are friends again and cherish no implacable hatreds. Moreover, it is very useful practice, this fighting. From time to time marauding tribes sweep down from the north, for goodness knows what purpose, since there is nothing worth while to steal; perhaps they want only to take prisoners for slavery. At any rate, they never get what they come for, but are always repulsed with great slaughter. After each of these victories there is festival, to the neglect of work.

For defense against invaders it becomes necessary to build walls around certain strategical areas within which all may take refuge in time of danger. The task of building these walls and other military works is managed in a characteristic manner. All the people together, even the women, join hands in a mighty communal exertion, so that the enterprise instead of being hateful and tedious is performed in a gay, holiday spirit, and when it is finished there are special festivals.

In the course of time these defended areas become little cities and the people grow to be aesthetic in thought concerning them, wishing at first to make them only beautiful, not powerful. To the fulfillment of this wish they contribute labor in common lavishly, as in the building of the military defences. Labor which they scorn to perform for private profit they give to their cities with passionate enthusiasm in a spirit of rivalry.

One city grows steadily more important and beautiful, be-

yond its share, and begins to assume leadership over all the others, laying the others under obligation to it when it can, with the result that the others are increasingly envious and distrustful of this one. Its permanent population multiplies rapidly. More and more men spend their whole time there in wrangle and debate, and this avocation, formerly a respite from labor, becomes a profession, so that many do nothing else. Besides these are craftsmen, traders, artists, singers and teachers; and there begin to be also those who seem to do nothing at all and wear finer cloth than is common.

Now ships appear, one, three, then fleets of ships. This city is going to trade. The ships voyage forth distantly; they bear away the products of the craftsmen in the city and return with exotic cargoes, such as perfumes, frankincense, spices and palatable foods.

One day a ship returns with a cargo of slaves. After that no ship returns without slaves, and whereas at first they were divided among the families of the adventurous sailors like any other booty, soon they begin to be sold for money, and in the great city there is regularly conducted a slave mart. But slaves are treated kindly. The women are taken into the households to be nurses and maids; the males are employed in agriculture in place of citizens who occupy themselves more and more in civic affairs. Also, many of the slaves are worked in quarries whence come the stones they need to build more temples in the fine city. The work of making it more beautiful goes on unceasingly.

Life becomes complicated. Money is introduced. Taxes are collected. The number of slaves increases, until the population of the principal city is more than one-half slave. Crisis comes. There is not enough food. This is owing partly to the increase of population and partly to the fact that so many people have forsaken agriculture.

This dilemma is met in an unexpected manner. Population is exported. Thousands of families are sent off in ships to found colonies. They are instructed to find two things: first, fertile land; secondly, tame people who can be made to work. Colonies so founded will be able not only to sustain themselves but to produce a surplus of food, this surplus to be sent back to the city in exchange for the glittering things a city prefers to make. All of this business is managed by the one city, which in consequence becomes a sea-power involved in colonial trade. And still it is in straits for means wherewith to bring to pass the vision of its own grandeur. It requires more and more labor to carry out its architectural schemes.

In the mountains are deposits of precious metal that have not been developed because none could be found willing to perform the drudgery of mining. This difficulty is solved at last by the importation of a lower class of slaves. These are set toiling in narrow subterranean passages that are hardly head high. It is thought a waste of time and labor to make the mining tunnels larger. The slaves may be unable to stand at their work, but they are chained to it. Thus the magnificent city finds money with which to prosecute its work, which it does with feverish haste, as if, with a foreboding of its end, it is yet resolved to make itself an eternal epic in pure beauty.

The more beautiful and powerful it grows the more its sister cities hate and fear it: yet for a long time they continue to pay the tribute which by one pretext or another it has laid upon them. This cannot last. The minor cities begin to revolt; but as they do they are put down and laid each time under heavy tribute, with or without pretext. This cannot last either. The minor cities begin to make alliances with foreign enemies, and in a little while the splendid city stands all alone in the peninsula, quite unable to feed itself, relying upon imports for sustenance, yet mighty still in sea-power.

When at length its money is exhausted, even the silver mines, and it has not goods enough of its own manufacture to exchange with foreigners for food, it turns its sea-power to uses of plunder, sending forth armadas to conquer distant cities, even its own colonies, looting and destroying them if they refuse to submit and pay tribute. Thus the proud and beautiful city, struggling for its life, turns outright to piracy. That is almost the end. In a little while those who had enslaved others are themselves conquered and led back to the curse as slaves.

This is done to them by a people who are on the same road without thinking of it—a people whose first state also had been one of hard-living self-containment in which all labor was of equal value, who in the same way grew weary of toil and turned from it to exploit the toil of others. When they have conquered the whole Mediterranean World, as they will, and can live in a superior manner by commanding the labor of others, they will need to give something in exchange. What will they give in exchange? They will give security and law. To them this will seem an ideal division of labor, for so long as it can last.

CHAPTER TWO

Who Made Me Divider Over You?

THE UNSOLVED PROBLEM OF DIVISION.—WHAT SHALL THE LABOR OF THE HIRELING BE WORTH?—THINGS PLATO PASSED OVER.—THOSE WHO EMBRACE THE CURSE BECOME CAPITALISTS.—MAN AS A LABOR STORING ANIMAL.—PARABLE OF THE VALLEY.

COULD THE IDYLLIC WAY ENDURE? or a self-contained community so frugal that none would be tempted to plunder it?

Plato thought a community of that kind might be pretty durable, even happy, but he was not quite serious, and when his young men rejected it on the ground that it would do for swine, he went on to describe what he believed to be the ideal republic, or at least the nearest possible approach to one. There would be slaves in it—that was taken for granted—and hirelings with nothing but their muscular strength to offer. The citizens would be farmers, artisans, merchants, physicians, a fighting caste of guardians, judges, and at the top a succession of selfless rulers. To hold it all together would be justice, and the ultimate point of justice, he believed, was a division of labor according to natural aptitudes, everyone to receive a reward equal to the value of work performed.

But by what scale should these unequal aptitudes be valued, and so accordingly, the rewards? What would the labor of the hireling be worth weighed against that of the artisan or the teacher, and by whom should it be weighed,—by the hireling or his betters? And that was not the only difficulty Plato passed over.

What of those who embrace the curse by excessive self-denial, as if they were making a passage through purgatory—who pro-

duce more than their neighbors, consume less, and store up labor at interest? Although these are few, the relative number is apparently constant and irreducible in any state of human society, idyllic or other; and these are the few who become capitalists. How grievously the simple human relationships may be thereby affected is naïvely told in the Parable of the Valley.*

By moonlight I came to a lovely valley lying deep in the protective embrace of mountains. Ingress was by a steep and difficult way, apparently seldom used.

Near the centre of the valley were twelve houses, not close together, yet clustered with a friendly, communal aspect.

As I approached the first house a man issued from it silently, walked in a purposeful manner to the next one, and knocked lightly. A second man immediately appeared. These knocked at the door of another house and were joined by a third. The three found a fourth man waiting, and so they increased until they were eleven. I walked near them and they were unaware of me. Not a word was spoken. All the eleven were masked in a kind of rude hood with openings only for the eyes.

In this way I came to the twelfth house. Three of the eleven placed themselves in front of the others and then, lifting their voices in unison, as if speaking a part rehearsed, they called loudly for the head of that family to appear.

He came in surprise and stood in the doorway.

The three spoke together as before, saying: "We have come to pronounce the sentence of this community upon you and what is yours. We have concealed our faces, not that we are in the least ashamed of what we are about to do, but in order, first, that you may be spared the temptation of calling for sympathy to those among us with whom you might claim special friendship and, second, that they may be spared the

* Recast from *The Blue Wound.*

pain of withholding it as individuals. And we speak in unison as you hear for the same reason. The sentence is that you, your wife, and your children shall rise immediately, clothe yourselves, take such food and goods as you may think wise to carry, and depart from this valley forever. And lest you should suspect that we covet for ourselves your house, your stores, and the use of your fields, we announce our intention to burn your house and all your stores and let your fields lie wild among us for all time as a reminder of this night."

"What have we done?" asked the man in the doorway. "Wherein is the offence with which we are thus unexpectedly blamed? Are we charged with any crime? If so, and we cannot prove our innocence, we shall humbly accept your judgment and depart. Otherwise our rights here are equal to any one's."

"We expected you to ask," said the three. "Our answer is ready. As to the condition on which you say you would accept our judgment, that is of no interest whatever. The sentence is final. As for what you have done, we do not ourselves clearly understand the nature of the thing, and we are too simple to examine into it deeply."

"Have we not been with you from the beginning here?" asked the man in the doorway. "Have we not been industrious? Have we not tended the sick and helped bury the dead? Have we not shared your hardships and tasted your sorrows?"

"This also we expected," said the three, "and it grieves us. It is true as you say. You have done all of these things. Nevertheless, you must go."

"But why?"

"What we know," continued the three, "is this: in the beginning we were all co-equal and free. Then the time came when we began not to be free. All of us were in debt to you. It was not much at first—only one tenth of our produce, or

in the extreme case one fifth. But your claims increased. It now is one quarter of our produce which you require from us each year, and we are no longer free. You say it is the law. We do not understand the law. We wish to be again as we were, all equal together, with no one having rights in the produce of another or putting a cloud upon the land of his neighbors. However, we are come not to parley but to execute the sentence. Make haste, please, and do as we have said. And you are never to return."

The door closed.

Within were sounds of lamentation and protest, turning to anger. The victims evidently knew the temper of their neighbors. Presently they issued forth—the man, his wife, two sons, two grown daughters, and a child. The women were voluble in their satiric comment on the character of the valley's inhabitants, the men cursed and the child wept. So they passed, bearing each a load apportioned to the strength.

As I followed them stumbling out of the valley our steps were fitfully lighted by the flames of the burning house.

What had happened here?

These exiles had been from the beginning the most industrious and the most efficient workers in the valley. Their wick was the last to flicker out at night and the first to be lighted in the morning. The exiles were not bad neighbors. They were only desperate workers. They bore their share of the hardships and were kind in their ministrations, but they avoided the festivities of leisure which the others enjoyed, and toiled instead. For this they were rather looked down upon. However, they had always a surplus of produce beyond their own needs, and when others were in want they loaned freely, though invariably with the stipulation that it should be returned with increase, that is, with interest. Thus, ten measures of grain loaned brought back eleven in pay-

ment. In this way the one family multiplied its surplus, but instead of consuming it in leisure and working less it began to perform for others many forms of irksome and disagreeable labor. If two or three families wished to make holiday or visit the city and there was work in the way of their pleasure this family would forego its own pleasure to perform for recompense the work which the others wished to shirk. They were all very simple people—the others were—and therefore willing to promise deferred value in exchange for the enjoyment of a present wish. In time all the other eleven families came to be in debt to this one, and when they could not pay at the end of the year the one was willing to settle for the pledge of a piece of ground. So the one family increased its wealth by claims upon the produce of others and by mortgages on their land. Ultimately it would have owned the whole valley, and the eleven would have been tenants or serfs —all working for one. When this had gone so far that the eleven could never hope to pay themselves out they resolved to expel the capitalistic family.

The motive was the same on both sides. All of them were seeking the same thing, namely, respite from irksome toil. The eleven pledged future toil for snatches of freedom, which is fatal. The one family pledged present toil for future freedom, meaning ultimately to gain such claims in the toil of others as to be able itself to desist from toil and live in leisure. Thus is capital created: first by such prodigious industry and self-deprivation that you have a surplus to lend and then by receiving back that surplus with increment. Few are willing to toil beyond their immediate needs in order to be able to lend. Many are willing to pledge future toil for immediate pleasure. Thus, lenders are few and borrowers many; none can afford to buy labor which they are able to

perform for themselves; and it is risky to sell labor to those who cannot afford to buy it, for the many are in the end possessed of the power to liquidate the debt by force.

It is a stark conclusion. Whether one accept or rejects it, or does either with reservations, it is a familiar fact that what took place in this valley is taking place everywhere and continually, between debtor and creditor groups within communities, between debtor and creditor communities within nations, and between debtor and creditor nations within the world.

Capital is formed by self-denial. It is labor stored. All capital is stored labor; all stored labor is not capital. The distinction is simple enough. The Pharaohs, who commanded labor instead of buying it, stored immense quantities of it in pyramids, and there once for all it was dead, or as now we say, unproductive. No one could eat a pyramid, wear it, or use it as a tool. But a ship or an engine represents labor that has been stored and so did Pharaoh's bulging granaries when the famine came; and stored labor in forms of that kind *is capital.* It serves as means to further production.

If man were not a labor storing animal there would be no civilization at all. Yet it is only the tenth part of him, or it may be the twentieth part, that has enough power of self-denial to store more than a seasonal quantity, from harvest to harvest, or from one pay day to the next. The one in twenty who would store more—the one who would double his exertions in time present in order to gain a future of effortless ease, was confronted in the beginning with a serious difficulty.

Nearly all the storable products of labor are perishable. So long, long ago the idea evolved of storing labor at interest—the idea, that is, of lending the surplus products of labor to others and charging these others interest or usury for the present use and enjoyment of them. Thus, ever renewed by the

labor of others, that twentieth one's own labor returns to him; more than that, it returns to him with increase, with the happy result that beyond his first simple intention of gaining for himself a future of ease without work, he finds that he becomes rich. He cannot himself use or enjoy all that returns to him, so he lends it again and again. Thus, labor stored in the form of debt on which interest is paid grows by accretion, silently and very fast, in the hand of the lender.

Seeing this, the many who borrow and pay interest wax fearful that a time will come when the few who are capitalists, like the one family in the valley, will own everything; owning everything they will be able to command the labor of others as if others were their slaves. Will not these in the end rule the whole world as proprietors?

Debtors imagine that sequel. There comes to be a debtor mentality. The sources of it lie deep in the not unattractive weaknesses of human nature. Forethought, thrift, a sense of providence, the behavior of self-denial—these are virtues, to be sure, yet they are hard and countermand present happiness.

That is why in the Mosaic law interest was forbidden. "Thou shalt not lend upon usury to thy brother; usury of money, usury of victuals, usury of anything that is lent upon usury." (Deut. 23:19.) Except to strangers. In the same law it was written that every seven years the creditor was obliged to release the debtor, even the debtor who had paid no interest. Only again the foreigner was excepted. "Of a foreigner thou mayest exact it again."

On the other hand, capital, formed in the only way it may be formed, has made possible all the means in the world whereby human wants are increasingly satisfied. The fear that if its power is let to run unchecked it will enslave the world is a real fear, politically and emotionally dangerous, and yet false. Nothing like that can happen. There can be only the illusion of it.

Capital being a generalized product of labor is, like all the specific products, perishable, too. It takes only a little more time. Where now is the fabulous capital of Venice, or, in fact, any that existed as recently as one hundred years ago? Just as it is that present life is owing to life forgotten, so if the capital that has vanished away had never existed none would be existing now. Time does it to life; change does it to capital.

CHAPTER THREE

Finding a Round World

JUST WHEN EVERYTHING WORTH KNOWING WAS ALREADY KNOWN AND NOTHING NEW COULD HAPPEN.—DAZZLING IMAGE OF A TURNING EARTH.—GETTING USED TO IT.—WHAT EUROPE NEVER DOUBTED.—DIVIDING THE APPLE FOR EUROPEANS ONLY.—SHADES OF CAESAR AND ALEXANDER WALKING IN EUROPE SEE A STRANGE GREY VAPOR.—WHAT THEY THOUGHT AN ENGINE WAS FOR.—THE MACHINE EXPELS SLAVERY.—THEN THE INDUSTRIAL REVOLUTION, A MONEY ECONOMY AND WAGE SLAVES.—EUROPE'S INTENTIONS FRUSTRATED IN NORTH AMERICA.—THEN THE TURNING TO ASIA.

IT WAS BELIEVED that everything worth thinking and saying had been written in books in the best possible style and that nothing could ever happen that had not happened many times before, when suddenly the earth became round and began to revolve.

If you consider how long it had been flat and at rest you will not wonder that it took men three hundred years to get the idea of living on a whirling sphere, which instead of casting them off into space by a centrifugal force they could understand held them fast by the soles of their feet because of a law they could not explain.

First they had to go around it a number of times to make sure of the spherical fact; also to break down the testimony of their common sense, and that was necessary, since to the senses everything seemed as it always had been, even the rising and setting of the sun, which was a total illusion. Then they had to explore it league by league and that was slow work. The means to begin with were such as had been suitable only for timid voyages in a flat world when there was nothing at all beyond the watery edges. When they had made drawings of strange oceans and continents and put them together a mental image began to form.

And what an image that was! In the immense darkness this

solitary life-bearing orb of land and water, sealed in prismatic vapors, turning in a shaft of sunshine to keep one half of itself always in the light, and not only turning but at the same time going round the sun by an annual path of its own, with its hat a little tilted, so that besides day and night from the turning there are years and a rippling of seasons north and south.

Next to a vision of the Creator this was the most dazzling and terrifying image man had ever imagined; and he had to imagine it because although he could go round and round upon it, chart it exactly, calculate its movements in space and foretell them, still never could he see it. From the moon he could see it, with a telescope, but not from anywhere upon it. Yet he did not become fixed in an attitude of worshipful veneration. His mind was too excited.

Two original ideas began to evolve. One was the idea of change, the other was the idea of progress; and they were deeply related. In no language before had there been any words to express either of these ideas as we understand them—that is, change as a principle of progress. Change before this had been thought of only as a movement from point to point in a cycle that repeated itself changelessly and forever; the thought of progress did not exist.

There was a third idea much more thrilling immediately and it occurred whole all at once. That was the idea of possession.

When the European geographers had got the land masses fairly right and the oceans all in place on their little globes they must have been astonished at the physical insignificance of Europe.

It was not a continent really; it was a peninsula, a fragment of Asia, so relatively small that if you did not know where it was you would have to look for it. But what of that? Indeed, the smallness of Europe on the map all the more dramatized the wonderful fact that European man was sovereign of the

world by right of having discovered it—the whole round world and everything in it, including people.

The simplicity of the idea put it beyond question. The act of discovery conferred title; and as for people upon the land, it was both their misfortune and their salvation to be discovered; they naturally became subjects. Until then, from time immemorial, a very large proportion of the human race had lived in some form of slavery, thinking it a normal condition, having known no other. And now the only thing new was that inferior races in other parts of the world were going to perform compulsory labor at the will of the sovereign European race—and be at the same time converted.

The idea of European sovereignty was nevertheless loaded with trouble. There were several competitive and jealous European nations and no such thing in fact as a European race. How should European rights in the world be divided? The answer was to let the Pope do it. In temporal matters Europe might be extremely quarrelsome but in Christianity it was fairly united; the Pope at Rome was its spiritual sovereign.

So the Pope divided the world as equally as he could between Spain and Portugal, these being at the time the two most powerful and adventurous sea-faring nations and in fact the only claimants. The Pope drew a line down what he thought would be about the middle of the earth; all west of it belonged to Spain and all on the other side to Portugal. The Portuguese protested that the line was too close to Africa, the coast of which their navigators had been exploring before Columbus discovered America. The Pope thereupon moved the line somewhat to the west, and this, as it later turned out, gave Brazil to Portugal, which was not intended.

That line could not hold. The Dutch, the British and the French awoke to the fact that the earth was being divided like

an apple. Their navigators went hurriedly forth to set stakes in it.

Coming to a shore with no Spanish or Portuguese signs upon it one would say, "I take possession in the name of His Majesty the King," or, another to a new river, "You belong to Her Majesty the Queen." Then they would sail home as fast as they could to get the reward, which might be money or fame or royal permission to found colonies on the new land and exploit it in any profitable way, provided they shared the profit with the crown.

For once, and for the first time so far as we know, the land-hunger of the human race was more than sated. Always before, from the beginning of the checkered story, it had been as Plato said with a lusty people expanding in a limited earth:* "The country, too, which was large enough to support the original inhabitants, will now be too small. If we are to have enough pasture and plow-land we shall have to cut off a slice of our neighbors' territory; and if they, too, are not content with necessaries, but give themselves up to getting unlimited wealth, they will want a slice of ours. . . . So the next will be that we shall be at war."

Or as it was with the children of Israel when the men who had been sent ahead to see what the Promised Land was like returned, saying, it was in every way as represented, overflowing with milk and honey, except that the people in possession of it were big and fierce and their cities were walled in. Whereupon the children of Israel murmured exceedingly, saying to Moses they had no need of a prophet to tell them they could have any land they were strong enough to take. Anybody knew that. And sooner than fight those dangerous-looking people for Canaan many were for going back to Egypt. For this they were

* *The Republic.*

condemned to wander forty years in the wilderness until they could harden themselves and make up their minds to go and take it.

Here now in the round earth was more land than anybody knew what to do with—unpromised land, virgin land desiring to be ravished; and as for the strange tribes and races who happened to be in possession of it as natives, their feeble powers of resistance were held in contempt by small bands of disciplined, resolute, well-armed European men.

This was conquest of a new kind. The vistas were too dazzling. The Europeans were fickle and never quite sure of what they wanted.

The Spaniards thought they wanted gold, and it ruined them; nevertheless, they put an indelible mark of language, religion and culture around the middle of the earth from the West Indies across Central and South America and all the way to the Philippines. The Dutch had New York in their hands and might well have had the North American continent if their imagination had not been beguiled by the Spice Islands in the fabulous Pacific, hence the Dutch East Indies. That left the British and French to fight it out for North America. Africa for a while longer was to remain the Dark Continent.

But for all of this, the work of the world did not change greatly in character for three hundred years. Spices and sugar and many kinds of exotic merchandise were more plentiful in Europe and there was tobacco. Yet the great staples of exchange were natural products, such as wool in trade for wines, grain and salt fish in exchange for silks, furs and naval stores valued in hardware and cutlery; and the word manufacture had still its right meaning, which was, *made by hand.*

Shipping had enormously increased, of course, especially overseas shipping with Europe at the center of the web, but except

that it was bigger, faster and more weatherly, as it had to be, there was nothing new about a ship.

Trade with the world was making Europe rich, as rich then was, and yet if the whole of it had suddenly disappeared the effect upon European life would have been less than we now could imagine. Only the cities and seaports would have been ruined. The cities were still small. Nine-tenths of the total life was self-contained in peasantry, the people producing for themselves their own food, clothing and houses, besides the rude cultural artifacts, all with no benefit of foreign trade.

Down to the time of Napoleon, the shades of Alexander and Caesar, walking in Europe, could have understood everything they saw, save perhaps only gunpowder and printing, and one thing more.

Alexander might have said: "Caesar, you know England. Is that its natural sky?"

And Caesar might have replied: "That dirty cloud? Only a worse fog than usual. I cannot for the life of me remember why I ever wanted to add that dismal country to my empire. Let's get on to sunny France, where moreover there is a military genius."

But if Alexander had insisted and they had stopped to find out what made the English sky so dirty they would have seen smoke rising from a high chimney, at the bottom of the chimney a roaring furnace that was not a forge, and near the furnace a great hissing contraption seeming to turn a wheel of its own accord, and that wheel to turn another by means of a continuous rope.

It would have been Caesar to say: "I perceive that this contrivance is meant to perform work; it is to turn things which would otherwise be turned by hand cranks and treadles. A queer people. They are not lazy, but they hate work; and besides,

in all this wretched country there is no proper supply of tame slaves."

They could not have known that what they saw was the beginning of the machine age. Nor could anyone have known it. The engine they were looking at was not the thing that was going to revolutionize the work of the world. No engine could do that. The idea of an engine is to entrap energy and convert it into mechanical power. The use of it, as Caesar perceived, is to turn or move something that would otherwise have to be turned or moved by windmill, a water wheel, animal power, or, lastly, man power, represented by Plato's hireling with nothing to sell but his muscular strength and so hardly fit to be deemed a citizen.

What shall the engine turn? It may turn a grist mill or a merry-go-round. That would not much change the ways of the world. But it may turn machines that spin and weave, machines that reproduce the motions of the skilled hand and outdo it in precision, machines in which are set the tools with which the old craftsmen made their things by hand—the saw, the drill, the plane and chisel, even the hammer, and of course a hammer weighing tons instead of pounds, and all of these acting with high speed upon the raw materials to transform them. The engine as a prime mover is necessary only in the sense that muscular energy is necessary to enable the skilled craftsman to perform his task by hand.

It was the machine the engine turns that made the machine age and it was not created all at once. Its evolution was unpredictable because undiscovered knowledge is like an undiscovered country, or like the round world which nobody knew was there. Twentieth century machines could not have existed in the eighteenth century. Even if they could have been imagined then, still for want of scientific knowledge they could not have been created. That is why Alexander and Caesar, in-

vestigating the cause of the dirty sky over England, could not have foretold the modern world, or that change in the next one hundred years would be more than all change until then since Babylon.

To comprehend that change it will be necessary to look directly at the machine, regarding its nature and its laws, some of which are strange and even yet imperfectly understood. Its coming was like the advent of a race of new beings on the earth, seeming sometimes to be malevolent and out of control. Meanwhile, however, some of the larger effects of its impact upon life, especially one, are to be observed.

The leaden cloud enveloped England and then appeared on the continent. The industrial world, like the round world, belonged to Europe, and European man conceived that he had rights of proprietorship and sovereignty in it. The tempo of European life was suddenly altered. Cities grew very fast under the greyish vapor. Besides the migration of people from the soil to the cities, population actually increased in an extraordinary manner because food was increasingly plentiful, nothwithstanding the fact that more and more of it came from overseas in exchange for machine products.

On the sea a new kind of ship appeared. It went at high speed, putting all sailing ships behind, and left in its wake a ribbon of that same greyish vapor. This new kind of ship multiplied with astonishing rapidity, and whereas the old sailing ships had loitered about, the new vessels were always in haste, going from a European port to a foreign port and turning immediately back in the same sea path.

Still another kind of ship appeared, not a cargo carrier but a fighting ship that spent its time going leisurely to and fro over the lanes of commerce or lying in groups at strategic points, especially where sea traffic moved through narrow places. A ship from England to India no longer went around Africa; it went

via the Mediterranean and through a ditch across desert land between the Mediterranean and the Red Sea.

Then in a little while the leaden cloud appeared in North America. Both in Europe and North America glistening roadways were laid between cities, and after that overland traffic was by strings of wagons drawn at high speed by one mechanical beast, breathing forth the same greyish vapor. And the faster and faster everything moved the less time there was. Both space and time were altered.

Beneath all visible phenomena there were profound social and political effects.

The engine driven machine made an end of slavery through the whole of Western civilization. It is true that conscience, too, was acting against that ancient institution and did hasten its downfall; yet it may be doubted whether the power of conscience alone could have prevailed against it if the mechanical slave had not been ready to substitute itself for the living slave, to say nothing of the fact that the possession of machines was in some ways more advantageous than the ownership of slaves, both regarded as wealth.

You might have supposed, and indeed it was feared, that the machine would dispense with labor. That did not happen at all. On the contrary, goods that had formerly been made by hand, and were costly to buy, were so cheapened by machine production that the demand for them increased almost unbelievably, with the result that the number of workers engaged in machine craft of all kinds was soon five-fold greater than the total number of all who had made goods by hand before.

What the machine really did, therefore, was to substitute a universal system of money wages in place of all the old ways of retaining labor, including slavery. Thus along with the machine appeared the proletarian man, calling himself a wage slave, and saying as follows:

"Formerly the master of slaves was responsible to them for two things, namely, sustenance and security. When he was no longer able to feed and protect them they passed to another, who assumed the responsibility. The practical reason for this was that the slave was property.

"Under the new wage system we have not master and slave any longer but employer and employee; and the employer assumes towards the employee no such responsibility as the master assumed toward the slave. The employer does not own the employee. He owns instead productive machinery, and for that machinery he *is* responsible. It represents what he calls a capital outlay. He houses it most carefully, insures it, protects it from rust in its hours of idleness, and if for any reason he cannot continue to maintain and protect it, then it passes to to another, as the chattel slave did.

"Now we, the toilers, are told that we are free. The employer does not own us. When he needs us he hires us for money and when he doesn't he sends us away and we are responsible for ourselves because we are free. In political theory we are free. Economically we are not free. We are enslaved by necessity and cowed by dread of unemployment and so pass our existence under the curse of toil with the added torment of insecurity. We may be willing to eat our bread in the sweat of our face but the bread is not always forthcoming."

Thus the yoke chafed as it always did, even from the beginning of the division of labor. The machine had made it lighter, no doubt; it had enabled man in general to perform work with much less spending of himself in cruel exertion. Not the absolute weight of the burden but the distribution of it continued to be complained of as bitterly as ever, and the problem stood as it was:

By what rule should the product be divided?

How and by whom should the tasks be allotted?

In its least aspect the conflict is one between classes within a state. In a formidable aspect it is one between unequal nations. In its last and terrible phase it is a *conflict between races.*

As the outline of industrialism grew definite Europe was no more in doubt about what she wanted from her round world at large. These three things she wanted from it—cheap food, cheap raw materials and cheap labor to produce them. Thus the work of the world would be divided according to the European man's sense of his own superiority;—for other people, the heavier and less rewarded labor of primary production; for himself, machine craft, trade, administration and government.

In that light the North American continent for a while was very hopefully regarded. The first disappointment was that as a docile native the Red Man entirely failed. With one grand gesture he signified that he would sooner perish than work the white man's way.

Then Negro slaves were moved in from Africa, and that seemed to go rather well for a time, especially on the cotton plantations, with the textile industries of Manchester wanting every day more cotton, but it was not for long because chattel slavery was already doomed.

Meanwhile Europeans themselves had begun to people the North American continent. They came not as overlords to mind or exploit natives but as immigrants to settle and multiply; and when they were strong enough they declared themselves politically free of Europe and founded their own industry. In the American environment they were unique. They could produce not only an abundance of food for themselves and a surplus for export to Europe but at the same time the raw materials they required for their own machine industry.

So it was that the European intention toward North America was defeated. There was still Asia, where the docile brown and yellow races represented more than half the population of the

entire earth. In Asia was everything the European man wanted. But there was one thing that he did not want and it was most unexpected. A warrior race—the only true one in Asia—turned apprentice, all the time concealing itself in a mask of servile suavity.

CHAPTER FOUR

Apprentice

COMPLETE EXAMPLE.—OPENING THE HERMIT KINGDOM.—A WARRIOR RACE IN A SERVILE GUISE.—NAÏVE DISCUSSIONS OF PROTECTION VERSUS FREE TRADE IN A SETTING OF ORIENTAL DISADVANTAGE.—DOING TO OTHERS AS OTHERS HAD DONE UNTO THEM.—THE MASK AT LAST IS CAST ASIDE.

ON A CHAIN OF ISLANDS lying off the eastern coast of Asia was the hermit empire called Japan. Foreigners were extremely unwelcome; but when anyhow they came the scene that presented itself to romantic Western eyes was one of pure enchantment. The life was leisurely and immemorial. People took it seriously and touched it lightly. Tasks were accepted and performed as if all the arrangements and contrasts of daily existence were inevitable. The environment, though not fertile or munificent, was extremely lovely; and the people treated it not as masters, free to act upon it as they wished, but as careful tenants. It seemed never to have occurred to them to change or contort the course of streams or in any way to serve their own convenience by laying ruthless hands upon natural things. Their houses were dainty and uncomfortable, without foundations. Their bridges were frail and impermanent. They had no beasts of burden. Their religion was a form of ancestor worship. Temples were of all their handiwork the most substantial; yet these were more artistic than magnificent. This world they evidently conceived to be a stopping place only. Thus, they were indifferent to its discomforts and fancifully aware of its beauties.

Although it was an island empire it had no ships. There was no intercourse with the outside world, no trade whatever. Foreigners were feared and distrusted. When any of them by

chance came sailing out of the unknown to this cloister, or were wrecked on its shores, they were sometimes sent away and sometimes murdered.

One day an alarm spread like a wind through all the islands. People gathered in tense groups to detain the news-bearers and remained long afterward in excited conversation. Some foreigners had come in ships. That was the news; but it was not all of it. Foreigners had come before and had been made to go away. These came in ships of incredible size, bearing weapons that smoked and roared; and they had sent a message ashore demanding to see the Emperor, whose person was sacred and belonged to the gods. The Emperor nevertheless sent his vicars to appear before the foreigners, who said:

"You have lived long enough in this absurd isolation. You must wake up and begin to take part in the affairs of the world. You shall trade with us. Everybody now trades with everybody else. All enlightened nations open their ports in an amicable manner to one another's ships. We come in a friendly spirit, but we do insist. We leave you to think it over. In three months we shall return and begin to trade. And one thing more. Hereafter you shall treat our shipwrecked sailors as if they were human beings. This has nothing to do with trade. It is elementary in civilization."

Then they made their weapons roar until the earth quaked and sailed away.

The people were greatly distressed. Counsels were bitterly divided. Some said it was of no use to resist the foreigners any longer. They were too powerful. It were better to receive them on their own terms than to be conquered. Suppose those roaring weapons had been turned upon the islands instead of the other way!

Others stood upon the legends of past experience. Several centuries before foreigners had been received. They quarreled

among themselves, cheated, insulted the shrines, made no end of turmoil, and had at last to be expelled by force. Far better, therefore, to resist at the beginning than to go through that again.

First one and then the other of these arguments prevailed. There was a commencement of feverish activities toward building ships and creating defences against the reappearance of the visitors. That futile impulse was almost immediately overtaken by thoughts of despair. Not in a generation could they hope to build one ship like those of the foreigners; and no doubt the foreigners had hundreds.

In the midst of this confusion the foreigners returned. There were those who had promised to come back and others with them. They jointly demanded admittance and rights of trade. The people being helpless submitted.

Looking back on it now we may believe that no other single event of the 19th century was so charged with fate of evil. This dwarfish race, with its sibilant tongue and ingratiating manners, had a hideous core. Imitativeness was the first of its animal gifts, and first among its mental endowments was an original power of simulation. From Western civilization it took satan without God, and from Western language three perfect words, which were *frankness, candor* and *understanding.* With these words, for three-quarters of a century, it concealed a mortal enmity; and not hot enmity as we understand it, but a cold, implacable, unarguable fact, more like the deathly thing we only know and cannot see in the void that lies between man and reptile.

The provocation was human; the revenge was horrible.

The foreigners began by establishing themselves in zones which they called their own. In these zones their laws and customs prevailed, and the islanders were forbidden jurisdiction therein. Next the foreigners laid down the terms on which trade should be conducted. These terms were very simple. Trade should be free. That was all.

Presently the little island empire was flooded with the cheap machine-made wares of the western world. The people were delighted and beguiled. They were particularly fascinated by the western trader's matches. They had never seen matches before. In a little while all through the empire at night you could see them lighting matches wantonly. They were cheap and most exciting. But the immediate and unexpected effect of the introduction of matches was to destroy the ancient and honorable craft of flint working. There was no longer any demand for flint pieces, since fires were so much more easily kindled with matches. And all the old flint workers were out of employment.

This was a typical case. It happened first with one thing and then with another. The foreigners had a way of bringing into the country the very things, cheap and machine-made, that would at once displace the hand-wrought things natively produced; also they brought, of course, a great many baubles and articles of no utility whatever which the people bought like children in a gaudy bazaar, with no thought of value or economic consequences. The foreigners in exchange took raw silk and tea and gold and silver.

After a while the islanders began to realize that since they had been trading with the foreigners they had grown steadily poorer. Unemployment had appeared. Many precious handicrafts had been hurt by the competition of the cheap machine-made wares of the West.

Nobody quite understood it. Somehow the foreigners were to blame. That everyone knew. But what then? They could not be expelled. They were permanently entrenched and grew all the time more numerous and powerful. After much anxious discussion the elders got an inspiration. They picked a number of the most intelligent young men and sent them forth into the lands of the foreigners, to learn their language and methods, and particularly to see why other people also were not impover-

ished by trade, provided it was true, as the foreigners said, that all people did trade together.

These young men began presently to return with important information. It was true, as the foreigners had said, that all people did trade together; but this was true also, which the foreigners had not told them, namely, that there was a modern science called economics by which other people were often able to foretell whether trade on certain terms, or trade of a given kind, would be advantageous to them or not; and wherein it might seem disadvantageous they controlled it by means of tariff arrangements.

That was to say, if people wished to produce their own matches by machines in order that their flint workers or their children might have a new trade in place of the old one, and foreign matches were so cheap that a match industry of their own could not profitably begin, then they barred foreign matches out by laying upon them a high import tax. The examples were many. The young men translated their information into terms of matches because that was something all the islanders could understand. The point never to be lost sight of was that the people who made their own things so far as they could, instead of buying them from foreigners, were always more prosperous than those who sold the raw produce of their fields and mines and bought manufactured goods from others.

Thereupon the elders went to the foreigners, saying: "We now perceive the true nature of trade and that so far as possible the things exchanged between people should be of equal labor value. If one nation produces only the raw materials and delivers them to other nations in exchange for manufactured goods representing the exercise of higher skill, that one nation will bear a heavy burden and permanently sink to the lowest level of human toil. We find ourselves coming to that situation. We see that we ought to make for ourselves a great many of the

things we buy from you. This we cannot do so long as you press your goods upon us at prices with which no factory of our own, beginning without skill or experience, can possibly compete. Therefore, we wish to do as you do in your own countries. We shall lay an import tax, please, upon foreign merchandise until such time as we are industrially strong and skilled enough to compete with you as equals. We thank you for having opened our eyes to these possibilities."

"But don't you see," said the foreigners, "that by putting a tax on the things you buy from us you will be making them dearer to yourselves. Take matches. We are selling you matches for a penny a hundred. Now suppose you lay upon them an import tax of a penny more. Then everybody will have to pay two pennies for a hundred matches. Where is the sense of that?"

"We see that," said the elders. "We see also that so long as matches are a penny a hundred we shall have to go on buying them from you, because, beginning as we shall have to begin without your knowledge of machines and your aptitude for industrial processes, we cannot make them for that price and be able at the same time to pay our labor a living wage. But at two pennies a hundred we could reasonably try. It is true, as you say, that the first effect would be to make matches dearer. But we perceive that there are two interests among us. On one hand lies the interest of the individual, whose advantage is served by the present cheapness of things; on the other hand lies the interest of the people, whose future is at stake. These two interests we find to be antagonistic, for the reason that the life of the individual is brief and discontinuous whereas the life of the people is continuous and forever. Thus, it is better that the individual for the present should pay two pennies a hundred for matches if thereby it becomes possible for the people in the future to have industries of their own. As we acquire experi-

ence the cost of making our own things will fall and in time our manufactures may be as cheap as yours."

The elders no doubt were very proud of this simple exposition. They had spoken naïvely and waited hopefully for the answer.

"It is a very controversial matter, this question of protection versus free trade," said the foreigners. "But we cannot argue it with you. Your country is in honor bound by the treaties you have signed with us."

"Yes," said the elders, "but when we made those treaties we were unskilled in trade. What we now propose to do is only what you do among yourselves. Every country among you reserves the right to say what trade it will receive and what trade it will reject, and the trade it wishes to reject is taxed by a tariff law of its own making."

"If we have that right and exercise it," said the foreigners, "it is because we reserved it in our treaties. Your treaties with us say that you shall not tax our trade but with our consent. It is all a matter of treaty. As we keep our treaties with one another so we expect you to keep yours with us."

The elders in their disappointment reflected deeply and took counsel with the young men who were continually returning from the lands of the foreigners in the west. They had no machines, no mechanical knowledge, no experience whatever in the ways of the modern world. Yet one thing they had more than the foreigners. They had the most docile and uncomplaining labor in the whole world. So they said: "What we lack in skill we can perhaps make up in the cheapness of our labor. At least, we will try, provided the foreigners will sell us machines to begin with and instruction in the uses thereof. It is the only way."

Happily the foreigners would sell anything, even machines and instruction. The islanders thereupon began to import machines; and at the same time they sent young men to all parts of the western world to learn the technique of industry.

In a short time the phenomena of western industrialism began to be reproduced under a cloud of grey vapor. The beginnings were halting and painful, and nothing would have come of the effort but for the docility of the toilers. Material wealth increased almost magically; as fast as it increased it was invested in the means to further production, that is, in more machines, and then by another great step, in the machines that make machines. Inevitably the attitude of the people toward their environment changed. They blackened their beloved landscape with smoke and polluted their streams with the waste matter of industrial processes. Cities grew. Population increased, as it always will under excitement and pressure, no matter how hard the conditions are.

Within the span of one generation the people mastered machine craft, learned how to build ships as big and formidable as any the foreigners had, how to make the weapons that roared, and—most amazing of all—how to import raw materials upon which to bestow their own labor, thus producing finished merchandise for export, turning the tables on the world. And one of the commodities they produced a great surplus of for sale outside was matches!

Having become an industrial people with machine-made wares of their own to sell they needed markets of outlet. Their young men were still returning from foreign lands with ideas, and one of these ideas was the thought of economic expansion. As the foreigners had done to them, so they would do unto others, for everybody was doing it and it was the way of the world.

Taking this idea literally and in the same grim, fatalistic spirit with which they had adopted all the rest of machine-made civilization, the elders began to look about for a people fit to be exploited, even as they had been exploited by the foreigners.

Against the sun, across a little sea, on the mainland of Asia, lived the Koreans. They were a people much more inert and

backward than the Japanese had been when the western traders came—a people so very poor and unindustrious that the foreigners had not thought it worth while to wake them up.

"Let us penetrate that land as a beginning," said the Japanese elders.

In doing so they collided with the great power of Asia just beyond, a sleepy, illimitable people who did not wish the islanders to get a foothold on the Asiatic continent. There was a war, and the islanders, although they were greatly outnumbered by the Chinese, won the fight handily.

The foreigners first took it as a splendid sporting event and clapped the islanders heartily on the back. On reflection, however, they—the foreigners—began to feel uneasy. It would be unwise, they said, to let these little islanders go too far. So the western powers conferred and then interfered on behalf of the great power of Asia and deprived the islanders of a great part of the spoils of conquest. The islanders, not yet strong enough to resist the western coalition, brooked their disappointment and went on working. They did succeed in keeping Korea as a toehold on the Asiatic continent.

Little by little they went further and presently they collided with the Russian power. It had undertaken to check their surreptitious progress in Asia. There was another war, and to the amazement of the foreigners they defeated Russia almost as easily as they had beaten the great drowsy people first encountered on the mainland. And the whole world then realized that a miracle had happened.

In one lifetime this solitary and secretive race, wanting at first only to be let alone in its hermitage, had become a power to reckon with, and the only power in the East able to challenge Western over-rule of Asia. From this time on until the sequel the feelings of the West were going to be more and more like those of Frankenstein when he had created in his own image a

giant he could neither control nor emotionally comprehend. But the West had not in fact created it. The Japanese themselves created it. When they were apparently weak and helpless they had yet one terrible means of defense, and that was their willingness to embrace the curse of toil with fatalistic fortitude.

All of this the elders shrewdly understood, and now with a record of two wars won and with warships and troops and modern weapons to back up their economic intelligence, they went again to the foreigners, saying:

"The time has come for us to control our own trade. Those treaties which you wrote with us when we knew no better, whereby you gained entry for your merchandise tax free, we now denounce. We will write new treaties, please, as equals. We shall say on what terms you may trade with us; and more than that, we shall have as much to say as you about the terms on which trade may be conducted in all this Asiatic world."

With a very wry face the foreigners consented.

The tools men use and the materials they work in shape and color their minds. Having borrowed a material civilization whole, as it were, the Japanese perhaps were powerless to avoid its evils. Labor ceased to be docile. It began to be clamorous, as western labor is, demanding that the severities of toil be mitigated and that more of the wealth it produced be made available for present enjoyment. There began to be riots and violent internal dissensions. All the ills of western industrialism developed in acute forms; and the elders in their perplexity could think of nothing better than to adopt the western panacea.

This was to hold before the people a vision of power and grandeur to be realized through economic conquest. A thought crystallized in their minds. They carried it into the country of the sleepy people whom they had beaten in the first war, and beyond them to India. The thought was: Asia for Asiatics. In the minds of the Japanese, however, there was a secret after

clause. They were thinking: "Asia for the Asiatics, under a Japanese yoke."

For themselves they had broken the Western yoke and made a weapon of it. Then the one thing they could think of in their turn was to do to all other Asiatics as the West had done to the East. When they were ready to try they delivered their fate into the hands of their warrior caste and the mask they had been wearing was defiantly cast aside.

PART TWO

MACHINE KINGDOM

CHAPTER FIVE

Is It Natural or Unnatural?

WHY MACHINE PEOPLE MIGHT THINK THEY MAKE MACHINES. — WHO MAKES THE HORSE? — THE SMOKESTACK AS A GENERATIVE SYMBOL.—IF IT WERE NOT THERE THESE WOULD NOT BE HERE.—ENGLAND COMMANDS THE INDUSTRIAL REVOLUTION.—THE BIOLOGY OF MACHINES.

EITHER THE MACHINE HAS A MEANING to life that we have not yet been able to interpret in a rational manner or it is itself a manifestation of life and therefore mysterious. We have seen it grow. We know it to be the exterior reality of our own ideas. Thus we are very familiar with it, as with our arms and legs, and see it in much the same way—that is to say, imperfectly and in some aspects not at all. Certainly it would look very different if for a moment we could see it from an original point of view with the eye of new wonder.

Fancy yourself a planetary tourist come visiting here, knowing beforehand neither God nor man, unable therefore to distinguish intuitively between their works.

Would you not think the machine that spins silk threads by the ton from cellulose more wonderful than the silkworm similarly converting the mulberry leaf in precious quantities? or a steel ship more amazing than a whale? What of the mechanical beast with a colorless fluid in its tail and a flame in its nose that runs sixty miles an hour without weariness? Would it not seem superior in many ways to the horse that goes forty miles in a day and falls down?

Suppose, moreover, that you know the tongue of men and are able to ask questions. You ask particularly about the automobile which you have mentally compared with the horse. They take

you to the factories in Detroit to see the automobile in process of becoming, under conditions of mass production, two or three taking life with a snort every minute. In one factory, they tell you, they make only one hundred a day, very fine ones; but in another they make five hundred, and in another more than a thousand a day.

You ask them who makes the horse.

They do not know. They teach their children to say God makes it. The horse is a natural thing.

Then the automobile is an unnatural thing?

They say no, smiling a little. Not an unnatural thing. The automobile is a mechanical thing because they make it themselves.

You ask them why they say they make it.

At this they are distressed. There has been some slip of understanding in the use of language. They explain it carefully. The horse is born. There is no horse factory. The automobile is made, as you have seen, in factories.

Still it is not explained. You argue it with them. What is it they do in the factory? They perform certain acts in relation to automobiles. These, of course, are necessary, vital acts. If they were not performed automobiles could not be. And yet, how does this prove they make automobiles? You ask them.

They ask you to say what else it could prove. You may say it proves only that they are fathers of automobiles; and since they seem mystified greatly by this answer you remind them that in relation to their own children also they perform certain vital acts, essential to beget them and without which children could not be, yet they are never heard to say they make children. They say children are born.

This has to be left as it is. Further explanations lead to worse confusion.

You ask them certain other questions. How long have they

been on the earth—themselves? How long have they had machines? What did they do before they had machines?

By their replies certain facts are established in your mind, and from these facts you make certain deductions, all clear enough to you but incomprehensible to them.

The facts are as follows: People have been here on the earth a very long time, millions of years, they think. Machines they have had for only a very short time, or, as you now see them, for only two generations. Before they had machines nearly everyone tilled the soil. There was no industry save handicraft. In the space of one hundred and fifty years, these conditions have so remarkably changed that now in a country like America only one-third of the people are required to till the soil; the other two-thirds live by industry and trade.

This does not mean what you thought at first; it does not mean that fields have been abandoned so that the people might go into industry. You are careful to get this straight, for it is very important. On the contrary, since machines appeared in the world whole new continents of land have been opened to cultivation. This was necessary in order to feed the industrial workers who live in cities, far off from fields, and buy their food, whereas formerly everyone generally speaking produced his own food, even the people of what once were called cities going forth seasonally to till and reap the earth. Actually, the number of people engaged in agriculture has increased; yet it may be only one-half, or as in America, only one-third of the total population where before it was the whole of it. What does this mean? It means that since the advent of machines the human race has enormously increased in number; it has so increased that the part of it which now is agricultural is greater than the whole of it was before. The new, non-agricultural part is the industrial part; it is the part that serves machines.

This fact is so astonishing that you wish to verify it. You ask

them what would happen if all the machines in the world should vanish suddenly away. Their answer is that probably one-half of the people living would perish. And that is what you thought.

What may you deduce from these facts?

First, you will be amused that people are so naïve as to think they make machines. Then you may say there are two kinds of people here, agricultural and industrial. The earth makes one kind; machines make the other. And you will feel as sure of this as if you had proved it to your senses when you have looked at a typical industrial city where people live densely in compacted habitations with no visible errand on earth but to run to and fro tending the machines that hum night and day in the factories.

Those tall, cylindrical, erupting forms called smokestacks will appear to you as generative symbols. If they were not there, neither would the people be there. Not only would the people not be there. They would be nowhere. They could never have existed. If the smokestacks disappeared, so would all these people, the industrial part of the population, leaving only the agricultural part—the part belonging to the soil—as it was before.

As a planetary tourist you may go home and think what you like. For us, the earth-bound, the problems are practical. We must think of machines as machines act, that is, logically.

One difficulty is that whereas the machine is automatically, unerringly logical, and nothing else, man has only a little logic; he has, besides, emotions, sentiments, instincts. In his unlogical character he has often opposed himself to the machine, meaning to destroy it. At the opening of the Liverpool & Manchester Railway, the first railroad in Great Britain and the first in the world, the anti-machine feeling of British craftsmen was dramatically symbolized by a lone weaver seated at a loom on a high hill. England was the industrial machine's first habitat on earth. There fanatical men led mobs against it.

Frail and clumsy as it was at first its life was indestructible. And now man would not dare to destroy it if he could. His own life is bound up with it. Steadily it has grown more powerful, more productive, more ominous. It has powers of reproduction and variation which, if not inherent, are yet as if governed by an active biological principle. Machines produce machines. Besides those from which we get the divisible product of artificial things, there are machines to make machines, and both kinds—both the machines that make machines and those that transform raw materials into things of use and desire—obey some law of evolution.

Compare any kind of machine you may happen to think of with what its ancestor was only twenty-five years ago. Its efficiency has doubled, trebled; its shape has changed; and as it is in the animal kingdom so too with machines, that suddenly a new species appears, a sport, a freak, with no visible ancestor.

Man's sense of material power within his environment has increased proportionately. It is colossal. Benefits such as formerly he would have thought beyond supernatural agency if he could have imagined them at all he now confers upon himself. More without end presents only technical difficulties. No physical circumstance forbids him. Nevertheless the fact, and only the more strange it is, that for reasons which he names economic or political he has been powerless to inform the augmenting body of machine phenomena with a rational or benign spirit.

CHAPTER SIX

Man's Fear of Machines Is Fear of Himself

THE HUMAN WILL ENGINED.—DEMON SPIRIT DEMON MACHINE.—THE PESSIMISTIC THEME.—SCIENTISTS AS MYSTICS AT THE KEYBOARD OF GOD'S ORGAN.

THE SPIRIT OF MAN is in his machines. He sees it and is afraid. So also his spirit was in pyramids and temples. Yet these evoke simple feelings of awe and admiration whereas the machine inspires a sentiment of dread. Where lies that difference?

The wonder of a pyramid is monumental. The wonder of a temple is beauty. But the wonder of a machine is function. There is the difference.

The machine is the will of man engined. It is the free extension of himself in the dimension of force.

Having as out of a dream raised up this force and seeing how for good or evil it may be multiplied by itself without end, he has moments of terror. It is not the machine he fears, though he may say it is.

First and last he has believed in many jealous gods. He has not yet met one of them face to face, but as he stands on the rim of knowledge, where light ends, groping for more elemental facts, and remembers that he knows only how force acts and nothing at all about what it is—well, then it occurs to him that *anything may happen.* What if he should touch a cosmic trigger! There is that.

But much more it is that he fears his own nature. The history of the human spirit is that often it sees the better way and takes the worse. As the spirit is so must the machine be. Demon spirit,

demon machine. Thus there will be good and evil machines and some good and some evil in any of them. The machine itself is not terrifying. What possesses it may be. This is man afraid of himself.

Fear moves the whole theme against science. Any one of its many variations may be so referred back. And that few are entirely free of it may be inferred from the fact that protagonists of science themselves contribute to the fear theme, as in the following expression, which is representative:

"Already the applications of science to human affairs have far outrun the ability of man to use them wisely. The engineer has provided agencies of incalculable value in time of peace, but they are also endowed with prodigious powers of destruction which can be loosed in time of war. Unless we solve the problems encountered in man himself the outlook is dark, indeed, and it may even be questioned whether our civilization will endure."

This was said in an atmosphere of science by one of a board of trustees named by the National Academy of Sciences to collect and administer a fund for the support of research in pure science. The speaker subscribed to the thought that "science carries within it not only the seeds of its own destruction but the seeds of its own salvation." Therefore, he said he was optimistic; he proposed toward salvation more knowledge, especially scientific knowledge of human behavior.

His optimism, contemplating a social organism with million-minded knowledge and power, appears to rest on the assumption that knowledge increases wisdom. Yet the problem, as he himself stated it, was that knowledge had outrun wisdom.

Every other variety of the theme is pessimistic. Religion, advancing the claims of faith against reason, complains of scientism that it absorbs man's idea of God and leaves him spiritually desolate. It takes away his beautiful myths, the inner truth

of them along with the tale; it has made him to regard himself as an ascending beast, responsible to his own wayward will; it has delivered him in bondage to his senses and reason, with all of life that proceeds from the heart left out and no way to satisfy the transcendental cravings of the spirit.

Among ardent religionists and modern mystics are those who propose a science holiday for so long as may be necessary to restore the lost prestige of the soul. Some would make it forever, wishing for mankind a return to the Middle Ages when faith and reason were reconciled in one body of knowledge and human thought reached to heaven. Yet even these will speak of a science of religion, a science of morals, a science of ethics; and their science holiday would turn out to be a selective suppression. They would doubtless wish to keep alive the sciences that pertain to hygiene and medicine and perhaps as much of the science of biology as could be limited to plant and animal life. They would admit astronomy and orthodox philosophy as belonging to the tradition of classical learning. Mathematics, that once had equal rights in that estate, would have first to be purified because it has latterly been a powerful tool in the hands of the profane. Zones free and forbidden would be necessary in chemistry, a little of which is needful to medicine. This of course leads to hopeless confusion.

It is not science they are talking about. Only certain effects of science are deemed sinister, or such new knowledge as tends to increase man's ecstasy of self-extension in power on earth.

The foreboding of the scientist is that with too much knowledge man may be tempted to destroy his civilization. What will save him is wisdom. Religion's foreboding is that with too much knowledge he will destroy his soul. What can save him is faith.

It is true that knowledge will alter man's ways of thinking about nature and God. That has nothing whatever to do with his religious feeling, which, though it may be intellectualized, has

not its source in the intellect and is probably, as a scientific fact, an instinct. Great scientists have been believers and non-believers, always in the individual case for a reason that could not be given. Faraday, who captured and delivered to inventive mankind the force of electro-magnetism, belonged to a small sect that hired no preachers; and if the world where his fame was had wanted to find him on Sunday it would have had to look for him in the pulpit of a little church in some unheard-of village, preaching a sermon on the soul.

Steinmetz, a noble worker in the field opened by Faraday, once drew a map to represent the idea of sequence in the wave phenomena of cosmic energy and so divided it into octaves that it suggested the key board of an organ. Other scientists, seeing it, wished copies of it, and so it got scattered around.

A man at the top of a great private research laboratory accidentally turns up his copy, in the way of looking for something else, and thinks you may be interested. Beneath the chart is a typed text, pasted on.

"Did Steinmetz write this?"

"No," he says. "I did that."

This is the pasted-on text:

The Keyboard of God's Organ.
(Over sixty octaves.)

The flash of lightning,
The roll of thunder,
The wonder worker, electricity,
The far-flung wireless waves,
The searcher for truth, light,
The conserver of life, heat,
The X-rays, with their gift for divining the unseen—
Are stops under the control of the master organist.
Never out of tune,

Man's Fear of Machines Is Fear of Himself

Perfect harmony,
No interference,
No friction,
The energy of the Universe.
Why doubt God's existence?

CHAPTER SEVEN

All Wheels Run by Faith

EZEKIEL'S VISION. — THE SPIRIT OF THE CREATURES WAS IN THE WHEELS.— A PROFOUND TRUTH.— PUTTING GOD OUT AND PUTTING HIM BACK.— IS SOCIETY A NATURAL THING?— THE FICTITIOUS QUARREL.— WHY ART CANNOT SEE RUTH IN THREE OUNCES OF RAYON MINDING A MACHINE.— STORIES OF INVENTION.

SOME HEAVENLY CREATURES once came calling on Ezekiel in a vision. Each one of them had four faces—cherub, lion, ox and eagle—and they were in other details wonderful; but Ezekiel particularly noticed their celestial motor vehicle. The rims of its wheels were high and dreadful, set with eyes, and: "The appearance of the wheels and their work was like unto the color of a beryl, and the four had one likeness; and their appearance and their work was as it were a wheel in the middle of a wheel. When they went they went upon their four sides, and they turned not when they went."

He concluded that the spirit of the creatures was in the wheels.

You would hardly expect a prophet to seize at a glance the physical principle of a foursided wheel that seemed to go on its four sides without turning. That principle may yet be discovered. If this ever happens we shall call it science. But with that kind of wheel in his hands, though he were moving the traffic of the world by means of it, still would the true scientist admit rationally what is stated emotionally in the negro spiritual:

Ezekiel saw the wheel
Way up in the middle of the air.
Little wheel run by faith,
Big wheel run by the grace of God,
Way up in the middle of the air.

Here, besides the rare aesthetic perception to make poetical use of a mechanical image, is a profound truth. Every wheel we have is a wheel within a wheel. Every wheel that runs does run by faith, though you take it to be only the faith implicit among us that the big cosmic wheel will run true and not fail. And what makes the big wheel run at all nobody knows.

Do you know what happens when you turn the switch to light the house or cook the food or start the electric motor? At the power station they know many more facts about it than you know. In the laboratory they have some scientific theories about it. But at last, really, no one knows any more about this force of electro-magnetism now touching our every-day existence at every point than you know yourself when you turn the switch. You know what that force will do. You do not know what it is, nor does anyone else know.

Certainly no one would hold that science is more unreligious than art, especially modern art. Yet art supports the case of religion against science. This it does on aesthetic ground. The machine is making the world ugly. Machine civilization with its standards and methods of mass production is sunk in idolatry of a fabulous materialism, power, wealth, success. Where is culture in this vulgar scheme? Where is nature?

But what art fears is that its own world of remembered images, ideas and relations will be swallowed up; and it cannot imagine how to create another that will contain this new reality. The world of machine civilization is set with strange forms. These are not symbols. They are direct facts, unhaunted by human experience. They have no analogies, no associations, no past. They exist for the first time originally in the present; therefore they recall nothing. That is why they are not symbols. Their meaning is not in them; it is outside of them, in their functions. There is no art tradition of how these machine forms may be seized by

the aesthetic sense and made into art forms, nor of how people may be related to them in feeling.

Ruth gleaning in the fields of Boaz stands in a simple threefold relation, to the universe, to the earth, to her man. She may be perceived aesthetically. Art can tell her something she would not otherwise know about herself.

Ruth clothed in three ounces of rayon minding an automatic power machine for capital—how may she be aesthetically perceived?

Gleaning was life and art included it. Machine craft is life too, yet art excludes it. Man interrogating the serpent is art material; man interrogating the atomic table is not. Art has nothing to tell him about himself. It does not see him aesthetically, which is the only way of seeing that can justify art; and since art does not see him it is probable that he will not see art. Nevertheless he will see many wonders.

Philosophy, too, has a case against scientism. This is high altitude. Philosophy once contained physical science and then set it off as a satellite. Now the moon behaves in the manner of a planet, expecting other bodies to revolve around it.

Between philosophy and science, nevertheless, is a working relation that cannot be broken. When science cannot get any further with facts alone and is blocked for want of new ideas it takes its facts to philosophy asking for another hypothesis to fit them. Philosophy proposes a new hypothesis. It may or not be true, but science, returning with it to the field of experiment, says, "Let's behave as if it were true and see what will happen. At least we may be able to knock down some new facts."

That is generally what happens. True or false, the hypothesis is a weapon for prizing new facts out of the unknown. Facts are required to prove it either true or false. The facts that prove it to be untrue may be strange enough to suggest a new hypothesis, and so the procedure is.

All of this, says philosophy, is quite right. That is as the relation should be. But when science becomes impatient with the rate of progress in the region of pure thought, where the hypothesis should come from, and enters it to find one on its own account, it very often forgets what it came for and ends by inventing a whole new system of thought, generalized from physical facts; and that is not its right business at all.

It is the affair of science, says philosophy, to explore the cause of phenomena, whereas it is the affair of philosophy to consider the cause of cause. It is not for science to comprehend philosophy, since philosophy comprehends everything—the whole, that is to say—and of the whole, science for all its luminosity is merely one part. Philosophy comprehends also religion, art, ethics, first cause, the purpose of life and the meaning of meaning. Science, not knowing its own limitations, is likely to betray man with the delusion that an account of the universe in physical terms is an account of everything in it, including himself. That is a disaster philosophy dreads.

Here is dangerous walking for the common lay person. He shall watch his step. Yet he may trust himself to recognize feeling in any language, and it is with feeling that philosophy argues the matter. For this purpose it takes anything it likes from religion, art or ethics, as it rightly may do, since it comprehends them; and then as it comprehends science also it is in a position to scold science out of its own text. It remembers many things about science that science itself would just as soon forget. There was a great scientist who reduced the universe to a mechanism, and said: "In this system there is no need of a God." He was right unawares. There was no need of a God in his mechanism for the reason, as it turned out, that there was no such mechanism. It would work mathematically, but not in any other way. Facts destroyed it. Mathematics is the scientific mind's tool of

precision. Yet more than once with that tool speculative science has proved the existence of a non-existent universe.

Philosophy accuses science moreover of idolatry and confusion. It has been heard worshipping a god named ether that had promised to explain all the mysteries of the physical world. This god was invisible; his existence could not be proved. But science said his existence was not at all important as a fact, only as an idea, and it proposed to behave as if the idea were true. Proposing, therefore, to found a physical doctrine on a metaphysical assumption. At another time science has seriously considered matter to be nothing but a series of holes in an imaginary medium. First it tries to explain the unknown by the known; then it proposes to explain the known by the unknown.

Now science, injured in its feelings, will be heard from in its own case. In the first place, if it were stupid it would not have this immense authority to be challenged. There is a certain structure. At the top is speculative science. There the mind is intellectually naïve, purposefully. It will take anything to be true, or one and the same thing to be both true and untrue or neither true nor untrue. This is the mind that may say: "We know that the world is round. But let us suppose it is flat and look at it that way." It is perhaps unfortunate that what happens in this region of thought becomes audible. No matter. From a beam of light passing for the thousand and first time through a prism, from the chance contact of two pieces of substance, or from one instant of irrational curiosity, may come a fact that will open suddenly a whole vista of strange knowledge.

This is discovery, and there is no technique of it. Galileo in a cathedral, gazing at the swinging lamps, perhaps because he was bored, discovered the law of the pendulum. This was of no practical use whatever. Merely a fact. Then someone invented a clock, all but one troublesome detail. How could the revolutions of its wheels be regulated? Ah, the pendulum!

Many years ago a physicist named La Grange might have been seen in his laboratory playing with a string that had been loaded with tiny weights at equal intervals. He would have said he was trying to make a mathematical analysis of the behavior of mechanically vibrating bodies. He noted certain facts of phenomena, gave them large names and reduced them to a generalization that had no relation whatever to anything real that people then had ever imagined wanting. Later the telephone was invented. People did want that; and having found how convenient it was in the neighborhood they wished to extend it over wide areas. Then the problem arose of how to transmit electrical vibrations long distances over a tiny wire. In the search for a solution of this problem La Grange's work was remembered. In view of analogies discovered since his time between the behavior of mechanical and electrical vibrations, what did those little weights on his string suggest? A device called the loading coil; and loading coils at equal intervals along a telephone wire, behaving as the little weights behaved on La Grange's string, made the first long distance telephones possible.

The pure scientist, fishing in the absolute sea, is not an inventor. In the field of invention there is the practical science worker with a problem given. Something is wanted, like a machine to tell time. He may have it all but the pendulum. If the law of the pendulum has not been discovered he is stuck. It sometimes happens that he will then go fishing himself beyond the rim of knowledge with miraculous luck. Nevertheless, discovery for its own sake, above the plane of invention, has the use of increasing the stock and variety of pure fact-knowledge, which is to increase the probability that the particular fact the inventor needs to solve his problem will exist when he wants it, like the law of the pendulum.

The modern idea of true scientific method is that new facts and the theories that correlate them shall continually descend

into the hands of the practical science workers who make the crude experimental models. It is on their benches you see the wonder of idea in the anguish of trial reality, spirit commanding matter and endowing it with form, purpose and function. The work of these is handed down to the field of technology, where the technician, the engineer and at last the mechanic brings the economic reality to pass.

The whole sequence lies in the history of the dynamo. An Italian scientist named Galvani in 1792 happened to get a piece of iron and a piece of copper into the leg of a dead frog, both at the same time. The leg jerked. Thereupon he announced excitedly to the scientific world that he had discovered the source of electricity in a frog's leg. Another scientist named Volta said that was ridiculous; it couldn't be in the frog's leg; it must be in the conjunction of frog's leg, iron and copper.

From this controversy came the true discovery that two metals immersed in acid produce an electric current. There, then, was the battery, which at once became the wonder toy of every scientific laboratory. Quite by accident it was discovered next that a wire charged with current from a battery had power to magnetize a near-by piece of iron. This meant that something jumped from the charged wire into the dead iron.

Thus scientific electrical knowledge stood until one day it occurred to Faraday to say, "If something jumps from a charged wire into a piece of iron to magnetize it, why won't something jump from a piece of magnetized iron into an uncharged wire?"

He made a coil of wire and attached the ends of it to a galvanometer, which was an instrument Galvani had invented to register electric current. The purpose of the galvanometer was to show if anything jumped from the magnetized piece of iron into the wire. Then he stuck the magnet inside the coil and looked at the galvanometer. Nothing was jumping. "No good," he said; but as he took the magnet away he happened to notice

that the galvanometer needle moved slightly. So he put the magnet inside the coil again. As it was going in the galvanometer needle moved, and then stood still again. "So!" said Faraday, "Maybe the magnet wants to be wiggled." He wiggled it and as he did the galvanometer needle moved; if he stopped wiggling it the galvanometer needle stopped. This proved that something did jump from a magnetized piece of iron into a coil of wire, provided the iron magnet was kept moving.

Well, there is the complete principle of the dynamo. That is all a dynamo is—a revolving magnet within a coil of wire. Yet Faraday, having made this discovery, did not invent a dynamo. He was not an inventor to begin with, and, besides, before anybody could work with his facts they had to be formulated. A mathematician did that. Years elapsed before there was any practical application of the formulated scientific facts to the everyday work of mankind. It was necessary for someone to have the idea that to be able to carry power further from its source than the reach of a shaft or a belt would be a great convenience; and it was necessary for that idea of a thing wanted to connect with the idea of means. At last the thought came. If it was true that electric current was energy, and true that you could produce it by revolving a piece of magnetized iron inside a coil of wire, then why couldn't that energy be led away by wire from where it was produced to any distant point at which you wished to use it?

Thus was added the economic link to complete a chain of events by which now all the electric power in the world may be traced back to the jerk of a dead frog's leg under the eye of naïve scientific curiosity.

All of this is science in its own case. And if it were a body with a mechanism where the feelings ought to be it might rest its case on the evidence and say no more. But it belongs to life;

therefore it is controversial and has a spirit of retort. Reason can no more let faith lie than faith can let reason lie.

Science boasts of having delivered man from darkness and superstition. Only ten generations ago faith burned a man for saying the earth revolved. Galileo, who founded experimental science with a thud by dropping two bodies of unequal weight from the top of the leaning tower of Pisa to prove that the sacred Aristotle had blundered, was imprisoned in his old age, not precisely for that impious act but because, besides, he held with Bruno and Copernicus that the sun was the center of the universe; and although he recanted, still he was on parole for the rest of his life lest he should say again, "The earth turns." Even long after this the pioneers of modern science wrote down their discoveries in cypher, backward, upside down and mirror-wise, fearing the fate of heretics. Some of these writings, notably those of Leonardo da Vinci, perhaps the most gifted experimental scientist since Archimedes, are not wholly deciphered to this day. The literature of science current—the latest book or notable speech—will still recite the roll of martyrs.

Then there are those, not themselves scientists, who lisp the language of science with literary skill and say such stupid things as that philosophy is the pursuit of infantile minds and cannot survive the facts. This makes only a sense of scandal. What is a fact? The simplest fact, if pursued, leads science to what it calls an explanatory crisis, as every scientist will admit.

That science has moods of intolerance and sometimes forgets the distinction between dogma and hypothesis is merely a weakness that keeps it kin. But of all its reactions the one most human is to the taunt that in this scientific age human progress, if it may be called progress, is forward, not upward. To this science answers that a scientific age is still an ideal, for one has never yet been realized; and that certainly there has never been such a thing as a scientific human society.

As it regards the physical universe the scientific mind conceives order—complete, perfect and sublime order—and is moved thereby to awe and reverence, often to a state of deep religious feeling, with or without a specific God image. Then it turns to regard human society and conceives it to be a bedlam, a muddle, torn by disharmonies and uproar. And this it accounts for, saying the physical universe is the work of nature and therefore scientific; but man made society, and society is artificial and unscientific.

As to the conclusion, it is probably wrong. Society and everything belonging to it must have existed from the beginning as a potential within nature. Society, therefore, is a natural thing. If not—if society is an artificiality and a disorder—then nature contained the potentiality of artificiality and disorder, wherefore her own order is not perfect.

But in any case, here are certain interesting implications. Does the theory of evolution hold for the species man only up to the point at which he becomes a social animal and begins to make society? If so, the law of evolution is not absolute, since it breaks; if not, and the law of evolution holds for society, how is it that a law of nature has produced a result, namely society, which to the scientific mind is a scandal of disorder?

CHAPTER EIGHT

Truth in a Piston

NO NECESSITY FOR MACHINES TO BEGIN WITH.—WHY THE ANCIENTS DID NOT MAKE THE INDUSTRIAL REVOLUTION.—THE MISSING IDEA.—NOW NO WAY TO GO BACK IF WE WOULD.—LOGIC OF MACHINES.—HOW A GARAGE MECHANIC THINKS.—WHY AMERICANS ARE EMINENTLY THE MACHINE PEOPLE.

IF AT THIS POINT the question were moved it would be: Shall man go back to an age of faith that he remembers or shall he move on through doubt and uproar, pursuing the idea of a scientific commonwealth?

The mystic who says to go back has the advantage of being positive. Science can say only to go forward in knowledge and all will be well,—*provided the problem of man himself can be solved.*

It seems a terrible dilemma; nevertheless it is supposed that man has this choice to make. The scientific mind supposes it. In a brilliant little book entitled "Daedalus, or Science and The Future," J. B. S. Haldane, of Cambridge University, stops to consider whether the pursuit of scientific knowledge is likely to be abandoned. "It is after all," he says, "a very recent form of human activity and a sufficiently universal protest of mankind would be able to arrest it even now."

He may have been thinking back to Archimedes who, on discovering the law of the lever, exulted: "Give me whereon to stand and I will move the earth." Many years before Christ the Greeks and Alexandrians imagined cog wheels, pinions, pulleys, steam power, pumps, pneumatic and hydraulic machines, and had enough sound knowledge of the physical and mechanical sciences among them to have begun at that time the true scientific age.

What they lacked was the economic motive. The Romans who succeeded them had no feeling for science; they had only military and political instinct. After the rule of Romans came the rule of faith. Man moved his whole treasure to heaven; and forbade himself on pain of torture and death to rediscover what the Greeks knew two thousand years before.

The possibility that this history may be repeated is a theatrical thought. The imagination delights to play with it. However, a crucial fact of difference is left out.

Probably because it had no economic motive behind it, or for want of time, or for any reason that may be, the fact is that Greek science did not enter the scheme of life. They got no further with it than theory, description and model. Though the whole of it were lost or forgotten life would go on as before and on the same scale as before. But if this knowledge had been used to multiply the means of life—steam power for engines, for industrial machines and for transportation, instead of turning toys and swinging temple doors with it—then people could no more have lost it than they could have lost the art of agriculture by which they lived. Population would have increased enormously, industrial empire would have appeared in the Mediterranean part of the world more than twenty centuries ago, and all modern history would be very different.

There was never any absolute necessity for the machine. Life could exist without it, only, of course on a much smaller tapestry. It is use that creates the necessity for the machine. The scientific use of physical and mechanical knowledge to increase both the agricultural and the industrial means of life has made it possible in our time to sustain on the earth a population that could not otherwise exist, that would otherwise have perished before it was born. This is a fact we keep forgetting. It is the fact that relates human life to science in a vital sense.

There is no way to go back.

A wish to live again in the past is very old. The future is unknown, the present is turmoil, but the past may be anything we like to think it was. We may perfect it by wistful imagination and live in it as in our dreams. Man has always had in him the myth of a golden age, a time to go back to, a yearning for return. All of this revolt against science, this fear of the machine, this notion that knowledge may be leading civilization to an abyss, may be and probably is referable to that ancient, infantile myth surviving unawares in the modern mentality.

No rational being would exchange the whole of the present for the whole of the past, only parts of one for the other. Well, that is impossible. Nor can any troublesome part of the present be got rid of by the alternative, sometimes suggested, of standing still. The science holiday again.

It is no more possible to stop than it is to go back. Why this is true is not so easily stated. A principle of acceleration acts. We know it and feel it, our everyday calculations include it, and yet it is difficult to say what it is. Progress, though it were progress forward only and not upward, must be at an accelerating rate. Knowledge increases in that manner; so does wanting.

Epochs and ages we speak of in a way to make believe we understand them. We know much more about the present than about any past age or epoch, and yet how little we understand the present!

A way to see his own works and interpret them to himself is one of man's great needs and he is not sufficiently aware of it. When he is he will find the instruments. What they will be like we do not know, any more than it was known beforehand what the telescope or microscope would be like.

One of the classics of science is the story of Herschel, a musician whose interest in the heavens led him to become an astronomer. He had first to master mathematics. Then, as he could not afford to buy a telescope, he resolved to make one; and for this

purpose he had to master the science of optics and the technology of instrument making. From a musical performance he would rush back to his lodgings to resume the labor of grinding and polishing reflecting mirrors by hand. After hundreds of failures he produced a telescope equal to any in the world and discovered the planet Uranus.

Such zeal is common among workers in the tradition of science. Ways therefore have been found to search the remoteness of the heavens, to discover the past of many things, to apprehend the unknown and to see the invisible, each way with its method or science.

But where is any science of the present? We know more about the movements of astronomical bodies than about the play of everyday economic forces. There is a way whereby man may contemplate his own thoughts and yet no proper or deeply considered way whereby he may contemplate his own works and refer their significance to his understanding. Philosophical contemplation of the universe as a mechanism is a grand activity of the mind; the machine that has appeared suddenly in the earth is an object of momentous meaning, and the philosophical mind is loath to perceive it; the aesthetic mind will not.

Berdyaev writes a blind and terrific passage on man machined:

* "What had happened then in the history of mankind? How are we to explain the fact that the whole order and rhythm of life had undergone a radical change? Why did the decline of the Renaissance, already apparent in the nineteenth century, become much more accentuated in the twentieth? I am deeply convinced that an unexampled revolution and crisis of the human species had taken place, one that cannot be recognized by such outward signs as had distinguished the French Revolu-

* *The Meaning of History, Nicolas Berdyaev.*

tion from year to year, a revolution that was, in fact, immeasurably more profound. I have in mind the changes associated with the introduction of machinery into the life of human societies. I believe that the triumphant advent of the machine constitutes one of the greatest revolutions in human destiny. We have not yet made a just estimate of its importance. The advent of the machine brings about a revolution in all spheres of life. It rips man away from the bowels of nature and changes the whole rhythm of his life. Formerly, an organic tie had existed between man and nature, and his communal life had been governed by a natural rhythm. The machine radically modifies this relationship. It steps in between man and nature; and it conquers not only the natural elements for the benefit of man, but also, in the process, man himself. It both liberates and enslaves him once again. If man had formerly depended upon nature and had, as a result, lived a meagre life, the invention of machinery and the resultant mechanization of life while in some ways enriching him yet impose a new form of dependence on him, a dependence, perhaps, even more tyrannical than that exercised by nature. A new and mysterious force, alien to both man and nature, now makes its appearance in human life; and this third, unnatural and non-human element acquires a terrible power over both man and nature. It disintegrates the natural human forms. It disintegrates and divides man so that he ceases to be the natural being he had been from time immemorial."

And there he leaves it.

The machine will reward contemplation. Try it. Any machine will do—the small gasoline engine on one's own premises. There is much to be learned from bringing the mind to dwell upon it.

The history of the human mind is there. Circles, true angles and the revolving wheel first presented to the intuition of man as symbols of mystery and supernatural power. That is to say, they were seized by acts of religious and aesthetic perception.

Reality has also that way of disclosing itself long before the facts are found out. Many years before it could be proved scientifically at all the Greeks deduced the sphericity of the earth from their aesthetic sense. The sphere was the ideal form of a solid; therefore the earth was round.

The science of experimental mechanics, raising such forms as the circle, the angle and the wheel to the power of function, was an achievement of the reason, working practically.

Invisible in the machine are physical laws. Man did not invent these laws. They are inherent in the universe. But he had to discover the facts and then formulate them as laws, and this was the work of the speculative faculty, working in abstraction.

How strange that the machine you are looking at, acting by what is proved and proving that by which it acts, should be a form of truth the signs of which first appeared in superstitious rites of magic and had then to be pursued through millennia of error! Even this may not yet be its whole reality. Very likely not. What perversity is error! Always the wrong way first and the right way last. In every case the right way, once we find it, is so direct and obvious that to have missed it seems the strangest fact of all.

So there may be many ways of arriving at truth. To the reality now acting in machine forms, religion, art, philosophy and science have all contributed by moving knowledge one step at a time, with no sense of direction, no goal in sight, and yet steadily hitherward. The spectacle of the human mind exerting itself blindly, erringly, victoriously, to bring about a condition it cannot foresee is utterly mysterious to the reason.

And why suppose there is or ever will be a period to that mystery?

The internal combustion engine was invented by grand tinkers and mechanics, whose only idea was to make it work. It was already working, in millions of automobiles, before there

was any scientific understanding of what happened in the cylinder. It was known only that a mixture of gas and air was compressed by the piston coming up, then received a spark and exploded, driving the piston down. But why did the engine sometimes knock? Nobody knew; and not knowing was a limitation on the further development of the engine. We could have gone on with it as it was, and it was good enough for all ordinary purposes, but until that question was answered there could never be such a thing as a two-thousand horse power engine weighing no more than one big horse, and that was the kind of engine that was going to be needed for *the airplane that was coming.*

Now regard a physicist in the Bureau of Standards at Washington at the beautiful play of exploding gas in soap bubbles. If you ask him what he is doing he will say he is making thermodynamic studies of gaseous explosive reactions. This is pure research. He is not thinking of any particular problem. He is curious only about the behavior of gases. Yet many technicians and grand tinkers are watching him intently because he may find out something that will tell them why their engine sometimes knocks.

In the research laboratory of a great automobile corporation the approach is from a different angle. The reason for the knock is in the fuel, namely, gasoline. Well then, what is gasoline? They break gasoline down to its parts, explore each part separately, and know what that stuff is. Then they spread out before them the atomic table and begin to search for an organic compound which added to gasoline will produce a more favorable happening in the engine cylinder. They have no idea what it will be; they know only what they want it to do, and there is no certainty that it exists.

Now, the number of organic compounds that may be constructed from the atomic table, given an inch of type each for

description, would fill hundreds of books. For all practical purposes the number is infinite. Therefore when you go looking for a certain compound, character unknown, that must do a certain thing, you are looking for one grain of sand on the ocean beach. It is impossible to search the beach one grain at a time. You can only pick up a grain here and another there and examine it hopefully. So they explore the atomic table, trying this compound and then that one, and after four years they are discouraged. They have found compounds that make gasoline better and compounds that make it worse, and each one is marked on the table. So there is a point here and another over there and one away up near the top, hundreds of them, in fact, but there is no drift to follow and they are sick of just groping around.

Then one man with nothing else to do sticks pegs into those points on the flat atomic map—an inch peg for gasoline, a half-inch peg for a compound half as good as gasoline, a longer peg for one a little better, and so on. Still he discerns nothing.

One day the boss scientist comes in to see how they are getting on. Seeing the pegs, he says: "What's this?" It is fumbling they say. Nothing has come of it. And they feel even a little foolish at having been found playing with the pegs. The boss stares at the pegs a long time, says, "Well, try anything," and turns away. At the door he looks back and for no reason at all stoops to bring his eyes level with the table, and squints.

Suddenly he becomes excited. "Come here," he says. "Look as I am looking. I think I see a warp across the tops of those pegs. Look! Don't you see they tend slightly to grow taller in that direction to the upper left?" The others look as he is looking. They see it too.

Not consciously intending to do it they have raised the atomic table to the third dimension. There is a warp in this third dimension and it gives them for the first time a sense of direction. Following the warp they come to something nobody had ever

thought of—a lead compound which, added to gasoline, does create a more favorable happening in the engine cylinder. And at that moment the great airplane engine that was yet to appear became a possibility.

The knock is the machine's own protest against error. The evil in itself is not serious. But the sound is one we hate to hear. Sound of error. This is significant. We should probably find by going deep enough for it that man's passion to perfect the machine, even the sound of it, though the upper motive be rational or economic, is really from the essence of his nature. It is as if he were proving something to himself. What science continually and rationally seeks is the constant. What the restless spirit seeks is certitude.

Belief in human perfectibility is a faith for which the evidence is weak and conflicting. But in the machine man finds the principle of perfectibility. To increase its precision, sweeten its rhythm and raise its power to any sign, he has only to discover the true laws of its being and bring them into a relation of harmony. Then logic is implicit in its behavior.

It may be the spirit will not change, but from perfecting, minding and living with machines the mentality does. Certainly a machine environment will induce new habits of thinking. To act upon a machine with passion, malice or impulsive ignorance is to wreck it, and the lesson is final. To command its power you are obliged to act upon it with knowledge, reflection and understanding. It is not obedient to you; it obeys laws you cannot alter or corrupt. And since you can neither alter nor corrupt them you may trust them. They cannot fail.

The garage mechanic is not a scientist; yet he thinks scientifically. Observe him. There is trouble in the mechanism. The rhythm breaks. The power is lost or it may be only that there is a wrong sound. He takes your facts and entertains your opinion. Yet he does nothing overt at once. He listens, reflects, speeds up

the engine and slows it down, cuts out one cylinder at a time by shorting the current across the tops of the spark plugs, drives the car around the block, then leans against his bench and lights a cigarette. "I think I know where the trouble is," he says. With that he enters the mechanism at a certain point, goes to the spot and there it is—what he thought it was.

Now consider what has occurred in this familiar instance. What was to be found was X, namely, the cause of trouble. There were many facts in several categories—historical facts of doubtful importance from you, facts of knowledge in his experience, facts of sensation in the particular case. How has he acted upon these? By methods of analysis, analogy, synthesis, *as if, is as,* induction, deduction, generalization and hypothesis. He may not know what an hypothesis is. If you should say to him that he has been thinking scientifically, or explain to him the process by which he arrived at his *I-think,* he would be bored. He thinks scientifically without knowing that he does and calls himself a trouble shooter. The way of it comes from experience.

Sooner from observing machines than from observing ourselves we may come to precise ways of thinking, to an understanding of the natural principles of equivalence and reciprocation, applicable also to human affairs, and to such a generalization as that a thing is for what it is for.

Each part of a machine is for what it is for. Each machine in the great scheme of machines is for what it is for. We make machines with organs and chemistries that simulate creature reactions to stimuli. All of them feel. Some of them see. There are now some to think mathematically, these substituting in drudgery for the mind as others substitute for the body; but how stupid it would be to expect them to think politically or philosophically.

Perhaps man shall never know what he is for. Nevertheless he might very well know what his institutions and methods and

specializations are for. He might know, for example, that physical science is neither for prophecy nor for handing down the social law. One would think the scientific mind as such would know this. But there has lately come over it a rage to prophesy, to say not only what is but what will be and should be in all things. And having said what ought to be believed it goes so far as to resent in the popular mind a lively scepticism, forgetting that scepticism is its own first virtue.

Americans are eminently the machine people. They have more machines than all other people in the world. Here the authority of science, resting upon facts and upon the thing that works, is such that no absurdity can diminish it. Credulity for that which may be demonstrated is unlimited. For the new fact there is a kind of appetite.

Here at the same time is a scepticism from which science is no more immune than phrenology. Science giving law to man's works is unchallenged; undertaking to give him also the law of his being, it is challenged. The behavior of mind in the fundamentalist, even in Tennessee, is somewhat like this. He asks: "Is there a scientific theory of the origin of human beings that can be proved on such evidence as would hang a man in Tennessee?" The answer is no. In that case he will believe what he likes.

But believing in the theological doctrine of the special creation of man he will not for that reason reject a scientific fact in plant or animal biology, say it is impossible to make a fuelless engine, or impugn science as a whole. He prays for rain. Science, he reads, thinks it can find a way to make rain. He remembers with a smile that science not long ago classed the idea of rain making with ideas of magic. If science can make it rain, so much the better, The fundamentalist will buy his rain, but he will not stop praying, nor will be agree that fact knowledge is

the only kind of knowledge there is. Who shall say this is not a sound attitude toward science?

Knowledge, too, is for what it is for. A preference for the useful use of scientific knowledge lies deep in the American genius. It was the theme of Ben Franklin who may be taken as the founder of science in this country. A text for it will be found in one of the forgotten Lyceum Lectures delivered by Abraham Lincoln before he was elected President. "All creation," he said, "is a mine, and every man a miner. In the beginning the mine was unopened and the miner stood naked and knowledgeless upon it . . . Man is not the only animal that labors, but he is the only one that improves his workmanship." And how strange, he added, that after the discovery of steam power it was two thousand years before the amazing thought occurred to anyone that it would move useful machines as well as toys.

This perfectly illustrates the difference between discovery and invention. Practical people will be very inventive in the application of scientific knowledge; it does not follow that they will make many new discoveries of their own. Americans are the most inventive people in the world; they excel in technological research, that is, in finding new ways to apply existing knowledge. Their record in the field of pure science is less impressive, which is owing perhaps to the fact that even here the end is practical. Their idea of pure research is not to improve their standing in the world's hall of fame; the aim is to keep workers in the field of technology supplied with an abundant store of fact knowledge.

When Abraham Lincoln was speaking of discovery and invention in that Lyceum Lecture, year 1860, there were only five kinds of power in the world—man power, animal power, water, wind and steam. Since then two new powers have been added. Gas and electricity. At any instant another may be discovered. Where? There is no telling where or what or under what cir-

cumstances. The unknown is nowhere, meaning it is everywhere. It is in the common occurrence, in the familiar object, in the artless question, in the queer twist of a thought.

Man's passion to pursue it is a fact he can give no account of. Always he has been afraid. Does he go on notwithstanding, or is it because he is afraid that he goes on? In one case a lonely hero in the universe; in the other case a brave planetarian who would sooner meet the dangers of knowledge than bear the terrors of superstition. Once he gets used to the idea it is much less appalling to live on a sphere whirling in space than on a flat world with edges sticking into the void. Life cannot fall off.

There is also the simple probability that he is a child in existence naturally growing up. Knowledge happens to him as he wants and needs it. That by taming wild energy he will imperil his soul more than he did by taming the wild grasses and beasts is absurd to suppose; and that it is any more likely he will destroy civilization with machines than it was that he would achieve that calamity with clubs cannot be proved as a scientific fact. As to that, your opinion or mine is as good as that of science. Whatever it is that runs ahead of us and beckons us on—it is not afraid.

CHAPTER NINE

Plenty Was Not the Answer

WHAT MAN WANTED WAS A FABULOUS WORLD.—IN QUEST OF IT HE FINDS THE REAL ONE.—SUDDEN IDEA OF THE MACHINE'S SLAVE VALUE.—DEATH OF FAMINE.—YET IN A WORLD OF PLENTY ALL THINGS ARE FULL OF LABOR AS THEY WERE BEFORE.

IN THE FILE OF PRAYERS, if one is kept, the thickest and dustiest bundle must be the one marked, Man's Supplications for Plenty. He was loath to believe that God's second arrangement with Adam at the gate was forever. When he was not wistfully misunderstanding local weather conditions, thinking it a chastisement when they were bad and a sign of relenting when they were good, he was dreaming of having in his hand the horn of plenty, filled with the fruits of the earth and overflowing, as if sometime, somehow, the principle of limited fecundity that governs the natural earth could be suspended.

But his prayer was never quite frank. Always he left something out. What he wished for was *miraculous* plenty, and when he prayed for plenty what he associated with it was the thought of freedom from irksome toil. But the earth mother was a hard unsentimental employer. Her wage scale was fixed. It could no more be changed by prayer than by strikes or collective bargaining. The reward, whether generous or not, was in exact proportion to the amount of work performed. And that is true to this day; it is true both of primitive agriculture where it survives and of scientific agriculture as machine people know it.

To say that scientific agricultural practice has greatly increased production is not at all the same thing as to say it has increased the natural productivity of the earth or that it has

broken the wage scale. When you see a man acting upon the soil with wheeled implements, power tools, chemicals, airplanes to dust his orchards and gardens with insecticide, you have to remember that all this represents a terrific increase of exertion to bring forth food. One tractor represents the power of thirty horses; and nature does not produce the tractor.

When at length the realistic mind perceived that here was a natural fact upon which prayers, thanksgiving, sacrifice, idolatry, and the pretentions of magic were all alike wasted, the spiritual part of us no doubt had been willing to accept the sentence. Not so the earthy and lusty part. The curse was heavy. There was never a risk man would not take, no kind of heroic exertion he would spare himself, to escape the evil, the boredom, the drudgery of repetitious toil.

From such puerile motivation came the Age of Discovery, then physical science, purposeful mechanical invention, the industrial era, and all the artificial marvels of the modern world. These effects are historically traceable; and if it should occur to you to wonder why they are so much more vivid and astonishing in the West than in the East, that is easily explained. The European mind went on with the phantasy of an earthly paradise of plenty and leisure after the Oriental mind in weariness of wisdom had given it up.

Until four hundred years ago the Europeans believed that somewhere in the world was a fabulous land whose inhabitants lived as in dreams, eating and drinking from golden vessels, wearing priceless jewels like common beads, sated with ease and luxury. Kings, courts, astronomers, and navigators believed this. The vulgar fancy was for a place such as Cockaigne of the medieval ballads where all features of the landscape were good to eat or drink and nobody ever was obliged to work. In quest of this mythical region the pioneer feats of circumnavigation were performed.

What a disparity between the character of the motive and the shape of the deed! or is it that men do not know their motives?

The round earth was explored. It was found to be full of labor. This, of course, was a terrible disappointment.

The ceaseless mind then turned to alchemy with the idea that base metals were changeable into gold; from this came chemistry and the study of matter and physical phenomena in a new way, taking nothing for granted. This was the beginning of true science. As to what might come of it practically there was at first only the rudest kind of notion. Dimly it was understood that exact knowledge must somehow increase man's power, give him control of the elementary circumstance, enable him perhaps to command that which hitherto he had got by hazard. When a great body of fact knowledge had been accumulated, men began to see little by little how it might be dynamically applied. Then the epoch of mechanical invention.

The idea of machines was not new. Long before the beginning of the Christian era the ancients had produced many wonderful automatic devices; but mechanical knowledge with them was a department of magic. The use of machines was to mystify the multitude. Brazen figures were made to move, dragons to hiss, temple doors to open and close, trees to emit musical sounds, and lamps to trim themselves perpetually by means of floats, cog wheels, cylinders, valves, and pistons, all acting on sound principles of pneumatic and hydraulics. Much of this ancient technology was lost or forgotten. The European mind rediscovered it gradually in a spirit of scientific curiosity, with no clear economic intention. And but for a simple practical idea, one that was very slow to come through, the machine no doubt would still be what it anciently was—an object of superstition, the toy of wonder, an accessory of priestcraft.

And what an obvious idea it was! Merely to exploit the machine's slave value. Merely to see an engine as a beast of burden

and the loom as a projection of the hand, both instruments of magnified production, to spare the labor of mankind.

That moment in which the use of mechanical energy came to be so conceived was one of elemental significance. All the chances of human life were altered, though not as anyone supposed nor as they were meant to be.

The course of internal evolution requires to be imagined. It is slow beyond perception. It may not be a fact; or, for aught we know, it may be finished in the species. Suddenly, man begins to augment himself by an external process. His natural powers become extensible to a degree that makes them original in kind. To his given structure—the weakest among animal structures in proportion to its bulk—he adds an automatic, artificial member, responsive only to his will, uncontrolled by nature, fabulous in its possibilities of strength, variation, and cunning.

His use of it in three generations has changed the design of civilization out of recognition. That change alone which sets our time off abruptly from all time before is the fact of potential plenty. We take this for granted as if it were a natural fact, whereas instead all the circumstances have been invented.

We who are born to the view cannot see it. We cannot imagine what it was like to live in a world where famine was a frequent visitation and all things were scarce. Yet never until now has the human race known what plenty was. Immemorially the word has signified food.

> *See, the smell of my son is as the smell of a field the Lord has blessed. God give thee of the dew of the heaven and fatness of the earth and plenty of wine and corn."*

The cornucopia, horn of plenty, never contained a fabricated thing; only the fruits of the earth.

That old meaning of the word has been recently lost. Modernly we speak of goods; we talk of the standard of living, which

is understood of course to include proper quantities of food, and to mean, besides food, an endless number of artificial things which people increasingly require for their comfort and well-being.

Mechanical energy does not produce food. Nor has the principle of limited fecundity that governs the earth been suspended. Yet the machine has enormously increased the food supply in two ways: first, agriculture is equipped with power tools, so that one man on the soil now may perform the labor of many; second, transportation has made all the food-producing areas of the world accessible, so that grain from the middle of the North American continent and grain from Argentina are mingled unawares in the European loaf.

This use of the machine to distribute food swiftly over the whole world from where there is a surplus to where that surplus is needed has had profound political, economic, and social consequences, beginning with an increase of the human species vastly beyond any number that had at any time previously existed or could ever before have been sustained upon the earth. The North American continent has been peopled from European stock. Its present population is equal to that of all Europe in 1800. This drain of emigration notwithstanding, the population of Europe in the same time has trebled.

And still there is plenty.

Where it is not actual it is potential. Who have not plenty are either too inert or too ignorant to put forth the modern effort. What people may use, enjoy and consume now is an X quantity, determined neither by the rhythms of nature nor any biological principle but simply by the free total of their own exertions.

Was that what man wanted? Since he appears to have provided himself with plenty, shall that bundle of dusty prayers be recalled or sent to the furnace?

But, no; this is not *miraculous* plenty. Once more he is dis-

appointed, thwarted this time by his own inventions. Plenty he has found, or the way to it; toil he has not escaped.

The machine that was to have been a labor-saving device becomes an engine of production that must be served. It is as if you could not save labor at all—as if you could make it only more productive, thereby achieving an abundance of things with no effect whatever upon the necessity to perform monotonous labor. All this labor-saving machinery we live with notwithstanding, never were people more complaining of their tasks. That might mean only that they were increasingly conscious of an abating evil; but there is no certainty that the abatement even where it is noticeable is permanent. The signs are otherwise.

In all material respects people are better off than ever before. Their bodies are more comfortable, their minds are free from the terror of hunger, they have much more to enjoy and consume and hope for, because their labor is more richly rewarded in things. See the amazing quantity and variety of things such as only the rich could once afford now circulating at the base of the human pyramid. Not necessaries only. Silks, watches, ornaments, shoes like those of queens and ladies, plated ware, upholstered furniture, soft beds, besides things that were formerly non-existent and therefore beyond the reach of kings, sultans and nabobs, such as electric lights, plumbing, motor cars. In the United States a motor car to every six persons! And still no sign that the curve of human contentment is rising; no sign that the curse of toil will ever be got rid of.

Instead of saving labor the machine has multiplied it. True, the hours of industrial labor are fewer than they were, e. g., now eight where they were ten and twelve a day; but this is merely to compare worse with better where better is, and that is not everywhere. For a proper contrast compare the industrial with the idyllic task. Even eight hours of labor a day continuously performed by the industrial worker represents a much greater

sum of annual effort than his ancestor put to the soil. Consider also how the machine, directly or indirectly, has laid new work upon races hitherto naïvely existing in a state of nature.

The riddle is that industrial civilization, having created to its unknown ends a race of mechanical drudges, requires nevertheless a contribution of human toil more intense, more exacting, more irksome than ever. As toil it is more productive; there is more to consume. Life has been expanded. It is safer. Physically it is inconceivably richer. Was that the goal? What else is gained?

You would think that when man had found a way to provide himself with artificial things in unlimited plenty and a way at the same time to spread the food supply evenly over the face of the earth, the gift of universal peace might follow. Never was the peace more frail; and this, as we shall see—the frailty of the peace—also is a product of the machine.

CHAPTER TEN

To Debit and Credit

HOW STANDS THE ACCOUNT BETWEEN MAN AND THE MACHINE?—THE SPIRITUAL ACCOUNT.—RELIGIOUS FAITH DECLINES AS MAN FINDS THAT HE CAN PROVIDE PLENTY FOR HIMSELF WITHOUT BENEFIT OF PRAYER.—"JUST IN CASE THERE IS NO HEAVEN."—THE DISCIPLINE OF POVERTY IS DESTROYED.—AUTHORITY OF THE STATE IN PLACE OF GOD'S ROD AND THE TERROR OF HUNGER.

So FAR we have been regarding machine people, which is to say, ourselves. Before going on to look at the machine itself and to witness the irrational economic behavior of a machine world, let us ask:

How now stands the account between man and the machine, not as concerning his material welfare but in terms of life? Beyond the economic reckoning, how has the machine touched life in its deep concerns?

The first, the one incomparable vital fact, is that the machine has enabled the population of the world to double itself in one hundred and fifty years; and if you take time present to be noon o'clock of history, one hundred and fifty years would be perhaps one minute in the life of mankind. This alone is the most awesome event since Genesis.

The second most important fact is that notwithstanding this prodigious increase of human life there is either plenty or the potentiality of it over the face of the entire earth.

Thus the machine has destroyed the oldest and most cruel discipline there was in the world, namely, the discipline of despairing hunger, putting nothing comparable in its place.

Whether invention affected philosophy more than philosophy affected mechanical science is a question that need not be debated. It is certainly true that a mechanistic theory of the uni-

verse, with God left out, belonged to the machine age and would not have been possible in any other. That way of thinking at the top, together with the discovery that man could provide plenty for himself with no benefit of prayer, caused a decline in religious faith throughout Christendom; and so the second most powerful discipline in the world was greatly impaired.

But in any organization of life there must be an omnipresent power or principle of discipline. The need for it is so imperative that one may think of it as an instinct of the soul. When it happens for any reason that the authority under which people have arranged their lives breaks down they turn to another, even though it may be one they do not like. Well then, the discipline of hunger having ceased to act and the authority of religion having declined, what would you expect to see? You would expect to see the rise of the Authoritarian state; and that in fact has taken place everywhere in the world, even in free countries, overcoming in some cases strong political traditions. Thus, although he may be free from the fear of hunger and released from fear of God, man still is not free. He finds himself standing in fear of the state, or, in the most enlightened case, submitting to the progressive authority of the state over his wayward behavior.

From the decline in religious faith it would naturally follow that people should begin to say: "Just in case there is no Heaven where all rewards shall be reversed, we want ours here and now." And the people who say this are the machine's own children,—its children literally and in fact, for if the machine had not fathered them they would not be here.

In creating densely populated industrial regions the machine created also proletarian man and clothed him with political power.

Conceived at first as a means whereby labor might be dis-

pensed with, the machine instead raised labor to the rank of full human dignity.

Employed at first by the European people to exploit and enthrall the backward and abject races in the world, it became for these a symbol of release.

So stands the account between man and machine in respect of the principal items,—dangerously out of balance. There are great debits and credits to be reconciled and settled, not finally, of course, nor ever perfectly, but only in a weatherly manner. Yet to do even that we desperately need much more of one thing no machine can produce. It has enlarged man's world, it has in a sudden and perilous way increased his possessions of fact knowledge, it has invested him with power to coerce and command nature, it has bewildered his daily problems; it has added at the same time not one feather-weight to the sum of human wisdom.

PART THREE

VERTEX

CHAPTER ELEVEN

The Machine at Work

THE FIRST LAW OF THE MACHINE.—HOW IT ACTS.—COST AS A FUNCTION OF QUANTITY.—THE MORE THE CHEAPER, CONTRARY TO THE HUMAN LAW OF FATIGUE.—TENDENCY OF THE DIVISIBLE PRODUCT TO INCREASE FASTER THAN WANTING.—WISHFUL WANTING NOT ENOUGH.—THEN SURPLUS BY THE LAW.—DOING WITHOUT BECAUSE THERE IS ALREADY TOO MUCH.—THE ITALIAN SOLUTION.—AMERICAN PHENOMENA.

THE FIRST LAW of the machine is that *cost is a function of quantity.* What that means is to be examined.

The economic purpose of the machine is to cheapen production. There is otherwise no point to it. But if we say things are more cheaply made by machine than by hand we speak very loosely. What we mean is that a quantity of things is more cheaply made by machine than by hand.

For example, the cost of one yard of cloth produced by machine is many hundreds of times greater than the cost of one yard of similar cloth produced by hand. Obviously, the power loom is a very costly piece of machinery to build, and so is the engine that drives it. If you produced on a power loom only the amount of cloth a weaver could make by hand nobody could afford to buy it. But when you produce on the power loom a quantity of cloth one hundred times greater than a weaver can make by hand, then, of course, it is much cheaper. And the more you produce the cheaper it is. So with anything. The greater the quantity the lower the cost. Hence the term quantity production, or mass-production, meaning, first, to standardize the product, as to make it all black, all one texture, all one width or shape, and then to bring a chain of machine power continuously to bear upon its multiple production.

Observe the working of this principle. Take watches. Hitherto

they have been made by hand, slowly, laboriously, instances being not uncommon of a craftsman spending half his lifetime to make a very fine one. Under these conditions watches are rare and costly. Only the very rich can buy them.

Suddenly they began to be made by machines. A very good watch can be made for fifty dollars. There are a million people who want watches at that price. This is an original demand, a kind of vacuum, represented by a million people who have never had watches and now for the first time may possess them. For a while watches cannot be made fast enough to meet this want. The industry for that reason expands very fast. Then all at once the demand is satisfied. The million have watches. The vacuum has been filled. Hereafter the demand will tend to be static; it will increase slowly as the population increases or as people in general grow richer, little by little. The watch-making industry, therefore, is depressed. It has to limit production.

Now comes someone with the idea that by carrying the machine method further a watch can be made for ten dollars. There are twenty million people who can afford to buy watches at that price. The ten-dollar watch appears. The demand again is like a vacuum, twenty times greater than the first. For a while ten-dollar watches cannot be made fast enough. The makers of fifty-dollar watches throw away their old machines, instal new ones, increase their production, reduce their costs, and not only make what was a fifty-dollar watch for twenty-five but contribute also, in a competitive manner, to the supply of ten-dollar watches. Suddenly, what happened before happens again. The twenty million have watches. The vacuum is filled.

Then someone says: "But there are one hundred million who would buy watches at two dollars." So the process is repeated, still lower in the pyramid. The two-dollar watch is not a fine watch, but it will keep time; and as you would know, with the improvement that has taken place in machine practice the cost

of making any kind of watch, even the finest, has been greatly reduced. A watch ceases to be a luxury or a token of caste. It is a necessary part of man's personal equipment, all the way down to the base of the pyramid.

There you have the cycle. The use of the machine is to cheapen the cost of production. The sign is quantity. When the supply at a given price has overtaken the effective demand you have either to idle your machinery, in which case your cost of production will rise, or open a wider demand at a lower price. To lower the price and keep a profit you have to cheapen the cost of production still more. This you can do only by increasing the quantity, which again overtakes the demand, creating again the same necessity to cheapen the cost by increasing the quantity in order to be able to make a lower price for greater demand. Thus supply pursues demand downward through the social structure.

There is at last a base to the pyramid—its very widest point. When that is reached—what? Well, then you need bazaars in a foreign sun, heathen races of your own to train up in the way of wanting the products of your machines, new worlds of demand. You turn to foreign trade. And if you are an aggressive country that has come late to this business, as Germany was, and find that most of the promising heathen races are already adopted and that all the best bazaar sites are taken, you may easily work yourself into a panic of fear and become a menace to the peace.

This law of the machine,—that cost is a function of quantity,—works in exact reverse of the law that governs human exertion, which we may call the law of fatigue. Regard a man at labor,—regard him as a living machine. There you see that the cost of production runs the other way. It does not *fall* with quantity. It *rises*. Suppose that in the course of a day's toil the man is expected to produce ten units of anything you like to think of,—if he is a cooper, let it be barrels. The barrel that costs him least is

the first; the one that costs him most is the tenth. From the tenth one on, if he goes on, the cost tends to become prohibitive. Fatigue will stop him.

From that first law of the machine, that knows no fatigue, you get a chain of economic and social consequences, all new in the world, including the paradox of surplus; and then the tragic and absurd irony that when a surplus appears the people who have produced it will begin in a competitive manner to sacrifice their standards of living in order to keep their machines going.

Imagine in the simplest terms the change from a state of life in which there was no surplus and couldn't be, to one in which surplus becomes a problem.

Begin with a feudal barony. It is a closed economy, self-contained. At the head of it is the lord. The land belongs to the lord and the people belong to the land. Everything the people produce above their own sustenance belongs to the lord. But this product over is not surplus. It is the lord's part. The lord and his family and his retinue in the castle directly consume it: food, drink, clothing, armor, trappings, even the castle itself. In that scheme there is no place for a machine. It would upset the life.

Nevertheless, the machine appears. The lord becomes a capitalist. Not the same lord in person, to be sure, but the same in principle, in symbol and fact of hereditary power, with the same way of feeling about people and the same idea of his right to take the whole of what they produce above their own minimum needs because he owns or provides the means of production.

Formerly the means of production meant land. Now, instead of land, he owns textile machinery, and he sets the people at the task of minding machines. The product is cloth. It is much more cloth than the lord and his family can consume. Therefore, he must sell it. To whom? To his own work-people? Perhaps if he raised their wages they could use more than they do use, and yet they cannot use anywhere near all of it. The solution of

course is to sell it abroad for money, and because it is cheaper than cloth ever was before it sells very easily. When the money comes back he gives out to his work-people enough to satisfy their wants and keeps for himself the remainder, to do with what he likes. As to the terms of division, it is again as it was in the feudal scheme, except that now it is a money-and-wage economy.

As the lord prospers in this new way others imitate his example and improve upon it, and presently there is a textile city like Manchester and a lively competition for customers in foreign lands who will buy cloth. In a little while there are several textile cities, and very hard competition among them; and next there are textile cities in several countries and international competition for foreign markets in which to sell cloth, or whatever else the machine product may be.

When the competition has become very intense the cost of goods must be cheapened, both in order to widen the demand and to undersell one's competitors; and the way to cheapen the cost of production is to increase the quantity, according to the first law of the machine, namely, that cost is a function of quantity. And so a time soon comes when the divisible product of the machine tends to exceed effective wanting and there is surplus.

To wishful wanting there is probably no limit whatever; but there is a point at which the effort necessary to gain the object of one's desire—that is, the toil—will be weighed against desire, and only when and if the object is deemed worth the effort is wanting effective in the economic sense.

Thus, competitive industry comes to the point at which its foreign customers will buy no more at that price, or not enough to absorb the total machine product; and that is the point at which the machine people begin to sacrifice their own standards of living and work harder to produce more in order to keep

their machines going and reduce the cost still more, for if they stop, or if they idle their machines, their costs will rise and they will find themselves out of the race, unable to sell at all.

Beginning about 1870 there was a sudden and uncontrollable increase in the output of industry from two principal causes. One was the rapid rise of competitive industry in Germany and the United States; the other—much more potent—was the discovery of a new and cheaper way of making steel. This one discovery transformed the aspect of industry by increasing its potential power as much, perhaps, as tenfold. Until then people spoke of the iron age; after that it was the steel age.

For a quarter of a century prices fell continuously. In that time all the capital employed in industry was lost at least once, probably twice or three times. The producer's only hope was to improve his machines and increase production, for as he did that his cost per unit fell and for a little while he could undersell his competitor. In methods of production and in the efficiency of machines there was necessarily amazing progress; nevertheless, when all other means of reducing costs had failed, it had to be taken out of labor.

In the United States it was not so bad because here the domestic demand for manufactures was very expansible, and besides that, a tariff wall always protected American industry from foreign competition. In Germany it was very bad.

Her advantage was that the German people would work harder and longer for less money than the British. The competition was between these two.

The British Government, disturbed by her new rival's success in foreign trade, made a study of labor conditions in Germany. It found Sunday labor very prevalent in the factories. "Only the hours of divine service are excluded," said a report from Saxony.

Commenting, the London Economist said: "The question of

Sunday labor is one of considerable interest for England, for it is unquestionable that among the causes of Germany's ability to compete with England as a mercantile and industrial country the fact that here more hours are worked for less money is not the least important. The prohibition of Sunday labor would, of course, mean increased cost of production, and every increase in the cost of production will render it more difficult for Germany to outrival older manufacturing countries in the markets of the world."

What might have happened does not detain us. What did happen was very fortunate.

First, the food supply from free virgin land in North and South America increased at the same time in a prodigious manner, so that notwithstanding the wild energy of the machine the equilibrium between agriculture and industry was fairly well maintained.

Second, there was still room in the world for colonial development on a vast scale. This occurred, and the outlets thereby created for the surplus product of machines were most timely.

Third—and this is very important—finance, to save itself from deluge, got control of industry. It was unable to buy industry out. All the banks in the world had not money enough to do that. This apparently insuperable difficulty it solved in a simple manner. It formed industry by groups into great joint stock corporations and sold the stock to the public. And although generally finance did not keep control in a literal sense, it did so center it as to make the management responsive thereafter to financial counsel. The classic instance in the United States was the formation of the Steel Trust, which was in very earnest a measure of desperation. The steel-making machine had become a demon whose pastime was panic. By this feat of finance, which occurred in all industrial countries, a new rhythm was established. It was most imperfect; absolute control of production was impossible.

But panics from over-production were thereafter episodic, not continuous, and this was a great improvement.

However, that was not for long. After the First World War Italy was where Germany had been in 1870. The following conversation took place in February, 1925, between the Italian Minister of Finance and a visiting journalist from the United States, the journalist beginning it:

"The industrial idea is new in Italy. It is since the war. You had a clean slate. You could have done anything you had the imagination to do. First you might have made a scientific survey of Italy's latent genius and resources, and then you might have thought of producing goods that should be uniquely Italian and therefore non-competitive. But what have you done? You have gone in for the great staples of world commerce, such as cotton and woolen textiles, artificial silk, and motor cars. Don't you see that in doing this you take on the competition of Great Britain, Germany, France, Belgium, the United States?"

"Yes, we see that."

"Those countries have the field and the experience and better access than Italy to sources of raw material."

"That we know, also."

"Then how can you hope successfully to compete with them? What have you that they have not? What advantage against theirs?"

"One you haven't thought of."

"What is it?"

"A man can live on less in Italy than anywhere else. We don't know why that is. It may be the way the sun shines on him. But it is a fact. That is our advantage. With that we shall succeed."

"Do you realize what that means? You are saying that Italy proposes to found an industrial career on the lowest terms of human existence. Your people will not accept it."

"But they will."

"How do you know they will?"

"Because they will do anything sooner than starve."

What a finish for the morning hope of the machine age!—if it were. Monotonous tending of the machine on the lowest standard of living; alternative, starvation.

Suppose it were true. Suppose the Italian people did accept the terms and acquired the knack and skill. Then Italian manufactures, being cheaper than any other, would sweep the markets of the world. The older industrial nations—Great Britain, Germany, France, the United States, et al.—could protect their domestic markets by tariff barriers, but they would find themselves losing their foreign markets to the Italians. For such industrial countries as are obliged to exchange a machine surplus abroad for food the loss of foreign markets would be fatal. They would have to meet the Italian competition. They would have to say, as the Italians were saying: "It is that or starve." They would have to let down the standard of living to meet Italy's wage cost. This would oblige Italy to make her standard lower still, and thus, in a cycle, until all of them were sunk in misery.

During the ten years immediately following the First Global War the extraordinary prosperity of the United States became the envy and alarm of Europe. Committees of engineers and economists were sent to explore American economic phenomena. The British government sent one. The League of Nations undertook a study of American industry to see if it would be possible, in the words of Monsieur Loucheur, "to transpose certain parts of the American system into the European system."

One of the French explorers was André Siegfried, an eminent economist, who wrote a book entitled, *America Comes of Age.* He said: "The question that Europeans find most intriguing is whether America will be able to withstand international competition and at the same time maintain her enormous wages and exceptional standard of living. Possibly we are not aware of

the immense effort that has been made since the war to adapt American industry to the change in the labor market, by installing the very latest equipment. One is almost tempted to state that Europe, with her intelligence, technical perfection and high civilization, could adopt the same policy and also profit by her lower wages and a less pretentious mode of living."

Which was to suggest, as if it were inevitable, a competitive levelling down of wages and living standards between the machine people of Europe and those of America. In order to do what? In order to sell away a surplus of machine products.

And Spengler * pushing the idea of machine competition to its logical end, foresaw the sequel to be a deadly struggle between the white and colored races: "The innumerable hands of the colored races—at least as clever and far less exigent—will shatter the economic organization of the whites at its foundation. The accustomed luxury of the white workmen, in comparison with the coolie, will be his doom. The labor of the whites is *itself* coming to be unwanted."

* *Man and Technics.*

CHAPTER TWELVE

Paradox of Ruinous Plenty

THE PRINCIPLE OF RHYTHMIC TENSION THAT GOVERNS LIFE HOLDS ALSO FOR THE MACHINE KINGDOM.—WHAT HAPPENS WHEN THE RHYTHM BREAKS.—THE WORLD AS A FOOT MAY HAVE TOO MANY SHOES.—THE NEW DUTY TO CONSUME.—WASTE REGARDED AS A NECESSITY TO KEEP THE MACHINES RUNNING.—PEOPLE WASTING THEIR OWN LABOR.

To SAY that people may have to consume less in order to produce more, and that they may have to do this precisely because there is already too much, in a world of unlimited potential plenty, seems to make a kind of Mad Hatter nonsense. Yet people were continually saying, "We must do it or starve." That is what the Italian Finance Minister said. And the idea of economic necessity, founded upon this apparent contradiction, became dogmatic in the world. Therefore, let us look at what is called necessity.

We shall find that to begin with there was none, the motive being profit only, plus the preference for the machine task; that as machine craft develops, however, a kind of exigency does appear; that when machine craft has been carried far the exigency becomes extreme, tending to grow vital, and that at last it does in fact become vital, though this had never been inevitable. When it has become vital as a matter of practical fact, then people will fight for markets as they will fight for ground on which to grow their food. We have seen this unfold.

Everything that is not still or dead must exist in a state of rhythmic tension. It is true of the plant, it is true of the animal, it is true of each race of plants and each race of animals, it is true of the kingdom of plants against the kingdom of animals. It is true of people, as individuals, as races, as a species. And it is true, also, of the machine.

In the living organism growth of tissue at a normal rate consonant with the rhythm is vital. A wild growth of that same tissue will be fatal. In the aggregate of life there is equilibrium among millions of different forms, each form striving but never succeeding to dispossess every other form and take the world. The oyster, if unhindered, would displace every other living thing on the earth in maybe ten generations and then, of course perish for want of space in which to contain itself. What hinders the oyster and at the same time preserves it is that principle of tension in nature without which it would be impossible for innumerable forms and varieties of life, the relations of which to one another are reciprocal, neutral, hostile, anonymous, to exist together all in one great taut pattern.

Now regard the third kingdom, artificial, implanted with mechanical beasts, that contains civilization. Life in this environment is economic. Its characteristic behavior is a progressive differentiation of labor. Tasks are divided and subdivided until, at length, there are countless separate groups of people, each one performing a singular function to which it is trained and tending to become unable to perform any other. The subdivisions are beyond enumeration. They multiply so fast that the book of the census cannot keep up with them.

The shoe industry, for example, does not consist in shoemakers. You might search it in vain for a shoemaker—that is, one who should know how to raise a pair of shoes from flat leather. In the shoe factory the material passes through a train of machines. Each machine is minded by an operative who performs one little specialized part of the work in endless multiple. The product is shoes by thousands of gross.

But who determines what kinds of shoe and how many shoes shall be made? What becomes of them when they are made? Who knows they can be sold? What if they are not saleable?

If you address these questions to one of the operatives mind-

ing a machine you will find him dumb. He knows only his own function.

It is very complicated. There are two industries here. One is the shoe industry; the other is the shoe machine industry. One could not exist without the other, yet they are separate and very unlike. The shoe industry itself, that has dispensed with shoemakers, will have a finance department, an economic department, a buying department, a department of production science, a style and designing department, a chemical department, a department of distribution, a sales department, an advertising department, and others we do not think of. It is all about shoes. These are all shoe people. They agglomerate in shoe towns. They think shoes. The world is a foot. The more it can be shod the better. They live by shoes.

But to do this they must be able to exchange shoes for the things they want. Shoes, therefore, must have a relation of value to every other thing in the economic world. It follows that, in order to have this exchange value, shoes must have also a relation of quantity to all other things. If for any reason the production of shoes becomes suddenly abnormal that exchange value is lost. It is like one kind of tissue growing wild in the organism. Shoes are necessary; but an excessive quantity cannot be absorbed by the economic body. There will be in that case a morbid pathology in the shoe industry, unemployment in the shoe town, despair among the shoe people, many of whom have never learned to do anything else. Left to themselves, without shoes to make, they might even starve.

It may be in the same way a soap town, a textile town, a garment town, an iron town, a motor vehicle town like Detroit, a rubber tire town like Akron, a furniture town like Grand Rapids. It may be all of these—that is to say, industry as a whole, increasing its output at an abnormal rate. As you project the thought you begin to see, first, the vital importance of rhythm, equi-

librium, tension, in the realm of industry, and then the inverse meaning of a sudden competitive increase in the machine power of the world.

The power of artificial plenty and the tendency of the machine's divisible product to increase faster than effective wanting make this now a buyer's world where formerly and where always before it had been a seller's world because there was never enough of anything. Business no longer sits in Asiatic dignity waiting for its customers; it must up and seek them. The buyer is pursued.

As I write, the strains of a Liszt rhapsody float into my window. They come from a farmer's cottage a little way down the road. I had seen, some days ago, a motor truck stop at his house and unload a large cabinet radio. At the time I noticed that it got slightly damaged squeezing through the tiny doorway.

What does this mean? First, it means that a salesman from the city went through this road selling radio sets for a nominal cash sum down and the balance on monthly instalments. He sold one there, another in the next house but one, and a third further on. How many he sold to the end of the road I do not know.

But what does it mean that the city sends a man through a country road in southern New Jersey to sell costly radio instruments in this beguiling manner to people who cannot afford them? Those who bought them I know were all in debt for other things bought on the instalment plan. It means there is a necessity to sell this industrial product. It is the necessity of a factory that has overtaken the normal demand and must force the sale of its surplus. It is the necessity of all who work in that factory and live thereby. It is the necessity of industry in general, governed as it is by a principle it did not invent, namely, the principle that the divisible product of the machine is cheap in proportion to the quantity.

As with radio sets in my country road, so with all manner of artificial things, with the whole divisible product of the machine, in every road, every street, every market of the world. How to produce enough is no longer any problem at all. How to sell what is increasingly produced—that is the problem. Evidence thereof is the commonest thing we see. It is painted in the landscape. It illuminates the cities at night. It is in our marginal vision when we read. There is no lifting one's eyes to heaven, no casting them down in shame, no seeing whatever without seeing it.

Each day a forest is cut down and consumed for wood pulp to make the paper on which producers advertise their wares. The use of advertising is to stimulate in people a sense of wanting. Selling is a high profession to which men are trained in special schools. To exchange goods for money over a counter, to higgle with the individual buyer—that is not selling. Clerks and peddlers do that. Selling is to create new ways of wanting, new habits of comfort and luxury, new customs of having. This is done by agitating the mass imagination with the suggestive power of advertising. Business reserves its most dazzling rewards for one who can think of a way to make thousands, millions, whole races of people, want that thing today which they knew not the lack of yesterday.

Why is this so?

And why is there never enough wanting?

Because *the divisible product of the machine tends to increase faster than wanting.*

A steam calliope jamming its way through the crowded street of New York City to advertise a new model of a popular motor car at a reduced price is a spectacle to bear reflection. It is a symptom of saturation in the home market. When Henry Ford was making only a thousand cars a day he did not advertise. There was a ready cash demand for the whole of his product.

When his capacity was five cars a minute he began to advertise on billboards and to sell on the instalment plan.

As the natural cash demand for a thing is overtaken it begins to be pressed for sale on credit. At this point finance companies appear. They are formed for the purpose of lending credit to buyers. Desire shall be made effective. Thrift shall be overcome as a modern evil. To consume: to consume more and more progressively: to be able to say in the evening, "I have consumed more today than I consumed yesterday," this shall be recognized as a duty that every individual owes to the industrial society in which he lives, down to the last wage earner; and in fact it is a duty he does owe both to society and to himself, for unless he buys the machine products of other wage earners others will be unable to buy his, and they will all be out of work.

Suppose that in this *economy of surplus* people were to come awake one morning under the spell of having dreamed that it was again a world of scarcity, such as their forefathers knew, with never enough of anything; and suppose, believing this, that all with one impulse they returned to the old ways of thrift and bought nothing they could do without. Suppose this happening in peace time. What would be the outcome? There would be depression in industry. Machines would stop. Millions who tend them would be disemployed. Nothing would be safe, not even your own money, for there would be panic on the exchange and trouble at the bank.

This is not to speak of the United States only. Here the proliferation of things is more astonishing than anywhere else because Americans make machines faster and work them harder; but the same necessity acts in all industrial countries.

For example, American business was the first to organize a great internal system of consumer credit. The name—consumer credit—was an American word device that turned out to be psychologically perfect for the end in view. The effect of it was

to destroy the old copy-book maxims of thrift and to make buying on credit a national folk-way.

What the procedure comes to is that business, through finance companies, lends its customers the money to buy with, the customer promising to pay it back in regular instalments, with interest.

This practice did increase buying enormously, and not, as you might suppose, for a year or two, but during year after year, and this for two reasons: *first,* that a man in debt for a thing he has learned to possess and enjoy will work harder and more perseveringly to keep it than he would have worked for the wish alone before the experience of possession; and, *second,* that by keeping customers in debt instead of leaving them free to save up their money and then spend it, business is able to direct buying, or to canalize it, in ways best calculated to keep the machines going.

The more conservative European countries were at first aghast. They could not believe it would work. But the pressure of the machine brought them to it, even France, where the old law of contract had to be changed to make it possible.

The logical sequel is waste, and waste so systematic and so artfully organized as to seem almost an economic necessity. At any rate, it does keep the machines running; and if they are not kept running, even by waste, everything will be dearer.

Observe to begin with an extreme form of ostentatious waste in the modern case. There is a marble house, set upon a hill, the crown of which has been sliced off to make a level space of ten or more acres. The hill commands a pivotal view of miles of beautiful land, all privately parked, enclosed within stone walls. In the house are one hundred rooms, and fifty servants. The grounds require the constant attention of twenty or thirty men. There is a private golf course.

To make the landscape and build the house one individual

has consumed in his own aggrandizement thousands of labor years, meaning by a labor year the product of one human being in a year's time. This was labor performed in quarries, mines, forests, mills, shops, and factories. When the labor of creation ended the labor of continuous service began. Perhaps as many as two hundred persons here and there are engaged in the work of maintaining this palace, keeping it warm, filling its larders, and dusting its rooms, all for the use and comfort of one human family.

Formerly only a king or a mighty lord who owned a great many slaves could do what this rich man has done. The difference is that whereas in the other time one bought the slave, now one buys the labor. The lord who owned slaves and wasted their labor was at least conscious of a relation between himself and the human beings who toiled for him, no matter how much he may have abused that relation. The man who buys labor bears an impersonal relation to those who perform it. He thinks of his gratifications not in terms of labor but in terms of money. Any one who has money may command the labor of others in what way he likes, be it whimsical, grotesque, or mad. Hence the craze for money. It gives the possessor instant power over the toil of his fellow beings.

You may say, "So, even in the modern case, as it always was, the grandeur of men like the grandeur of cities is in proportion to the amount of human labor they can waste." That is true. Only now those ostentatious forms of waste, although they continue to provoke social bitterness and to excite black enmity in the hearts of the multitude, are relatively unimportant. Why? Because now the people themselves are the great wasters. The unrich, aping the rich, waste much more of their own labor than the rich altogether waste, and in the same spirit. If diamonds represent a waste of human labor so do imitation diamonds.

Observe people in the shops as they spend their money for

baubles, tinsel products, filmy things to wear, ornaments, and novelties, laces and embroideries, made by little wage slaves of whose human existence the buyers have no thought at all. Everyone is anxious to have the newest styles, no matter how frail and indurable they may be. And these people are not rich. They are for the great part wage earners themselves, exchanging their money for the toil of other wage earners, with a fatuous preference for those products of others' toil which represent the most wasteful use of human labor.

As if by some cunning law of perversity beauty and inutility are woven together. All stout and durable things are ugly, not that they have to be, but that no one has taken thought to make them otherwise. The sheer, the fragile, the most perishable things, containing the maximum of labor and the minimum of resistance to wear—these are the things most admired in the shops, as by a point of honour. The silliest and most wasteful buyers of all, those who buy always with their eyes and are in the greatest anxiety to carry off the showy goods guaranteed to be latest in vogue, are themselves low in the scale of wage earners.

The consequences of this attitude are multiple. For example, in a New England shoe town the workers tending miles of automatic shoe-making machinery call themselves wage slaves; but when they spend their wages they are good snobs and keep up with the styles. They buy wearing apparel made by the garment workers of New York and as far as their money will go they select the brightest, the least substantial and the most decorative things.

Then the garment workers, likewise calling themselves wage slaves, buy the thin, indurable, high-heeled shoes with fancy leather tops produced by the complaining toil of those other wage slaves.

All must have their fling at the curse. They must be able to

say, "We can be a little like the rich. We may have expensive things, too." So they waste the toil of others, even as others waste theirs, for it is a mark of human distinction to be wasteful of labor.

One essential commodity most shockingly wasted is coal. Although it is the principal source of the energy required to move the wheels of the machine world it is wasted by habit and custom, in ways thoughtless and unnoticed. It is wasted by the people going continuously to and fro on trivial errands or with no errand at all, just to be idly moving from a sense of boredom. It is wasted in the blaze of great electric light signs advertising unimportant merchandise, like chewing gum and face powder, old things in new labels. It is wasted in the hauling of raw commodities, such as cotton, back and forth across the world as the price may rise or fall a little here or there. It is wasted in the unnecessary duplication of haulage, as when staple articles of commerce made in Chicago are sent to New York, and the like goods made in New York are sent to Chicago, crossing on the way. It is wasted throughout the whole system of railroad transportation in consequence of the mania to develop longer instead of shorter hauls, so that it comes to be cheaper to ship a ton of freight a thousand miles than to ship it one hundred. It is wasted by the fatuous perpetuation of obsolete industries in wrong places, hundreds of miles from their sources of fuel and labor and raw materials, causing millions of tons of unnecessary haulage.

The labor that mines coal is morose, rebellious and brooding. Its environment is drab and ugly, its housing is generally mean. At the worst you may find a miner, his wife and three children, all in a house of two rooms, one a combination kitchen and living room and the other a bedroom. It is night. Before the stove hangs the miner's damp pit clothes, steaming and stinking. The furniture is poor and scarred from much moving about. One may

shudder to think how desperately the world's prosperity rests upon this form of labor and how recklessly it is wasted and exploited in an impersonal manner, even by millions of others calling themselves wage slaves. And then, in one corner of the bedroom, you will see a pair of patent leather shoes, and on a nail over them a red-striped silk shirt. These are his own contributions to the waste of toil. And he sleeps with his wife in a gilded bed.

CHAPTER THIRTEEN

Global Design

THE DIVISION OF LABOR AND THE ALLOTMENT OF TASKS AS BETWEEN NATIONS AND RACES.—BACKWARD PEOPLE SHALL BE MADE TO WANT AND WORK.—STILL NOT ENOUGH WANTING.—CONTROL OF PRODUCTION A MYTH.—FATAL IDEA OF ECONOMIC NECESSITY.—MACHINE PEOPLE BEGIN TO INVADE ONE ANOTHER'S MARKETS.—WOODROW WILSON ON THE REAL REASON FOR THE FIRST WORLD WAR.—THE UNLEARNED LESSON THAT WAS BOUGHT AND PAID FOR.

THE NEXT PATTERN is global.

It has appeared that as you begin with machines your population divides. It becomes part rural and part industrial. If the rural part can feed the industrial part and provide also the agricultural and mineral products the machines require as raw material you may have a balanced, self-contained life.

But no country, once having begun with machines, has ever stopped at that point. Each country in turn, and as fast as it can, goes on and on until the time comes when the need of its industrial workers for food and raw materials is greater than the native production; and that time comes soon because machines call up people very fast—calling them from agriculture and calling them also out of the void.

Then you have to look abroad for food and raw materials. That means you have to go into other countries where there is labor that can be persuaded to produce a surplus of food and raw materials in exchange for your surplus of manufactured goods. It is then that you begin to think and speak of your economic necessity.

You found your foreign policy upon it. The origin of the necessity lies in your own idea of an advantageous division of labor. What you are proposing is not simply an exchange of goods; it will be an exchange of the high caste labor of machine craft

for the low caste labor of primary production in foreign lands.

But suppose those people in foreign lands to whom you allot the inferior and less rewarded task of primary production decline it? Suppose they don't want your manufactured goods, or don't want them enough to be willing to work for them? Suppose they are unwilling to produce a surplus of food and raw materials to exchange for your surplus of machine products.

That makes a dilemma of course. The answer to it is that world-wide wanting must be stimulated. The private trader does what he can to create new desires in foreign lands, but what he can do, though it may be a great deal, is never enough. Therefore, governments must act, and they will act in the name of civilization.

The world is full of backward, inert, idle people who want too little. They must be brought forward, modernized, electrified, taught how to want more. Why? Because they are needed as consumers. They must consume their fair share of the machine's divisible product. This blessing shall be put upon them; and to put it upon them becomes the famous "White Man's Burden."

The results, nevertheless, are slow; and they are slow not only for a reason the backward people know very well, namely, that in order to satisfy new longings they will have to perform more work, but for another reason. This business contains a self-retarding principle.

In order that the exchange shall be profitable for the industrial country its imports of food and raw materials must be cheap, which means that the people who are engaged in the tasks of primary production must work for low wages. Because their wages are low their buying power is limited. It is never enough at any rate to absorb the entire product of the industrial country's machines. There is still a surplus, actual or potential; and surplus is a ruinous thing. So again, either you will have to slow down your machines—and if you do that your costs will rise according

to the law of machines—or you will have to sell the surplus at a loss, merely to be rid of it, knowing as you do that it will reappear.

It follows that the pressing anxiety of industry is how to regulate and limit production in order not to overwhelm its markets. Its chronic nightmare is over-production, meaning a quantity of divisible products in excess of the immediate sum of effective desire. Hence combines, pools, rings, cartels, committees, and associations of manufacturers, which the courts are powerless to prevent even where they are forbidden by law. These are vital measures of mutual preservation. Yet they are but protocols of truce. They very soon break down and have to be made all over again.

Control of production, save here and there for a little while, is a myth. It could be managed only in case there was a monopoly of machine power. Once there was. There is no longer and never will be again. Industrial production, taking it broadly, increases in an uncontrollable manner.

What happens is absurd. Having exhausted the buying power of those far away people who produce their cheap food and raw materials, having saturated their own colonial markets, then the industrial nations begin to invade one another's home markets with competitive and similar machine products, or with special products pressed for sale at prices below cost on purpose to discourage or kill new competition. This last may be called dumping. The practice, in fact, is very old.

Once the Dutch had a profitable monopoly in the manufacture of briar pipes. In Flanders for sound economic reasons there was a desire to cultivate craftsmanship, and they said: "Why should we send our money to Holland for pipes. We can make pipes, too. Let us do it, not only that we may keep our own money at home, but that we may do also as the Dutch and sell our pipes to other people at a profit." So it began.

Seeing what this competition might lead to, the Dutch said: "We will sell our pipes at a loss in Flanders until this upstart industry shall have been ruined. Then we can raise the price higher than before."

To this the people of Flanders retorted by laying a prohibitive import tax upon Dutch pipes, to keep them out. Thereupon the Dutch loaded a ship with pipes, sailed it over to the coast of Flanders and wrecked it there. It was salvaged, of course, and the people of Flanders got a cargo of pipes for nothing. This was a piece of momentary good fortune; but for the next two or three years pipes were so ruinously cheap in Flanders that the new industry perished. Thus the Dutch, by sacrificing one shipload of pipes, saved their monopoly.

The most notorious recent example of the same method was what the Germans did with chemicals. Thanks to the beautiful work of their own chemists they took the lead in the manufacture of chemicals, especially the synthetics derived from the coal tar ring; and then in order to protect what amounted to a monopoly they made it their policy to destroy the beginnings of chemical industry in any other country by selling chemicals there so low that competition was impossible. They were so successful at it that when war came Germany could, and gloatingly did, make her enemies suffer for want of certain pharmaceutical drugs the use of which had become universal.

Both for exploiting the low wage labor of people who provide it with food and raw materials and for dangerously invading its neighbor's home markets with unwanted goods, each industrial nation pleads its own economic necessity, as if it were:

Inevitable that a nation's machine population shall over-pass its own means of sustenance:

Inevitable that it shall then import food and raw materials in order that its machine population shall increase still more:

Inevitable that the tumescence of its cities shall be limitless, and

Inevitable that its economic necessity shall become greater and always greater by an endless spiral.

One thing was inevitable. This idea of economic necessity, getting control of the political mind of Europe, was bound to involve the world in its first machine war.

When that war had been discontinued, Woodrow Wilson said: * "The real reason that the war we have just finished took place was that Germany was afraid her commercial rivals were going to get the better of her, and the reason some nations went into the war against Germany was that they thought Germany would get the commercial advantage of them. The seed of jealousy, the seed of deep-seated hatred, was hot, successful commercial and industrial rivalry. This war in its inception was a commercial and industrial war. It was not a political war."

But the world was not yet prepared to learn the lesson that had been bought and paid for. It was this:

When two or more machine-craft nations invade each other's markets with competitive products they are silly rivals, wasting their strength in economic strife. . . . When two or more such nations compete for privileges in an unskilled country to command its raw materials in exchange for machine products, *they are antagonists.* . . . And when two or more such nations have to build warships to guard the seaways by which they receive sustenance for themselves and their machines and to protect the foreign markets in which they have made special outlets for their manufactures, *they are enemies.* One fatuity will lead to another and the sequel will be war.

It was a lesson that would have to be bought and paid for again, at a higher price.

* Speech by the President of the United States, Sept. 5, 1919.

CHAPTER FOURTEEN

The Machine Escapes

WHAT THE FIRST WORLD WAR RELEASED.—DRAMATIC MIGRATIONS OF THE MACHINE.—IT BECOMES A SYMBOL OF LIBERATION.—THE EUROPEAN MONOPOLY BEGINS TO COLLAPSE.—A MURDERED DREAM.

IN GERMANY the task of bending the country's industrial power to the uses of the First World War was assigned to a man who possessed one of the very brilliant Jewish minds in the world. In him were combined the three high characteristics of his race, which are loyalty, intellectual realism, and dreaming imagination. His practical job was more complex than that of the chief of staff. Yet his mind was not wholly occupied with this care. His critical faculties and his imagination were always free.

Reflecting on the economic meaning of the war, he was led to examine the essential character of international trade, and so perceived clearly how wasteful, irrational and dangerous a great deal of it was—Germany pressing the surplus product of her machines for sale in Great Britain, the British doing likewise in Germany, both competing at home and abroad with the industrial surplus of the United States, ships passing on the seas with cargoes of similar goods endlessly duplicated, and all the machine-craft nations seeking peasant nations to be exploited for food in exchange for manufactures.

It was true in this way the world had been growing richer in things, and yet the cost was frightful. The resort to force was a confession that international trade was bankrupt in reason and understanding.

He was competent to reach a conclusion, standing himself at the head of one of Europe's great industries. And he made a

dream. It was that when the war had come to an end and people were themselves again they would see the vital importance to civilization of dividing among them the work of the world agreeably to their special aptitudes and the facts of environment—these to produce a surplus of whatever it was they had a genius for making and the materials ready; those, another kind of thing in which their skill and situation gave them an advantage, and so on through the whole series of natural and artificial things with which human wants are satisfied. Thus duplication and strife would be eliminated. Not only would there be enough of everything; from the cease of senseless waste in private and public war, there would be a saving of power and capital sufficient to water all the deserts of the earth and recreate man's vista here.

As a dream it was most alluring. As a plan it was worthless, for it contained two fatal assumptions, namely, that you could always find a Solomon to administer it and that people would submit to the benevolent tyranny of his wisdom. He himself was destined by his end to illustrate how people really behave. His name was Walter Rathenau. After the war he became Foreign Minister and was then murdered on the altar of fanatic nationalism.

It was a sign.

The war released a flood of repressed passions in nationalism. Great and small groups of submerged people asserted rights of self-determination and clothed themselves with frontiers and nationhood. Nearly all of these, together also with old countries whose character until then had been agricultural, were concurrently seized with the thought of economic completion—that is to say, with the thought of having machines and industries of their own, for they had seen a new thing. Industrial nations and none other were powerful in the world. Nations without machines were helpless.

The effect of all this upon the machine was like the effect of new pasturage upon an animal race. It multiplied enormously and broke all bounds. No one could any longer control it.

Only a few years before Great Britain alone had controlled it. She had a monopoly of its power and use by right of having been the first to develop it, and she was for a while the only nation having a large surplus of manufactures to sell in foreign countries. Then came Germany and France. Of these two Germany was Great Britain's aggressive rival, making nearly all of the same things and most of them cheaper. After 1870 the United States developed industry very fast, but for twenty years more her exports were principally agricultural because she herself consumed the entire product of her machines, besides importing manufactured goods from Europe in exchange for meat and grain and raw cotton. It was not until about 1890 that American machine products began to invade the markets of the world in a large way. And at about the same time Japan appeared as an industrial nation, having in a few years equipped herself with Western machines and trained her imitative hand to mind them.

Such, roughly, was the economic state of the world at the outbreak of the First World War. The powerfully industrialized nations were three in Europe, one in the West and one in the East—five altogether, representing hardly more than one-fifth of the world's total population.

If we regard only the countries where the industrial population had so outrun the native food supply that the sale of manufactures in foreign lands to pay for food had either become, or was believed to be, a vital transaction, then we count out the United States. That left only four and the competition among these four for markets, for colonies, and heathen tribes to be instructed in wanting, for private pathways by land and sea to the sources of food, for access to the raw materials required by

their machines, was already desperate and dangerous. Between two of them it was deadly.

Even then it was so.

Nevertheless, in those five countries that were already intensively industrialized machine equipment went on increasing. During the war it increased for obvious reasons. God was on the side of the most machines. After the war it continued to increase for other reasons.

One reason was peculiar to Germany. There the building of industrial works was a way of baffling the Allied creditors. The government, the industrial dynasts and the bankers did it together, using first printing press money and then all the gold and credit they could borrow from a silly world.

Another reason was peculiar to France. Restoring the industries of the devastated regions meant building them a second time, since they had been already once reproduced elsewhere in France during the war.

But the reason over all lay in that fixed idea of economic necessity, not changed in the least by anything that had happened, only now more desperate than ever, owing both to the intensified competition of the older countries among themselves and to the spread of the machine into other countries.

How the competition among themselves was intensified may be illustrated in the case of textiles as between Great Britain and France. Before the war both imported raw cotton and exported fabrications of cotton; but whereas Great Britain exported principally the cotton cloth of universal commerce, France exported special products representing her genius for style and artistry. Now, however, having made large additions to her general textile equipment, France felt obliged to compete directly with Great Britain in the cotton cloth of common commerce. To do this she must extend her foreign trade parallel to Great Britain's and divide the markets hitherto dominated by the

British. As with cotton cloth, so with other manufactures, particularly those of iron and steel, wherein France proposed to compete and was equipped to compete with both Germany and Great Britain as never before.

Each step she took in that direction increased her economic necessity, for now almost the last thing you would expect to see in France was taking place. Although the native population as a whole was static its character was changing. The industrial part of it was growing; the agricultural part was waning. People were deserting the fields to embrace industrial life. In every city there were housing problems and public credit was employed to build small dwellings for the wage earners; yet in the country, two hours from Paris, you would see houses empty and going to ruin, whole rural villages in the way to be abandoned, vineyards perishing for want of care, fields going to grass instead of grain. Their industrial power was rising; their agricultural power was falling. Before the war they were, or might have been, self-nourishing on their own soil, like the people of the United States. That precious security they cast away. In place of it they took on the anxieties of empire. They must impose upon Morocco the blessings of European civilization in order to have an outlet there for the surplus of their machines.

Dramatic were the migrations of the machines at this time and not unlike the migrations of natural species, men and beasts, in search of food. The machine seeks either cheaper raw material or people to mind its processes.

There was Italy, with a population greater than that of France, growing half a million a year. Suddenly the Italians were resolved upon an industrial career. Before the war this thought was dim among them. In the crisis it took shape. After the war it became an enthusiasm and smoke-towers began rising very fast. Definitely they turned their minds from agriculture to industry, not merely in order to become self-supplied with manu-

factures instead of buying them from other countries with lemons and olive oil but in order to grow rich and powerful in foreign trade.

Poland perceived her destiny to be industrial. Likewise Czechoslovakia. Spain and Greece began to import machinery, and Spain was so anxious to develop industry that she paid bounties out of the public treasury on exports of textiles. India, whose historic economic function had been to send raw cotton to Great Britain and buy cotton cloth from Manchester, was already consuming half her own raw cotton in her native mills; she was not only satisfying three-quarters of her own want for cotton cloth but beginning actually to export that commodity, even to the United States. The Japanese manufacturers of cotton goods were invading the Egyptian market that was formerly Great Britain's own, underselling the British there. You would think China would be Japan's natural outlet for cotton goods. So it was. The difficulty was that China was beginning to supply herself.

The Chinese instance was poignant. A few years before—until the war, in fact—China exported only food and raw materials and imported manufactured goods; nothing else to speak of either way. This was as the Western industrial nations wished it to be. So anxious were they to have it so that they bound China by treaty not to put tariff barriers against the goods they wished to sell in the Chinese markets, except by mutual consent—that is to say, with their consent.

The war suspended this thralldom. The Chinese imported machines and began to make their own things, especially cloth. Power looms appeared as by magic. And after the war they continued to appear. During three years after the war the number trebled, and in 1922 the table of Chinese imports and exports presented a strange face. Among her imports were machines and machine parts; also semi-manufactured goods to be finished

in Chinese factories. And one-fifth of her total exports consisted of manufactured goods. China an exporter of machine products!

And so up and down the earth. In Brazil, where there was hardly any visible production of artificial things before 1914, the whole outlook changed. After that Brazil was able from her own machines to meet the whole of her want for matches, textiles, footgear, wallpaper, phonograph discs, hardware, hats.

The colonial system that was to have answered forever Great Britain's need for raw materials and food in exchange for machine products could not hold in that character. In India the revolt was political; elsewhere it was peaceably economic. Canada was already powerfully machined; she was exporting motor cars. Australia, going in the same direction, was beginning to export shoes. The Union of South Africa took steps to subsidize local industry. Ireland no sooner gained control of her economic life than she put a tariff wall around herself to limit the sale of foreign goods, meaning British goods as well, thinking thereby to foster infant industries.

Well, everyone was doing that. The old industrial countries were protecting themselves against one another's goods, the last to come to it being Great Britain herself. For a century she had been the protagonist of free trade, abhorring tariffs, because she was paramount in machine craft and could beat her rivals both in their own markets and in her own. That advantage having departed from her, she was driven to tariff protection; she put up barriers against other people's goods if they were too cheap, because they were too cheap, and called it safeguarding home industries.

CHAPTER FIFTEEN

Omens of Deluge

HOW MECHANIZED WARFARE ALTERS THE STATUS OF INDUSTRY.—IT BECOMES AN ATTRIBUTE OF STATE POWER.—CONTROL OF IT IN THE ULTIMATE CASE PASSES FROM FINANCE TO GOVERNMENT.—STEPS TOWARD MORAL DEBACLE.

THE FIRST MACHINE war profoundly altered the significance and status of industry. Formerly it had been privately owned and privately managed; and when and if it happened that private ownership was unable to keep rhythm and order in it, finance intervened. But finance was private, too. Government as a rule touched it gingerly or hardly at all, except to regulate its social behavior.

But during and after the war industry came to be regarded as an attribute of state power, almost as clearly such as the military establishment. And why not? Security, independence, national welfare, economic advantage, diplomatic prestige—were these not all as dependent upon efficient machine industry as upon an army or navy? Mechanized warfare had done this.

The new way of thinking about industry, therefore, was basically political. A factory thereafter would be like a ship—a thing to be privately owned and privately enjoyed only in time of peace, always subject to mobilization for war. Great Britain and other countries, too, began to subsidize so-called key industries as formerly they had subsidized ships, provided they were built under the eye of the Admiralty, and so built as to be quickly converted into cruisers or armed merchantmen.

Thus, control of industry by finance, whether it had been for good or evil, was greatly lessened; and in fact finance itself

was engulfed by the same rising tide—the tide of economic necessity now translating itself as a political imperative.

Formerly finance had been consulted in war. You could not undertake a war without a war chest, and it was the banker who said whether or not the war chest could be filled with gold.

When the First World War started it was the solemn opinion of finance that it would end within six months because it could not be financed beyond that limit. There was nowhere a war chest that could stand it.

That opinion was sound enough provided the laws of solvency were going to hold. But they were not going to hold. The war went for four years and then did not stop for want of money. Governments had learned a new thing. They had learned that in war the very first step is to suspend the laws of solvency; when you have done that you can print money to pass from hand to hand, and that can go on for a long time. If it breaks down, you have only to wipe the slate and begin all over.

After the war international finance was powerless to prevent the colossal mark swindle, Germany printing and selling all over the earth billions of paper marks that were going to be repudiated. What made it possible was that nobody could believe that a great nation would in a deliberate and calculated manner sell out the honor of its signature on a piece of engraved paper. Who would ever trade again with a nation that did that, or take its word for anything? Well, Germany did it. What was more, it paid her very handsomely to do it. Worse still, finance was unable to visit the slightest penalty upon the authors of this financial enormity; on the contrary, international finance was obliged afterward, for political reasons, to float a gold loan for Germany and restore her to solvency and credit. In Germany itself finance was unable to prevent the industrial dynasts from appropriating to themselves all the middle class wealth that was invested in bonds, mortgages, annuities and savings banks.

Thus ended in the world the moral authority and prestige of international finance.

After the First World War the horizon was dark with a confusion of strange omens; and although some of them were dim and shapeless, at least ten were distinct, and the ten were these:

The advance of government everywhere toward control of the economic life;

The identification of industry with political power;

An excess of industrial equipment already present in the world;

The continued and competitive increase of that equipment nevertheless for national and political reasons;

The rise of trade barriers, every nation fearing the effects upon its own industry of receiving cheap goods from another;

Unemployment as a chronic social evil in the richer industrial countries, and yet in the world at large people still running from the soil to tend more machines;

The amazing growth of urban tissue in the economic body;

Inflation and debasement of money on grounds of national policy in order both to force exports and diminish imports, everyone wanting to sell more and buy less;

The total collapse of debtor and creditor relations, and,

A moral debacle that made nations callous and cynical toward repudiation, which became competitive and was carried to a point at which only one great nation could say it had not dishonored the signature on its bond—and that one, alas! held out only until its honor began to hurt, whereupon repudiation became universal in the world.

CHAPTER SIXTEEN

The Signs Are Written Away

QUESTIONS TO WHICH ANSWERS ARE FORBIDDEN. —THE MORAL AND ECONOMIC RUIN OF INTERNATIONAL TRADE AS A DIVISION OF LABOR FOR ADVANTAGE.—IN A PROFIT AND LOSS SYSTEM CREDITORS CAN NO LONGER AFFORD TO BE PAID.—LOOKING AWAY.—ONE MORE ECSTASY.—AFTER THAT THE GREAT WORLD-WIDE DEPRESSION AND THEN THE SECOND WORLD WAR.

IT WAS WELL UNDERSTOOD that these were ominous signs. But what were they saying?

The Italians suggested a bitter competition in terms of living, those to survive who would accept most patiently and at the lowest wage the drudgery of minding machines. That might go rather far; ultimately it would come to absurdity. To whom at last should they sell their goods? Not to the impoverished workers of other industrial countries, defeated in the struggle. To whom else? To the agricultural countries? But these, for the reasons we have seen, were tending as such to disappear. They were buying machines. Italy brought nothing to the solution. She was merely coming tardily to do what others had done to excess.

A brilliant Belgian economist suggested that only the most efficient equipment would survive, and only enough of that to satisfy the natural demand for goods. All the rest would have to be abandoned because there would be no profit in working it. Well, it was to be seen if people would abandon their machines without a struggle, purely for rational reasons. Much more was it likely that the higher cost of working the less efficient equipment would be compensated by a lower wage rate, unemployment being the worker's alternative. Moreover, if all the inefficient and unnecessary machines were scrapped that would mean

only to postpone the sequel. The competition would begin all over again.

There were those who suggested that we were facing toward the mercantile system of the Middle Ages, when it was the custom for each nation jealously to protect its home markets from the competitive handicrafts of other nations and to prohibit or punitively tax the exportation of raw material to rival countries. So we were. To say it was merely to indicate the rock upon which, if nothing happened, the ship of trade was bound to wreck herself.

Besides the political motives that were impelling nations not hitherto machined to found industries of their own, the exchange of foodstuffs and raw materials for machine products began to be reconsidered in principle, with a growing sense of injury.

In theory this was an exchange by which the industrial nation satisfied its food wants and the agricultural nation its industrial wants, to mutual advantage. But how came the industrial nation also to acquire wealth by the transaction? Performing the preferred industrial task, it got not only its food but a profit over.

What else could it mean that after a series of years the industrial nation should come to have large interest-bearing investments in the other country, owning its railroads, tramways, water-works, and banks?

What else could it mean that the richest country in foreign investments was the one that had been for the longest time engaged in exchanging the surplus product of its machines for the food and raw materials of other countries? How was it that those other countries, after having served her for many years with food and raw materials, invariably owed her a great deal of money?

Or, if they approached it from the other point of view, they found in the economic literature of industrial nations a certain finished doctrine, which was that the exchange of manufactured

goods for food and raw materials was a paying business. It was not primarily a vital transaction. It became vital only by extension—that is to say, when in the course of time the industrial population had increased beyond the native food supply. But in the beginning the motive was gain. Nakedly, it was an exchange of skilled labor for unskilled labor, to the enrichment of the former; it was a division of labor among nations on a kind of caste plan.

There was much to be said for it. In no other way could civilization have been spread so fast; by no other method could the world have become so rich in a few years. There was much to be said, also, for piracy. It diffused manners, customs, and wealth; it made people acquainted with one another, it made a flat world round, and laid the foundations of modern commerce. All difficulty begins when the peoples to whom the less profitable tasks have been allotted become intelligently dissatisfied and resolve to change their status, as the American colonists did, as all lusty nations were bound to do.

Modern trade evolved from piracy. There was a time when all transfer of goods between nations was by joyous might. It is pleasant to believe that the cause of the decline of piracy was a rise in the moral sense of mankind. It is more likely to have been the other way—that as piracy declined for rational reasons rules to govern commercial conduct became necessary. To enforce the rules became everyone's duty. To break them was punishable. From this would germinate a moral sense. Piracy was bound to fail. On a large scale, continuous and competitive, it simply was not feasible. Competition ruined it.

There was a marginal time in which one was either pirate or trader, agreeably to circumstance. The early Greek in his dangerous ship never knew which he was; nor did anyone else. He took when the taking was good; when it was not, he bartered. The Romans finally abolished piracy in the Mediterranean, but

on the high seas it was the great romantic enterprise down to a very recent time. Some of its heroes are venerated as daring navigators, pathbreakers of empire.

It takes some effort to remember that trees are still standing that were already old when the world was a place where finding was keeping. If what you found was in the possession of savages or heathens, you exchanged for it the hope of civilization, maybe a few glass beads. Toward the end, this wonderful business began to be hedged about with restrictions. You had to be careful not to take anything forcibly from people who had treaties of amity with your own country, for if you did they made trouble for you at home, diplomatically, and you might even be hanged at the end of an otherwise glorious voyage.

But if you swindled them in trade, that was all right. Naturally, the first theory of trade was to give the least and get the most. There was else no point to it.

The significance of trade has fundamentally changed in our time. What was a private adventure has become a national necessity, vital to the existing form of the principal industrial states of the world. And yet that first rude theory of it, representing the step from piracy to commerce, universally survives. This, at last, is the crucial fact.

It has been impossible to part with the notion that there must be gain in trade—a profit on one side beyond the mutual satisfaction of unlike wants with unlike goods. Hence the term, *balance of trade,* meaning the balance in your favor, or against you, from the transactions of commerce. The rule is that the industrial nations come out each year with a balance in their favor. The countries with whom they have been exchanging machine-made goods for food and raw materials owe them money. This simply means that the industrial nations charge more for what they sell than they pay for what they buy. Hence the gain. That is how they get rich. It is more than a rule; it is

the very principle of trade; and if you say there is any other principle the commercial mind becomes instantly stark. What would activate trade if not the hope of gain?

Nevertheless, trade on that principle was bound to fail, as piracy failed, and for the same practical reason. On a vast scale, with unlimited participation, it was not continuously feasible. Every nation could not have a favorable trade balance. So long as three or four nations had a monopoly of machines and machine craft it could be managed; it could even assume such colossal proportions as to create the illusion of being permanent as the way of the world.

That monopoly is broken. The machine is increasingly a common possession. Its power is dispersed and there is much new and unbidden ecstasy in the exercise of it. And whereas it was that a few nations exploited many, what now opens to view is the prospect of all nations simultaneously engaged in the effort to exploit one another. Every frontier a trade wall. Each nation forbidding others to do unto it that which it is bent upon doing to them. So we seem to return to the middle of the sixteenth century, no wiser than the British were when the Parliament voted "An Act Avoiding Divers Foreign Wares Made by Handicraftsmen Beyond the Seas, 5 Eliz. c. 7, Statutes of the Realm, Vol. IV, Part 1, pp. 428-429, 1562." It reads:

> *"Whereas heretofore the artificers of this realm of England (as well within the city of London as within other cities, towns and boroughs of the same realm) that is to wit, girdlers, cutlers, saddlers, glovers, point-makers, and such like handicraftemen, have been in the said faculties greatly wrought, and greatly set on work, as well for the sustentation of themselves, their wives and families, as for a good education of a great part of the youth of this realm in good art and laudible exercise:*

Yet notwithstanding so now it is, that by reason of the abundance of foreign wares brought into this realm from the parts of beyond the seas, the said artificers are not only less occupied, and thereby utterly impoverished, the youth not trained in the said sciences and exercises, and thereby the said faculties and the exquisite knowledge thereof like in short time within this realm to decay; but also divers cities and towns within this realm of England much thereby impaired, the whole realm greatly endamaged and other countries greatly enriched.

For reformation whereof, be it enacted by our sovereign lady the Queen's Highness, and by the Lord Spiritual and Temporal, and the Commons of this present parliament assembled and by the authority of the same that no person or persons whatsoever, from or after the feast of the Nativity of St. John Baptist now next ensuing, shall bring or cause to be brought into this realm of England from the parts of beyond the seas, any girdles, harness for girdles, rapiers, daggers, knives, hilts, pummels, lockets, chapes, dagger-blades, handles, scabbards, and sheaths for knives, saddlers, horse-harness, stirrups, bits, gloves, points, leather laces or pins, being ready made or wrought in any parts beyond the seas, to be sold, bartered or exchanged within this realm of England or Wales; upon pain to forfeit all such wares so to be brought contrary to the true meaning of this act, in whose hands soever they or any of them shall be found, or the very value thereof."

Would it come to that again? Or was it more to be expected that from a universal war of machine competition one titanic industrial nation would survive, with a monopoly of foreign trade and the might to force its surplus goods on other people's markets? That nation would fall in time and not altogether from its own weight. It would, of course, abuse its power; but more-

over it would be unable to collect its favorable trade balance from all the rest of the world.

You see, there was more than one way to read the signs. There were so many ways in fact that people generally gave it up and tried for a while to make believe they had written them all away in a series of amiable, peace-loving treaties.

The signs were perhaps too obvious. That has since been said. However, if there had been but one reading of them, and that reading the right one, still no one would have known what to do about it. There was the true difficulty.

International trade was morally and economically bankrupt. That was what the signs were saying. The one impossibility was for it to continue in its immemorial character. It had come to the end of its own reason; and this fact was confessed in the paradox that although it was a debit-and-credit system a time had come when the creditor nation could not afford to be paid.

Witness the dread with which European statesmen, economists, bankers, and industrialists regarded the payment of German reparations. How could Germany pay? In goods? There was no other way. She could not pay in gold. There was not enough gold in the world to do that; in any case, she did not have it and could get it only by selling goods, which came to the same thing again. To whom should she deliver her goods, if she delivered them? To whom should she sell them, if she sold them? Great Britain did not want them. Great Britain's chief anxiety was how to keep her own factories going—factories producing goods of the same kinds that German factories produced. France did not want them, nor Belgium, nor Italy, nor the United States, and all for the same reason. They were all wanting to sell the surplus products of their own machines.

But if the Allied creditors forgave Germany her reparations debt, or so much of it as she would have to pay to them directly in competitive goods, that would be still worse. For Germany

then would be free to compete in the markets of the wide world on her own initiative and keep the profit. And all the time the markets of the wide world, in Asia, Africa and South America, were tending to become less and less exploitable because people everywhere were beginning to found industries of their own and were on the way to be natively supplied with machine products.

There was the writing.

And yet, since nobody could think of anything else to do, the feast was resumed. That was possible only because there was one very rich country, the richest of all, that could afford for a while to give away its surplus in exchange for worthless paper. On a debtor-creditor principle that was already ruined, even ridiculed by debtors, international trade advanced to a new plane of ecstasy.

Then the Great Depression and the Second World War.

PART FOUR

ONE MORE WORLD

Here the view comes closer. It does not really change. Things that have been witnessed in beginning and outline will be recognized as they appear again, the difference being that they reappear as acute and magnified facts against a background of the machine world's second global war. But there comes also another view. The word for it is LANDFALL, a sailor's cry, meaning the first sight of land at the end of a long voyage. Another world lies there.

CHAPTER SEVENTEEN

The Crashing Wheel

SOFT-LIVING NATIONS IN FLIGHT FROM WORK.—ACROSS THE LINE OTHER NATIONS WORKING HARDER FOR A SINISTER REASON.—THE SECOND WORLD WAR.—WHY THOSE TO WHOM VICTORY WAS COMING RAN NOT FORTH TO MEET IT.—SENSATION OF TERRIFIC ROTARY MOTION OUT OF BALANCE.—THAT WAS FROM THE GREAT WHEEL THAT HAD LOST ITS AXIS.—SPENGLER'S THESIS OF THE TREASON TO TECHNICS.

AT ANY TIME during the ten years that immediately preceded the second global war one might have seen that the principal nations were divided as by a line,—and it was a line of ugly omen.

On one side of it were nations in flight from work. These were the richer nations,—notably the United States, Great Britain and France,—all trying to consume more than they produced, defending above everything else a standard of living, and supporting their unemployed out of public funds. This they were rich enough to do for a while.

On the other side were nations that worked very hard and at the same time accepted a lower standard of living in order to consume less than they produced. These were nations calling themselves the have-nots, notably, Germany, Italy and Japan. It was not that they loved hard work. Far from it. Their intentions were sinister. The surplus of what they produced over what they consumed was neither hoarded nor invested. It was spent upon mighty preparations for conquest.

Therefore, these nations, too, were in flight from work, only, first, they would have to conquer the world. The point of doing that was to make themselves over-lords and task masters. Then they could take to themselves a life of ease.

The most ridiculous of men had one other distinction. As he leaped into the war with a butcher's knife the sight of the carcass

so excited Mussolini that he forgot the ideologies and screamed the truth. The conflict, he said, was between, on the one side, the lean, hard-working nations that had got possession of the power, and, on the other side, the fat, soft-living nations who, resting upon a monopoly of all the gold and riches in the world, were no longer able to defend it.

The soft-living nations were unprepared. For this they afterward reproached their leaders most bitterly. Why had they not foreseen this thing?

But they had foreseen it. Everybody had. The trouble was that the people, looking straight at it, even knowing it was true, nevertheless put off believing it.

When the aggressor was small upon the horizon they said, "He is not there."

When he was very big they said, "His wheels may come off," or, "Maybe if we pretend not to be afraid of him he will go the other way."

All the time they had the resources and the strength to prepare a defense equal to the menace. Physically it was quite possible. Politically it was impossible. If free people were unwilling, as they certainly were, to embrace beforehand the evil of hard living in a competitive manner, no popular government could impose it upon them.

As it turned out, however, all that precious labor of the nations calling themselves the have-nots was doomed to be lost. Was that because it was wicked? We like to think so. Yet it may be only that it was not enough. All that we can be sure of is that once more,—for one more time at least,—the desperate ninth-hour labor of those other nations calling themselves free was bound to be overcoming.

So again the victory was for these; again they could chain the aggressor down. Again there was a way back to that state of the

world which is not war and may be therefore called peace; but this time with no one running forth to meet the peace in an ecstasy of gladness. Why was that?

As the end of the war drew near people everywhere, and most of all those to whom victory was coming, were seized with foreboding. They were dreading peace. Reasoned anxieties about how the world should be governed afterward, or by whom, had nothing to do with this strange feeling. It was more like an instinctive alarm, arising from sensation; and the sensation was that of terrific rotary motion out of balance. The mechanical image would be a great balance wheel, off center, running faster and faster, and no way to slow it down.

Let the name of the great wheel be international trade. During the nineteenth century it was for a while in beautiful balance. What it balanced, as we know, was an exchange of labor between, on the one side, the people who had invented and controlled machine technics, and, on the other side, the no-machine people; and although the people who controlled machine technics were few and the others many, as it were one to twenty, still it was that the machine people ruled the world.

The first war was owing to the fact that by degrees the great wheel had got out of balance. The war threw it very far out,—so far that it couldn't be put back. Nevertheless it continued to revolve, faster than before, becoming more and more dangerous.

Then the second war.

What the first one did to the wheel the second one did tenfold; and that was what caused the sensation people had of what was happening to their economic world.

A momentous effect of the first global war, as we have seen, was that the machine got free and went migrating and became a symbol of deliverance to all the belated people in the world. The possibility of this had moved Spengler to write with bitter-

ness on what he called the *treason to technics.* He said:* "The immense superiority that Western Europe and North America enjoyed in the second half of the nineteenth century, in power of every kind—economic and political, military and financial—was based on an uncontested monopoly of industry . . . The role of the rest of the world was to absorb the product, and colonial policy was always, for practical purposes, directed to the opening up of new markets and new sources of raw material, not to the development of new areas of production."

So long as the rest of the world kept the role the great wheel revolved in perfect balance.

Then toward the end of the century the treason to technics began. Instead of keeping their technical knowledge to themselves the machine people,—Western Europeans and North Americans both,—began to teach it in their schools for all the world to learn; instead of exporting only the finished products of their machines they began to export "secrets, processes, methods, engineers, organizers."

Spengler foresaw that a time was coming when the "exploited world" would "take its revenge on its lords." The thought of it made him sad and despairing. He believed in the betrayed lordship of his darling *inventive carnivore.* If he had been writing fifty years earlier he would not have included North Americans. If the monopoly of machine technics had remained in Europe all might have been different. And that was, indeed, the grand intention.

While it was a British monopoly the secrets, the methods, the machine designs, were protected with military zeal. To impart them to an outlander was a crime akin to treason. Nevertheless, British craftsmen and mechanics came as immigrants to Amer-

* *Man and Technics, Oswald Spengler.*

ica with these secrets in their heads and greatly assisted to found American industry.

Knowledge escapes by a kind of osmotic process. This of course may be very slow, and for a long time it was. But during and after the first war, knowledge of machine technics spread as if it were carried by the winds. Why every intelligent nation wanted machines has been explained. In the first place, it was seen that a nation without industrial power of its own was helpless in time of war, even as a neutral, and, secondly, there was no longer any doubt that a people who produced only a surplus of food and raw materials for export and exchanged it for manufactured goods were thereby committed to an inferior economic status with a standard of living lower than that of the machine people. Thus new machine industry became apparitional all over the world and no sooner had a country found its own way with machines than it began to want markets for a surplus of machine products and a favorable balance of trade, like England.

At a luncheon in London Lord Astor turned to me, saying: "Do you know, as a result of the war, many countries now have industries that are not entitled to have them."

My answer was to ask: "How does an Englishman determine what countries are entitled to have industry?"

He was thinking not only of the countries that now had machines of their own for the first time, but also of the fact that the three principal industrial countries had enormously increased their capacity during the war, especially Germany and the United States, and meanwhile Japan had arrived.

Such were the conditions under which Great Britain argued that even if she could afford to pay her war debt to the United States Treasury the Americans could not afford to receive payment.

Why not? Because Great Britain would have to pay the debt

in competitive industrial products, such as textiles, machinery and hardwares, having nothing else to pay with; and if the Americans took such goods from her what were they going to do with the American labor that was employed in producing goods of the same kind, and producing not only quite enough to satisfy their own needs but a great surplus for sale in foreign markets? If Great Britain should sell her goods elsewhere in the world to get the money to pay her debt to the United States Treasury it would come to the same thing in the end, for in that case she would be taking foreign customers away from the Americans.

And how did the Americans meet this dilemma?

First they set up very high tariff barriers against all goods of foreign manufacture, those of England included. That was done to protect American labor from the competition of low-wage foreign labor and to uphold the American standard of living. Then they loaned to Europe billions of money with which to buy the surplus products of American industry.

All those billions were lost; so also was lost the entire European war debt to the United States Treasury. More than that, or worse, a very large part of the money loaned by America to Europe at this time was used to increase Europe's industrial capacity still more, and this not only in countries that had industry before, like Germany, but also in countries where industry was new-born, such as Poland and Czecho-Slovakia. Thus, the Americans were really buying with their own money future competition for their own foreign trade.

CHAPTER EIGHTEEN

The Famishing Machine Belly

WHY THE GREAT WHEEL HAD TO GO ON TURNING FASTER AND FASTER UNTIL IT CRASHED.—HOW THE FACT OF VITAL ECONOMIC NECESSITY WAS ARRIVED AT.—A PATTERN MADE IN ENGLAND.—"WE MUST EXPORT OR PERISH."—JAPAN'S IDEA OF KILLING UNWILLING CUSTOMERS AS A WARNING.—THE GERMAN SOLUTION.

AND YET BECAUSE THE POLITICAL, social and financial ruin of international trade was an event the world was not prepared to face, all this immense absurdity was passed over. Very few rational statements were made about it. No matter how dangerous or how irrational it was, the great wheel had to go on revolving.

It was by this time so far out of balance that the profit motive was no longer able to control it, whereupon governments laid their hands upon it, thinking they could make it run true by passing laws and regulations; but all they did, if they did even that, was to make its behavior worse.

Why did it have to go on revolving?

Because the machine people, controlling the world, had so managed it that trade had become in fact a vital necessity.

Producing of their own less than enough food to sustain themselves they had to sell their machine products to far away people who could be trusted regularly to produce a surplus of food; but in order to do that they had first to import minerals and fibers to feed their machines, else there could be no machine products to exchange for food.

They had made a new belly in the world,—the machine belly. And in order to feed themselves they had first to feed their machines.

Remember that in the origins of trade there was no element

of necessity, hardly any. The spirit was adventure, the motive was greed and the method was ruthless spoliation of the innocents. How then did this unnatural fact of vital necessity evolve? We have seen how it evolved. Nevertheless, the original example will bear its weight here.

England was the first to arrive at it. All the others came to it in the same way, by emulation.

Writing on the uses of foreign trade at the very beginning of the modern machine age, Adam Smith said:* "The land and labor of Great Britain produce generally more corn, woolens and hardware than the demand of the home market requires. The surplus part of them, therefore, must be sent abroad and exchanged for something for which there is a demand at home. It is only by means of such exportation that this surplus can acquire a value sufficient to compensate the labor and expense of producing it."

The time was 1776. If we have the faintest idea of what the standard of common living was at that period in England we know that there was no surplus of human satisfactions. The same labor and land and capital that produced what Smith called an exportable surplus might have been employed to produce more of the goods people wanted at home instead of goods to be sent away. We know also that the goods they sent away did not all come back in the form of anything the people wanted. A great part of what was exported took the form of investments in foreign countries, appearing as tramways, railroads, docks, London facades in Shanghai and Hong Kong, and so on.

The kind of trade Adam Smith was talking about was trade for profit. There is no word about its necessity. But the profit was so great that Great Britain sacrificed her agriculture to industry. In a little while there was no more surplus corn to sell abroad,

* *Wealth of Nations.*

only machine products like woolens and hardware. In a little while more she was importing from foreign countries not only food for human consumption but also the raw materials her machines devoured, even wool, although formerly fine wool had been one thing she had always of her own more than enough.

Thus it was that in time England became the navel of the world. Her umbilical cords ran overseas to every source of surplus food and raw materials; and as the cords became vital to her preferred way of existence she had to protect them. To protect them she had to control the seas, and that was costly. Nevertheless, it was wonderfully profitable so long as she possessed what amounted to a monopoly of machine technics. The first nation to threaten that monopoly was Germany. The second was the United States.

In 1914, when the principal industrial nations were only four in the world,—Great Britain, Germany, France, and the United States, Japan having not yet arrived as a formidable competitor, —even then there was not trade enough to go around. Germany was prepared to go to war for more room in the sun, meaning by that her own sources of raw material to exploit and a colonial empire like Great Britain's, full of inferior and docile people performing the role to which they were destined according to Spengler, namely, to produce the food and raw materials and exchange them for machine products.

But if in 1914 it was true that there was not trade enough to go around,—trade in that aspect of vital necessity,—and true that machine people were already prepared to fight one another for advantage in it, what would you expect to come afterward, seeing that the effect of the first war was enormously to increase this mortal industrial competition?

What did come afterward is soon told.

Among the old industrial nations after the first war there were

many more machines than before and therefore a larger machine belly to feed and a greater machine product to be sold. Countries that had formerly bought this product now had machines of their own and were making machine products both for their own use and for export. Japan aggressively arrived. Thus on one side machine people were increasing very fast; on the other side the no-machine people were decreasing. It had the simplicity of arithmetic.

It was then that there was no more profit in foreign trade. Only the necessity remained.

It was then that governments took control of it, subsidized it with public funds, and began to manage it in terms of statecraft.

One result was that the delicate enginery of foreign exchange began to break down, and there was extreme disorder in the normal functions of money. Germany for one evolved a system of barter in the primitive principle, exchanging with her neighbors goods for goods, thereby dispensing with money settlements.

In all industrial countries unemployment became a chronic and progressive social evil. Other markets failing, the machine people engaged in a bitter struggle to sell their products to one another, similar and competitive products,—each one at the same time putting up barriers against the others. Each one trying, that is, to invade the home markets of its competitors while desperately defending its own.

Germany was saying, "We must export or die."

England was thinking the same thing.

The United States believed that only a marvelous revival of world trade could ever bring her prosperity back; if that did not happen her days of expanding economy were finished.

Japan's idea was to condition her unwilling Chinese customers by killing a few millions of them in order to impress upon

the remainder the importance of buying Japanese machine products in preference to any other.

Lastly, Germany and Italy solved the problem of unemployment by undertaking vast military preparations, intending when their war machine was big enough either to destroy their competitors or displace them.

CHAPTER NINETEEN

Ultimate Crisis

THE FULL SPECTACLE AS ADVERTISED.—REALITY RAISED TO THE PLANE OF FANTASY.—NOW ANYTHING MAN IMAGINES TO DO THAT HE CAN DO.—MACHINES FIGHT MACHINES.—ACTIVITIES IN THE MACHINE WOMB.—CRUCIAL MILITARY IMPORTANCE OF TECHNOLOGY.—THE AFTERWARDS.—ENGLAND'S MISGIVINGS AT BEING SAVED BY A TOO POWERFUL RIVAL.—PLANNING A BRAVE OBSOLETE WORLD.—THE WHEEL SHALL GO ON TURNING ON AN AXIS OF GOOD WILL AMONG MEN.

THEN THE SECOND GLOBAL WAR, the full stupendous spectacle,—as advertised. Machines fought machines.

Man in his relation to his fighting machines might have been mistaken for a species of lively insect, so small he was to look at, so relatively insignificant.

Behind the fighting machines were the machines that made them and then the machines that made the machines that made them; and minding all of these or building them, rivet by rivet, piece by piece, bit by bit, were millions of workers, both men and women, performing repetitive tasks to which they were trained, hardly one in a thousand knowing more than that a certain tool would do a certain thing if you held it *so*.

Beyond these production and assembly lines were the engineers drawing on paper the shapes of newer things; and somewhere back of these the research laboratories, locked and guarded by sentries in uniform, where the creative mind was at work,—the scientists, the inventors, the master technicians,—thinking, fumbling, groping, trying anything once, and finding very often not what they were looking for but something unexpected and better.

Idea, invention, translation; then method and production. Somewhere in that sequence was the invisible V for victory. The war would be won by those who could gain and keep superiority in machine technics.

Therefore again, suddenly, the industrial capacity of the world was enormously increased. It was increased in two ways, namely, by the multiplication of machines, and, secondly, as much or maybe more, by the invention of methods whereby production time was astonishingly foreshortened.

Nor did it stop there.

Fearful that for all they could do their own production would not be enough, the master machine nations,—to speak only of Great Britain and the United States,—assisted other nations to expand such industries as they already had and to build new ones. Thus there was a forced and subsidized propagation of industry in Australia, Canada, India, even New Zealand, with British and American help; while under the system of Lend-Lease, American machines and the secrets to go with them were offered to any of the United Nations that could undertake to make use of them,—no other obligation incurred. And not machines only. Entire units of industry were uprooted like trees and shipped in burlap from the United States to Russia. Under the Good Neighbor Policy and Lend-Lease combined American machines, American factories, American knowledge, were exported to Latin America. The United States Government loaned money to Brazil to found her own steel industry, and all the equipment was American.

Long before the end of this second war it was evident that machine technics would become as common in the earth as agriculture. The monopoly that had belonged first to Great Britain and had been twice shared,—once by Great Britain with Western Europe and again by Western Europe with North America,—was broken forever.

And there was another thing even more startling to be reckoned with.

It had become only too evident that American superiority in machine technics was incomparable. As the *arsenal of democ-*

racy, producing such weapons and implements of war as she required for herself and a fantastic further quantity to be divided among the United Nations, the United States alone had developed an industrial capacity equal to the task of meeting the peace-time needs of the entire world for ships, planes, motor vehicles, machines and engines.

This amazing development had been necessary to win the war. Great Britain had been the principal beneficiary, owing her survival to it. Nevertheless, when she began to think of the probable shape of the post-war world she could hardly regard without dismay a power she could never hope to compete with on even terms.

What would the Americans do with it? Would they employ it to their own national advantage or would they co-operate? To employ it in a co-operative manner would mean of course either to share it or to limit it,—to build fewer American ships and planes and machines for export in order to leave room for others.

Yet suppose they were willing to divide the trade of the world with Great Britain in an unselfish manner. Still, would there be enough? What of their former customers, those nations with expanding young industries of their own, beginning to make for themselves more of the machine products they had formerly bought from England and America and tending to become competitors, looking for somewhere to sell a surplus for profit? And if that question could be answered, what of the defeated aggressor nations with their machines, especially Germany and Japan? Or what of China, now resolved to finish what Japan began, namely, industrial development to the point of independence for Asia, in order to be free from economic domination by the machine people of the West? Lastly, what of Russia, with a kind of passion to master machine technics, and doing it?

If it were only that the axis of the great wheel had shifted,

that fact could be accommodated. That was not what had happened. The very principle of axis was gone. The principle had been, as Spengler said, that monopoly of industry which enabled the first machine people to divide the tasks of the world as they pleased.

Yet the power of nostalgic believing is never so great as when the portents of catastrophic change are visible. The voice of authentic delusion in the whole world was saying the wheel must go on revolving as if nothing had happened. Only first it must be shrived and blessed. What had made it behave so badly was sin. The new axis should be good will among men.

Take it from the Anglo-American projection of the post-war world, beginning with the Atlantic Charter and continuing down to the British confession, entitled, Report of the London Chamber of Commerce on the General Principles of a Post-war Economy.

What was wrong with the world before?

Those machine people who largely controlled the natural resources of the earth had been too selfish, too much concerned with their own profit and their own standards of living, too unmindful of the needs of others. That was wrong. That was why the great wheel went out of balance; why international trade became a moral and economic nightmare. Hereafter it would have to be all different. Nations would have to think not only of themselves but of one another at the same time. If all people had equal access to raw materials and to markets according to their needs, then they would be happy and prosperous.

"But there is a fundamental trouble with nearly all of these discussions," wrote Hartley C. Grattan.* "The prescription is right out of the standard economic pharmacopoeia, but the patient that the doctors are hopefully prescribing for is dead.

* *A Warning to the Peace Planners,* Harpers Magazine, January, 1942.

Our friends are talking mostly about a world which doesn't exist; they are proposing to rationalize a state of affairs that is over and done with; they propose to reorganize a world that has disappeared down the drain of history . . . To reorganize the world it will not be sufficient to figure out where Great Britain and the United States can buy and sell without cutting each other's throats, or even how to give Germany and Japan and Italy reasonable chances. It will be just as necessary to calculate how Canada and Australia and India are going to sell their stuff, including manufactures. And with regard to manufactures, it will be necessary to take into the calculation not the driblets they poured into the international market before the present war broke out, but the vastly increased quantities they will be pouring out when they shift their war plants to making peacetime goods . . . The world is filling up with manufacturing nations . . . There is hardly an 'outlet for manufactures' in the world now that isn't interested in producing this and that at home to escape the need for importing such things . . . The point is that the manufacturing industries are well established in lands we still like to think of as backward areas, and are multiplying rapidly under the pressures created by the present war . . . In India, Japan, China, Cuba, Thailand, Ceylon, the drive to industrialize is inspired by a desire to escape dependence on the export market (or, in reverse, to cut down imports), *and also*, to provide remunerative employment for the millions who are today excess population."

The great wheel was going to crash.

CHAPTER TWENTY

Ghost of Economic Necessity

THE THREE THINGS THAT HAVE HAPPENED TO INTERNATIONAL TRADE.—THE PROFIT DEPARTS.—THE HEWERS AND BRINGERS CEASE TO BE DOCILE.—NECESSITY AT LAST IS FACING THE EXIT.—AN EVENT IN THE MIND OF A JAPANESE EDITOR.—DILEMMA OF THE PLANNERS.—A PREMISE IN TROUBLE.

WHILE CIVILIZATION ENDURES people will always exchange with one another unlike and unique goods, representing their special skills and aptitudes, and find endless satisfaction in doing it. That kind of trade might go very far without becoming dangerous to the peace of the world. But international trade regarded as a vital necessity, a few high caste people ruling the world and commanding the labor of many to provide both the food they eat and the raw materials to fill the bellies of their machines,—that exchange was ruined.

Two things had already happened to it. One, competition had killed the profit out of it; two, the docile people of the world were discontinuing to be docile.

Neither one of these things nor both of them together would be fatal so long as the necessity was vital. Let it be a question of survival for the machine people,—to live or not to live,—and such a thing as profit would not matter. As for the producers of food and raw materials, beginning to revolt, they could be somewhat appeased, they were in fact already being appeased, by more favorable terms of exchange and a higher standard of living. In the extreme case they might be put under compulsion. Abominable as that would seem to us now it was very common not long ago, when trade was for profit only and no thought of necessity in it. Necessity is resourceful and cruel. It kept the great wheel

revolving out of balance for a long time. The idea of necessity had caused two world wars.

But now at last necessity itself was on the way out.

The meaning of that fact is too radical to be seized all at once. It will come to you slowly. Disturbing perceptions of it have sometimes a strange occasion.

Not long before Pearl Harbor, reflecting on what might be the next state of the world and what we should do with a conquered Japan, I was turning the pages of the Japan Times Weekly, especially the advertising pages, for it was a number devoted to foreign trade. And there were the things the Japanese were going to make and sell all over the world, and everywhere at ruinously competitive prices, save in Asia. They would enclose Asia from competition in order to sell goods there on their own terms.

What things? All of the things Japan once bought from the machine people of the West before she learned how to make them, first for herself and then for export; and of course the same things that the machine people of the West still want to sell in the East, such as machinery, tools, hardware, electrical equipment light and heavy, glass, perfumes, pharmaceuticals, chemicals, motor vehicles, garage equipment, guns and ammunition, typewriters, plastics, rayon, cotton goods, agricultural implements, surgical instruments, optical goods, engines of all kinds, tires and rubber goods, wire cable, leather belting, and so on and on. And for nearly every one of these things she would have to think first of importing the raw materials.

In the same number of the magazine there was a continuing discussion of the Greater Asia Co-prosperity Plan. Under this plan the inferior people would be the hewers and drawers, and the inferiors were all people other than Japanese. Thus from China, coal and ore; and perhaps, too, the culture of the silkworm, seeming to be beneath the dignity of an over-lord people,

would be transferred from Japan to China. From Indo-China, rice and corn and rubber. From Thailand, rice and lumber and lac. From the East Indies, more rubber, more sugar, tea, tobacco, copra and oil. From the Philippines, sugar, hemp, tobacco and more lumber.

Food for the Japanese and raw materials for their machines. Five or six hundred millions of Chinese, Javanese, Malays and Balinese performing the tasks of primary drudgery for ninety millions of Japanese, who would reserve for themselves industry, banking, shipping, administration, profit, power,—and empire.

There was nothing new in this plan, only that it was Japanese. It was Japan intending to do to Asia what the West had done to the East. Nor was there anything new in the naïve Japanese words, "In this way the relationship will become one of give and take and will benefit both parties to the greatest advantage."

But there was an editor, too, thinking his own thoughts, as an editor sometimes will; and suddenly all this grand thesis collided with something the propaganda bureau had not put in his mind. He did not intend this to happen. It was an accident. He was writing an editorial on what Japan would do if and when the United States stopped buying her silk, and he said, defiantly, "As the United States believes it is ready to do without much or most of its silk, by the substitution of nylon, this country also has to learn to do without some of the things which silk dollars could buy. Synthetic methods are not confined to one country."

And from there he went headlong to the accident. "The growing power of chemistry," he said, "is doing much to provide the have-not countries with the products they need, even as Germany has been able to make synthetic rubber. No research or manufacturing chemist today would hesitate to predict that most countries in a not too distant time will be able to find all the essential things in their own back-yards. There will be merely the necessity to pass soil and rocks through machines or proc-

esses for the recovery of wanted materials. The outlook offers a distant solution to the problem of international trade. It should not be necessary for a country in order to live to send its manufactures to distant lands or to import the necessities."

Now what had he said? If it were true, then neither the China Affair nor the contemplated conquest of the Asiatic world could be regarded as a rational adventure. Yet there was pride of idea in what he had written; he believed it. What would the censor say? So, therefore, he added this: "Japan in due time, like other countries, will have to find her opportunities within her own economy, but the situation today demands interim measures such as the government is working out."

One of the mad wonders of history was thus defined. War as an interim measure,—a war in the present belonging to the past, a war not to perpetuate international trade but only to keep it alive for a little while longer.

Although he made it worse by trying to do something about it, this Japanese editor was at least aware of the rip in the nether garment of his thoughts. He had gone forth to see what he could see of the future and this had happened to him coming back. It had happened also to many planners of a planned world, but either they did not know it or they were not so easily embarrassed, especially the Americans, with their charter of universal brotherhood under which all the cruelties of economic reality were going to be resolved by the golden rule, enforced by a powerful world police.

They had to think of everything beforehand, and so they came to rubber. What should be done with that troublesome stuff? They proposed that the Americans should scrap their synthetic rubber industry, keeping only a few pilot plants to remember it by, just in case the rubber-growing brothers should be sometime tempted to betray the brotherhood. Why should the Americans do this? In order to oblige themselves to go on buying natural

rubber in Asia, instead of producing rubber for themselves; for unless they did go on importing it, what would become of the people in Asia who had learned to live by rubber, to say nothing of the Dutch and English brothers who owned the rubber plantations in Asia? Why not in the same way scrap the nylon industry in order to restore the American demand for raw silk?

But it was very improbable that anything like that was going to happen.

In nearly all first thinking about the post-war world, certainly in all planning for it, the economic premise was that the sources of raw materials were limited by nature. It followed that a machine nation would live in dread of famine, for if the supply should fail, or if for any reason it were cut off, its machines would starve. And as the number of machine nations kept on growing and control of raw materials became for that reason more important, even vital, the fear of famine would be bound to rise and beget the thought of war.

"Therefore, look," said the planners. "Only planning can save us from a brutish end." And they agreed that a way would have to be found to give all people access to the natural resources of the earth by some rule of live-and-let-live, that raw materials would have to be rationed in an equitable manner, and that every nation should have as much trade as it really needed. So said the Atlantic Charter.

CHAPTER TWENTY-ONE

Landfall

AS THE MACHINE DELIVERED MAN FROM THE FEAR OF FAMINE SO ALCHEMIC TECHNOLOGY NOW DELIVERS THE MACHINE.—THE MALTHUSIAN DOCTRINE OF RAW MATERIALS FOR THE MACHINE BELLY IS OVERTURNED.—REVOLUTIONARY IMPLICATIONS OF THAT FACT.—MAN ACTING UPON THE INWARDNESS OF MATTER TO CHANGE ITS FORMS IS MAN IN A NEW DIMENSION.—NOW HE MAY ADAPT HIS MEANS TO HIS FANTASTIC ENDS INSTEAD OF ADAPTING HIS ENDS TO THE LIMITATIONS OF MATTER AS NATURE MADE IT.—WHAT WILL THAT WORLD BE LIKE?

IF THE FIRST PREMISE WERE TRUE, a planned world indeed might be the only hope. It would be the same old world still. The only thing new about it would be deadness.

But the first premise was not true. In a former state of knowledge it was. In the present state of knowledge it is not.

The sources of raw material are no longer limited. They are molecular and co-extensive with matter.

The meaning of this fact is extreme and revolutionary. It means that if we will we may now advance from the age of machine technics to one beyond that has yet no familiar name; it means that as we pass, if we do, we shall cease to think of raw materials as deposits of solar energy that must be dug out of the earth's crust, as minerals to be found only in certain volcanic regions, or as plant life that will flourish only here and there. The machine, becoming universal, will be no longer the symbol of life's extension on earth. In that sign, the laboratory will take its place.

Regard both the event and the timing of it.

The machine that had delivered the human race from fear of famine was in its turn threatened with hunger. Then just in time man receives from nature an apparently unlimited grant of further credit. He will say that he worked for it. So he did. His mind was tireless in the quest. Yet never was it certain that he

would find what he sought; there was even no certainty that the knowledge existed.

Seeing how events of great discovery do occur in a certain order and that the order could not have been different, since A must come before B, we take their history as if there could have been no other. But A does not predict B, and neither does one discovery foretell another. As for the symphonic form in which these events seem to take place, this they could not receive from man because he never has any idea what the form is. Blindly he works to create his own future. He sometimes does not know it when he sees it, or again, if he sees it he may so dread it that he would go back if he could. Then it is only crisis or despair that can move him onward.

In old text-books you will find that one hundred and fifty years ago the political and economic thought of the world was sunk in gloomy meditation on the food supply. A man named Malthus had written a treatise in which he demonstrated what was then a fact, namely, that population in a natural way tended to increase much faster than the food supply. The number of arable acres was a limited quantity, not by any means increasable, whereas the impulse of the human species to reproduce itself knew no limit whatever. It followed logically that the human race was doomed to be limited by a dying fringe of misery and starvation, unless it could limit itself in a voluntary manner by continence, which was not imaginable . . . There was no hope for the poor, nor any for the wage earner. If wages were increased so that the standard of living might rise, population would increase all the faster, and in a little while everything would be worse.

No one could reason away this black Malthusian doctrine because no one could imagine what was going to happen. It was such a thing as had never happened before. A revolution was about to take place.

It was not that vast areas of virgin land were going to be opened, as in North America; there would soon be an end to that and the situation would be again as it was, according to the Malthus formula. In that way the doom could be only postponed. Primitive agriculture was passing; scientific agriculture was coming. That was the revolution. Knowledge was increasing. The application of scientific thought to agriculture, plus the machine, plus modern transportation, so increased the power of man both to bring forth food from the soil and to make it available that in one hundred years after Malthus population increased as it had never increased in any one century before since the race began, and the more it increased the more food there was, to the point of chronic surplus.

From this unpredictable solution of the food problem there was a tremendous release of human energy. The amount of human labor necessary to be spent in agriculture began to fall in a headlong manner. The fall was such that in the United States, for example, where in the beginning it required the labor of nine on the soil to feed one in the city and the population was nine-tenths agricultural, a time would soon come when the labor of one on the soil would feed two in the city, making the population one-third rural and two-thirds urban. That was what made the industrial age possible. Otherwise it could not have arrived; the labor for it could not have been spared from agriculture.

But with the rise of modern industry came the problem of the machine belly. As it had been once supposed that the human food supply was limited by what the primitive art of agriculture could produce, so when people began to worry about enough raw materials to feed their machines it was supposed that the sources of these also were limited,—a coal measure here, an oil well there, a fibre plant or a rubber tree growing only in certain regions. Who owned the coal measures, the oil wells, the regions

producing those certain shrubs and trees, could feed their own machines and starve the machines of their rivals.

Thus there came to be a Malthusian doctrine of raw materials and it was implicit in the power politics of the world.

Like the first Malthusian doctrine, this one was true at the time,—true, that is, in relation to a state of knowledge then given. Today it is true only so far as people continue to think and behave as if it were. In a little while, if we advance, it will be remembered as a superstition. Already we know better. The disparity between what we know and what we do is the supreme tragedy.

Liberating knowledge does not come by revelation. Its seed is idea. Where idea comes from we do not know at all. From the seed it grows wild and by little, or seems to die out and then appears in another place. Its beginnings very often are trivial.

What happened to the old ivory trade? Men wanted more and more ivory, especially for billiard balls, and the supply was failing. It would not pay to cultivate elephants for the tusks, even if you could get enough that way. Where did ivory come from? Not from the elephant really but from what the elephant ate. What the elephant ate was grass. Therefore, ivory was from grass. The elephant was a chemical works converting something that was in the grass into a thing called ivory.

You might have been sure that when the demand for more ivory, or for something that would do in place of it, became very urgent, so that the incentive was high, a brooding chemist would begin to think like that and end by finding what that something was in the grass the elephant ate that made ivory. At any rate, the chemist did; and he found it in milk, for one place. Then it was possible to do purposefully in a laboratory what the elephant does naturally without knowing it. After that there were plenty of cheap billiard balls.

Such very roughly and long ago was the beginning of plastics,

and yet it was only under stress of war's necessity that people began really to perceive the possibilities of plastics in place of natural raw materials like iron and lumber; only then that they began to imagine plastic automobiles, plastic airplanes, plastic houses, even plastic cities, and to speak of the plastics age. And the sources of this material are as free and wide as air and sunshine.

For many years one of the great driving gears of the international trade wheel was named textiles. The people who had invented textile-making machinery, especially at first the British, imported the raw fibrous materials, such as cotton and wool, made them into cloth and exported the cloth to all parts of the world. Among the principal buyers were those who produced only the natural fibres and made no cloth for themselves, because it was cheaper to buy cloth from the machine people than to weave it for themselves by hand. This exchange seemed beneficial and permanent, especially permanent. It represented a division of labor between peoples,—those who had the suitable areas and climate to produce the fibres and those who had the suitable machines to make the cloth. One result was that the common kinds of cloth were very cheap. How else but by this division of tasks could the world hope to be well and cheaply clothed?

Then the meddling chemists again, with nothing better to do, only to see if they could, found a way to make yarn for textiles without natural fibres,—that is, without wool, flax, cotton or silk. They found they could make it in their laboratories out of a chemical mess that lay at the cellular base of all plant life; as they went on they found ways of making it from coal and air and water, even sand. But they needed machines to ingest their sticky stuff and spin it forth as yarn in commercial quantities. That was the impish mechanic's job. He invented the mechanical silk worm.

For a generation we have been staring at the prodigious rise of the artificial textile industry with a kind of local wonder, loath to accept its economic implications, so loath in fact to do so that governments have subsidized with public funds,—what? Not the wonderful new textile industry but the culture of natural fibres, like cotton, because the producers were injured by the competition.

Only twenty five years ago the first anxiety of any nation thinking of war was about nitrates. No raw material was more essential; without nitrates you could not make high explosives. The one natural source of this material in great quantities was a rainless desert on the western side of the Andes, belonging to Chile, where for many ages bird guano had been deposited until there was a bed of it two miles wide, two hundred miles long and five feet deep.

Before the first world war both Germany and Great Britain accumulated great piles of this Chilean guano, but not enough; no sooner had they begun to shoot at each other than they realized how stupidly they had underestimated the amount of explosives it was going to take. The German navy tried to blockade the Chilean coast to keep the British from getting any more; the British navy had the same thought at the same time, and the British navy won.

All of this time and energy was wasted. When Germany was cut off from Chilean nitrates she remembered that her scientists knew a way of filching nitrogen out of the air. They got from the air all the nitrogen they needed for the duration of the war, and since then all nations have been getting their nitrates from the air, both for fertilizer in time of peace and for high explosives in time of war, and the Chilean beds are forgotten.

The air is free. Everybody has plenty of air.

Only five years ago it would have seemed that if your subject were mechanized warfare you could write a plan of grand

strategy on rubber alone. No nation without rubber could go far with mechanized war. Its system of motor transport would break down. Indeed, Japan's strategy was so aimed; and when she had got control of the rubber of Asia, cutting off both the United States and Great Britain from their principal sources of supply, it might have been for the United Nations an irreparable military disaster. Fortunately on this side we knew how to make synthetic rubber. We had never done it, but we had the chemical knowledge, the formulas and the materials. What were the materials? Petroleum was one. Alcohol was another. Petroleum comes out of oil wells and the supply may be exhaustible, but alcohol comes from wheat or corn or potatoes or cane. We can plant and reap it, as much as we need, and so can anyone else.

In the same way you might have written a plan of grand strategy based upon oil. That in fact was written many times, as *the world struggle for oil.* Possession or control of the sources of oil was one of the important aims of power politics. Before oil it had been coal.

Why are coal and oil so important? Because they contain and can be made to release solar energy that was caught and turned cold in the crust of the earth millions of years ago. One is solid. The other is fluid. They are so much alike in chemical nature that both can be made to do the same work. Yet neither coal nor oil is the source of energy. They only store it. The source is sunshine.

What so suddenly invested petroleum with its supreme importance was the arrival of the internal combustion engine. Motor transport and aviation both rest upon it.

Imagine then that all the oil wells in the world go dry, as they sometime may; imagine that there is no more petroleum at all. In that event do you suppose we should have to abandon the internal combustion engine? Do you suppose we should lose our wings and fall out of the sky? Not at all. Two things would happen. The engineers would re-design the engine, and for the re-

designed engine the chemists would design the fuel. They would work together.

Everyone knows what it means to say the engineers would re-design the engine. That task belongs to the mature science of machine technics where now you may take any wonder for granted. But the chemist designing the fuel is man in another figure. His task belongs to alchemy, regarded as chemical technology.

Here the change takes place.

Hitherto man has acted on the outwardness of matter as he found it, not upon the inwardness of it. That is to say, he has accepted matter in its natural forms as nature left it; he has adapted his ends to the means. Thus, petroleum as he found it was not the ideal fuel for his internal combustion engine; it was only the most abundant and the most available, and he adapted his engine to it.

Now, however, he acts upon the inwardness of matter to change the form of it as he likes, so that instead of adapting his ends to the means he may adapt the means to his fantastic ends.

He finds that matter in any one of its natural forms is what it is because its molecules have a certain atomic structure. That fact is no longer final. He can alter the fact.

He has never seen the internal structure of the molecule. Nevertheless, he can draw a picture of it. Then he makes the astonishing discovery that he can change the picture. He can re-design the molecule. He can break it down and build it up again to another design, and as he does this to the molecule the form of matter he wants is bound to appear. He commands the form.

Is it rubber he wants? Either there is not enough of it in the natural form or he has been cut off from the source of it. He knows that rubber is rubber only because its molecules have a certain internal design. All around him is other matter full of molecules that can be re-designed; and when to the molecules of

this other matter he has imparted the rubber design, lo! there is the rubber itself, though the other matter he started with may have been in its natural form as unlike rubber as petroleum or alcohol.

Is it energy he wants?—energy in a liquid state that may be carried about in tanks, like petroleum? He may have no petroleum of his own, or again, not enough.

He notes that sunshine still falls upon the earth as it did when its energy was being stored in coal and oil. From there he goes on to see that there is an annual catch and store of it in plant life. When from plant life he has made alcohol he has solar energy again in the liquid state. And so he may reap it year after year instead of digging it out of the ground where nature happened to put it.

There is more.

Hitherto when for his ingenious ends he has wanted a material that was very hard or one that was very tough he has had to take the hardest or toughest he could find in the natural form and make it do, whereas now he says only that he wants something that shall be of a certain hardness or a certain toughness, able to resist heat or cold to certain extremes, and the chemist undertakes to produce it. When he has produced it he gives it a name and it is a name strange to nature.

Again he has re-designed the molecule, and this time to a pattern nature never thought of.

Man acting upon his natural environment to alter it and man acting upon matter to change its forms are two different species.

Given now the carbohydrates, the vegetable oils, the alcohols, sunshine and air and land and water, it is possible for him to shape matter to whatever form he likes, or nearly so, and becoming entirely so.

Would man, in the age of alchemy, be less warlike? Probably not. But if he found himself able at will to create the conditions

of self-containment in all vital respects and came thereby to be released from the dire idea of economic necessity he would be perhaps less likely to involve himself in total war. He would be only as warlike as he really and irreducibly is, *not more so.* What happens to him in total war is that he becomes helplessly more so; that is to say, he finds himself obliged to make more war than he intended.

That had already happened to him somewhat in the first global war; in the second it became, of all the facts of feeling, the one most terrifying.

If the magnitude of the second war could have been imagined beforehand no one, not even the aggressor, would have dared to begin it. As it went on it seemed more and more to be acting as a force in itself, creating its own momentum. What man had started he felt powerless to limit or stop. So people began to say, "It must go on to the end," as if they couldn't help it; and in that sense their attitudes became fatalistic and strangely passive. Victory and defeat were words equally without meaning. One might be as disastrous as the other.

But of course war cannot provide its own momentum. Passions and fears may provide it. Here, however, was momentum greater than could be accounted for by any emotion; it increased even as the emotions that controlled it at first began to subside from sheer weariness. Killing became emotionally dull and all the more terrible for that reason. It was only something that had to be done, and that had to go on being done—*to the end.*

What was it that gave the war that aspect of an uncontrollable, self-accelerating force, beyond human responsibility? The explanation was simple and dreadful. The momentum was mechanical. Literally so. In the mathematical sign momentum is mass multiplied by velocity. That was it. On both sides technology, *organized* and *impersonal,* was increasing the mass and velocity in a desperately competitive manner, and until technol-

ogy on one side was beaten the war was bound to go on. The resources of technology were fairly equal; no secret or miraculous weapon was possible. Each side anticipated the other's inventions; for each new offensive invention there was an immediate defensive answer, and then something new again for the other side to answer. This kind of equilibrium in the world of physical science and machine technics is perhaps owing to a law that we do not clearly comprehend. One may ask: What if the aggressor had been able to produce the unanswerable weapon? Yet on reflection this turns out to be a fanciful question. It is like asking what might have happened to history if Napoleon at the Battle of Waterloo had possessed a thousand twentieth century machine guns.

What reason is there to suppose that man would not in the same way, even in a more frightful manner, overwhelm himself with the added powers of competitive alchemic technology?

In his nature perhaps no reason whatever. It is only that his interests, his obsessions and his economic motivations would be deeply altered.

Imagine a world in which societies might exist and flourish in self-contained regions corresponding in principle to the self-contained farms of an ideal valley, each farm beginning at the stream and running to the top of the hill, so that each farmer has therefore his own water, his own pasture, his own lowland and upland, and on the hillside his own woodlot. He is not by reason of this simple and perfect self-containment isolated from his neighbors. Neither would whole societies be isolated from one another or limited in their cultural development by reason of being able to produce from their own land, from their own water, from the free air and sunshine, all the necessary materials, each one for itself and by its own labor, in a non-competitive manner.

In that scheme machine technics would naturally become

subordinate to alchemic technology. Process would become more important than function. The machine would be domesticated and in time become native.

The machine kingdom, like the animal kingdom, is probably complete. Evolution undoubtedly will go on, new species may appear, and now and then a sport, as in nature, but the biological principles are established. Whatever now you want a machine to do, that it can be made to do. You do not ask what a machine can do. You say what you want it to do and the machine appears. In that world invention is no longer by innocent inspiration; it is organized and systematic.

The thrill-time of discovery ends when you know for a fact that there are no more continents and oceans to be found. All after that is exploration.

It is enough now to know that in the dimness beyond the finished world of machine technics lies another world of undiscovered oceans and continents. The adventurous spirit of man may be trusted to do the rest, heedless of change or consequences. Until now it has never failed. What will be found there cannot be foretold because so much of it will be original, things hitherto unimagined. Nor can the consequences be foreseen.

It does not follow, for example, that the same people who possessed the creative genius for machine technics will be masters also of alchemic technology and therefore paramount in the world. Special aptitudes may appear in unexpected places. What was ever more unpredictable than that the English, of all Europeans, should have been first to master machine technics, coming thereby to lead the industrial revolution that transformed the whole world? Nothing in their history had suggested it. Thus it may happen that new centers of power and prestige will appear. The tempo of human existence may change. Process is slower than function. A chemical reaction cannot be hastened like a machine job by turning the work faster and set-

ting against it harder cutting tools. The gods of speed and bigness may lose their famous authority.

If at last the human enigma does not blow himself off the earth he may come to a future such as he had not imagined, and, for all his folly, a future of his own making, knowing as he made it more than he could believe.

It is a future that cannot be planned. No new world ever was planned. But from the causes that will be acting in it certain effects may be supposed, such as:—

That we shall find out what the machine is for, tame it accordingly, and use it only for what it is for; and that certainly is not to serve man in his flight from work, nor yet to serve those who would use it to fix others in an inferior economic status.

That the world will fall naturally into regions of balanced economy, essentially self-contained, with the result that conflicts over the division of labor may cease as between nations and races and continue only as between the parts of a complete social body, each part of which can see the whole and see itself belonging,—

> *For as we have many members in one body, and all members have not the same office, so we, being many, are . . . every one members of one another*

That civilization will become much richer in variety, probably as rich in that sense as it was before machines, expressing itself rather in contrasts than sameness;

That the distinction between industrial and non-industrial people will disappear;

That the land will be restored to its former estate because agriculture more and more will become a chemical science, and great organic chemical industries will be founded on the soil;

That the machine itself will be modified by the characteris-

tics of the people who employ it;—in the East smaller machines answering to the Asiatic hand and in the West always more powerful machines suited to the spatulate hand;

That the fearsome behemoths of the industrial age, like the behemoths with which nature experimented, will give way to formations of optimum size, so that bigness as such will cease to be a problem;

That dense masses of industrial people will disperse, going themselves to the land instead of importing its produce from afar, and,

That in these migrations the mass man, with his mass thinking and mass ethic, whose projection in the world of the crashing wheel was toward chaos, may tend to disappear.