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MAN'S SOCIAL STORY

HOW THE WORLD
HAS BECOME
"ONE HOUSEHOLD"

E. H. CARTER, O.B.E., M.A.

Late Scholar of Jesus College, Cambridge

E. J. ARNOLD & SON LTD.
GLASGOW LEEDS BELFAST

PREFACE

This little book attempts to outline the story of Man in his search through the ages for Food as his first need, and to set that story in Man's social and industrial environment as conditioned by geographical and historical factors.

During the two World Wars of the twentieth century, one of the most vital problems was to feed our people hard at work at home—and it remains the most vital problem in our post-war impoverished Britain. It is therefore of the utmost importance that everyone, whether living in town or village, should know something of how "the Earth" feeds him and keeps him alive.

In this age of rapid transport by aeroplane and of lightning communication by wireless, the world has already in time of peace become *One Household* for industrial and agricultural purposes, for Man as food-producer and maker of implements and machines. The story even of a glass of milk (see Chapter XIII), as it is produced and delivered in these days at our doors, itself illustrates this vast scientific and mechanical revolution of the Modern Age. And, as another tiny part of this revolution, never was there a time, thanks to broadcasting, to the motor-bus and the aeroplane, when our own urban population, juvenile and adult, saw and heard so much of the countryside and could learn at first hand of the skill and patience of all those, at home and overseas, working on farms and in factories, upon whose combined efforts they are dependent for their daily sustenance and welfare, in peace no less than in war.

Moreover, it is historically just, in outlining such a theme, to emphasise Britain's own contribution to mankind's welfare—how Britain in her greatest days taught and led the world in the democratic way of life; in colonising and civilising hitherto undeveloped lands; in agriculture as in other industries—how her horses, cattle and sheep as well as her machines helped to spread her name and fame the world over; and, again, it is fitting to recall what we in this land owe to other

lands and peoples,and above all in these days to other members of the British Commonwealth scattered over the Seven Seas.

Thus care has been taken "lest the line of approach through social and local history tends to obliterate the great landmarks of history." (*Handbook of Suggestions*, Board of Education.)

The author expresses his gratitude to Miss M. le S. Kitchen for various researches; to the Corporation of Coventry and to their late Clerk of the Peace, Mr. Frederick Smith, B.A., F.G.S. for kind permission to reproduce the historic plan of an "open" field still existing in Coventry in 1822 (see Pictorial Supplement) from Mr. Smith's book *Six Hundred Years of Municipal Life* (1945); and to two neighbours, to Farmer Bevan and to Mr. Charles Goode, enthusiastic local historian and former pupil of our village school, who first opened my eyes to the history that lies at our very doors wherever one may live (see Appendix I); to Miss F. E. West for the Appendix on *Cookery Through the Centuries*, of special interest to Girls' Schools; and to Miss M. Graham Brown, M.A., late of Truro Training College, for the *Local History and Regional Survey Project* (Appendix) which, it is hoped, will be welcomed not only as an aid to Social Studies in Secondary and Technical Schools, but also by Young Farmers' Clubs, County Colleges, Adult and Youth Organisations, Holiday Camps, and other educational and recreational societies all enjoying excellent opportunities for regional surveys.

The author's indebtedness to standard works is acknowledged in the footnote references, in the hope that these may also be found useful for further reading and for the library.

E.H.C.

ARLEY HOUSE
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WARWICKSHIRE

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MAN'S SOCIAL STORY

I CIVILISED LIFE BEGINS IN THE EAST

THE GREAT RIVER VALLEYS: EGYPT TO CHINA

Food-collecting to Food-growing—Farms and Villages—Beginnings of Trade and Commerce; of Writing and Counting—The Peoples of the Old Testament—Our Debt to the East

MAN must eat. Before Man knew anything of fire, houses, clothing or metals, he did know he must search for food in order to keep alive, a lesson which even Modern Man has to learn over again when War cuts off his food supplies.

This search for food occupied the greater part of Early Man's waking hours; no doubt it was a "hand to mouth" existence, plucking and eating berries, seeds and fruits, or feasting on birds' eggs and wild honey. As Man in time learned to make and use clumsy weapons of flint or stone, he became a Hunter, feeding on the flesh he killed and going hungry when the chase failed. The next step was the discovery of Fire which enabled him to cook the flesh he had previously eaten raw. Then in due course came the knowledge that certain seeds—which we call corn—could be stored for use in winter or in times when other food was scarce.



Caveman's Weapons and Tools made of Stone or Flint

But perhaps the greatest discovery—the Agricultural Revolution of the Stone Age—came when Man found that seeds sown in the earth would grow into new plants, each seed in time producing many seeds. So men passed from food-collecting and food-storing to food-growing, and some of

them became Farmers. But all this is the story of probably several hundred thousand years of human endeavour, and during these long Ages some of our savage ancestors slowly began to be civilised.

The business of food-growing meant staying in one place instead of wandering about hunting animals and searching for food; so the corn growers settled down in little villages, and they tamed animals which provided them with milk. But it was



A Man of the Early Times

only in the safer parts of the world, where they were less likely to be attacked by enemies, that the early farmers were able to think out new ideas and learn to grow better crops and produce sufficient food.

Ten thousand years ago the safest and most prosperous parts of the world were the valleys of five great rivers: the Nile, the Euphrates, the Tigris, the Hwango-Ho and the Indus. Look at a map and you will see why.

For example, the valley of the Nile is guarded on the west by the great Sahara desert, where there was no food for animals and hunters could not travel. To the north and east it is guarded by the Mediterranean and Red Seas, barriers men

could not then cross, for in those days they had no sea-going boats. Dense and dangerous forests protected it against hunters from the south. The Tigris and the Euphrates valleys were also well protected by the Arabian Desert, the Black Sea, the mountains of Kurdistan and the Persian Gulf.

So the men who first began to farm in those valleys were very fortunate. They had water in plenty, rich earth and something like safety. For hundreds of years they were undisturbed by any great wars or invasions, and they learnt many new things about living, including new ways of tilling the soil.



An Early Egyptian Peasant

The valley of the Nile has a warm, healthy climate. It is a rainless country, but every year the snows melt and the rains fall in the mountains of Abyssinia, at the source of the Blue Nile. Then a great volume of water comes down, the lower river floods, and its banks are kept fertile. The early farmers soon saw how well things grew in this soil flooded by the river, and they began to dig ditches to carry the water over wider and wider areas. This is called irrigation and it was a big step forward in the history of farming and of food-producing.

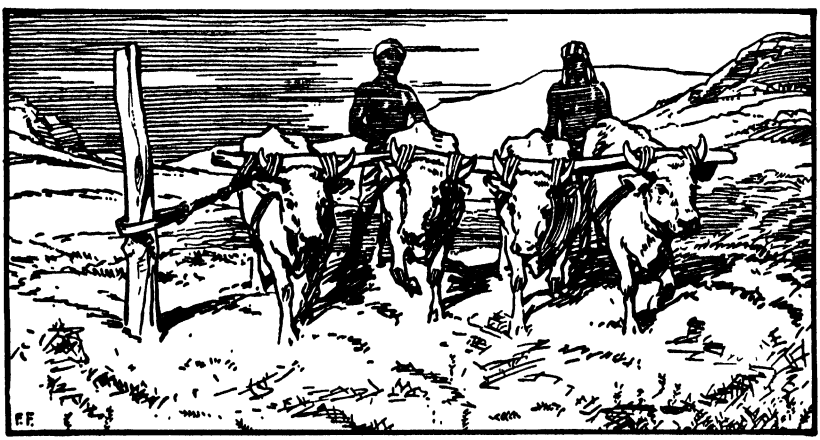
In their well-watered soil the Egyptians, as the people of the Nile valley came to be called, grew fine crops of corn, and we can see from drawings in their tombs that very early in their long story they ground the grain by rubbing it between two stones as they knelt on the ground. Other tomb drawings show them milking their odd-looking wide-horned cows, and

in still later drawings we see them hoeing and ploughing.

The first farmers used digging sticks much as the Australian natives do to-day. The Egyptians used a hoe which had a long curved point fixed to a handle, with a cross bar to strengthen it, the whole implement having somewhat the same shape as a scythe. It was rather a clumsy implement, but their hoe was a great improvement on the old digging-sticks which made only shallow scratches for the seed, for the Egyptians could use their hoe to make furrows, or narrow trenches, in which to sow the seed.

Hoeing, however, is hard work when there are big areas to be tilled, and men began to try new ways of making these furrows. They shaped heavy blocks with a point underneath them and dragged these along. This worked quite well in soft ground though not when the soil was hard; so handles were fitted to the blocks, and one man walked behind pressing the point into the earth while other men pulled. These were the first ploughs, an invention far more important in the history of mankind than motor-cars, for men can live pleasantly without driving about at a great pace, but they cannot live without eating; and to be sure of getting food they must know how to plough the land and sow the seed.

Ploughs were improved from generation to generation, and men invented other implements for harvesting and threshing corn, such as reaping hooks (which for a long time had flint



A team of oxen treading out the grain (Ancient Egypt)

blades) and flails. They also thought out how they could use other animals, as well as the dog, to help them in their work. In due course of time we find pictures of the awkward triangular Egyptian ploughs being drawn by oxen—not yet by horses. To this day many of the peoples in the Balkans and Central Europe, in Asia and Africa, use the wooden ox-drawn plough.

The Egyptians had oxen and donkeys as working animals, and the Sumerians, the people who lived near the other two great rivers, Tigris and Euphrates, had camels as well; but neither people had horses until about two thousand years before Christ. It was the Hunnish people of Northern Asia who first caught and tamed the horse. The Sumerians and Egyptians came to know about horses through invasions of warriors from the north, and for a long time afterwards they used the horse only for war.

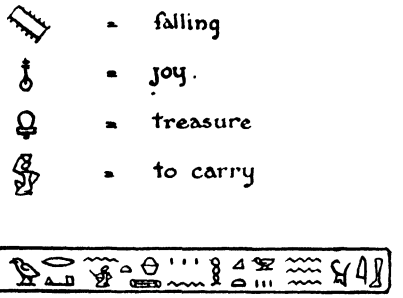


Harvesters cutting the heads of ripe corn (Ancient Egypt)

But as early as 4000 B.C., both the Sumerians and the Egyptians reared flocks of goats and sheep, not only for food but also for their wool which they wove into cloth. By this time the Egyptians had sea-going boats, and they traded their cloth and grain with the people living on the island of Crete. Because it was an island, Crete was also a safe place where men had time to think and build, and very early a fine city called Gnossus was built there. But Crete was small and had not much pasture or plough land.

This gave the Egyptian farmers the chance of making another advance in history. They not only grew wheat and kept animals for their own food as the earliest farmers had done; but they produced more than their own country could

use and they exchanged the surplus for goods from other lands, such as Crete and Sumeria—that is, they began to engage in trade and commerce. For this, they had to keep accounts. So it was in the valleys of the Nile, the Tigris and Euphrates that men first learnt to read and write and invent weights and measures, hours and minutes.

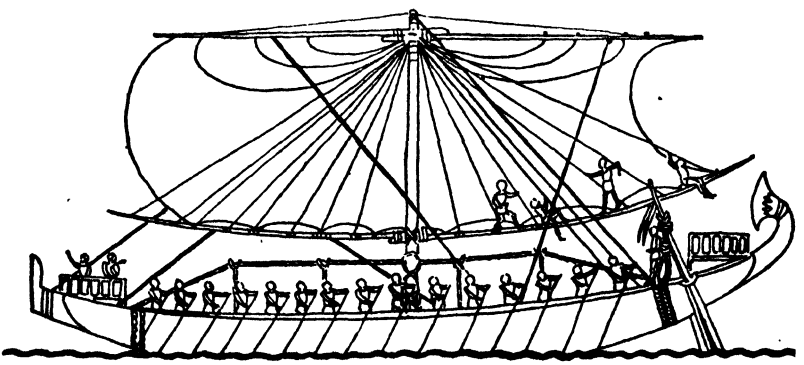




(I have given bread to the famishing.)
Egyptian Picture Writing

Naturally these people living in Egypt, Sumeria and Crete exchanged ideas as well as goods. By about 2500 B.C., the rich in all three countries were living very comfortable lives, with fine houses, palaces and temples, clothes and jewels and pottery, and things made of metal as well as of stone and wood. So the long Ages of Stone were succeeded by the Age of Bronze, and then by the Age of Iron—in which we still live. The poorer people of the river valleys were not so fortunate as the richer, and many of them were slaves; but even the slaves were no longer in constant danger of dying through starvation as were the men and women of the hunter tribes.

As time went on, Egypt grew richer and richer under strong kings called Pharaohs. Beautiful cities were built, such as Memphis and Thebes. But the Egyptians were sensible enough to realise that the greatness of their country depended more on



An Egyptian Ship

the soil than on the cities, and they continued to pay great attention to Man's first need, to food-producing.

By 2000 B.C. most of the land of Egypt belonged to great nobles or barons, who made experiments with different kinds of crops and animals. They grew barley and learnt how to make beer from it; and vines and pressed the grapes for wine; and dates and figs, and vegetables such as beans and lettuces. They also grew flax for linen; and papyrus, a reed from which many things were made, including the first kind of paper (the word derives from "papyrus"); and the first shoes, which were plaited sandals. At the same time they improved their flocks, and kept bees, geese and ducks, which they had found in the marshes at the mouth of the Nile. Roast goose was a favourite Egyptian dish. But they had no hens, for the hen was still a wild fowl in the jungles of India, and it was not tamed until somewhere about 1000 B.C. The everyday meals of ordinary Egyptian people were of dried fish, dates, cakes of ground grain, and beer.



Papyrus Reeds

On the whole the Egyptian nobles were good landlords. One of them, a great prince who lived about 1900 B.C., wrote:

"No labourer have I arrested, no shepherd have I banished, there was no superintendent of workmen whose labourers I have taken away from their work. In my time there were no poor, and none were hungry in my day. When the years of famine came, I ploughed all the fields of my nome (district)

from the southern to the northern boundary. I kept the inhabitants alive and gave them food, so that not one was hungry. I gave to the widow even as to her who had a husband, and I never preferred the great to the small."

An English duke living in 1900 A.D. could certainly not have boasted of more.

Around Babylon, the great Sumerian city on the Euphrates, equal care was taken of the land. Hammurabi, who was Emperor of Babylonia about 2250 B.C., wrote:

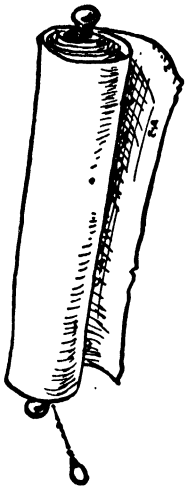
"When the gods gave me the land of Babylonia to rule and intrusted their sceptre to my hands, I dug out the Hammurabi canal, nourisher of men, which brings abundance of water to the Babylonian lands. Both its banks I changed into fields for cultivation, and I gathered up heaps of grain, and I procured unfailing water for the Babylonian lands."

He also made laws to prevent men from stealing cattle or sheep, laws about pasture and grazing rights, and laws which fined farmers if they did not keep dangerous animals such as bulls under proper control.

One of the most important crops in the Babylonian Empire was sesame, a plant whose crushed seeds gave good oil. The Babylonians probably cooked with this, while the Egyptians used more butter. There were other differences in their ways of cooking and their cooking pots, and they used different herbs for flavouring. The Cretans had their own special dishes too—which the Romans in due course brought to Britain—one of which was the pheasant, and a special flavour, saffron, which they got from a plant of the crocus family.

II

But the people who differed most from others in their food and food habits, because special rules concerning them were part of their religion, were the Jews. Their first homes lay north of Babylon, between the Euphrates and the Tigris. But about 2000 B.C. their patriarch, Abraham, led them forth to find a land of their own. They were not then a very civilised people. But later they had great writers and poets, and the story of their religion and their wanderings, their wars and heroes is told in the Old Testament, written on "rolls" of



Papyrus Roll

papyrus, and such "rolls" were the first books. It was the Jews to whom Man first owed faith in One God.

You will remember how Joseph's brothers went into Egypt to buy corn, how Joseph himself became a great statesman there, and, later, when the Pharaohs oppressed them, how Moses (about 1320 B.C.) led the Jews out across the Red Sea. Joshua had at last conquered the Promised Land for them, the "land flowing with milk and honey" which was called Canaan. Their great king David, who made Jerusalem his capital, lived about a thousand years before Christ.

By that time there had been many wars between the people of the Nile and the people of the Euphrates and Tigris. The face of the world had changed and new people were becoming important, the greatest of whom were the Persians.

The Persians became masters of the world from the Mediterranean to India. They conquered Babylon, and part of Egypt up the Nile to beyond Thebes. They did not add much that was new to the story of farming; but through the extent



An Eastern Shepherd of the time of Joseph

of their Empire and their great roads, they spread over a wider area the knowledge men had already gained. In this way, plants whose natural home was in Asia, such as the invaluable onion and the pomegranate, became well known and much used farther west, and along Persian roads the useful hen found its way in due time from India to Europe.

But away in the far east, unknown to the Persians, lived a race of great farmers, the Chinese. China had a civilisation quite as old as Egypt, but the Chinese were far less fortunate than the Egyptians both in their soil and in their climate. China is a vast country with much rocky or dry land, many steep hills and many raging rivers such as the Hwang-ho or Yellow river. A Chinese poet far away from his home described it in these lines, written in 1121 B.C.—

"White clouds are in the sky,
Great shoulders of the hills
Between us two must lie.
The road is rough and far,
Deep fords between us are.
I pray you not to die."

For centuries China's story was one of disastrous floods and equally disastrous droughts, both followed by famine. But her engineers even in those far-off days came to the rescue of her food-producers. They controlled the river floods by dams, canals and reservoirs, drained the sodden deltas at the river mouths, irrigated the arid lands, and made terraces on the slopes of the hills.

Even in those far-off times, China had a Land Department, with an important Minister who supervised these works, and taught the people which soils were suitable for each crop, how to take care of their tools, and how to use manures. The Chinese hoarded dung, fish offal and kitchen refuse with quite unpleasant zeal. Their villages stank; but by digging these things into their fields they made their soil so rich that they could get two or even three crops a year off the same land. Their chief crop was rice, but they also cultivated fruit trees, grafting and pruning them, and feeding them with special manures, with excellent results.

Long before forks were invented, and while everyone else



A Chinaman eating with chopsticks

in the world was still eating with fingers or knives, the Chinese ate their meals with chop-sticks, a delicate and difficult art. Their manners were charming, but they ate many strange things: bamboo shoots, sharks' fins, and bird's nest soup—said to be made from a kind of juice manufactured in the swallow's mouth! The "birds' nests" were in later times made in Borneo and millions were exported to China every year.

Why should we study the ancient history of the East? The answer is that civilised life began and was developed in the East, and mainly in what we call the *Bible Lands*. How far would the average citizen go in his day's programme if he were to put away, as of no use, the things which he has inherited from the early East?

"When he rises in the morning and clothes his body in *textile garments;* when he sits down to the breakfast-table spread with spotless *linen*, set with vessels of glazed *pottery*, and with drinking goblets of *glass;* when he puts forth his hand to any implement of *metal* on that table (except aluminium); when he eats his morning *roll* or *cereal* and drinks his glass of milk, or perhaps eats his morning chop cut from the flesh of the *domesticated animal;* when he rolls down town in a vehicle supported on *wheels;* when he enters his office building through a portico supported on *columns;* when he sits down at his desk, spreads out a sheet of *paper*, grasps his pen, dips it in *ink*, puts a *date* at the head of the sheet, writes a *cheque* or *promissory note*, or dictates a *lease* or a *contract* to his secretary; when he looks at his watch with the *sixty-fold division* of the circle on its face: in all these and in an infinite number of other commonplaces of life—things without which

modern life could not go on for a single hour—the average man of to-day is using items of an inheritance which began to pass across the eastern Mediterranean from the East when Europe was discovered by civilisation five thousand years ago."[1]

II "WE ARE THE CHILDREN OF GREECE."

Our Debt to the East and to Greece—The Live Soil and its Medicine—Bread and Wine—The Crown of Wild Olive

The East taught Europe. First in Europe to be affected by the culture of the East was Greece, whose city states developed the finest civilised life that Europe and the world have seen. We Europeans are "the children of Greece," for Rome learnt from Greece and spread Greek ideas from the East to the West.

Again, when the change from the Middle Ages to the Modern World began, that change was hastened by what is called the New Learning, which, though new to most people of that time, was a re-birth and development of the Old Learning of Greece and the East. Above all, the ancient Greeks loved freedom—as do their heroic descendants in our own days—and the very word "democracy" is the Greek word for "government by the people."

As long ago as when the Chinese were building their big engineering works to protect their farms, the Greeks were becoming important in the west. The Greeks and the Chinese of that time knew nothing about each other. The highest mountains in the world, the Himalayas, and other ranges, stood between them by land, and no one had yet travelled so far by sea.

Look at a map of the world as the Greek historian, Herodotus, thought it to be. He says he does not know how far the land stretches north, and he does not imagine that there can be anything farther east than India. He drew this map about 450 B.C., but the Greeks began to be important people

1 For this and some other quotations see *The New Past and Other Essays in the Development of Civilisation*, edited by E. H. Carter, published by Basil Blackwell.

as early as 1000 B.C., when David was King of Judah, and before the Persians had conquered Babylon and Egypt.

The Greeks are also specially interesting in the story of Man as Food-Producer, because they were the first people who really saw that the soil is a living thing. The Egyptians, Babylonians and Persians had learnt by practice that growing seeds need water, and that different seeds grow best in certain kinds of soil; and the Chinese knew that soil could be made richer by manure. But it was the Greeks who first saw that the soil is something like an animal, that it breathes and has a circulation, a digestion and even a skeleton, and that if the soil is not healthy seeds cannot grow well in it.

Farmers knew that the earth had to be ploughed before seeds were sown, but the Greeks knew that this was because the seeds could not grow unless the hard surface had been broken to let in the air. Farmers knew that seeds need water, but the Greeks realised that the soil itself needs water if it is to be kept fully alive, and that it has many little tubes, like veins, which carry the water about under the surface. The Chinese knew that the soil needs manures to make it rich, but the Greeks learnt that the earth actually eats, and that if crops are grown in it and draw the strength out of it, it has to be given food before it can help new plants to grow. That is a lesson that all farmers and gardeners have to learn in order to grow Man's food.

As to the skeleton of the earth, a certain Greek farmer moved to a new district, and there he cleared all the stones out of the surface of his fields as he had done in his old home. But his crops failed because the shoots were drowned in mud. From this and other experiences, the Greeks learnt that the soil must have a stiffening of rock particles or of stones to protect its breathing organism, just as the ribs protect the lungs.

So the Greeks gave medicine to their soil. They treated their fields with marl, a kind of rich earth which has many chemicals in it. The Greeks did not know the chemicals were there or how they worked, but they did know that marl bound the earth together, enough to keep its breathing and water passages open, yet at the same time left it soft enough for

seeds to be sown easily in it. Then they gave the soil food. Where grain had been sown and the soil was tired, the Greeks grew crops of lupins, beans, peas, lentils or vetches, which they cut down green and ploughed into the earth to feed it. They also fed it with manures, noting carefully which sort of manure was best suited to each type of soil and also to each crop. Not all soils need the same manures. Just as you can feed a horse on grass if it is not doing heavy work but must give it grain if it is expected to jump or pull big loads, so too the diet of the soil must be changed according to the work you expect of it.



Threshing the corn (Ancient Greece)

For instance, growing linseed (and oats) is hard work for the soil, and it needs rich food to do it. The Greeks found that the best food for their soil was bird manure, and they kept many pigeons for their dung, which they used not only on their fields but also on their gardens to grow beautiful flowers. The next year they grew a different kind of crop in the linseed or oats field, perhaps grass, and for this the field needed lighter food, like horse-dung, or in some cases it did not need any food at all, for over-manuring can give the soil indigestion, just as over-eating can give us a pain in the stomach.

Once they realised that the soil is alive, the Greeks wondered whether it would die if too many crops were sown in it. Learned men met at Athens to discuss whether the farmers were killing the soil, and to find out if the earth could possibly go on growing enough crops to feed all the new human beings born every day, for there were many more men in the world than there had ever been before, though far fewer than to-day.

The same problems—for finding food—still exist. During our own times men have met at Washington in the United States and elsewhere to discuss just these questions.

The Greeks lost interest in the questions before they had



Greek sailors trading with Britons

found answers. Being great sailors, and having a difficult land to cultivate because of its many hills, they began to import more and more of their food from other countries, from Egypt and also from the rich grain-growing lands near the Black sea. This importing of food ruined many of the small Greek farmers, who left the country to find work in the towns, while the big landowners of Greece gradually gave up making their valuable experiments in manures and in drainage, and drifted away from the soil into the more amusing cities, leaving their estates to be farmed by their slaves.

For a long time every city in Greece was a separate state; each tried to be more important, more splendid and alive than its neighbours. There were about 150 of these city states, and Athens and Sparta were the most famous. But by 325 B.C. all the Greek cities had been united under a mighty leader, Alexander the Great, and he spread the Greek language and ideas throughout his vast Empire from the River Nile to the River Indus.

A man living in a Greek city in Alexander's day had bread and wine for his breakfast. Then he went out about his business, and at mid-day he had a light meal of more bread

with olives, with cheese or onions or cucumber, wine to drink, and fruit or nuts. He had apples, pears, plums, grapes, figs and dates to choose from, and peaches which were called Persian apples. His nuts were walnuts, hazel-nuts, chestnuts and almonds. All these things were grown in Greece, except the dates which came from Egypt, and the corn for the bread, most of which came from the lands round the Black Sea. His big meal of cooked meats he ate at night.



Grinding the corn (Ancient Greece)

The olive and its oil were used in many ways in the homes of Greece, and we need not be surprised that a crown of wild olive was the chief prize in their Olympian Games. The olive " was used for cooking, for washing and for lighting. No one in Greece (outside fashionable hotels at Athens) eats butter; bread and olives or bread and goats' cheese are their 'bread and butter,' and Herodotus gives a minute description of butter-making or 'cow-cheese-making.' Hence oil is used in almost every dish, and every Greek cook would be lost without it (just as we miss our 'fats' in time of war). Again, the Greeks used no soap, but rubbed themselves with oil, and if that was insufficient, put scents on it. Lastly, when they outstayed the sun (which they did far less than we do), they had no other light but oil or resinous torches. Hence the multitudes of oil lamps in every classical museum. For each of these purposes thrifty housekeepers used a different quality of oil. The olives were squeezed in presses; the first squeeze produced eating oil, the second anointing oil, the third burning oil, and, finally, the remainder—skins and all—was used as fuel."[1]

In the afternoon the Greek citizen probably went to the gymnasium to take exercise and discuss politics with his friends, or he may have preferred to go to an open-air theatre to hear one of the great Greek Plays which wise men still read to this day. " Politics," " gymnasium," and " theatre " are

1 Zimmern, *The Greek Commonwealth* (Oxford University Press).

Greek ideas and words; and "school" is a Greek word meaning "leisure" to study. The Greek citizen did not do hard manual work because his slaves did it for him. This leisurely life gave the Greeks an opportunity to produce many of the greatest thinkers, artists and writers the world has ever known. They were interested in everything to do with men and with living, in freedom and the best forms of government—and, among other things, the Greeks wrote very good cookery books!

That we in Britain owe much to Greece we can judge from the many Greek words in our language. "You read *poetry* or *history* or learn *arithmetic* or *mathematics;* you go to the *theatre* and see a *tragedy* which makes you cry or a *comedy* which makes you laugh; you hear about *astronomy,* the story of the stars, or about *geography,* the story of the earth; you are ill and a doctor comes to see you who is either a *physician,* who gives you a pill, or a *surgeon,* who perhaps cuts something out of you. The Greeks taught the world about all these things, and all the words in italics are derived from Greek."[1]

1 *Histories,* Book I, Marten & Carter (Blackwell).

III

OUR DEBT TO ROME AND THE ROMAN EMPIRE

Social life in Roman Literature and the New Testament—The Immemorial "Open" Fields—The Parable of the Sower—St. Paul, Roman Citizen—The Germanic Invasions

In their early days the Romans had no kings or emperors. Rome was a great republic of free citizens. Gradually the Romans conquered Italy and the lands around the Mediterranean, until the whole of that sea seemed to be their private lake.[1] The Romans civilised Spain, and also Gaul which is now France. Then in 55–54 B.C. their general Julius Cæsar made two raids on Britain; but a hundred years were to pass before they conquered and civilised Britain. Germany they neither conquered nor civilised.

1 Some 2000 years later the Dictator Mussolini, hoping to emulate the ancient Romans, tried to make the Mediterranean a "private lake" again—in an age when it had become the world's great highway.

The Roman conquests gave more power to the leaders of their conquering armies. In 50 B.C. the two greatest leaders were Cæsar and Pompey, and they fought each other for the supreme mastery of the Roman Empire. Cæsar won and had himself made Dictator for life. So great and enduring was his fame that in modern times men who tried to imitate him were sometimes called Kaiser or Czar.



A Roman Shepherd of early times

Julius Cæsar was murdered, but his adopted son, known as Augustus, succeeded him and received the title of Imperator (Emperor). It was during the reign of Augustus that Christ was born in the Roman province of Judæa. St. Paul, as he proudly tells us himself (*Acts of the Apostles*, xxii, 27–28)[1], was a Roman citizen, though he belonged to one of the peoples Rome had conquered.

Under Augustus and his successors the Roman Empire grew, until its limits were on the west the Atlantic, on the north and east the rivers Rhine, Danube and Tigris, and on the south the desert of Africa.

The Romans were great farmers as well as great conquerors and law-givers and road-makers. In the early days before the Emperors, the chief generals and leaders of the people were proud to remain farmers. One of them, Cincinnatus, was actually ploughing his fields when a messenger from the

1 See the conversation between St. Paul and the Roman Captain, *Acts of the Apostles*, xxii, 27–28.

Senate (the Roman parliament) called him to be Dictator at a time when Rome was in trouble, and after he had done his duty he resigned his high position in the State to go back to his farm.

Cato, a great statesman and writer, who was Governor of Sardinia, devotes many of his books to farming and gives some very good rules which still hold good to-day. When he was asked what were the three most important things for a farmer to do, he answered:

"In the first place, thorough ploughing; in the second place, thorough ploughing; and in the third place, manuring."

He also wrote: "The owner of a farm should often see for himself whether it is properly ploughed. For this he need simply thrust a staff through the furrows; if the staff passes through without resistance, the soil has been properly ploughed . . . Fields should be ploughed when neither too dry nor too wet, or the plough will simply tear up large clods. Even the best soil is unfruitful in its deeper layers, and the large lumps torn up by the plough bring part of this under-soil to the top and reduce the fertility of the surface. Care must always be taken to break clods of earth. Ploughing should make the earth porous and friable (or easily crumbled) to keep it productive."

Cato was also interested in manures. "When you are going to sow corn in a field, keep your sheep there first," he advises. He also thought it a good idea to keep large aviaries of birds for the sake of their dung. He considered the best way to use manure was to spread it well over the fields in winter just after rain, and plough it in before sowing seeds in spring.

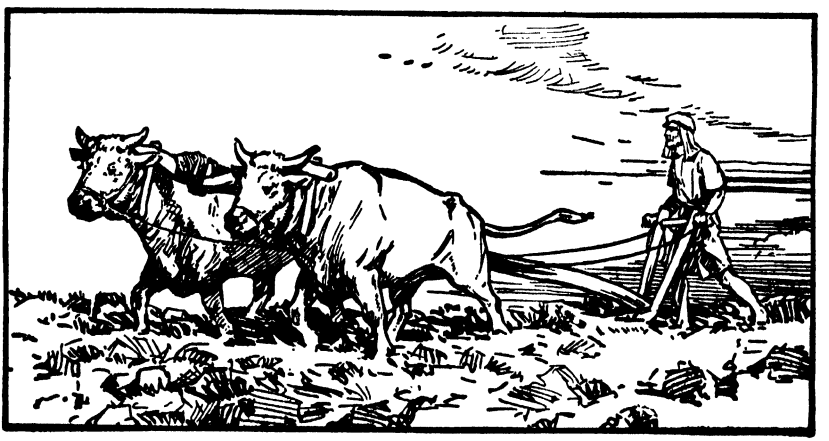
Wherever the Romans conquered new lands, they always tried to learn something about farming, for one of the very first duties of statesmen in all ages is to see that the people are fed. In Britain they found men using marl, as the Greeks had done. The Ancient Britons did not know as much about the nature of the soil as the Greeks, but they had found out by practice that there were two groups of marls, one greasy and one rough to touch. One of the greasy marls was a white chalk which we now use, finely powdered, for cleaning silver. The Britons valued this so much as a fertiliser that they dug

mines for it, sometimes a hundred feet deep. When the Romans occupied Britain, they tested the white marl and found it so good that one dose of it would act as a tonic to a field growing grain or grass, for as long as fifty years.

Whenever the Romans discovered anything new of this kind, the travellers along their wonderful roads spread the new knowledge throughout their lands, from the Tweed to the Tigris. They had one road which ran, a firm and fine road, right across their Empire from York to Jerusalem, 3655 English miles of road, broken only by two short sea crossings, the English Channel and the Adriatic.

By far the best pictures of farming at the eastern end of that famous road are to be found in the New Testament.

In the parable of the Sower we can see the open, unhedged, ploughed fields, which were common throughout Europe until modern times, and in Russia until the Revolution. From these open fields, the sweep of the sower's arm scattered some seed " by the way-side," that is in the road, where it was trodden down by the passers-by ; and some fell on rock, and some among the thorns, for the fields were not skilfully cleared as we clear them to-day. But the widespread interest in farming is shown in the parable of the man who gave a great supper, for the excuses of the guests who did not go to the supper were : " I have bought a piece of ground and must needs go and see it," and " I have bought five yoke of oxen,



Ploughing with oxen (at the time of the New Testament)

and I go to prove them." From the parables of the Lost Sheep and the Good Shepherd we learn how well the eastern farmers cared for their flocks, so that the sheep knew their master's voice and would follow him. And Christ himself is the " Good Shepherd."

All through the Gospels (which were written in Greek and within the Roman Empire) are short vivid stories of the farming life of the East and of those Eastern countries where life still goes on to-day very much as it did in the time of Christ.

One of the greatest Roman poets, Virgil, who died just before the birth of Christ, wove into his splendid Latin verses living pictures of farming in the West.[1] He had too some very good advice to give farmers about the care they should take in collecting seed each year for the next year's harvest. Only the best seed should be chosen, he said, and picked by hand, for, if men did not keep trying to improve their crops by this selection, the plants would lapse into their wild state like the wild wheat of the early farmers.

Two other later Roman writers, Columella and Pliny, who both lived in the first century after Christ—when Britain had become a Roman province—had equally sound advice to give. Here is Columella's advice about drainage, which could not be bettered to-day:

" Superfluous moisture must be drawn off the ditches, either open or covered .... Open ditches must be wider at the top than at the bottom; if they are of the same width throughout, the sides are undermined by water, and the falling earth fills up the ditch. Covered ditches are dug to the depth of three feet, half filled with small stones or coarse gravel, and the earth dug out is then thrown over the top and levelled ... At the end of the ditch, two stones are placed upright, like pillars, to support a third, like a small bridge; this keeps the ditch open."

Pliny gave rules for what we call rotation of crops, explaining how the same kind of seed should not be sown two seasons running in the same place, because the soil needs a

1 Ask your Public Library for a translation of Virgil's *Georgics* (from the Greek word for *farmer*).

change of plants—just as people need a change of air—to keep healthy.

To the Romans at the height of their greatness, as to the Greeks in their brightest days, it seemed natural that all intelligent men whether living in a city or in a village should take an interest in farming, a lesson our own country is perhaps at last learning. Farming means food-producing, and we know how vital that is in time of peace no less than in time of war.



Inscribed Badge worn by a Roman Slave.
The words run: "Hold me, lest I escape, and take me back to my master Evvientius on the Estate of Callistus"
British Museum

In the early days the Romans were allowed only very small farms, about $4\frac{1}{3}$ acres for a family. As we have seen in the case of Cincinnatus, however important their position in the world, the owners looked after the land themselves. But later, again like the Greeks, great land-owners who had many acres went to live in the cities and left the land to be worked by ill-fed slaves, sometimes with their legs in chains, or by criminals sent in gangs from the prisons.

The character of the citizens of Rome, after a thousand years of its history, changed for the worse. Constantine the Great, who had been proclaimed Emperor at York, decided to leave the old capital, Rome, in 326 A.D., and to build himself a new capital much farther east, on the Bosphorus, between Europe and Asia. It was called Constantinople, the city of Constantine. To-day it is the Turkish city of Istanbul. It is to Constantine that we owe Sunday as the day of rest and worship, and it was he who made Christianity the official religion of the Roman Empire.

The Roman Empire at last became divided. The eastern empire lasted another thousand years, until the Turks with modern weapons, guns and gunpowder, took Constantinople in 1453. The western empire began to break up much earlier, soon after 410, when Alaric the Goth conquered Rome. Germanic tribes, known as Barbarians, living outside the

Roman Empire, broke through the Roman frontiers. These Barbarians destroyed much of the old civilised life. Schools and libraries were burnt, estates ruined and cities destroyed. "To-day there is on every side death," wrote one who was living in those times, "on every side grief, on every side desolation." So it was with the break-up of the old Roman-Greek world; so it was again even in the twentieth century when modern European civilisation seemed on the verge of destruction. The ancient Greek culture and Roman rule did not penetrate to Germany, a very significant fact in the world's history.

Little by little these peoples from the north and east, wandering over the old Empire's frontiers, occupied the civilised Roman lands. In course of time, mainly through the guidance of the Christian Church, they became the New Nations of Europe—the Franks in France, the Angles and Saxons in England, the Lombards in Lombardy, the West Goths in Spain, and so on. The western parts of Europe fell for a time into a state of turmoil and ignorance, and the centuries of these "migrations of the peoples" are sometimes called the Dark Ages—and very dark they would have been but for the work of the Church.

For agriculture they were very dark indeed. Nothing new was added to Man's knowledge of the soil on which his very life depends, until the dawn of a new age and of a new learning of the ancient wisdom of Greece.

IV BARBARIANS INTO NEW NATIONS—THE CHURCH AS CIVILISER

Barbaric Huns and Civilising Arabs—When Farms were Battlefields—Our Debt to the Church—The Feudal Age, the Age of Faith and of Crusade

The Middle Ages is the name given to the centuries between the break-up of the orderly Roman world and the rebirth (or renaissance) of experiment and learning—that is, roughly from the fifth to the thirteenth century. During the earlier of these centuries, men were so busy fighting that they had little time to think of much else. As usually happens in time of

war, farms and villages often became battlefields, retreating armies burnt crops to starve their enemies and victorious armies drove off great herds of cattle for food. The wildest and most destructive of all the barbarians were the Huns.

It was the Huns who first caught and tamed the horse in northern Asia, thousands of years before Christ. By the time they came pouring into Europe at the end of the fourth century, the Huns were bow-legged from generations of riding. They ate, drank and sometimes even slept on their small swift horses. They cut slices of raw meat and held them in the grip of their crooked thighs to cook a little between the heat of their legs and the heat of the horse's body, and they carried little hard balls of curd cheese which they softened in water from skin bottles. They ate savagely like animals; they were very ugly and very strong and they fought as savagely as they ate.

The Huns loved plunder more than anything else in the world. They would sweep into villages yelling and killing, take everything of value, set fire to the houses and drive off the cattle to their own crude camps of tents and heavy store wagons. Their native drink was made from fermented mare's milk, but always they tried to loot enough beer and wine in their raids to keep them drunk for days at a time.

Contrast this way of living with the ideal of the Roman Poet, Petronius Arbiter (died 66 A.D.):

"Small house and quiet roof-tree shadowing elm,
Grapes on the vine and cherries ripening,
Red apples in the orchard: Pallas' tree
Breaking with olives, and well-watered earth,
And fields of kale and heavy creeping mallows . . ."

But the people of the Dark Ages were by no means all as brutal as the Huns. The most intelligent and civilised were the Arabs, the followers of Mohammed, and to the Arabs the Middle Ages owed much. They made their way from Asia along the north coast of Africa. In the eighth century they crossed the Straits of what we call Gibraltar (which derives from Gebel-el-Tarik—"Hill of Tarik," named after their leader Tarik). They had taken most of Spain by 711. They brought many good things with them, including the neat

Arabic figures (4, 5, etc.) which came from India, and which we use to-day instead of Roman numerals (IV, V). They invented algebra (an Arabic word). They taught Europe how to make paper. They introduced new plants, the chief of which were those health-giving fruits, the orange and the lemon. They also brought coffee into Europe. They were great coffee drinkers because their religion forbade them to drink wine.

Coffee grew wild in Abyssinia, and there are several legends of how it was first found to be good to eat, for in the third century it was eaten, made into a paste rather like our chocolate. It was the Arabs who found out how to turn it into a drink and who introduced coffee-drinking into Europe.

Tea was a Chinese plant, and in the third century it was used only as medicine. Not until the sixth century did the Chinese use it as we use it to-day, and it was unknown in Europe for hundreds of years after that. In England tea remained a rare drink right down to the reign of Charles II. Pepys, who kept a famous diary during that reign, notes that he drank his first cup of it, " a China drink," in 1660, and in 1667 he writes:

" Home, and there find my wife making of tea; a drink which Mr. Pelling, the apothecary, tells her is good for her cold."

The Romans drank wine, both in their camps, and at their great banquets where the guests lay on couches crowned with garlands of flowers and ate delicately-cooked food brought from all parts of their wide Empire. The chief drink of the Barbarian armies was beer, and they wore trousers and fur coats, which shocked the Romans who wore the toga or cloak. The art of cooking was forgotten, like many other civilised



Romans at a meal

arts, during the constant warring of the Dark Ages. The Barbarians had crude manners and ate coarse food, and most of them were fighters rather than thinkers.

The later centuries of the Middle Ages when the Church was teaching the New Nations of Europe the Christian religion, and something of the law, the order and the arts of the old Roman-Greek life, are sometimes called the Age of Faith and of Chivalry, The Age of Chivalry is the Age of the Crusades, of armoured knights and hero kings, of poets and painters, of saints and great churchmen. In this age it is the Church, and especially the monks, who deserve the first place in the story of agriculture, of caring for the land that fed the people. The monks, who held many farms in all parts of Christian Europe, were almost the only people to try to improve their estates. They themselves with their own hands drained marshes, cleared forests, brought waste or barren land under the plough so that it bore crops, and made roads and bridges so that they could move about easily on their own lands. The monks did more than anyone else to keep Europe from forgetting the arts and crafts of the old world. St. Benedict (died 543) insisted on the value of work for his followers; he taught them *Laborare est orare,* "To work is to pray."

In most lands, but especially in England, France and Germany, stood small, strong walled towns and the fortress castles of the great barons. On the Continent, these barons had private armies which they did not hesitate to use in their own quarrels; but in England, thanks to the wise rule of William the Conqueror, the barons had been forbidden to call up their men to do battle against their King or their neighbours. Of course they did this sometimes, especially when there was a weak king. This happened in the reign of Stephen, and at other times in the Middle Ages; but there was on the whole and has always been less private and less cruel warfare in England than in other countries.

V THE MANORIAL VILLAGE OF THE MIDDLE AGES

Lords and Villeins—The old "open" strip-fields, ox-ploughed—Bread and Beer Crops—Manor and Town—The Black Death and the Peasants' Revolt

I

In the Middle Ages the prosperity of farming was a matter which concerned the lord of the "manor" (which we may think of as a "village") and his "tenants." Part of the land was kept by the lord for himself, and on it his food was grown by his villeins.[1]



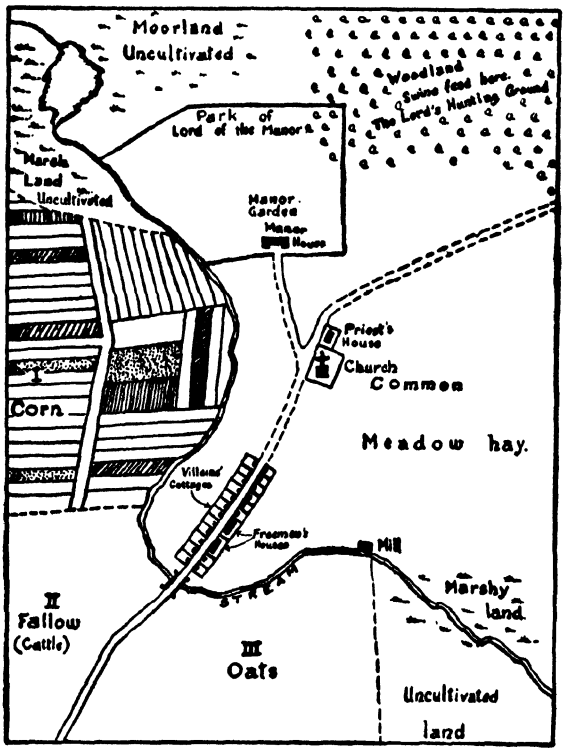
Peasant of Richard II's reign

Throughout the Middle Ages, the villeins formed the great mass of the population of Europe. The villein in England "was neither a servant nor a labourer for wages. He occupied land, and like Chaucer's ploughman had cattle of his own. He was a partner in a village association in which the village affairs and the village farm were managed co-operatively. But he was unfree in the sense that he had to live on the manor and might not leave it, and he had to do certain things for his lord, of which the most important was working three days a week on the lord's home farm. But he did not belong to that small class of "freemen" whom the Great Charter made famous: "No freeman shall be imprisoned or dispossessed unless by the lawful judgment of his equals or by the law of the land." However, in the Middle Ages—when the population of England was about a twentieth of what it is nowadays—

1 *Villein, tenant, demesne, farmer, arable*—all these words about the land derive from the Latin of the Romans: *villein*, from *villa*, a farm or estate; *tenant*, meaning "holder" of land; *demesne* or domain, land of the *dominus* or lord; *farmer*, *one who paid firma* or rent for land; *arable*, from *aro*, plough.

the mass of the people had some land for themselves on which to grow their own food and learn to farm.

The lord's land, the villeins' land, and that of any "free" men who happened to live on the manor, were all mixed up



Plan of medieval manor, with its "strips" and three-field system (I, II, III).

See also page 51 (plan).

together in the village farm, which consisted of three huge arable or ploughed fields, sometimes of a hundred acres, fenced in to prevent cattle straying from the surrounding country of "waste" or "common" land or woodland.

In the Middle Ages and long afterwards, rural England did not look like a great garden, as it does to-day with its well-tended, small fields. Not only in England, but throughout Europe, for at least two thousand years, and sometimes until modern times, the arable field was divided into strips. Each

of these strips was separated from its neighbours by a broad double-furrow, and so the great arable field of hedgeless strips was called an "open" field.

Every villein or peasant had a number of strips of land scattered over the arable fields. For example, a deed of 1397 tells that Morgan Gough held "three acres one rood of arable land lying in the fields of Mobury—whereof one acre (strip) lies in Brokeryg between the lord's land on either side; and one acre (strip) in Totecombe between the lord's land and the land of Thomas Cobbe, and (a strip of) three roods in Brokeryg between the lord's land and the land of William Crocker, and half acre (strip) there between the land of Thomas Cobbe and the land of Ralph Smale."

How the village folk worked its land co-operatively is told in the fourteenth century poem *Piers Plowman:*

"Now are Piers and the pilgrims to the plowing gone
To plow his half acre; many a one helped him.
Ditchers and Delvers dug up the ridges,
Thereat was Piers pleased and paid their full wages . . .
Each man in his way found him work to do.
And some to please Perkin picked away the weeds."

If the strips were acre strips, they were four measuring poles or rods (22 yards) in breadth and a furrow-long or furlong (220 yards) in length, that is, as much as a yoke of oxen could plough without needing a rest. Ploughmen to-day still measure the acre in the same way as their forefathers measured the open-field strip.

Throughout the Middle Ages and long afterwards, one of the big arable fields in each village, that is, a third of the plough land—was left "fallow" every year; which meant that, though it was ploughed and harrowed, no crop was sown in it for a year or more in order that it might have a rest-cure, for men had forgotten how to feed the soil. During the first year, one of the three arable fields was ploughed by the oxen in winter and sown with wheat (or rye) for the bread crop; the next year it was ploughed in spring and sown with oats or with barley for the drink crop (beer), with perhaps peas and beans in one part, chiefly for food or fodder for the cattle; the third year it was left fallow. Then in the fourth year wheat

or rye might be sown again, and so on. These were the crops that Shakespeare tells of:

" . . . . . thy rich leas'
" Of wheat, rye, barley, vetches, oats and peas."

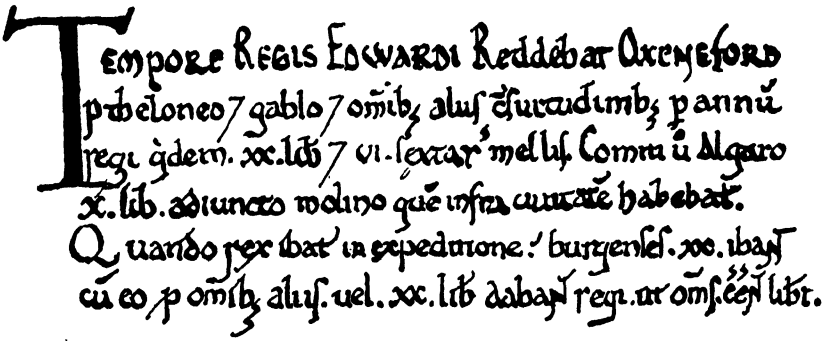
But in those days there was never enough fodder or dry food to keep all the cattle alive all through the winter. Every Martinmas, the cattle, except a few needed for ploughing and milking, were killed and their meat salted and stored for eating in winter, when people had to go without fresh meat.



A Pedlar

Each manor or village made itself as far as possible self-supporting. Of course some things such as salt and millstones might have to be bought from fairs or markets, or from pedlars, or travelling chapmen with their pack-horses.

A decree of Charlemagne (800 A.D.) shows how thoroughly his stewards in the Holy Roman Empire looked after the Emperor's manors: "We desire that each steward shall make an annual statement of all our income, giving an account of our lands cultivated by the oxen which our ploughmen drive, and of the lands which the tenants ought to plough; of the pigs, of the rents, of the fines; of the game taken in our forests, without permission; of the mills, of the fields, of the forests, of the bridges and ships; of the freemen, and the districts under obligations to our treasury; of markets; of vineyards, and those who owe wine to us; of the hay, firewood, torches, planks and other kinds of lumber of the waste lands; of the vegetables and millet; of the wool, flax, and hemp; of the fruits of the trees, of the nut trees, larger and smaller; of the grafted trees of all kinds, of the gardens, of



TRANSLATION:—In the time of King Edward (the Confessor) Oxford paid for toll and gable and all other customs twenty pounds and six sextaries of honey yearly to the king. But to Earl Algar ten pounds in addition to the mill which he had within the city. When the king went upon an expedition, twenty burgesses went with him for all the rest, or they gave twenty pounds to the king that all might be free.

(Extract from *Domesday Book* of Oxford; reproduced actual size)

the turnips;[1] of the fish-ponds, of the hides, skins, and horns; of the honey and wax.

"They shall make all these known to us, set forth separately and in order, at Christmas, so that we may know how much of each thing we have .... Each steward shall have in his district good workmen—namely, blacksmiths, a goldsmith, a silversmith, shoe-makers, turners, carpenters, sword-makers, fishermen, soap-makers, men who know how to make beer, cider, and perry, and other kinds of liquor good to drink, bakers to make pastry for our table, net-makers who know how to make nets for hunting and fishing; and other sorts of workmen too numerous to be named."

About two centuries later, our William the Conqueror ordered that detailed survey of all the English manors to be made which we call Domesday Book, and its story is told in all our English History books. *The history of even a remote village is the history in miniature of the nation.*

II

If the lord lived in the manor house, he might know his tenants well and take an interest in their welfare. But many lords visited their manors only now and then, for they often

1 The great value of turnips was not known in England until almost modern times—See Chapter IX.



Peasants of the fourteenth century

had many manors in different parts of the country and they travelled about eating up their share of the produce of each manor in turn.

The steward looked after the lord's land and collected in the Manor Court any fines the villeins had to pay, e.g. "William Jordan for bad ploughing on the lord's land—Fine 6d." "The Parson of the Church" is to pay a fine "for his cow caught in the lord's meadow." "From the whole township (except seven) of Little Ogbourne, for not coming to wash the lord's sheep, 6s. 8d."

It is now recognised that the open-field system of farming wasted very little arable land and was well suited to the needs and resources of the medieval village community.

It should be remembered that most towns began as manors or villages. Birmingham "in the Domesday Survey appears as a little hamlet, with only nine landholders, all in villeinage .... By the early fourteenth century, industry had made some headway .... In the sixteenth century, the village was becoming a town with two markets ... two gildhalls with endowed schools, three churches ...."[1]

Some of the methods of the old manorial government lasted

1 Gill: *Studies in Midland History* (Oxford University Press).



A fifteenth century Manor House

in the towns almost to modern days—until it was reformed and made efficient by the Town Councils Act of 1835.

When the great plague, called the Black Death,[1] swept from Asia over Europe, and over England (in 1348–49), people died like flies—in those days men knew so little about disease and medicine. Over a third of the entire population of our own country was wiped out in a few months. Agriculture suffered, for in many villages there were not enough peasants left to gather in the harvest. "The attack of the pestilence was sharp and widespread, though irregularly distributed, but its effects were shortlived."

Both before and after the Black Death, villeins began to pay money rent (instead of a service rent) for their land. And with the money, the lord began the modern system of hiring labourers for wages, a system which became "the economic basis of modern industrial society."[2] This process was hastened by the Peasants' Revolt of 1381, when the first English Socialist, the priest John Ball, preached to the people:

"Ah ye good people, the matters goeth not well to pass in England, nor shall do till everything be common and there be no villeins nor lords, but that we may all be made one together . . . ."

1 So called from the *black boils*, its chief symptom.

2 See Lipson's *The Economic History of England*, Vol. I (A. & C. Black).

By the end of the Middle Ages—in England but not for a long time in the rest of Europe and in Russia not until 1861—villeinage or serfdom died out, until under James I, it became a legal maxim that every Englishman was free. And so John le Villeyn was no more—John the Villein (or peasant) who "holds half a hide of land" . . . scattered in strips . . . "for which he owes three days' work in the week, or vi pence, and ten eels each year upon Ash Wednesday to the lord's table."

Wars, bad harvests and plagues (for the Black Death was only one of many epidemics which swept over the country) were discouraging for farmers. Few were able to try experiments to improve their crops until the agricultural revolution connected with the names of Tull, "Turnip Townshend" and Squire Coke (see later chapters). Much of England remained until almost modern times, as it had been throughout Europe for some two thousand years, carved up into open fields, often divided into "strips." Such a farm actually survives at Laxton (Notts.) to this day, and the modern visitor is impressed by the "openness" of the three large fields,[1] with their "strips" still divided amongst about thirty tenants.

When Henry VIII destroyed the monasteries, much of the land in England changed hands. "The monasteries had also served as almshouses for the poor, as banks for valuables when people went away, as guest-houses for travellers, and as models of good farming."[2] And though some of the new landowners were improvers of farming, others became pasture-and-sheep-farmers and turned adrift the old labourers.

1 Orwin's *The Open Fields* (1938) (Oxford University Press) is the standard work on this subject and contains a full account of Laxton with plans and illustrations.

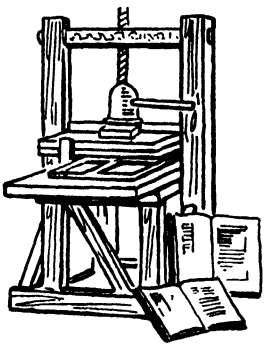
2 Marten & Carter's *Histories*, Book II.

VI THE NEW LEARNING AND THE NEW WORLD

The Invention of Printing—The New World sends potatoes, sugar and tobacco to Europe—The Indies and the "Grocer"—Wool, the Woolsack and the "Draper"—Elizabethan England—Beggars and "Public Assistance"

Things did not improve much during the passing of the Middle Ages until strong, capable kings, such as the Tudors in England, curbed the pride and jealousy of the great nobles and suppressed civil wars.

As peace and order were restored, more people had time to think, and they turned eagerly to the wise things written and the fine things done centuries before in ancient Greece and Rome, and a "New Learning" gradually developed with the help of the old learning. From the thirteenth century onwards in Europe, there began a splendid flowering of men's minds—in poetry, painting, crafts and science. Sailors were now using the Mariner's compass to help them to make great discoveries. Soldiers had their new guns and gunpowder, and with these the Turks battered the walls of Constantinople in 1453. About the same year the German, Gutenberg, had set up the first known Printing-press with movable type in Europe, and Printing meant as great a change in the fifteenth century as Broadcasting did in the twentieth century.

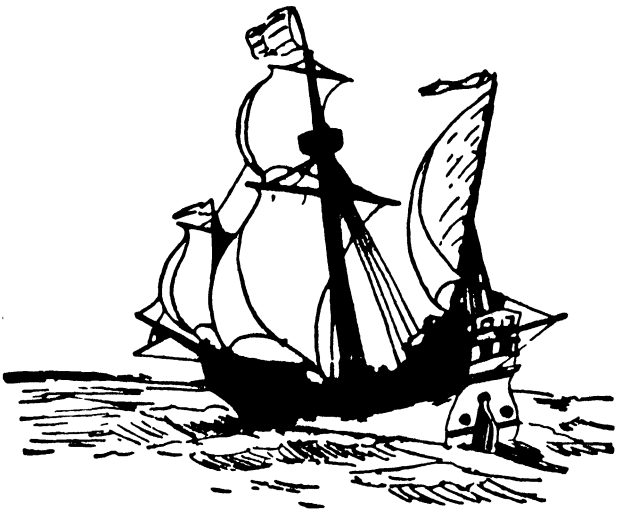


Gutenburg's Printing-Press

New and rich goods were soon being made and traded from country to country. In 1492, a Genoese sailor, Christopher Columbus, set off in his tiny ship from Spain, westward across the unknown ocean, to find a new route for trade with the Indies and the East. After sailing for over two months, he came to land which he thought must be part of the Indies, but in fact it was an island—one of those ever since called the West Indies. But neither the islands nor the natives had anything to do with the real Indies of the East, and Columbus died without

knowing he had discovered the New World of America. The Red Indians of America were hunters and not farmers and, like the Tasmanian and New Guinea natives when first discovered, they were still living in their Stone Age.

From America, in the next century, one of Sir Walter Raleigh's followers brought potatoes, which were to become in time one of the most valuable crops in Europe. From America too came turkeys[1]—they did not come from Turkey



Columbus on his way to the New World

in spite of their name. Columbus sailed from Spain, and it was the Spaniards who first made sugar as well as tobacco popular in Europe. Raleigh was, it seems, the first Englishman to smoke a pipe.

Farming and food-producing lagged sadly behind during this great period of re-birth into the Modern Age. At the beginning of our Elizabeth's reign, methods of farming as primitive as those of the ancient Egyptians were still in use in England. There was little or no irrigation, the drainage was bad and the manuring poor. The few cattle that were kept through the winter were given straw and hay and sometimes peas and beans, and " browse " or tree loppings (which

1 "*Turkey,*" applied originally to the Guinea-fowl, a native of Africa, with which the American (Mexico) turkey was at first confounded (*The Oxford English Dictionary*, Vol. XD.



Farming operations in olden days. (*a*) Ploughing; (*b*) Sowing; (*c*) Threshing with flails; (*d*) Cutting down the corn with sickles; (*e*) Piling the corn into stooks; (*f*) Carting the corn to the barns. N.B.—This seems much the hardest task of all for the reapers

British Museum

you can see cattle eating to-day when they are hungry). The cows gave such poor milk that in some parts of the country they were not milked from Michaelmas to May, but had to be given a rest, like the soil, because they were not properly fed. As much butter as possible was made and salted and put into stone jars for winter use; but fresh butter, fresh milk and fresh meat were very hard indeed to get after the middle of November.

Until farmers learnt the value of turnips and other root crops for feeding cattle in winter, they had to kill in the autumn the cattle not needed for milking or ploughing, and to salt and spice and store the meat for eating in the winter. This partly explains why Columbus and other great discoverers were so anxious to find sea routes to the Indies, where grew the *spices* such as cloves, pepper, nutmegs and cinnamon which were needed to make the salt meat pleasant to eat. Everyone wanted spices and it was the most profitable of trades. The "grocer" was a merchant who bought and sold spices and other overseas produce wholesale or by the gross. A few years after the defeat of the Spanish Armada (1588), the first expedition of our East India Company sailed from England (1601) and brought back (1603) a million pounds' weight of pepper, which took eight years to sell.[1]

Nowadays we should think the animals of the Tudor age very small and wretched, but the Elizabethans were very pleased with them and with their own farming. William Harrison, in his description (1577) of England, speaks of the size and beauty of the English cattle, and says that "in flesh, tallow, hides and horns they were not easily exceeded." Tallow was important because it was still the chief source of light, but the flesh we should now consider very poor meat.

Harrison, too, notes with pride that wheat lands yielded "as much as 16 bushels from an acre"; but for a modern farmer that would be a very bad harvest. Nowadays the average has doubled and is about 32 bushels to the acre in England. Again, Harrison remarks that England was covered with "divers bogs and quick-moors," without realising that this was land which should have been drained and farmed,

1 See Williamson: *The British Empire & Commonwealth*, Vol. I (Macmillan).

just as in 1941 the War taught us to cultivate neglected fields. And Harrison was proud of English gardens, enriched by the "strange herbs, plants and annual fruits daily brought unto us" (thanks to the Great Discoverers) "from the Indies, Americas, Canary Islands and all parts of the world."

In the later Middle Ages and in Tudor times, England was successful in the rearing of sheep. Sheep were then exceedingly important, not so much for their mutton to eat as for their wool to make cloth and to sell overseas, especially to the cloth-makers of Flanders. The wool trade made England rich, and much land was enclosed within hedges for sheep pasture, because landowners could make more money out of wool than out of anything they could grow. From Edward III's time, thanks largely to the Cistercian monks, England became the largest wool-growing country in the world, as England's sister nation of Australia is to-day. And our Lord Chancellor still sits in the House of Lords on the "Woolsack," the symbol of the wool trade as the basis of our commercial greatness. The "draper" (French *drap*, cloth) was a dealer in woollen cloths.

In certain areas and at certain times, portions of the open arable field were being displaced by sheep pastures without regard to the interests and the rights of peasant holders. But land enclosures of various kinds have a long history in our country. "As early as the end of the twelfth century, landlords had begun to withdraw their demesne lands (or home farm) from the village farm, to enclose and cultivate them in separate ownership... But whatever form the enclosure took... it was always directly opposed to the open system of farming in common."[1]

When men began to enclose their land for sheep farms, they and the cloth merchants often became wealthy, as the fine churches and houses (dating from the fifteenth and sixteenth centuries) of the Cotswolds and East Anglia show to this day. Many of them went to live in towns, leaving their stewards to collect the rents and look after the few shepherds needed to care for the sheep. And the peasants, who had ploughed and sown and reaped and milked, now found themselves out of

1 Lord Ernle: *English Farming Past and Present* (Longmans).

work. Often, too, they lost their cottages and their strips of land. Selfish landlords would sometimes turn them out of house and home, because their strips were wanted to enlarge the sheep farms. Others would raise rents so high that the poor people could not afford to pay them. In poverty and distress they roamed the country, sometimes even forming terrifying bands of beggars.

"Hark! hark! the dogs do bark,
The beggars are coming to town;"

belongs to Tudor times.

There were so many poor by Elizabeth's reign that the government itself had to arrange with the parishes to help the poor—and this was the beginning of the system of the "Relief of the Poor and the Distressed" which to-day we prefer to call "Public Assistance."

So the rich grew richer. At town banquets "beef, mutton, lamb, kid, cony, capon, pig, deer, fish and wild fowl, each in season" were served, with "French, Italian, Grecian, Spanish and Canary wines." It is Harrison again who tells us that most of the cooks for these great banquets were "musical-headed Frenchmen and strangers." Queen Elizabeth drank beer for her breakfast, for tea and coffee were not yet used in England.

Then towards the end of Elizabeth's time (she died in 1603), men began slowly to realise that, in spite of these rich banquets and the wealth now flowing in from a New World, the people would starve if they could not produce better food.

In the course of the centuries, and at different times in different areas, the strips of the big "open" fields were "enclosed" within the smaller "fenced" fields of to-day, both for pasture and for corn-growing; and the system of landlord, farmer and labourer became general.

The enclosure of the "open" fields was doubtless necessary for the increasing food needs of the country; but we should not forget what rural England has lost by the decay of farming "in common" which once gave our people a living interest in the land and an education in managing the manor or village and its affairs.

VII THE BEGINNINGS OF CHANGE TO OUR OWN TIMES

Dutch Farmers and Engineers—Scottish Farmers and Cromwell's Soldier-Farmers—The Draining of the Fens—"Enclosed" for "Open" Farms—History in Field-Names—"The Oldest fear in the world"

The first people in Europe who really understood the importance of good farming were the Dutch. By the end of the sixteenth century they were the best farmers in the world. The low-lying position and small size of their country, which at first seem disadvantages, actually helped them to become good farmers, because they were forced to learn drainage to save their fields from the sea, and they had to find ways of growing as many crops as possible on each piece of ground in order to feed themselves at all.

In England, which was a comparatively big country for the number of people then living in it, and had rich, safe soil, less scientific methods were possible. But the Dutch had to be clever and careful in order to live, and so they were the first to re-discover and improve upon the farming ways of the medieval world.

The Dutch left none of their land lying fallow or uncropped, but kept it healthy by a "rotation" of crops, growing different crops on it in successive years, and by feeding it with ploughed-in green stuffs and manures. The crops they grew included *turnips*. In other countries turnips were then grown only in gardens as vegetables. But the Dutch used them both as a tonic for their fields and to feed their cattle in winter. For they did not kill off their herds in autumn as the English did, but kept them indoors and fed them in their stalls, giving them not only hay but also turnips sliced up and warm mashes of grain and linseed cakes. This diet made the cows' milk very good and plentiful, so that the Dutch had more than they needed even in winter, and they early began to use the surplus milk to make their famous Dutch cheese.

Two English writers, Fitzherbert and Tusser, knew something about these Dutch discoveries, and wrote of them in books

which were published just before Elizabeth came to the throne. But English farmers disliked new ideas, and there were few like Sir Richard Weston who would adopt these good methods.

Weston was a Surrey knight, born at the end of Elizabeth's reign. He was educated in Flanders and saw for himself the great advantages of Dutch farming. He wrote books filled with good advice, and he tried Dutch ways on his farm near Guildford. He made experiments in several rotation systems, growing turnips and clover, sainfoin, lucerne and rape, as well as grain, hay and beans. He found he could cut the clover two or three times a season before ploughing it in, and that it was fine summer food for cows. In winter he fed his cattle on oil-press refuse together with brewers' grain (from which beer had been made), and so began what has since developed into a big industry, the manufacture of cattle-cake for winter feeding.

Weston was very successful and it is surprising so few people copied him, but the English are a conservative people and somewhat suspicious of change. All through the reigns of James I and Charles I—when Parliament and King were at loggerheads—little change was made in farming in England. But the Scots were much quicker in adopting new ways; probably few of them had heard of Weston, but they made experiments of their own. In 1650, during the Civil War, when Cromwell marched north against the Scots, their farming was years in advance of English methods.

There were farmers in Cromwell's army, and they were so impressed by the Scottish farms that, in their military despatches on the very eve of the Battle of Dunbar, they told the English Parliament:

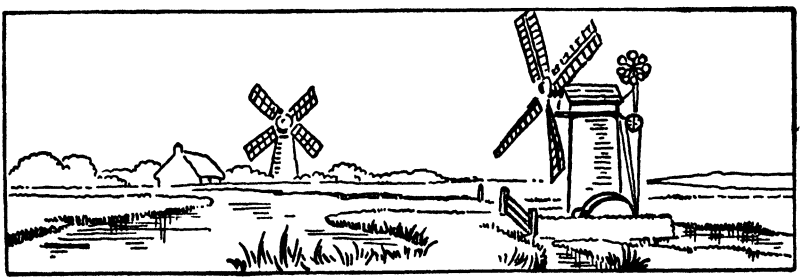
"... in these parts where the army marched (which was East Lothian) was the greatest plenty of corn that ever they saw, and *not one fallow field;* but now it is extremely trodden down and wasted, and the soldiers enforced to give wheat to their horses."

This shows that the Scots had given up the old wasteful system of fallow. They had managed by good rotation to use all their land every season, and also to grow heavier crops of grain than the English grew on their land.

Then, about this time, the English began to wake up. Landowners, working farmers, members of Parliament, and even poets like Milton, seriously discussed the problem of farming. The biggest problem of all was how to produce more corn, more meat, and more milk, all at the same time.

One way of course was to farm more land. In 1630 a private company was formed, called the Company of Adventurers, which began to drain the *Fen Lands* around the Wash. A famous Dutch engineer, Cornelius Vermuyden, was in charge. He planned straight cuts to shorten the rivers and designed a network of drains. By this method he succeeded in reclaiming a large tract of land, and was knighted for his work. The Civil War between Cavaliers and Roundheads put a stop to this fen-draining for a time; but when Charles II was King, the Company set to work again with renewed energy, using pumps worked by windmills (as you can still see in the Fens). The result was the 100,000 acres of farm land known as the Bedford Level, so named after the Earl of Bedford who was Chairman of the Adventurers. The fen drainers had many difficulties to overcome, apart from engineering problems, because the men who lived on the drier parts of the Fens, growing a little food, fishing and shooting wild birds, were very angry at having their lives changed. During the Second World War of our own days many more fen acres were reclaimed for farming and food, and many more had to be re-drained after the terrible 1947 floods.

Owners everywhere who "enclosed" their land were strongly opposed by the village people. Yet the enclosing of the "strips" into fields, surrounded by hedges to make



Windmills for fen draining

compact farms, was essential for the new improved way of farming, as the Dutch and the Scots well knew.

The eighteenth century village often consisted of (i) the three arable fields, (ii) the common meadowland, and (iii) the Common or Waste—which is still called the "common" to-day in the few places where it has not been enclosed. This common or waste was used as a pasture by all the villagers at all times of the year, and it consisted of woodland, sometimes roadside strips, and sometimes of common in the modern sense.[1]

The village tenants could afford to rent the old small "strips" of the "open" farm, whereas few could afford to rent an "enclosed" farm. Again, many villagers who had used the common land could not prove their legal right to do so, and many worked such small pieces of the old "open" fields that these pieces were not enough to make an "enclosed" farm. To earn a living, some of the free or yeoman farmers had to become hired labourers to some richer man, whereas before the "enclosures" they had worked for themselves.

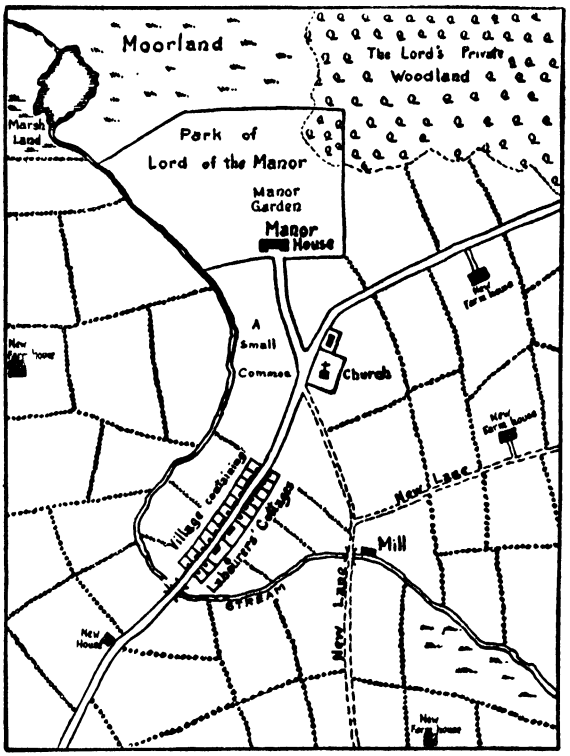
The small yeoman farmers had been "the Pride of the Nation in War and Peace . . . hardy, brave and of good morals." But not all the yeomen were owners of the land they tilled with their own hands. The father of the Tudor bishop, Latimer, was "a yeoman but had no land of his own," that is, he was a tenant-farmer.

But many tenants felt they were unjustly treated—as many were—and there were many risings against "enclosures." Fences were broken, ricks burnt, and cattle injured. But the enclosures went on through the centuries. Though it was very hard on some people at the time, farming could not have improved enough to feed our growing population unless compact enclosed fields had taken the place of the patchwork strips of the old manorial village.

Parliament passed numerous Acts enclosing the open fields, the waste and common land of many of the old villages. There were about 130 Enclosure Acts before 1760. But the number rose to over 1800 between 1760 and 1815, that is, in the years when the farmers had to feed the hungry factory workers of

1 See Hammond: *The Village Labourer* (Longmans).

the new towns of the *Industrial Revolution*—and when the factory workers had in their turn to make the munitions wherewith to fight Napoleon for no less than twenty years.



Plan of the same manor as on page 34 after "enclosures."

The number of the sturdy farmers called yeomen declined. The wise Elizabethan law[1] which forbade the building of a cottage without at least four acres of land was ignored, and the way was paved for the wretched slums in our big towns which disgrace England even in the twentieth century.

On an enclosed farm, a field could be properly drained and manured as one piece, and produce a crop of even quality, and of course it was much easier to make experiments in the rotation of crops in an undivided field belonging to one person than in a field belonging to many people.

Again, in the old open-field system, all the sheep and cattle

1 1589.

of all the villagers had grazed together on commons, marshes and waste land, or on the stubble after the grain crops had been harvested and on the weeds in the fallow fields, and this food was poor. But in the closed or hedged fields, better food was grown, and good sheep and cattle could graze together without mixing with other people's poorer or diseased beasts, so that the quality of calves and lambs steadily improved. Yet these changes did not take place quickly enough to solve the big problem of how to produce more grain, more meat and more milk. Clever farmers, willing to spend a great deal of time, money and trouble on experiments, were needed to solve this problem.

At last, in the eighteenth and nineteenth centuries, British farmers led the world, and the story of their lives became the story of farming. They showed that the soil is ever fertile if it is looked after in the right way, and they found the right way. They defeated *the oldest fear in the world*, the fear of famine, which had haunted Man ever since he was a hunter following wild herds, and which haunts him still in time of War.

But with the coming of the steam engine and the factories, farming ceased to be our main industry, and we realise the disastrous results of our neglect of agriculture whenever we are at war and need all the food that can be produced.

Even nowadays, in spite of great changes in farming and village life, we can learn and trace much of Old England by a study of *field-names*, for every field had its own name handed down by the aged to the young. Some old field-names will tell of a change of physical features, of swamps and islands where all nowadays is dry and far removed from water,[1] or of forests and underwood where blades of corn are now a flourishing crop. Other names will point to the previous existence of the vast common fields. Some names will indicate ways in which special crops were ordered to be

1 *Water* rights have caused much trouble to mankind, especially when the weather has been unusually dry. Where (as in parts of Iraq and the Middle East) there were few running streams or wells, small wars and fights for the control of the water (for irrigating the land and its crops) were common. Our very words *rival* and *rivalry* came from the Latin *riva* (the branch of a stream). See Freya Stark, *Baghdad Sketches*, in the Guild Book Series (chapter on "The Death of Mandall").



Archers at practice (from the Luttrell Psalter)

grown, and there were few villages without a " Flax Piece " ; and others tell of trades now extinct, or of metals long since worked out. Again, scarcely a village can be found without a field called " the Butts," a name dating back to the Middle Ages when archers won fame in the Welsh and French Wars, and when every Englishman had to have a bow of his own height and butts (mounds or targets) for archery were erected near the village, where the people were expected to shoot up and down on every feast-day or Sunday or pay a fine of a half-penny.

And there are still aged grandfathers who learnt from their fathers and can tell how the tithe was gathered in corn and other farm produce, and which is the " barn field " where the old tithe barn stood ; and in this oral tradition our old village history is kept alive.

The old field-names can still be traced on the "Award" maps of Enclosure Commissions (from 1710 onwards) or Tithe " Commutation " maps of 1836, maps sometimes to be found in old parish chests kept in the church, or at the Clerk of the Peace's Office for the County, or in old private estate offices.

VIII THE AGRICULTURAL REVOLUTION AND THE COMING OF THE MACHINE

Seventeenth Century Food and Cookery Recipes—The Coming of the Machine—Tull's Drill—"Turnip Townshend" and Prime Minister Walpole

The first and greatest of the British farmer-experimenters was Jethro Tull, who was born in 1674, when Charles II was king. Farming was then very flourishing, for the English were (and still are) great meat eaters;[1] and, because in those days transport was slow and not much was known about preserving meat, little or no meat was brought from other countries. So the English farmers always had a good market for beef and mutton, which was sold fresh in the summer and spiced or salted in the winter. The allowance for each of Charles II's sailors was two pounds of best salt beef a day, while at a big party given by a nobleman at least five kinds of meat would be served for the first course, "a sallet (salad); a fricassee (a kind of stew); a boiled meat; a roast meat and a carbonado (grilled meat)." The second course was of poultry and game, and the third of baked pies, sweets like marzipan, comfits and fruits.

Here is a recipe from a cookery book used in quite small country houses of the seventeenth century:

"Cut a shoulder of mutton like a shoulder of venison, take samphire, parsley, a little onion, a little green shallott, an anchovy, a few capers, then peel a very little nutmeg, salt, pepper, shred with beef suet, cut as small as can be; so stuff the mutton outside and inside and place it upon the spit. Pour into your drip-pail some samphire liquor with a spoon; when it begins to dry, baste the meat with butter and lard; about a quarter of an hour before it is roasted sprinkle over it an onion sliced up and squeeze an orange into it. . . . . It will make good roasting!"

Another recipe for a cake begins: "Take two quarts of

1 The names of many of our inns tell the same tale. In the author's village of Fillongley, Warwickshire, there are (or were) inns called *The Durham Ox, The Bull's Head, The Shoulder of Mutton, The Butcher's Arms.* (Note also *Weavers' Arms, The Wagon Load of Lime, The Plough*—all surviving names reminding us of the old village industries).

cream and the yolks of ten eggs." But we cannot do that after two destructive World Wars !

Naturally such cooking was very good for farmers' pockets, though they did not get as high prices for their products as farmers do now. But in spite of the prosperity of farming, Jethro Tull did not at first mean to be a farmer. Like Cato the Roman, he studied law, and hoped to become a statesman. But he was so often ill that his doctors told him he must live an open-air life. So he took an " enclosed " farm in Berkshire, and retired there in a bad temper, much disappointed at having to give up his career.

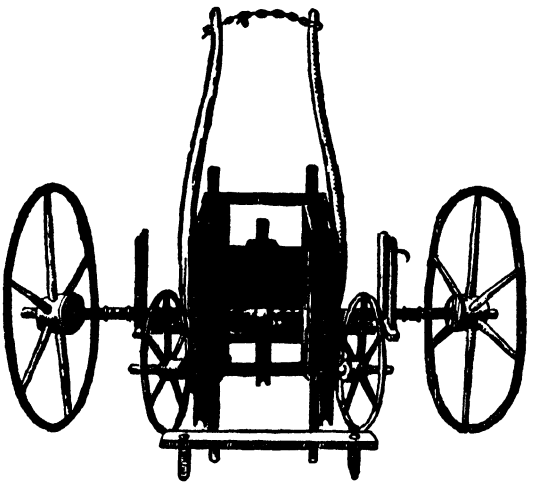
Very soon, however, Tull began to love his farm and to be interested in all farming problems. What first caught his attention was the great waste of seed when corn is sown broadcast by hand, as it had been all through the ages. In this hand-sowing, some of the seeds fell, like the seed in the New Testament parable, on hard and stony ground where it could not grow. On the other hand, the seeds that fell in good earth often grew so thickly that the shoots had not enough room to develop and were very difficult to hoe and weed.

Tull realised that hoeing is of great importance, for he knew, as the Greeks had discovered long before, that the earth is full of millions of little channels or tubes. In dry weather the sun sucks the water up out of the earth through these tubes and it passes away as vapour into the air, leaving the soil parched and the plant roots without food. But hoeing breaks the tops of the little tubes and keeps the water in the earth.

Can seed be sown, Tull asked himself, so that none of it will be wasted, and be so spaced that there will be room for the plants to grow well and for the soil to be hoed properly ? He decided that this could be done quickly and well only by a machine, but he did not know enough about machinery to make an instrument himself, so he began to look for one which he could adapt to his purpose. He found what he wanted in a church. He copied the groove, tongue and spring in the soundboard of an organ and, in 1701, made the first known horse-drill, a set of boxes hung between two large wheels, with a tube running down from each box to the earth. These tubes scratched furrows or channels as the drill was

drawn along, and at the same time the seed trickled down them from the box into the furrow, and a rake fixed on behind smoothed out the furrows again, covering the seed neatly with earth. The tubes were so placed that the furrows were far enough apart for a hoe to be used between them, to break up the surface and seal the water into the earth for the good of the growing crop.

Tull's drill and his horse-drawn hoe were inventions of great importance to all, whether living in towns or villages, because they increased the production of food, and food is



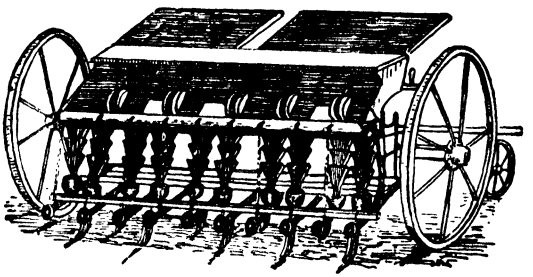
Jethro Tull's drill
From "The Horse-Hoeing Husbandry"

always man's greatest need. They were something entirely new, which none of the good farmers of the past, Chinese, Egyptians, Greeks or Romans had ever thought about, and they were the real beginning of the series of changes in farming which gradually made it the highly mechanised industry it is to-day.

But just when he had bought a new farm and was beginning to profit by his invention, poor Tull fell ill again and had to go away to the South of France for his health. There he noticed how finely the French farmers crushed—or pulverised—the soil in which they grew their vines, and when he returned to England he used this method for his own grain

crops and found it helped them to grow much better. Tull wrote a book, *Horse-Hoeing Husbandry*, in which he described his inventions and his methods of "husbandry" or farming. This book was translated into French, and the French thought as well of his drill as he had of their pulverising. But for a time not many English farmers followed him; it was again the Scots who first adopted Tull's drill, and its use gradually spread southward into England after Tull's death.

One Englishman, however, did use Tull's method with enthusiasm. This was Charles, Viscount Townshend, who was exactly the same age as Tull himself. Like Tull, Townshend set out to be a statesman, but his career in politics was rather a stormy one. He was the brother-in-law of Robert Walpole and, during the earlier years of George I's reign, the Government was described as "the firm of Townshend and Walpole"; but the two quarrelled, and while Walpole went on to become the first Prime Minister of England, Townshend retired (in 1730) to his estate in Norfolk and took up farming to help to feed the nation.



A modern drill. Some are much larger than the one illustrated, but they are similar in principle

Lord Townshend soon found that he could not make satisfactory progress with the old "open" field system. Tull's horse-hoe could not be used at all conveniently in the narrow strips, and again, much good soil was wasted in the "balks," those hard ridges of earth of varying width piled up and left untilled to separate the strips in the great arable fields. So Townshend "enclosed" his estate, dividing it into compact farms with fields of about the size we know to-day. Then he began experiments in the "rotation of crops," trying to find a means of doing away with the need for fallow, which was still very common in Norfolk.

Since Sir Richard Weston's day, turnips had been almost forgotten, but Townshend had seen them being used successfully

in Germany. He revived turnip growing in England and made a great improvement in it. Turnips sown broadcast by hand were often too small to make it worth pulling them up and carting them, and though they acted as a tonic to the soil, and animals could be turned in to crop off the turnip tops, yet the "roots" were not stored for winter food. But by sowing the seed with Tull's drill, and keeping the rows weeded and hoed, Townshend found he could grow fine large turnips, well worth the trouble of carting and storing. Added to the usual hay and straw, they much improved the winter diet of his beasts.



"Turnip Townshend"

Growing big turnips instead of small ones did not in any way affect the good this root crop did to the soil, and with its help Townshend worked out a system for doing away with fallow. Townshend's system became known as the four-course Norfolk Rotation. One year he grew wheat in a field, the second turnips, the third barley (or some other summer grain) and the fourth red clover. These changes kept the soil healthy, so that the fifth year he could begin the rotation again safely with wheat, and none of his fields ever had to lie fallow, left uncropped for a "rest-cure." Since each of his fields was enclosed, he need not sow them all with wheat the same year, as he must have done the "strips" in a large "open" field. Thus each year in different fields he had all four crops, giving him also a rich mixed diet for his animals all the year round. He need no longer kill off cattle in the autumn, and he always had plenty of fresh meat and milk and butter.

Townshend also began to use marl again, the fertiliser which the Romans had found the Britons using seventeen centuries before; but, like many other wise farming ways, this had been largely forgotten. He found that greasy marls bound together the sandy soil of Norfolk and made it twice as rich and much easier to work. His experiments became so famous, and he was so fond of singing the praise of turnips that he

became known all over England and beyond as *Turnip Townshend.*

Many farmers, as well as his own tenants, followed Turnip Townshend's example, and much land, including Norwich Heath, was enclosed and improved through his efforts. When Townshend started farming, that Heath was worth only 1s. 6d. an acre rent. Townshend had it enclosed and a good road built across it in 1760 (when George III became King); and when the new farms on the Heath were worked on his four-course system, the same land was rented at 15s. an acre and at the same time gave a good profit to the tenants who farmed it.

Turnip Townshend! Few people realise what we owe to the "roots" called turnips, common enough nowadays, once grown only in gardens—"Rotys for a Garden" says a fifteenth century book of cookery recipes. Robert Child wrote in 1651: "Some old men in Surrey, where the Art of Gardening flourished very much, report, That they knew the first Gardeners that came into these parts to plant cabbages, colleflowers, and to sowe Turnips, Parsnips, and Carrots, and to sowe Pease, of all of which we have few, or none in England, but what come from Holland and Flanders." He then adds he could name "places in the North and West of England where the name of Gardening and Howing is scarcely knowne, in which places a few Gardens might have saved the lives of many of our people, who have starved those dear years."

"I introduced turnips into the field," says Tull, "in King William's reign; but the practice did not travel beyond the hedges of my estate till after the Peace of Utrecht" (1713). Many landlords and farmers even classed turnips with rats as unpleasant things brought from Germany in Hanoverian times!

Turnips, by keeping cattle alive in winter, at last made it possible for the Englishman to have fresh meat at Christmas, and "it converted some of our counties from rabbit warrens or swamps into cornfields and pastures."[1]

1 See *English Farming Past and Present*, Lord Ernle (Longmans), and *The Oxford English Dictionary*, Vol. XI, which honours the *turnip* with four of its learned columns.

IX THE "ROAST BEEF OF OLD ENGLAND" AND ELSEWHERE

The Agricultural and Industrial Revolutions—England's world-famous cattle, sheep and horses—Eighteenth century Transport and the Great Engineers—The England of Arthur Young, Cobbett and "John Bull"—Enclosures

As crops improved through the methods of Tull and Townshend and fodder[1] of all kinds grew more plentiful, it became possible for other men to make experiments in improving breeds of cattle, sheep and horses. And so began an important chapter in the history of the world, for in due course our sheep and horses, and the cattle that made the "roast beef of Old England," became so famous that they were exported all over the world.

One of the first great stock-breeders was Robert Bakewell, a farmer's son, who was born at Dishley, in Leicestershire, in 1725. Bakewell was sure that beasts could be bred and fed "to weigh where you want them to weigh, that's in the roasting, not the boiling parts." Large animals were the most admired in his day, but "small in size, great in value" was one of his maxims. Another was "best to best only;" that is, he very carefully chose only those animals which had the points he wanted—small bones, good flesh and quick to fatten—and he bred from these until he had produced a fixed type of animal. Long-horned cattle were famous in the Midlands, and Bakewell described his Long-horns as "a small, clean-boned, round, short-carcassed, kindly-looked cattle, inclined to be fat," and they were certainly good meat, but the cows were not very good milkers.

In the past cattle had been bred for three purposes: first as draught or transport animals, for oxen had once pulled the heavy wagons as well as the ploughs; secondly, for meat; and thirdly, for milk. By Bakewell's day, horses instead of oxen were being used more and more for transport and farm work; and though they cost more to buy and to feed, they were so much quicker that it paid to use them. For cattle as

1 *Fodder*—Hay and other dried cattle foods.

food-producers, Bakewell set out to breed only good meat and good milkers, but he did not succeed in producing both qualities in the same beast. With sheep he was more successful in breeding for a double purpose.

Sheep were bred for meat and for their wool. Once, as we have seen, when the wool trade was England's greatest wealth, their fleeces mattered much more than their flesh. But with the Industrial Revolution and the inventions of the eighteenth century, England had many other rich trades, wool was no longer of such importance, and farming gradually ceased to be regarded as our main industry. Bakewell succeeded in breeding little fat sheep, which not only had a fine fleece but also weighed almost twice as much in meat as the older Leicestershire sheep "with skin rattling on the ribs like a skeleton covered with parchment." Bakewell's "New Leicester" sheep soon became famous all over England; but in cattle-breeding he was less successful.

Bakewell also bred fine strong black horses, on one of which he always rode around his farm, keeping an eye on everything. His most handsome horse he showed in London, and George III, whose nickname was "Farmer George," heard so much about it that he asked to see it. Bakewell took his beautiful black horse to St. James's Palace, and the King came out and admired it greatly, but he did not draw too near, for the horse was far more proud and arrogant than the King and would not allow anyone but Bakewell to touch him!

All Bakewell's animals were treated with great kindness. They were not only well fed, but also well housed in large clean airy pens, and the pastures where they grazed in summer were flooded in winter to improve the grass and then drained off and provided with shelters and drinking troughs.

People flocked to Dishley to see for themselves the farm from which such fine beasts came, and, because there was no inn in the neighbourhood, a great number stayed with Bakewell as his guests. He was proud of showing them his stables and dairies, and the wharf he had built so that his grain crops could be collected by boat. The roads in England were still very bad, and lanes were often impassable, and as Bakewell

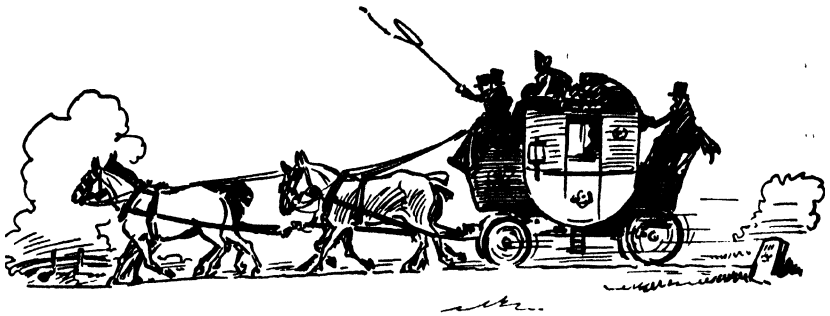
had a well-watered farm, he cut small canals and made the best use he could of his streams. Across one of them he built a "turnip trap," which saved cartage; the turnips pulled up in fields far from the farm buildings were just thrown into the water and floated down to be caught in the "trap" behind the barn where they were stored.

Bakewell had a museum to show his guests, in which there were many animals' skeletons and stuffed animals, showing the stages in his improvement of various breeds; but nothing that Bakewell showed gave away the secrets of his breeding success, which were known only to his Dishley Society. Because of this secrecy, Bakewell became unpopular with less successful breeders. In spite of his good ideas, like many another pioneer, he died (1795) poor and even a bankrupt, partly owing to the enmity of his rivals, to the expense of his methods and to his over-lavish kindness to his guests. After his death his flocks were split up, and his famous sheep exported to all parts of Europe and America, where the breed is still to be found.

Bakewell himself "must have somewhat resembled the typical English yeoman who figures on jugs of Staffordshire pottery: a tall, broad-shouldered, stout man of brown-red complexion, clad in a close brown coat, scarlet waistcoat, leather breeches and top-boots."

Others carried on Bakewell's work, following the same general lines, though they did not know the details of his method. The most successful with cattle were two brothers named Collings, of County Durham. The younger brother, Charles, paid a long visit to Dishley and admired Bakewell's farm, but he decided to make his own experiments on the shorthorn breed of cattle. Charles Collings bought a bull, which against everyone's advice he chose because it was "mellow" to the touch, while breeders in those days thought a healthy bull should be muscular and hard. From this bull, called Hubback, and four cows, called Duchess, Cherry, Daisy and Favourite, Charles Collings and his brother Robert bred a fine new strain of shorthorn cattle, which were both good milkers and good meat.

Of this breed was the famous Durham Ox, whose picture,



Stage coach in the 19th century

taken from an old print, can still be seen in many country inns; but the most famous animal of all was the bull, Comet, bred by Charles Collings, and sold in 1810 for a thousand guineas. Comet's descendants are to be found all over the world; and the shorthorn cattle remained the best "dual-purpose" breed, both good dairy cows and good flavoured beef—the real "roast beef of old England"—though other more modern breeds have beaten them at either one or the other of these uses.

Besides Bakewell, Collings and others, important work for agriculture was also done by Arthur Young (1741–1820). He farmed in Ireland and in England, but it is as a writer that he served farming best. He travelled through England, France and Germany, making careful notes of experiments wherever he went, and published books on agriculture which were read all over Europe. He became secretary to the Board of Agriculture (a national society, not then a Government department), which was founded in 1793 to spread farming knowledge. The Board gave prizes for farming inventions and for essays on new methods, and it attempted to make the first survey of agriculture in England. This was a difficult thing to do because the roads were still so bad. Arthur Young, writing of the main road between two quite important towns, Preston and Wigan, says:

"I know not in the whole range of language terms sufficiently expressive to describe this infernal road . . . with ruts which I actually measured, four feet deep and floating with mud from a wet summer. What, therefore, must it be in winter?"



Turnpike

These bad roads were then the only means of communication. Along them travellers in a hurry rode, while heavy stage-coaches rolled along more slowly, and great clumsy wagons for goods creaked more slowly still. Pack-horses[1] and pack-mules were still much used, carrying all manner of things in boxes or panniers slung one each side, while herds of cattle and flocks of sheep had to be driven great distances from the farms to the towns where they were needed for food. There were many delays and accidents on the way, and it was impossible even for good farmers to get the food in good condition to the places where it was needed.

Because of this difficulty of transport, supplies and prices of food varied very greatly in different counties, and Arthur Young realised how bad this was for farming, and that farmers would become discouraged if no better means were provided for distributing the fruits of all their hard work. Through him the Board of Agriculture approached Parliament again and again with petitions and plans for improving the roads, but as a result of the costly surveys it undertook, the Board got into debt and was forced to end its useful work in 1822.

However, by this time the *Industrial Revolution* had progressed rapidly and those great engineers Brindley (died 1772) and Smeaton (died 1782) had made our great canals. The first steam-driven boat had appeared on the Clyde (in 1803); the Scot, McAdam, had taught England, about the time that Napoleon was defeated at Waterloo (1815), how to make the

1 The bridges by which main roads crossed streams had to be wide enough for a pack-horse with its two bundles to cross safely. Often bays or recesses were made on the middle pier of the bridge, into which foot passengers could step to allow a pack animal to pass. Pack-horse bridges still remain here and there.

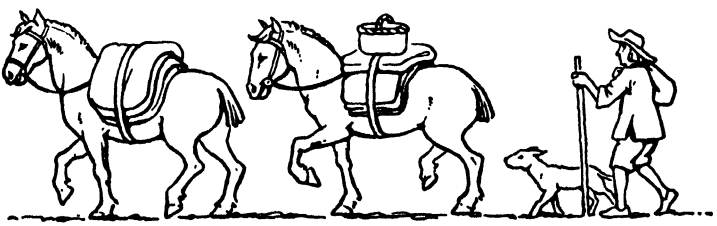
good modern roads of to-day, and Stephenson's first train (1825) ran at the then terrifying speed of fifteen miles an hour on our first railway, between Stockton and Darlington.

Arthur Young's books continued to be useful for many years and are still read to-day, though with later discoveries some of the things which were new and exciting to him seem just obvious common sense in our own times.

In various ways many of the yeomen and the poorer villagers suffered by the "enclosures" of the eighteenth century. Their old communal right in the "Waste" and the "Common," where they could keep a cow or a donkey and gather firewood, rested on custom and had never been formally recognised by the law, and they did not understand the legal process by which the "enclosures" were made. "The poor in these parishes may say," wrote Arthur Young, "'Parliament may be tender of property; all I know is I had a cow, and an Act of Parliament has taken it from me!'"

But the new "enclosed" farms were necessary if the ever-increasing urban and factory population of England were to be fed. Subsistence farming gave way to farming for sale and profit, and a famous old East Anglian character could say: "Don't let anyone talk to me of the 'good old days'; they were bad old days and worst of all for the poor."

John Bull remains the nickname for the typical Englishman, but he belongs to that period in English history when the yeoman was the backbone of the country. The modern Englishman would scarcely recognise himself in the yeoman or burly farmer in his riding boots, low crown hat and yellow waistcoat, though there is fortunately still a great deal of "John Bull" in the people of our land. The perfect expression of him in English literature is in the works of William Cobbett (born



Pack-horses

in 1762), the son of a small farmer, who described what he saw about England in his *Rural Rides* (published in 1830). Cobbett has been called "a most furious believer in Liberty,"[1] as are most workers on the land.

Like Cobbett, Young was much interested in the yeoman farmer. Arthur Young "taught the world how to farm, introduced science into the farming industry, and stampeded the industry into enthusiasm . . turning waste lands into rich pastures and causing the harvest to be multiplied. He also raised the military force called the Yeomanry, and his health was drunk after that of the King."[2] No wonder George III paid him this handsome tribute: "Mr. Young, I am more obliged to you than to any man in my Dominions."

X SQUIRE COKE AND THE WORLD OF HIS TIMES

The U.S.A. and the British Empire—Protection and Free Trade—"Heart of Oak"—

Another famous scientific farmer was a man very different from the delicate Tull, the burly, genial hot-tempered Townshend, the secretive Bakewell or the hard-working Collings brothers. His name was Thomas Coke, later Earl of Leicester. He was five years old when Clive won the battle of Plassey in India (1757) and seven when Wolfe took Quebec in Canada two years later (1759). After leaving Eton College he began life as an idle young man of fashion, a handsome dandy in a powdered wig, with lace ruffles at his wrists and throat, after the fashion of the eighteenth century.

Like most of the rich and fashionable young men of his day, Coke made what was called the Grand Tour, travelling through Germany and France, and staying for some time in Rome. There he lived a very gay and carefree life, dancing and riding, and enjoying the friendship of the Young Pretender's Queen, the wife of Prince Charles Edward Stuart, "Bonnie Prince Charlie."

1 With acknowledgments to *The Listener* (2nd Jan. 1941)—Desmond MacCarthy on *William Cobbett.*

2 *Evening Standard.* For Arthur Young, read *Sheep and Turnips,* by Miss Defries (Methuen).

Coke was not in the least ambitious to become a statesman, and indeed was most unwilling to enter politics. But when he was twenty-five his father died, and he had to return to England to look after his estates. Then, in 1776, he was chosen as the Member of Parliament for Norfolk and was elected unopposed. It was in that year of 1776 that a group of England's colonies in the New World issued their Declaration of Independence, calling themselves for the first time the United States of America.

Coke remained in Parliament until 1833, the year that an Act was passed abolishing slavery in British colonies. Thus Coke was an M.P. during one of the most fateful half-centuries (1776–1833) in world history: when the U.S.A. won her independence and taught Britain to re-model her colonial government until the Empire became what it is to-day, a Commonwealth of Free Nations, unique in the world's story; when Australia, New Zealand, South Africa and India were coming more and more into the picture; when the industrial and agricultural revolutions were in full swing and when the first steamers and trains were invented; when the French Revolution (1789) stirred the world; when Britain for a time stood alone against Napoleon, and Nelson with the Royal Navy guarded our shores against invasion; and when the first (1832) of the great reforms of Parliament took place which continued until Britain became a completely democratic country.

It was during this period that the English people felt very strongly about the Corn Laws. These old laws, which changed from time to time in detail, were passed to "protect" farmers by preventing foreign corn from being imported unless English growers were getting certain fixed prices for their grain. Naturally farmers and landowners supported these laws, which kept the home market safe and profitable for what they grew. The high price of corn helped the farmers, but it also kept the price of bread high. Every year there were more and more people in England who were no longer employed on the land, but who suffered through the Corn Laws because they had to pay more for bread. These were the people who worked in the coal mines and in the new iron works and cotton and other factories in the new towns which sprang up like mushrooms

from the last half of the eighteenth century. In Ireland the potato famine—due to "Potato Blight," a disease first noticed in Europe and North America about 1840—meant starvation for the Irish peasants. Sir Robert Peel then decided to put an end to the Corn Laws (1846) with their taxes or duties on foreign corn, so that corn could be imported free of duty.

The change over of England to a "Free Trade" country was now almost completed. But a century later, when food was scarce as a result of two World Wars, England had again to "protect" and help the farmers to grow corn, etc. to feed the people. The first duty of any Government is to provide food for the nation.

Thomas Coke M.P. supported the Corn Laws. Once in Norwich this led to his being attacked by an angry mob. He might have been seriously injured had it not been for a butcher, who had the clever idea of turning loose a bull which scattered the crowd while he hurried Coke into his shop and promptly put up the shutters!

Coke was an able man, although he had been such an elegant idler, and he turned out to be a brilliant farmer. When he inherited his estate at Holkham, in Norfolk, his farms were in a miserable condition. The land was "open" and unenclosed as it had been for centuries, and the soil was so poor that "two rabbits fought for every blade of grass." The bony sheep and lank cows of the estate gave neither good wool, milk nor meat, and Coke's tenants refused to pay him more than 3s. 6d. an acre rent at the highest, while some of them paid only 1s. 6d. and then said they could not make a living.

Coke "enclosed" land and began to farm himself, determined to show that not only a living but a fine profit could be made if modern methods were used. He had kept his eyes open during his travels, even while most people had thought him interested mainly in clothes, and he had noticed many things about farming; but he knew that he had still much to learn. So he visited other estates, such as his neighbour Townshend's, where the latest improvements were being used, and he gave big parties to which he invited grain-growers and stock-breeders from all over the country, men of all kinds, with whom he discussed farming matters.

Coke's first striking success was in growing wheat. The villagers who had worked the old "open" fields in the Holkham district did not attempt to grow wheat. They considered the soil too poor and grew rye instead. But Coke marled and manured his enclosed fields, draining those that were sodden and irrigating those that were dry, and to the surprise of the whole district he grew as good wheat as any in England. Then he experimented until he found the best rotation of crops to suit his land, and grew excellent crops of cattle fodder as well—turnips, mangolds, clover and rye-grass.

This enabled Coke to feed his animals properly. Until he took over the land, most of the cattle were still being killed in the autumn, and the tough, stringy meat had been salted, while the few animals kept through the winter could only be given straw or " browse." No wonder the sheep and cattle had been poor and bony. The local breeds began to improve at once on Coke's good food, and he further improved them by importing new blood from other parts, bulls and milking cows from Devonshire, sheep from Sussex, pigs from Suffolk and even all the way from Naples. The animals bred from Suffolk and Neapolitan pigs produced the best pork ever tasted in East Anglia, while the Holkham flock of 800 wretched-looking sheep gradually changed into a flock of 2500 fine fat South-down sheep.

Coke also greatly improved his farm implements. Very clumsy ploughs were still in use in the Norfolk "open" fields when he went there, so heavy that it took four or even five horses to draw them. Coke tried new designs and encouraged all the blacksmiths of the district to make experiments, until he had light and easily turned ploughs which could be worked very comfortably by two horses. He bought the latest and best machines—horse-hoes, drills and harrows—and was one of the first Englishmen to be interested in the work of a young Scottish farmer named Andrew Meikle, who was trying to make a machine which would thresh harvests more quickly than the grain could be beaten out by the old hand-flails or by treading out with oxen. In 1788 Meikle succeeded in building such a machine, and later, by adding shakers and fans to it, he made it not only beat out the grain but also

separate the crop neatly into three piles, of grain, chaff and straw, all by one process.

Coke was not at all a selfish man. He shared his discoveries with all his tenants, and not only taught them and lent them machines, horses and good stock to breed from, but also built them good houses and farm buildings; so that instead of grumbling at having to pay 3s. 6d. an acre rent, they became only too eager to sign leases for as many years as possible at three and four times that figure. In forty years, from 1776 to 1816, the rent-roll of the Holkham estate increased from £2200 to £20,000 a year, and it had been possible to pull down the workhouse, for there was no poverty left in the district.

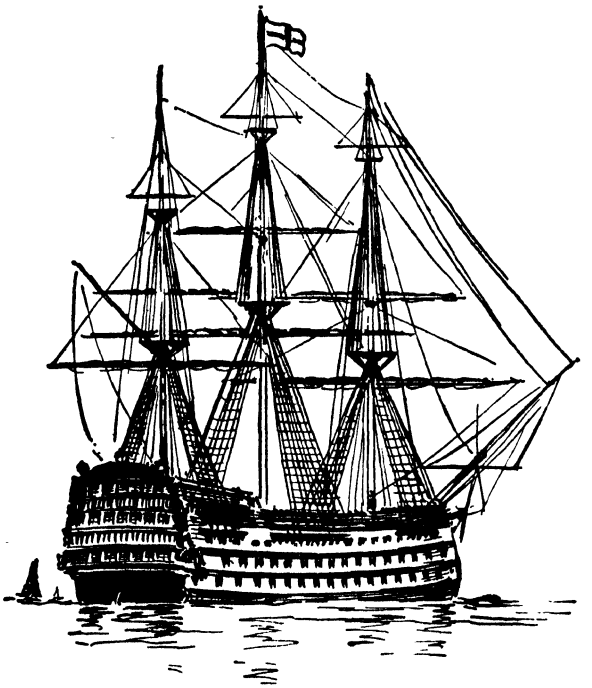
Coke's energy was amazing. He was never satisfied with all he had done but was always trying to improve or find out something new. He discovered a new oil-cake for winter feeding, and he produced by selection a new fine form of hay. To do this he gathered together the children on the estate and showed them the best kind of grasses. Then he sent them out to collect the seeds of these grasses. Everywhere the children went they kept a sharp look-out for the type of grass-head Coke had shown them and stripped the seeds into little bags he had given them. It was a good game to see who could collect the most, and from this specially chosen seed Coke grew his fine hay, of even length and high feeding quality.

Where his land was too steep for crops Coke grew trees, planting fifty acres of them each year, until he had 3000 acres of good timber, which sheltered his fields from the North Sea gales. And in 1832—the year of the great reform of Parliament—he was able to set sail in a ship built from oak trees which he had planted himself as acorns. When Coke was fifty-three, Nelson had won Trafalgar (1805) with sailing ships built of oak. "Heart of oak are our ships!" sang England in those days.

Coke's fame spread far and wide. The Holkham Sheep Shearings became an important annual event in the farming world. For at shearing-time Coke kept open house, and many of the men who came to his early parties to teach him came back to learn from him. At one shearing Coke had 7000 visitors, including his neighbour, the Duke of Bedford, who

was farming the Woburn Abbey estate on the same lines. Arthur Young, who himself did much important work for farming, describes how he saw them both, Coke and the Duke, in shepherds' smocks, superintending the sheep pens.

Squire Coke, that great farmer, lived through ninety years (1752–1842), and we have seen what great events took place in all parts of the world during his long lifetime. Perhaps the most important of these events was the defeat of Napoleon,



The Victory
(Nelson's ships at Trafalgar were built of oak)

the first of the modern *Dictators*. "Had our people not energetically developed Agriculture during the French Wars, the growing industrial population could not have been fed nor the power of Napoleon humbled, and famine must have done what the armies of France failed to do." It has been said that the British farmers and peasants contributed as much to the defeat of Napoleon as did the British sailors by their broadsides at Trafalgar or the British soldiers by their stubborn squares at Waterloo.

XI THE WORLD INDUSTRIAL AND AGRICULTURAL REVOLUTIONS

The Age of Steam and Machines—Australian Wool and New Zealand Lamb—Harvesters for American prairies—British Engineers—Food-Producing by Machinery

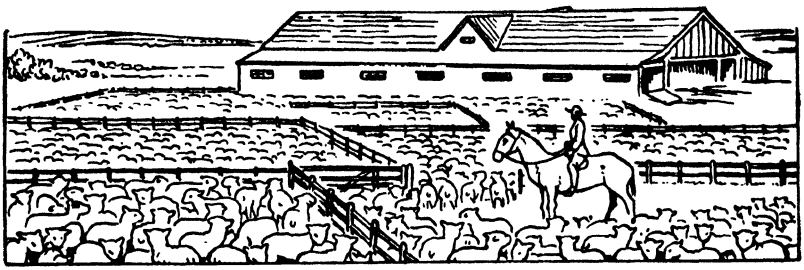
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In George III's reign—while Arthur Young was travelling through the countries of Europe and making maps of the roads and farms of England—James Cook, a farm labourer's son who had become a young officer of the Royal Navy, was sailing (1768–1779) his sloop through the almost unknown South Seas. There he was charting the coasts of half-forgotten islands which Dutch and Portuguese sailors had discovered in the previous century, and finding many new ones. The largest of the islands Captain Cook coasted were *New Zealand* and *Australia*, which were one day to be among the most important food-producing countries of the world.

The Maoris, then the ruling race of New Zealand, were even in those days a people of some culture. But Cook found the natives of Australia still using digging-sticks, scratching shallow runnels in the earth, and throwing in the seeds of wild plants, just as elsewhere the first skin-clad farmers of the Stone Age had done many thousands of years before.

Australia (which means "South Land") seemed a very dry continent and difficult to farm. But the British colonists who settled there after Cook's voyages gradually built up systems of irrigation. These so much improved the land that all kinds of crops could be grown: wheat and apples in the colder parts, vines in the middle zone, and cotton, sugar and tropical fruit in the really hot districts. But sheep-farming proved the most successful industry both in Australia and in New Zealand. Little by little Australia, which in Cook's day had been uncultivated and without a single flock, became covered with great sheep farms, and began to supply all the big manufacturing countries with wool, while New Zealand lamb was soon to be eaten all over the world.

These great changes in the Southern Hemisphere took place

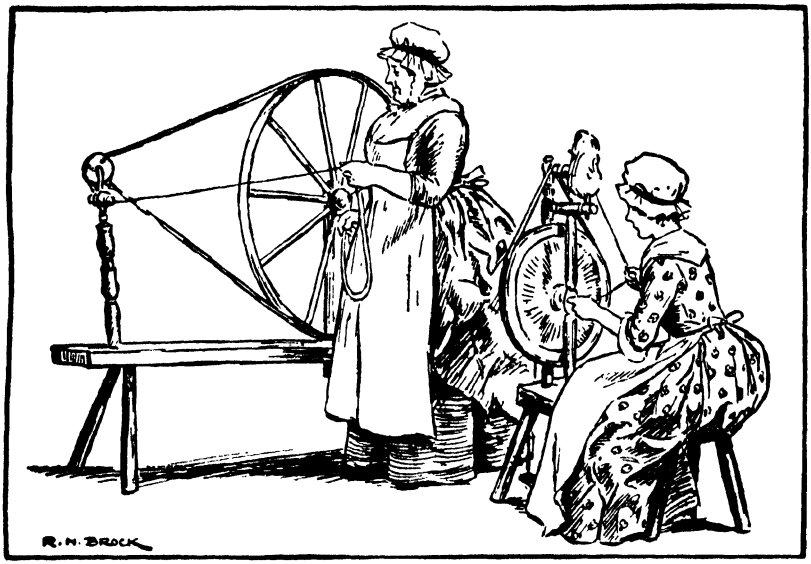


An Australian sheep farm

during the nineteenth century, and at the same time changes as great were taking place in Europe, and above all in Great Britain, which led the way. For the Age of Steam had dawned.

The earliest steam-engines did not move; they were built where they were needed for working pumps in mines. Then they were improved, especially by James Watt, until they could be used instead of water-power to drive the new machinery invented during the Industrial Revolution for spinning and weaving and for working metals and coal. Next there came steamboats, the very first of which was a little tug called the *Charlotte Dundas,* which panted along the Forth and Clyde Canal in 1803; and then, in 1821, George Stephenson, "the father of railways," produced his moving engine, *Locomotion.* This was the first engine ever built to pull a train to take passengers, though other "moving engines" or "locomotives" had by then been used for drawing trucks in collieries and iron foundries.

With the "Coming of Steam," the world suddenly seemed to get smaller and smaller—as it later seemed to shrink even more rapidly with the coming of the petrol-engine, the aeroplane, the wireless, and modern machines, until it became the One-World of our own day. Long distances could be covered in the age of Steam more quickly and easily than ever before, and more people and more goods were moving about, for the old industries had expanded very quickly, while new things were constantly being made. At the beginning of the eighteenth century, farming and the woollen "home-spuns" industries were the most important. Then the great cotton industry was developed in the numerous Lancashire cotton factories, with their new power-looms, until England became



Mother and daughter at work at their spinning-wheels two hundred years ago

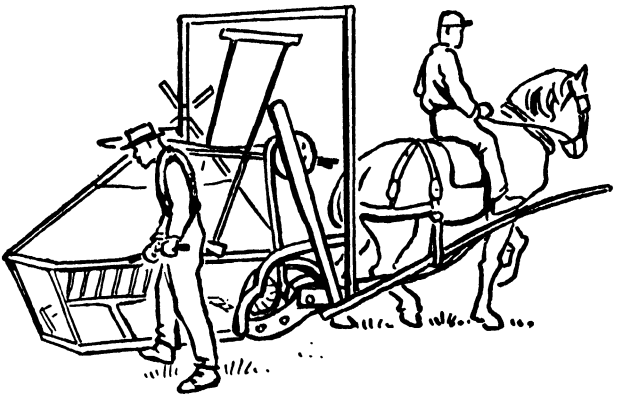
the greatest cotton manufacturing country in the world.

Among other new things were many different types of farm implements. One of the first of these was the reaping-machine. Right down to the nineteenth century all the crops in the world were still being harvested by hand. Some were cut by mowers using long-handled scythes, and others were reaped with short curved sickles. But two farming families, quite unknown to each other, the Bells in Scotland and the McCormicks in America, began about the same time to experiment in building machines to do this work.

Most farmers considered such a thing impossible, and when Patrick Bell's early machines failed, they laughed and said, "I told you so!" But in 1828 Bell built a reaping-machine he was sure would succeed. So eager was he to give it a trial that he could not even wait until the corn was ripe, and he describes how he and his brother took the machine out and tried it, in secret, on the unripe corn in the middle of the night. It worked perfectly, cutting a wide strip of corn and laying it to one side in a neat swathe, so that the corn without raking could be gathered into sheaves.

Then Bell showed his reaping-machine to the public, made a drawing of it and wrote a pamphlet explaining it, and it

quickly became famous in Scotland. Its cutting blades worked like big scissors, and it was pushed, not drawn, by one or two horses. It could cut enough to keep six people busy gathering and binding the corn into sheaves behind it, and it cut closely, leaving only about three inches of stubble. Yet it was not popular, and in four years only twenty of these reaping-machines were built, two of which had been ordered by Australian farmers, and two by landowners in Poland.



McCormick's (American) reaping machine

The McCormicks did no better at first with their machine in America. Robert McCormick and his son were farmers in Virginia, and like Bell, they made many unsuccessful experiments at which people jeered. It was not until 1840 that the McCormicks sold a machine. Then in four years they sold over fifty machines. After that they moved, in 1847, to Chicago, which was then an isolated little town in the middle of great grain-growing prairies. There they built a small factory, which quickly grew into a large industry, and they sent one of their reapers to England, to the Crystal Palace Exhibition opened by Queen Victoria in 1851. Another American reaper, the Hussey machine, was also sent, and both caused great excitement, many English farmers at once ordering one or the other.

Then Bell's brother, who was still using the original machine of the midnight trial (the family called it the " Lass of Gowrie ") issued a challenge to the American firms. The McCormicks did not send a machine north, but at the Highland Society's Show near Perth in 1852 the good old " Lass "

met and completely defeated the champion Hussey machine, and the excited English farmers learnt with surprise that there had been mechanical reapers in their own island for over twenty years! Patrick Bell at last gained recognition and was presented with £1000 in 1868, while by 1871 the McCormick International Harvester Company was turning out 10,000 machines a year from the Chicago factory and exporting them to all parts of the world.

In the meantime other agricultural implements were being greatly improved. John Howard of Bedford, who started life as an ironmonger's apprentice, took up the problem of the plough, and founded the Britannia Works, where he made "ploughs suitable for every country under the sun; Cape ploughs, Indian ploughs with heavy bent-wood beams, ploughs of iron and wood for South Russia, one-way ploughs for South America, ploughs for Spain and ploughs for Turkey, double and triple ploughs of all kinds, with wheels and without."

Another great farm implement manufacturer, Robert Ransome of Ipswich, son of a schoolmaster, solved the problem of keeping an iron ploughshare sharp, so that there was no need frequently to repoint and grind it. Quite by chance he discovered that cast iron could be hardened to keep a lasting cutting edge if it was chilled during the process of casting. One day, while he was experimenting, some molten metal burst out of its moulding frame and spread in a thick layer over the stone floor. When this shapeless metal was being broken up to remelt, Ransome noticed that the part which had been in contact with the cold stone was far harder than the other, and he quickly perfected and patented the Chilled Iron Plough Share.

II

The next step was to apply "steam" to farming and food-producing. Meikle's threshing-machine, described in the last chapter, had been worked first of all by hand and then by horses. But quite early in the nineteenth century, new threshers were built which could be worked by wind or water-wheels, and then stationary steam-engines came into

use to supply the driving-power. In many parts of the country, farm labourers rioted and tried to smash the steam-threshers, which they thought would steal their winter work on the threshing-floors. But the engineers persevered with their new toy until they made portable farm steam-engines which could be used for pumping, grinding and sawing as well as for threshing. And by winding-up ropes attached to the load around a revolving drum, these engines could also be used for hauling felled trees, or for removing loads of clay from fields after drain-digging.

The early "portables" took six horses to pull them to the place where they were needed, which, as the agricultural engineer, Aveling, remarked was "like six sailing-vessels towing a steamer . . . an insult to mechanical science." Aveling had been a farmer on Romney Marsh, but he became so interested in the new mechanics of farming that he gave up his land and set up a small engineering works in Rochester. There he built the first self-propelling eight horse-power steam-engine, which could be moved under its own steam.

Aveling's ambition, like that of many engineers in his time, was to build a steam-plough, but in this he never succeeded. And there were still old-fashioned farmers who would not even use metal ploughs at all but continued to prefer wooden ones. Here is a song popular with these die-hards about the middle of the nineteenth century:

"Aye, an old wooden plough, and they say, to be sure,
As the wideawake farmer mun use 'en no more;
They mun all be of iron, and wood there's no trade for:
Why, what do the fools think as ash trees were made for?"

So later inventors left ploughing alone and turned again to harvesting machinery. The Americans were very much interested in machines to bind the corn sheaves. Improved models of the Bell and the McCormick reapers cut the corn and left it in little heaps the size of a sheaf; but the sheaves had to be bound and stooked (propped upright to dry) by hand, and in the enormous prairie fields of America where labour was scarce and wages high, this was expensive. Then the first American mechanical binders appeared in the early 'seventies, but they bound the sheaves with wire, and this

though cheaper than hand labour was still expensive. But by the harvest of 1879 two Americans, Appelby and Wood, had produced and marketed two different kinds of machines which knotted with cheap twine.

The invention of these knotter-binders in America, coupled with a disastrously wet summer in England, made 1879 one of the blackest years in the whole history of British farming. After years of fierce argument, the Corn Laws had been repealed in 1846 by Sir Robert Peel. A century later, however, after a second World War, England had to adopt Disraeli's policy—opposed to Peel's—of "protecting" the growers of the people's food at home. For a century England had been a Free Trade country. In 1879 English farmers, struggling with a wet harvest season, suddenly found their markets flooded with cheap machine-harvested American wheat. They could not sell their own grain which had cost them so much in money, anxiety and toil to produce. Bread was cheap, but farm labourers, thrown out of work because their masters had no money to pay them, could not buy it, while hundreds of the farmers themselves went bankrupt. By the winter, farms all over the country, notably in the water-holding claylands, were deserted, while many hungry people tramped the roads, some walking hundreds of miles to seek work in the factories of the cities.

Thus, what was a triumph for American farmers and others—and for cheap bread—was a cause of suffering to many in Britain. It produced an economic crisis: one of those ever-recurring crises in modern history (they had them in ancient times too), which cause unemployment and bankruptcy to some and which are a fertile cause of war. Mankind had not yet learnt to manage his world "household" wisely. "Economics" is the study of industry and commerce, of how wealth is produced and distributed. It is a Greek word meaning "the management of the household." To-day the "household" is no longer a family or a village as in earlier times, nor even a nation as before the days of engines and 'planes—it is now a world-wide "household."

The Australians solved the problem of getting cheap flour without ruining their farmers by building machines called

"strippers." With their dry climate and their enormous pastures, the Australians did not need the straw from their crops as bedding, or as fodder, for their beasts. They therefore did away with the time, labour and expense involved in binding, stooking, carting, threshing and stacking sheaves, and they harvested by machines which simply stripped off the ears of corn, shook out the chaff, and left the grain ready for grinding. Then the farmers set light to the standing straw, burnt off acres of it in an afternoon and had their land ready for ploughing again. The Australians did not invent this way of harvesting. The Romans had used it, towards the decline of the Empire, to feed the (by then) lazy, over-populated city of Rome itself. But the Roman strippers were simple machines of wood worked by slaves, while the Australian strippers were much faster iron machines worked by steam.

Even if straw were not needed in Britain, such a method of harvesting would be impracticable for British farmers. American and Canadian inventions have indeed progressed until they have produced "combined harvesters," machines which reap and thresh in one process, cutting the corn and delivering sacks of grain, sacks of chaff and also bound bundles of straw, as they go along. But this invention could not be generally used in Britain because of the climate. Only on very unusual occasions is the grain in this island dry enough to be put straight into sacks ready for the flour mills the minute it is cut. The difference in the climate and in the size of the country will always make British grain more expensive than grain from Canada and the United States, for it takes longer and costs more to harvest the small fields of Britain than to harvest the huge fields of the New Worlds of America and Australia.

Nevertheless, because British farmers understand and feed the soil, there is more rich land in this island in proportion to its size than there is in the United States, where in many parts the soil has been so grossly overworked without being fed that it has literally died. No crops would grow on it, and the bare earth cracks and blisters in the heat, tons of it at a time blowing away in great dust storms, leaving in some places scars of naked rock.

This is called soil erosion.[1] It is what the Greeks feared, but avoided by their wise methods thousands of years ago. The vast size of the United States, and the big profits to be had from such crops as cotton and tobacco, made the early nineteenth century American farmers careless and greedy. They worked the soil to a standstill and moved on to new lands in the vast West. But their descendants are paying for it. Soil erosion is now a national problem, and the United States Government spends huge sums of money to repair the damage done by this short-sighted way of farming.

The nineteenth century British farmer, on the other hand, believed heartily in "muck." He dug manures of every kind into his land, even in bad seasons when it did not pay him to do so. If it was within his power, he would no more have let the earth of England die than he would have let his cattle starve. Sometimes, as in the disastrous year 1879, events outside his control forced him to abandon the soil and to sell the cattle, but on the whole and taken throughout the nineteenth century, farming advanced.

The founding of many societies that held agricultural shows gave a stimulus not only to mechanical inventions, but also to breeding and to new methods of drainage. It was at a Royal Society Show in 1843 that the drainage engineer, Josiah Parkes, first saw some little clay pipes made by a gardener, John Reade, for heating his master's forcing frames. Parkes at once realised how such pipes could be used instead of ditches for draining fields. " My lord," he said to the Earl of Spencer, "with this pipe I will drain all England."

This was not altogether an idle boast. Parkes and his Scottish rival, James Smith, became the two great land drainage experts of their day. Between them they laid the foundation of what a twentieth century Minister of Agriculture called "the work which has made all Britain, could one but see under the surface, a continuous coat of fine quilting with tile-drains for stitches, county after county, landscape upon landscape, from Land's End to John o' Groats."

Throughout the nineteenth century, many land drainage companies were formed. The work they did made the soil

1 Soil erosion is a common evil also in certain African colonies and elsewhere.

and its produce so much richer that, in the middle of the century, it was said with truth:

"There is no bank in the whole country, no commercial speculation, no investment so sure and profitable as that of investing capital underground."

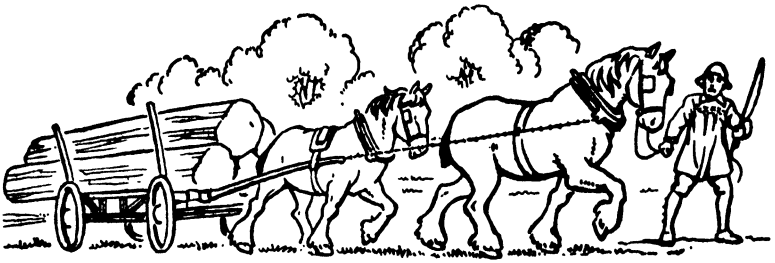
Yet the entire country could not have been given its quilted-pattern of drains without the help of the Government, mainly due to Sir Robert Peel. It was Peel who passed the first Public Money Drainage Act in 1846, making a loan of two million pounds to farmers who agreed to spend the money on scientific drainage and to repay it by instalments over twenty-one years. The drainage so improved their crops that they were well able to repay the instalments and still make a profit.

Good crops also mean good fodder, and good fodder means good beasts and good food for man, and so farm animals continued to improve throughout the nineteenth century—as we shall see in the next chapter.

XII BEASTS THAT TRAVELLED THE WORLD OVER

The "Shire Horse" for dockyards and factory towns—The Argentine Beef Industry—Scotch Beef—The Danish Bacon Industry—York Ham—Devonshire Cream—The Victorian Family

The interest in new agricultural methods had become so general in the nineteenth century, and there were so many keen breeders of farm animals that no one man took the lead, as Robert Bakewell and others had done in the eighteenth century. But British breeders continued to lead the world. A new group of societies was formed which kept stud-books to register the birth of thoroughbred animals of different strains, whether horses, cattle, sheep or pigs. There were some twenty of these pedigree strains which were acknowledged in all five continents to be the best of their type. Seventeen of the twenty were bred in the British Isles, the remaining being the French Percheron light-draught horse, the black and white Dutch Friesian milking cow, and the fine-wooled Spanish Merino sheep.



Wagon and horses (19th century)

Farmers in Britain became specialists, each trying to improve his own favourite breed. The *Great Horse of England*, now called the Shire Horse, had been famous since the days of the Crusades as a weight carrier, which indeed he had to be when an armoured knight with his saddle and weapons weighed not less than twenty-eight stone. But, as armour ceased to be used, lighter and quicker horses were bred for battle, and the " Shire " became a work horse. In the nineteenth century, Shire Horses were in great demand for pulling heavy loads in the ever-growing dockyards of London and Liverpool, and in all the big factory towns, for they are "great gallant lion-hearted workers, and yet as friendly as kittens. They'll pull till they break their hearts and can be led by a child."

James Howard of Bedford, son of John who made the ploughs, was one of the men who bred them, while Lord Wantage had another famous stud in Berkshire, not far from the farm that had once belonged to Jethro Tull. Another horse nearly as big as the Shire is the Clydesdale, many being bred during the nineteenth century, especially in Scotland, and they too travelled all over the world.

In Suffolk a lighter horse, the Suffolk Punch, was bred, notably by Thomas Crisp of Butley Abbey. Crisp also bred pedigree Shorthorn cattle, Southdown sheep and Black Suffolk pigs. His beasts won prizes all over England and in France, Germany and Russia, and were bought by farmers of many nations. " One day every horse-box within call would be telegraphed for to Wickham station, for a consignment of Crisp's horses bound for one of the Colonies. The next week

a whole menagerie of animals would be sent off to Prussia." It was to Prussia that Crisp's greatest horse, named Cupbearer, was sent, to breed cavalry chargers for the famous Uhlan regiment—which led the way when Germany invaded Belgium in 1914 (First World War).

Some breeders specialised in racehorses, bred from the light swift horses of Arabia; others in hackneys, the smart high-stepping horses of the Victorian carriage and pair; and others again, especially in Ireland, gave all their care to thoroughbred hunters.

Cattle breeders were just as active. In Aberdeenshire, Amos Cruickshank built up his famous herd of Shorthorns, bred for beef. His bulls were exported, some at a price of over £1,000 apiece, to populate the plains of the Argentine in South America, which has the biggest tinned beef industry in the world. Another Scottish farmer, William M'Combie, bred hornless black Angus cattle for their meat. His young bull, Black Prince, had to be taken to see Queen Victoria at Windsor. In 1878, M'Combie's hornless Angus won their greatest triumph when they were given first prize at the International Show in Paris. The jury judged them the best beef stock in Europe by a vote of twenty-four to seven, and it is largely through descendants of such animals that Scotch beef and farmers have remained famous ever since.

Further south, in Hertfordshire, a young farmer named Fowler was one day riding to Barnet Fair when he passed a man leading a pretty cow of a kind he had never seen before. Young Fowler had just married, and he thought this small gentle cow would make a good present for his wife, so he bought her for £7, and gave a five shilling piece to the drover. This was the best £7 5s. he ever invested in his life, for the little cow, an Alderney, gave such rich milk that Mrs. Fowler was able to make a stone of butter a week from her cream. Fowler at once imported more cattle from the Channel Islands and bred a herd from which he sold milking cows to dairymen in Denmark, America, Australia and New Zealand.

However, Jerseys, Guernseys and Alderneys are delicate cattle, and do really well only on good pasture in sheltered country. Unlike them are the little black Kerrys, the "poor

man's cow" of Ireland. The Kerry cow can thrive in bogs or on the stoniest pasture. As the Irish say, "if you were to put green spectacles on her, she would feed off the main road itself." Another hardy breed is the red curly-coated Devon. A red Devon ox drew "the plough which turned the first furrow in the soil of New England" for the Pilgrim Fathers, and the breed still prospers in the United States and in Canada.

The South Devon, a much larger, lighter-coloured chestnut cow, produces Devonshire cream, and the bulls of this breed are also the heaviest of any in the world. South Devons were eagerly bred by many farmers during the nineteenth century, when the Victorian father often had to carve his Sunday joint of roast beef for fifteen or eighteen children. But butchers can no longer sell these big joints; and the South Devon cattle, like those breeds of sheep which produced the vast Victorian legs of mutton, are no longer popular—unless indeed they might again be needed for the National Restaurants first founded in the Second World War of the twentieth century!

Among sheep breeders, Webb's (Sussex) Southdowns carried off all the possible awards at the Paris International Show in 1856. One ram was greatly admired by the Emperor Napoleon III—under whose rule France was defeated by Germany in 1871 when the Parisians had to seek safety from guns and shells in their cellars and "shelters." Webb gave his ram to the Emperor, though he had refused five hundred guineas for it from another dealer. However, the Emperor's ram proved a good advertisement, for many French breeders travelled to Sussex to buy Webb's Southdowns.

Elliot in the north bred Cheviots (whose wool makes a famous tweed), foxhounds, greyhounds and collie dogs. His collies were so intelligent and well trained that Queen Victoria sent for Elliot to ask if he would sell her one. Elliot replied in a stately way that it would be a great honour if Her Majesty would accept one as a gift. The Queen protested that this was far too generous of Mr. Elliot. Then Elliot's fine court manners melted, and he bawled heartily: "Noo, what's a pair o' collie dogs atween you an' me?"

To-day Hampshire Downs are one of the most famous flocks of sheep, and sheep from this flock have been sent to

South Africa, Australia, New Zealand, Canada and other parts of the world.

Most big farmers rather despised pigs, but Joseph Tuley, a poor Yorkshire weaver, had a passion for them. He experimented with all sorts of breeds, including pigs of Chinese origin, and finally he bred a beautiful boar whom he called The Druid. Tuley was earning only eighteen shillings a week, and he and his wife went short of food so that The Druid might live in luxury. They had their reward, for when The Druid grew up he won prize after prize and became father of the strain which made York Ham famous to this day. Another great pig breeder, Spencer of Huntingdon, can be said to have founded the Danish bacon trade. For again and again Danish dealers bought twenty or more of his pigs at a time. There was one period when almost every pig in Denmark was descended from the Spencer strain, and a great industry was formed to market the bacon.

The famous beasts of Britain travelled the world over. But the British farmer of the nineteenth century loved his beasts for their beauty and glory, and on the whole he neglected the wider commercial market, while other nations often reaped the biggest profits from the stock he bred.

XIII OUR DEBT TO MODERN SCIENCE

Transport before and after Railway and Steamboat—The Scientists, Liebig and Mendel—Rothamsted Experimental Station—War against Disease—Pasteur—
"When you drink a glass of milk . . . ."
"When you see a cow in a field . . . ."

I

During the eighteenth and nineteenth centuries and afterwards, men of science made numerous discoveries that were of the greatest importance to mankind. The invention of machinery of all kinds, of steam-engines, of trains and steamboats, affected all industries, including agriculture. Ways of transporting food, for instance, were completely changed by land and by sea.

Until the early years of the nineteenth century and the coming of McAdam's new roads and Stephenson's railways, herds and flocks had to be driven great distances over moors and downland cattle-tracks, or along the bad, deeply-rutted roads described by Arthur Young. Cases were not unknown of a sheep being drowned in the mud of a main road.

Dairy food and vegetables, and smaller animals like lambs, calves and poultry, were driven in huge, creeping, two or even three-decker wagons. These usually travelled at night when the roads were most clear, and they went so slowly that the drivers often fell asleep, while their teams of quiet horses plodded on unguided. There are stories of how other travellers sometimes played jokes on the drivers, turning their great wagons and horses around while they slept, so that in the morning the poor men woke up back in their own yards instead of in the market towns to which they had set out!

All this was changed by the spread of the railways, which could carry much bigger quantities of produce for longer distances and more quickly than ever before. The results were that farmers had a bigger choice of markets, and buyers a bigger choice of food, while there were no longer such great differences in the price of food in various parts of a country.

But, when steamships made the same big difference to the speed with which goods could be carried from one continent to another, European and British farmers were faced with a new world problem. They had to compete with produce exported from the New Worlds of Australia, New Zealand and the Americas. At first this consisted chiefly of grain, wool, hides and other such goods which did not get stale in transit. Meat, for instance, could only be taken far if it was boiled and tinned, and then it was not as palatable as fresh meat. Only 9050 tons of foreign mutton came into the British markets in 1882. But soon *cold storage*—a new scientific way of keeping food fresh—was discovered, and in 1899 173,000 tons of frozen mutton came into Britain, as well as beef and pork, cheese and butter and fruit.

Home farming, as we have seen, had already been severely hit by the import of foreign corn. Many British farmers had

turned from corn growing to grazing and dairying. Then suddenly, after the invention of cold storage, they found just as much foreign competition in the meat and milk product trades. Towards the end of the nineteenth century British farming was in a very bad way; the cost of production had increased, for modern machinery was expensive and labourers' wages, though still low, were higher than before; but the prices farmers obtained for their goods were lower because of the foreign imports, so that once again, though food was cheap, many farmers were very near to bankruptcy.

Yet throughout this time—gloomy though it was for farmers—and as the twentieth century advanced, men of science had continued to find out many things of real help to agriculture. First of all in importance are the researches which scientists have made into the nature of the soil. Geologists have found the reasons for there being too much or too little water in the earth, and have classified soil into different groups, giving the composition of each layer in each group. Soil chemists have analysed the minerals in these groups, and have made experiments so that they can tell farmers what crops the various types of soil are best capable of growing. From these researches we now know that soil is made up of humus, minerals, soil water, soil air, soil animals, and very small soil plants. Humus is organic matter, the rotting parts of vegetables and animals in the earth. The most important minerals, from the farmer's point of view, contain calcium, phosphorus, potash and iron.

As long ago as the sixteenth century, another line of research was begun to find how plants feed themselves. For a long time these researches were unsuccessful, partly because the early botanists did not know enough about the nature of the soil. Now botanists have shown that every plant is a small chemical laboratory in itself, feeding both from the carbon dioxide in the air which it turns into sugar, protein and oil, and also from the water, nitrogen and minerals in the soil. Nitrogen and such minerals as the plant absorbs weigh very little but are very important to its growth.

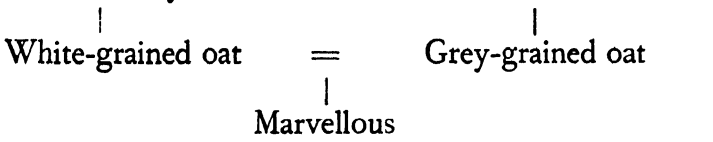
Man cannot do much to control one side of the plant's food supply; that is, he cannot greatly change the quality of

the air over the fields, though he can do something by planting or cutting trees and by draining or creating lakes, for trees and water both affect the surrounding air. But much more can be done to control that other part of the plant's food which it draws from the soil. We have seen that the very early Egyptian and Chinese farmers knew the importance of watering and manuring the soil; but now scientists are able to say just when to drain or water, and exactly what manures are needed to make different kinds of soil suitable for different plants. Again, scientists also now test the soil for acidity and advise farmers what medicine to give it, just as doctors prescribe medicines for human acidity. Calcium in the form of lime, and manganese in the form of basic slag, are the two great tonics for acid soil.

In modern times many very exact ways have been discovered in the laboratories and in the fields of testing soil and its effect on the growth of plants. One of the greatest experimenters was the German, Baron Liebig (1803–73), the founder of agricultural chemistry—and the inventor of an extract of beef which made his name known throughout the world. And most important field experiments were carried out by Sir John Lawes (1814–1900) and Sir Henry Gilbert (1817–1901) of the Rothamsted Experimental Station, Herts, where their work is still carried on. Much valuable research has also been done during recent years in Russia; and again at the Oxford Agricultural Economics Research Institute, and elsewhere.

Scientists have also helped the food-producer by breeding good types of plants. An Austrian monk and scientist, Gregor Mendel (1822–1884), found that when two different types of plant are crossed, certain "characters" of each reappear in a regular way in the succeeding generations. His careful observations of the common garden pea resulted in the famous law of heredity which still bears his name—Mendelism. Working on this new knowledge, plant breeders crossed small-eared good quality grain with larger-eared poorer grain, and then chose seeds from the new plants until they had fixed a strain of both good quality and large quantity. But it is no use producing wheat with a fine heavy head if the stem is not strong enough to hold it upright until it ripens. Some of the

early plant breeders made that mistake, and other crosses had to be made to produce a wheat with not only good grain but also a short strong straw. Each breed has its own name and pedigree. One good short-strawed wheat is called Little Tich. Here is the pedigree of an oat seed called Marvellous:



II

Yet another aim of the scientists is to breed plants which will not catch plant diseases, like Yellow Rust, which greatly reduces the yield of wheat.

Potatoes, of which 3,126,000 tons were grown in England in 1937, are subject to several bad diseases—Blight, Virus, Leaf Roll and Wart Disease. It was Blight which caused the great famine in Ireland in 1845 and hastened the Repeal of the Corn Laws. But now several breeds of potato have been produced which are free from this disease, and also many breeds which do not "catch" Wart Disease.

Nearly all the important diseases from which crops suffer are caused by tiny fungi, and the infection is then carried from one plant to another by small insects, such as greenfly or plant lice. Scientists have discovered various mixtures for spraying over plants which in some cases kill both the fungus and the insect without hurting the crop; but this is an expensive business, and many farmers have been nearly ruined by having to fight bad epidemics of plant disease.

Still more ruinous are the epidemics from which farm animals sometimes suffer. "Foot and mouth" disease, for instance, is so serious and so infectious that farmers are bound by law to notify the public authorities of any outbreak—and nowadays the announcement of the infected areas is broadcast. All infected animals, and any others which have been in contact with them, must be killed. It is a disease which may attack any cloven-hooved animal, and is marked by blisters in

the mouth and between the toes. Much research has been done into the cause of this disease, notably by the French scientists Vallée and Carré. But so far no sure preventive or cure has been found for it, and the animals suffering from it have to be killed to stop it from spreading.

With other diseases the scientists have been more successful. They have found means of curing tuberculosis in cattle, of inoculating lambs against dysentery, of vaccinating fowls against fowl-pox (which is the poultry equivalent to smallpox in humans), and of injecting dogs to cure distemper.

They have also traced the very curious history of a liver disease in sheep, which is caused by a small flat worm called a fluke. This worm lodges in the sheep's liver and lays thousands of tiny eggs. An egg passing out in the sheep's dung hatches into a minute larva, which can only live for twenty-four hours unless it finds a certain kind of fresh-water snail. If the larva does find such a snail, it forces its way in and grows into a small bag, which buds off internally and then falls apart into half a dozen little creatures like tiny tadpoles. These "tadpoles" then escape from the snail's shell and after a time fasten themselves to blades of grass, where they are called cysts. If a sheep eats a cyst, this develops into a fluke, the original sort of flat worm, and grows to about an inch in size, causing the disease called liver-rot.

It took scientists a hundred and thirty years to find all the links in this strange circle, and then they were able to tell farmers that they could prevent the disease of liver-rot in sheep by destroying the snails (which are essential to one stage in the fluke's life) with a mixture of copper sulphate, kainite and sand.

Equally complex is the life of a small thread-like worm which causes a coughing disease in pigs. This too can now be prevented by keeping pigs in pens with concrete floors, where they cannot swallow the harmless ordinary earth-worms in which the larva of the tiny thread-worm develops.

Some of the scientists who have solved the mysteries of plant or animal diseases have been women. One of the best known is Miss Ormerod (1828–1901) who made a life study of insect pests and was for ten years consultant to the Royal

Agricultural Society. She published two books about harmful insects, which have taught men to rid their fields of weeds such as docks, thistles, dandelions and charlock, because all these are the homes or food of destructive insects, fungi or weevils. This study of insects is known as entomology.

Another science which has done much to help food-producers is bacteriology or, as it is now more accurately called, micro-biology—that is, the study of all the tiny (or micro-) forms of life found in the soil and in plant or animal tissues, forms so small that they can be seen only through powerful microscopes. These minute plants and animals are called bacteria, algæ, fungi, bacilli and protozoa, or sometimes just "germs" or "microbes." Some of them are very useful in causing the decay of plant and animal matter in the earth and in releasing the nitrogen which helps to feed new, growing plants. Others cause dangerous diseases, such as anthrax and tetanus (lock-jaw).

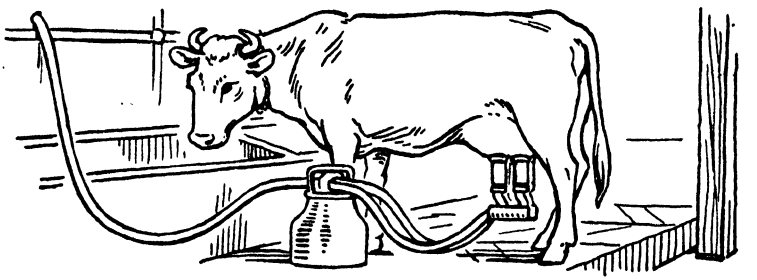


Pasteur

The first scientist to discover the nature of these minute but very important little atoms of life was Louis Pasteur (1822–1895), the son of a sergeant in Napoleon's famous 3rd Regiment. It was Pasteur, too, who discovered how to cure rabies, that form of madness which both animals and men develop if bitten by a mad dog.

Much care is now taken to prevent "bad" bacteria from spreading disease. Animals and even plant seeds are inoculated, seeds being treated by moistening them with skim milk and shaking them up in test tubes where "good" bacteria are growing on jelly. The good bacteria then stick to the damp seeds and protect them from bad bacteria.

Special care is taken with regard to milking, for it has been found that several kinds of "bad" bacteria can live in milk. So on an up-to-date dairy farm the cows' rumps are shaved, for germs might stick to their hair; the cows are washed before milking; instead of the old wide open pails, carefully sterilized, domed buckets are used; and, if the milking is done



Milking by machinery

by hand, the milkers wear white caps and jackets and both their hands and stools (the last thing they touch before beginning to milk) are disinfected. But much milking to-day is done by milking machines worked by petrol or electrical engines. All the parts of the milking machinery, and the bottles into which the milk goes, are sterilized (before milking is begun) by steam of a heat which kills bacteria.[1]

There is of course a great deal of natural grass-land in England where grass grows wild. But this for the most part is not good quality for grazing, and a sheep may have to wander over many acres to find enough food to satisfy it, while in the planted pastures a full-grown bullock can get enough food to grow fat off a single acre. The seeds used for these planted pastures have been carefully cultivated and tested for many years, and they were brought from many countries: the clover seed from Flanders and the rye grass from Italy in the seventeenth century, the cocksfoot and timothy from America in the eighteenth century; and other later strains from Denmark, France and New Zealand.

Now "grass" in a planted pasture is not just ordinary grass. It is a balanced mixture, usually of perennial and Italian rye grass, cocksfoot, timothy, rough-stalked meadow grass, small fescues, clover and perhaps lucerne—seeds which have all been studied and chosen for their high feeding value, while some of them before planting may even have been inoculated. Then the soil in which this selected grass is grown has been drained

1 For a simple account of the *Advance of Science*—"The Romance of Electricity" (Volta, Galvani, Faraday) and the "Conquest of Pain" (Pasteur, Jenner, Lister)—see Marten & Carter's *Histories*, Book IV (Blackwell).

and fed with natural or chemical manures; while the cow which eats the grass, even if she is not a pedigree animal, is the result of at least a hundred years' study in stock-breeding and in preventing animal diseases.

Farming, in fact, has a longer history than most of Man's activities, and modern farming is as scientific as any other industry.

So *when you drink a glass of milk,* think of all the long years of research and the many clever inventions which have gone to make it a pure and healthy form of food. Or *when you see a cow in a field,* do not make the mistake of thinking that the cow and the grass just grew without giving anyone any trouble! It is much more difficult to grow a field of good nourishing pasture than to build the same area of motor-road; and it takes far longer to breed a good cow than to make a motor-car, even a Rolls-Royce.

XIV THE ROMANCE OF ELECTRICITY FARADAY TO MARCONI

The Motor-car—Electric Lighting and the National Grid—Telegraph and Telephone—Ocean Cables—Wireless and Broadcasting—Atomic Energy.

I

We have grown so used to electricity entering into our daily life for many different purposes—lighting our buildings, working our factories, driving our tramways and trains, sending our telegrams, working our telephones and wireless sets—that it is perhaps difficult to realise that little more than a century ago none of these aids to our comfort existed, nor were in fact possible. They all depend on a knowledge of the relation between the property sometimes acquired by pieces of iron of attracting one another—which we call *magnetism*—and the ability of metals to convey the mysterious product of a galvanic battery—this we call an *electric current.* The discovery of this relation may be said to have affected the conditions of everyday life in civilised countries to a greater degree than any other since the invention of printing.

From quite early times men had been acquainted with the use of a piece of magnetic iron as a aid to steering ships, since a magnet, when free to move, always tends to point to the north. Something was known about electric currents when the Italian Volta, about the year 1800, had shown how to make galvanic batteries. Nobody suspected, however, that there could be any connexion between the two until about twenty years later, when Hans Oersted, a Dane, found that a magnet turned away from pointing to the north when a wire carrying an electric current was near it; and not long afterwards William Sturgeon, an Englishman, discovered that an iron bar would become a magnet if a wire carrying an electric current were wrapped round it.

These discoveries led men to think that there must be some connexion between electricity and magnetism. In 1831 such a connexion was proved, and its nature made clear, by the genius and patience of a great Englishman, Michael Faraday. The discoveries that he made were of such far-reaching importance that he has been called the " Father of Electrical Engineering."

Faraday was the son of a London blacksmith, and was born in 1791. At the age of fourteen he was apprenticed to a book-binder, and made good use of his opportunities to read many of the books that passed through his hands in the course of his work, particularly those treating of science. In his spare time he endeavoured to repeat, so far as his scanty resources would permit, some of the experiments described in the books that he read, and to assist him with his electrical experiments, he made a battery something like Volta's. He kept careful notes of all that he did, writing them out in clear, bold hand-writing.

In 1812, when the young man was twenty-one, he had an opportunity of hearing Sir Humphry Davy, the famous chemist and inventor of the miner's safety lamp, lecture at the Royal Institution. He had taken full and careful notes of the lectures, and he copied them out, bound them, and sent them to the lecturer, together with a letter begging Sir Humphry to help him in finding some employment where his love for science would be given some scope. He was granted an interview, and Davy, impressed by the youth's keenness, made

him his assistant at the Institution. Having thus become associated with this scientific body, Faraday remained a member of it all his life.

It was about the year 1824 that he began his long and persistent efforts to discover in what way magnetism and electricity were related to one another—as he felt convinced they must be. He knew already that electricity could be made to produce magnetism, and he set himself to find a method of reversing the process, so that electricity might, as he hoped, be produced with less trouble and expense than by the use of galvanic batteries. For seven years he worked at the problem, trying in turn every sort of combination of magnets and coils of wire. He kept notes of all his experiments, and from these notes, which have been preserved, we know that Faraday was more than once on the verge of finding the clue that he sought, but failed to notice it owing to the imperfect working of the instruments that he used, most of them constructed in the workshop of the Institution.

Eventually his perseverance was rewarded, and to his delight he found himself able to produce electric currents without using batteries, and thus paved the way for the making of the *dynamo-electric machines* that nowadays supply electricity in vast quantities for industrial and domestic uses.

This discovery of "electro-magnetic induction," as it is called, was Faraday's contribution to human knowledge, and for it his name is held to-day in grateful remembrance, since few men have made discoveries of such striking importance. The coils of wire and other apparatus that he used are still preserved in the museum of the Royal Institution. Throughout his life Faraday maintained his interest in electrical matters, though it was not until after his death in 1867 that any substantial progress was made in putting to practical use his discovery of nearly forty years earlier.

However, by 1871 several engineers had made machines for producing electricity by means of magnets, on Faraday's principle, although at first there were few uses for the electricity so produced; but a fortunate discovery a year or two afterwards by an engineer in Vienna greatly enlarged the prospect. While working with two of the new machines,

which were connected together by wires, he found that when one of them was driven round, the other one likewise began to run. Thus came about the invention of the *electric motor*, the forerunner of the machines that to-day form the motive power of factories of almost every kind.

The application of electricity for motive power purposes grew slowly. Lighting was the first important use to which the new agency was applied. The brilliant light given by the electric "arc" (or air-gap between two carbon roads carrying an electric current) had been known since the time of Sir Humphry Davy, and advantage was soon taken of the new electro-magnetic machines for lighting large buildings and open spaces. Nearly seven years had to pass, however, before a further invention, that of the electric glow-lamp used everywhere to-day for lighting shops and houses, gave the infant industry of electrical engineering its opportunity. This time it is an American, Thomas Edison, whose achievements have to be related.

Edison was born in 1847 and as a boy showed keen interest in such few electrical devices, chiefly concerned with telegraph work, as were known at that time. When he was nearly thirty, Edison turned his attention to the production of a small electric lamp which might be suitable for domestic lighting, the arc-lamp being too bright and powerful for this purpose. Edison came to the conclusion that sufficient light could be obtained if an electric current were passed through a fine wire or thread inside a glass bulb from which all air had been pumped out, so that the thread would glow without burning away. It was a long time, however, before he managed to find a material for the thread which would keep on glowing for a reasonable time without wearing out. In the end he solved the difficulty by using the charred fibre of a bamboo cane, and in 1879 he patented his new lamp; it proved a success and may be said to have started the electric lighting industry.



Edison

To Edison's disappointment it happened that, unknown to him, an English scientist, Joseph Swan, had been engaged in a similar quest; as far back as 1860 Swan had made an electric glow-lamp for working from a galvanic battery, though he did not follow the matter up at that time, since there seemed to be little scope for such lamps until the dynamo-electric machine began to replace the battery as a source of electricity. When the time was opportune, Swan again set to work and, as it turned out, produced his glow-lamp just about the same time as Edison. The two joined forces, and the *Edison-Swan lamp* began a new era in domestic lighting. Although the lamps used to-day for lighting our homes are made of different materials, they are truly the result of the patient work of these two inventors.

The invention of the electric glow-lamp quickly led to the planning of schemes for the distribution of electricity from central points to surround buildings which required light. Edison was among the first to realise the importance of this development, and he applied himself to the design of dynamo-electric machines larger and more powerful than those built up till then, so that ample supplies of electricity might be produced for lighting large numbers of the new lamps. Since that time the machines in electric generating stations have grown more and more massive and powerful, especially now that electric motors and electric heating and cooking appliances, as well as lamps, are worked by current sent out from central stations.

At the present day great dynamos driven by huge steam turbines of 20,000 horse-power or more, generate vast amounts of electricity; this is sent into a network of overhead cables on steel towers, called the *National Grid*, which covers a large part of the country, and from it supplies are drawn by towns and cities for the use of the people.

Edison's record of inventions is a long one and covers a wide field. Perhaps he is best known as the first man to make a machine that would record and reproduce music and speech. The *phonograph*, as it was called, employed records in the form of cylinders, not flat discs such as are used in modern gramophones; nevertheless, it was the forerunner of the instruments now so generally popular. Edison had not a little

to do with the improvements in telephone transmitters that have helped to make the telephone a reliable means of communication, and in the early days of the cinema his painstaking ingenuity did much to render the projection of the pictures on the screen as lifelike as they appear to-day.

II

We now turn to the use of electricity for purposes of communication. Even before the day of Faraday's momentous discoveries, it had been recognised that that mysterious agency could be made to serve the purpose of sending intelligible signals between distant points, and in 1837 Cooke and Wheatstone constructed an instrument which would transmit messages over several miles. At the same time attempts were being made in the United States to devise a practicable *electric telegraph* and an American inventor, Samuel Morse, introduced the well-known *Morse Code* of dots and dashes; when used with a simple and sturdy instrument of his design, this code enabled messages to be sent over longer distances and at greater speed.

For some thirty years or so it was possible to send messages over a telegraph wire in one direction only, but in 1868 a method was discovered by an American named Stearns of sending messages in both directions at the same time; this is called "duplex" working. It was improved upon, six years later, by Edison who showed how two messages might be sent at the same time in both directions through one wire: this was known as "quadruplex" working, and it enabled a telegraph wire to deal with four times as many messages as formerly.

The speed of signalling was, however, still dependent on the skill of the operator, until Wheatstone in 1874 introduced a method of sending and receiving messages on paper tapes, which could be run through machines far more quickly than any telegraphist could work instruments by hand. Nowadays telegraph instruments are coming to resemble typewriting machines in appearance, the message being tapped out on a keyboard at the sending end and recorded in typed characters

on a page of paper at the receiving end, ready for delivery to the person to whom it is addressed.

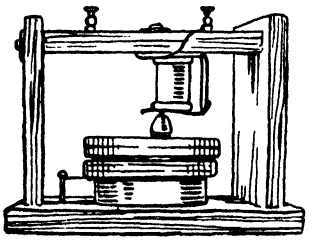
These successive improvements were concerned with telegrams between places on land where poles and wires could be used, but when attempts were made to send messages across the sea, entirely fresh problems arose to be dealt with. *Cables* were laid along the bed of the sea, the first of them being laid from England to France in 1851. Six years later a cable was laid across the Atlantic Ocean; but it was found that when the electric current reached the far end of the long cable, it had become too feeble for working any of the telegraph instruments then in use, and for a while it looked as if the attempt to send messages across the ocean was doomed to failure.

The difficulty was met and triumphantly overcome by the genius of a great British scientist, Sir William Thomson (afterwards Lord Kelvin), who ranks with Michael Faraday as among the most distinguished pioneers of electrical discovery. Thomson was born in 1824; his father was a professor at Glasgow University, and the boy learnt much from him in his early years. After graduating at Cambridge, he himself became a professor at Glasgow at only twenty-two years of age, and held the position for thirty-five years. His gift for invention was remarkable and embraced many branches of experimental science. In 1857 he constructed an instrument for receiving telegraphic signals by means of a beam of light reflected from a tiny mirror attached to a magnetised needle; this proved to be vastly more sensitive than any instrument previously known, and it made telegraphing across the Atlantic a success.

Ten years later, Thomson followed this up by designing another highly sensitive instrument which recorded the signals received through a submarine cable by means of a wavy ink-line on a paper tape. He also devised a series of electrical measuring instruments which, for the first time, enabled precise and accurate measurements to be made of electrical quantities. Although his electrical inventions were the most notable of his varied activities, he did valuable work in other fields also; he contributed to increased safety at sea by designing an improved form of mariner's compass as well as

a deep-water sounding apparatus for indicating the depth of the sea. Lord Kelvin died in 1907 after a life amazingly rich in scientific achievement, and was buried in Westminster Abbey near the tomb of an earlier scientist and philosopher, Sir Isaac Newton.

When the electric telegraph had been in use for about forty years, another striking discovery led to an entirely different method of conveying messages by electrical means—the *electric telephone*. The pioneer in this new field was a Scotsman, Alexander Graham Bell, who was born in Edinburgh in 1847 but went to Canada when he was twenty-three years old. He became a teacher at a deaf-and-dumb school, and it was while thus engaged that he conceived the idea of causing an electric current in a wire to vary from moment to moment in rather the same way that sound varies in music or speech. Bell argued that if he could only find some way of bringing this about, it might be possible to transmit messages to distant points by word of mouth, and not merely by code signals, as with a telegraph instrument.



Early electric telephone

After a number of unsuccessful attempts to construct an instrument that would embody his idea in a practical form, Bell at length made one containing an electro-magnet and a thin iron disc, which he hoped would reproduce at a distance words spoken to a similar instrument connected thereto by wires and a battery. He found that it did so, though very imperfectly, the received sounds being weak and distorted. Nevertheless, Bell's apparatus, shown at Philadelphia in 1876, was the first electric telephone, an invention that has influenced modern social life in all civilised countries perhaps more than any other.

III

All the valuable applications of electrical science so far mentioned—lighting, telegraphs, telephones—relied on metal wires for conveying currents of electricity from one point to another. In the year 1884, however, an event occurred which, though little noticed at the time, was destined to lead to an entirely new development in electrical enterprise—communication between distant points without any connecting wires! James Clerk Maxwell, who had been born in 1831, was then Professor of Physics at Cambridge; by purely mathematical reasoning he arrived at the conclusion that there must exist electro-magnetic waves, similar to light waves, and he worked out in detail how such waves would behave. Four years later Heinrich R. Hertz was able to find a method of producing these waves, and actually succeeded in sending simple signals a distance of a few yards by their means. About the same time too, Sir Oliver Lodge, working independently, achieved a similar result.

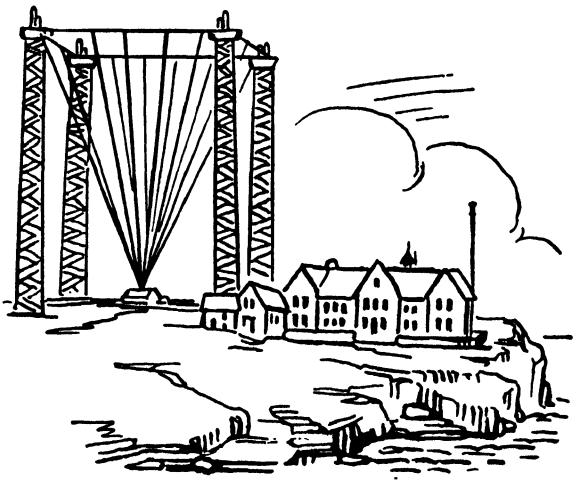


Marconi

The fascinating field of research thus opened up attracted many experimenters, and one of them, Guglielmo Marconi, has gained a world-wide reputation on account of the determination and inventive skill he has shown in devising methods of practical wireless communication. Marconi was born in 1874, and as a youth became keenly interested in the new discoveries which were then beginning to become known. By the time he was twenty-one, he had succeeded in sending wireless signals over moderate distances with greater certainty and clearness than any previous experimenter. He then journeyed from his native Italy to England and succeeded in interesting the British Government in his apparatus. In 1897 he proved that he was able to transmit messages between points at sea nearly twenty miles apart, and two years later messages were sent by his apparatus across the English Channel.

Encouraged by this success, Marconi set his mind on a far

more ambitious project—nothing less than the sending of wireless messages across the Atlantic Ocean! In many quarters the belief was confidently expressed that this would prove to be impossible, owing to the earth's curvature. Marconi, however, was not to be deterred by criticism of this sort. After some experimental transmissions between the Lizard and the Needles in the Isle of Wight, he had become convinced that this supposed difficulty could be overcome.



Poldhu wireless station

Accordingly, towards the end of 1901, he arranged for a simple signal (three dots, representing the letter " S " in the Morse Code) to be radiated from Poldhu, in Cornwall, while he himself listened with a telephone attached to the string of a kite flown in far-off Newfoundland, nearly 3000 miles away. To his delight, he heard three faint clicks, several times repeated, and knew that his aim had been realised.

Marconi's experiments up till then had been carried out with apparatus much less efficient than that used nowadays, and it is doubtful whether he or others would have progressed much further towards bringing wireless communication into common use, had it not been for the introduction of one of the most remarkable devices ever invented—the thermionic valve. In the early eighties Edison, while at work on his electric

glow-lamps, had noticed a curious discoloration of the glass bulb, for which he was at a loss to account.

Some ten years later, Sir Ambrose Fleming, then a professor at London University, in seeking to ascertain the reason for the " Edison effect," as it was called, mounted a metal tube round the filament inside the bulb. He found this arrangement yielded unexpected and surprising results, which became still more striking when, not long afterwards, Lee de Forest, an American scientist, added to Fleming's device a spiral wire " grid " between the tube and the filament. This " valve," as it came to be called, enabled weak wireless signals to be increased in strength very greatly, and formed a detector of wireless waves vastly more sensitive than any of those that had been previously used.

Sir Oliver Lodge and others showed that apparatus for receiving wireless signals could be " tuned " so that it would respond only to signals of certain wavelengths, and it soon became possible to transmit speech and music as well as messages in telegraphic code. This led to the institution of *Broadcasting* or sending out from central points music and speech for the entertainment of listeners provided with suitable receiving instruments. The United States led the way in 1920, and two years later a regular service began in this country.

In most countries broadcasting has now become a part of the national life. In recent years special types of valve that are sensitive to light have been developed, and these render possible the transmission of pictures of distant events, called *Television.*

We have seen that with the passage of years more and more uses have been found for electricity in man's service through the efforts of a succession of gifted scientists and inventors. Yet, strange to say, until comparatively recently, nobody was able to give any clear or confident answer to the question " *What is electricity?* " However, about the beginning of the present century a series of remarkable researches by Sir Joseph Thomson and Lord Rutherford at Cambridge, and by other physicists elsewhere, led to the conclusion that electricity is inseparably bound up with the constitution of *matter,* of which all substances are composed.

According to the view then generally accepted, all matter is composed of tiny *atoms*, each of which consists of a centre or nucleus, formed of a charge of positive electricity, and around this is grouped a number of infinitesimally minute particles charged with negative electricity. These are called *electrons*, and their number differs according to the nature of the chemical element which the atoms compose; thus, for instance, an atom of copper has a number of electrons different from that possessed by an atom of zinc. An atom may part with some of its electrons or may receive others, and what we are accustomed to term an *electric current* is, according to this theory, a continual drift of electrons from atom to atom: in a wireless valve a flow of electrons is set up from the filament to the plate through the meshes of the grid, and by means of the grid the electron flow can be regulated as desired.

Research into the nature of atoms is still being actively pursued, and as our knowledge of their constitution increases, so will our understanding of the true nature of that mysterious agent, electricity!

The generation of electricity from *atomic energy* is the latest development. This new source of power may be available in a few years on a large scale for the good of mankind. But to what terrible purposes it can be put we all now know since the first atomic bomb fell on a Japanese town and brought Japan to her knees at the end of the Second World War (1945).

XV THE SOCIAL SERVICES AND STATE CONTROL

Local Government, Factory and Education Acts—Trade Unions and Co-operative Societies—State Control in Democratic and Totalitarian States—Soviet Russia and Democratic Denmark —State Control in Britain

I

In modern times the State has organised numerous Social Services (Health, Insurance, Education and so on) for the benefit of the whole community of citizens who form the State. And it has undertaken more and more control of Industry, especially in war time when we are all alike "national

communists" with our lives and property at the command of the community.

By the end of the eighteenth century, the Methodist Revival (due to John Wesley) had already given great impetus to social reform. As the public conscience became more deeply stirred during the nineteenth century and after, many Social Services were organised and many Acts of Parliament were passed for that purpose.

This could not have been done without first reforming our government, both central and local.

The Great Reform Bill (1832) gave M.P.s for the first time to great industrial towns such as Birmingham, Manchester, Liverpool, Leeds and Sheffield, so that their needs could be voiced in Parliament. By gradual steps (1867–1928) the Vote was given by four great Acts to all adults, including women.

In its turn Local Government—in which men and women practise self-government—was reformed by two Acts setting up Town Councils (1835) and County Councils (1888). Under the guidance and stimulus of the Central Government, these locally elected Councils now look after all the Services that concern the citizens' daily life, such as roads, education, health and housing, and "public assistance" for the aged, the sick and the poor. Democracy and self-government demand education for all, and this was organised by the Elementary Education Act (1871), the state-aided Secondary School Act (1902), the Education Act of 1944 and other Acts of Parliament.

Meanwhile many Acts were passed to improve the daily life and conditions of work of the people. Numerous Factory, Mines and Workshop Acts (starting in 1802 and continuing ever since) have improved the worker's life in all our industries, while the great Trade Union movement has educated the worker in political and industrial affairs. Trade Unions sprang up in all the big towns (from 1824 onwards); two generations later the first great Trade Union Congress was held, and the Labour Party was formed (from 1904). This movement owed much to Robert Owen (1771–1858), who may be regarded as the Father of English Socialism.

But the farm workers had a very uphill fight; the pioneers,

six Dorset labourers, known as the Tolpuddle Martyrs (1834), were savagely sentenced to be transported overseas for seven years for taking an oath to their trades union. But nearly forty years later, the National Union of Agricultural Labourers was started by Joseph Arch, a Methodist farm labourer, and in due course an M.P.

This short summary of reform, embodied in numerous Acts of Parliament and worked by a vast army of officials and inspectors, serves to show how all-embracing are our Social Services, and how much has already been done to improve the national welfare.

After the First World War of 1914–18, many countries (which had never learnt the difficult art of self-government) were ruled by Dictators. These Dictators and their army of State officials so controlled the people's life and work and schools, that freedom and liberty were destroyed, and such countries became known as *Totalitarian States*—notably Fascist Italy and Nazi Germany.



Robert Owen

In Soviet Russia, the peasants after much suffering and a stubborn struggle had to give up their little individual farms and work together for the common good in large village or "collective" farms, grouped around modern Motor Tractor Stations. It was a hard struggle for the peasants to get used to the new mechanised farming on a large scale. But they worked in communities under an elected village elder, who called together the heads of houses to meetings to decide when to go hay-making in common, when to plough, sow and reap. Each worker had his allotted task, and a diagram was sometimes posted up in the farm to show the speed of work by pictures of tortoises (for the slowest), donkeys, bicycles, trains, motor-cars and (for the quickest) aeroplanes. These new communal villages of "collective" farms in Soviet Russia, unlike the village communes of old Russia, have their schools, hospitals, libraries, lectures, music, dancing, and wireless. Never in the history of mankind has there been so vast a revolution in industry, in village and town life, as in Soviet

Russia, which in Europe and Asia has nearly 200 million people with nearly an 80 per cent rural population.

What a contrast, in population and in farming, with the little democratic nation of Denmark with its three million people! In Denmark, instead of large communised farms, no less than 94 per cent of the farmers own their land and more than half the farms are less than twenty-five acres. Here was started the first co-operative dairy in the world, and modern Denmark, a small and fertile land, developed a prosperous export trade in bacon, butter and other farm products—which we missed so much when Nazi Germany occupied Denmark in 1940. All the world has much to learn from Denmark; and not least from its Folk High Schools where young men in the winter and maidens in the summer study happily together—a model for our County Colleges and Young Farmers' Clubs.

State Control of industries has made great strides even in democratic countries, as can be seen in the post-war history of British agriculture, our basic and most essential industry.

Once, as we saw earlier in this book, men grew food only for their own families. Then came the settled villages, in which some men were farmers and grew food for the whole village, while other men of the village had other occupations. Gradually the number of other industries grew, and a farmer was soon growing food not only for his own village, but was selling it in other villages and towns, and in due course in other countries and continents—until to-day different kinds of food are sent from country to country throughout the world.

And so the world has at last, in our own days, become one "household," a One-World.

II

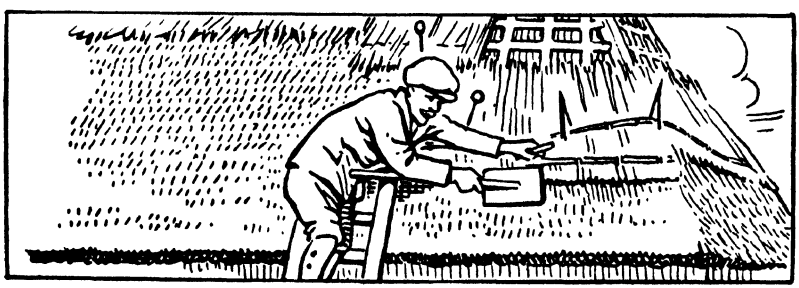
There are, however, few landowners left like "Turnip Townshend" or Coke of Holkham. The terrible year of 1879—when so many farmers were ruined by the bad harvest and the import of cheap American grain—was the beginning of the end for the old big estates with active landowners

themselves farming and so setting an example to their tenants. As time went by and food imports increased, landowners all over England had to reduce their rents to enable farmers to work the land in face of the new foreign competition.

Then, too, heavy taxation and death duties crippled many big estates, which had to be broken up or sold. More and more land changed hands, until about a third of the farmland of England was owned in small acreages by farmers who worked it themselves. Some of these small owners had not enough capital to develop their land to the fullest advantage, and in this twentieth century the State arranged subsidies and loans for fertilisers and drainage and the improvement of livestock.

Right down to the present century, farm workers used to be hired at fairs held at certain seasons, such as Michaelmas. Then the labourers who wished to change their job stood in the fairground, each holding the sign of his own skilled craft, the carter his whip, the shepherd his crook, and so on, and each made his own bargain (for wages and cottage) with the new farmer hiring him. Wages were very low according to modern standards. A head dairyman might get only twelve or fourteen shillings a week, but on the other hand he got a cottage rent free, and a certain amount of payment in kind, such as wood for his fire, seed potatoes for his garden, a little milk, butter or a few eggs every week, and a rabbit or two every now and then.

But the rural worker's life was hard and his hours long. Unless he loved his work and a country life, he was often tempted to go off and work in a factory town for bigger wages



Thatcher at work

and to " have his evenings to himself." This happened so frequently during the great factory expansion of the nineteenth century that many villages were deserted.

During the First World War, the minimum wage for an able-bodied man was fixed (1917) at 25s. a week, and, later still, County Wage Boards came into being, on which six farm labourers and six employers sat, under the guidance of three members appointed by the Ministry of Agriculture, and these boards fixed wages for the district on a sliding scale, according to whether it was a good year for farming or not. So at last farm workers began to share in the general prosperity. We have only to watch a ploughman, a thatcher, a hedger or a cowman at work to realise he is a skilled craftsman, and often too in these days he can drive and sometimes repair petrol engines, stationary or tractor, which are so essential to modern mechanised farming.

How much the ploughman, his lord " Sir Knight," and their world, have changed since the Middle Ages, we can judge from the poem of *Piers the Plowman* of 600 years ago :

" Surely, Sir Knight," said Piers then,
" I shall work and sweat, and sow for us both,
And labour for thy love all my life-time,
In covenant that thou keep Holy Church and myself
From ruthless and wicked men that would us destroy."

The world-wide agricultural, industrial and scientific revolution of the modern age has of course seriously affected all connected with British agriculture as with every other industry. And, with modern farming and modern transport, food supplies can be assured, and famine would become a thing of the past—if war ceased. Indeed, with peace and security, more food can now be produced than people can sometimes afford to buy, and both production and prices have then to be regulated by law.

This was done in England chiefly through Subsidies (or "grants") and Marketing Boards. New industries, such as the sugar beet industry, which employs much labour and is good for the land, were subsidised by the Government, while older branches of farming, such as dairying, potato growing and pig keeping may be controlled by Marketing Boards.

For example, by the Milk Marketing Scheme, which began in 1933, milk must be produced under certain conditions, and registered in certain grades according to the number of tests it has passed. Then all the milk has (in theory) to be sold to the Milk Marketing Board, which resells it, charging different prices for drinking milk, for milk for butter and cheese, and milk for dried or condensed milk factories. If farmers retail their own milk direct, they pay a levy to the Board. The calculations for working this scheme are so complex that they can be done only on calculating machines, which have been recently invented.

So two new types of technical experts come into the story of agriculture. We have already seen something of how engineers, stock and plant breeders, geologists, chemists, entomologists and microbiologists have helped in the growing of food. Now, in the Milk, Pig and Potato Marketing Boards, and in the subsidies for such branches of farming as the sugar beet industry, we see how the work of the experts in statistics has been applied to agriculture.

The new agricultural industry also gives work to many factories—factories for farm implements, and for chemical manures, for cattle-cake and other manufactured foodstuffs; for wire fencing and tractors and binding twine; for dairy apparatus, mechanical milkers, churns, separators and sterilizers; for sheep-dip and animal medicines, as well as for turning farm produce into market produce, such as cheese factories, flour mills, tanneries, and factories for " bully beef," potted meat and tinned fruits.

Then, too, there are the textile factories, kept going by cotton and flax growing farms; and the less known specialised branches of farming—vegetable flosses for silk, lavender for perfumes, jute and fibres for rope and string, as well as the market garden produce, the vegetable farms, flower farms, and farms which grow one thing only, such as tomatoes, usually for some big tinned food firm which makes them into sauces or soups.

Laws have been passed to regulate all these manufactures, and to protect both buyers and sellers. Farmers, for example, are protected by the Seeds Act of 1920, by which all seed

merchants are forced to guarantee their goods. Government inspectors may at any moment test samples to make sure that no weed seeds, such as charlock, have been mixed in as a make-weight with, say, turnip seeds, which they resemble. The public, on the other hand, are protected by the Adulteration of Food Acts, which force food-producers and shopkeepers to label their goods and state whether any mixtures or preservatives have been added to them.

Then there are laws such as the Destructive Insect and Pests Act, which compels people to notify insect and fungus pests, and provides for imports to be examined to prevent other pests coming into the country. The Colorado Beetle, for instance, which causes serious losses in potato crops, was brought to Europe in the equipment of the American troops during the war of 1914–18, and spread quickly through France, Belgium, Luxemburg and parts of Germany, creating much damage. The import into this country of all potatoes from districts anywhere within a certain distance of these infected crops was forbidden; and where any signs of the beetle were seen in Britain, farmers had to spray their crops with an arsenic mixture to kill the pest.

One of the financial problems which has caused trouble recently in England is the old problem of tithes. Long ago, tithes were a free gift, made to the Church every year, of about a tenth (or tithe) of the land's produce, in "thanksgiving to God and for the support of His priests." Farmers gave a tenth of their crops, or of their wool, meat, milk, fruit and eggs. Gradually the custom of giving tithes in kind lapsed, and they were paid in money, calculated on the worth of about a tenth of the land's produce.

"A transcript from a certain Vicar's Easter Book for 1714 shows the nature of the vicarial tithe and the manner of its payment:

'For House Duties every man pays three halfpence Duty for his House Offerings, two pence for every person that is above sixteen years of age. A new Milch'd Cow three halfpence, for every old Milch'd Cow . . one halfpenny. . . Each Oxgang four pence. Bees each swarm one penny. For every young Foal one penny. For every Sheep Skin that dies

between Candlemas and Clipping-time one halfpenny. Each servant five pence per pound for the Wages. Plaster one shilling for every Ten Tuns, if taken in kind the fifth part. The Windmill to pay two shillings. If any sheep be brought into the Parish before clipping-time, to pay four pence per score per month. If any Sheep be sold between Candlemas and Clipping Day, to pay one penny for each sheep. If they be couples (i.e. ewes and lambs) to pay one penny halfpenny each couple. Tythe Eggs for every cockerel three eggs, for every Hen two eggs—if the Hen sits it is payable. Herbage for depastured cattle.' "[1]



A fine old Tithe Barn

When tithes were paid and collected in kind (as in the above example), tithe barns were used for the storage of the produce—and fine specimens of these splendid old buildings are still to be found in most counties.

By the Tithe Act of 1936 a plan was made for bringing tithes in due course to an end. One of the Church societies, known as Queen Anne's Bounty, which deals with church finances, has the duty of replacing tithes by a scheme which many seem more willing to accept—and this Act affects landowners and farmers all over the country.

Thus, there are nowadays many laws controlling the production, marketing and finance of the agricultural industry, as well as laws for its protection. But many problems remain

1 Dr. and Mrs. Orwin's *The Open Fields* (O.U.P.)

unsolved, and what is now most needed is a clear long-term policy laid down by the Government for the industry as a whole *in time of peace no less than in time of war.*

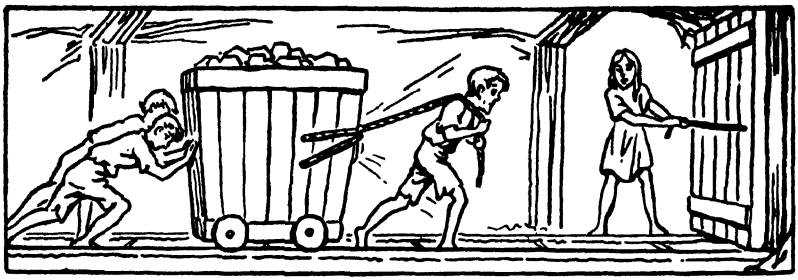
"We may have repaired in twenty months the worst of the land neglect of twenty years," said the Minister of Agriculture, speaking on the 5th February, 1941. "Our success in this (Second World) War depended, in the ultimate analysis, on the fertility of our soil and the physical conditions of our agriculture. Thanks to the magnificent response of farmers to the efforts of the County War Agricultural Committees, we have ploughed up between 3,000,000 and 4,000,000 acres.... All that had been done in the way of ploughing up, draining, ditching, liming, and fertilising was a material asset that would continue to exist when the war was over. It would then be for the nation to see that these gains are retained, and that our incomparable countryside never again becomes a land of neglected fields."[1]

XVI THE WORLD AS "ONE HOUSEHOLD"

The vast changes of the last hundred years—The Conquests of Science—Our One-World—The World Geography of Food—War and Famine or Peace and Plenty—What of the Future?

In the last hundred years, Man has seen by far the greatest changes in his age-long story. The steam-engine and the petrol-engine, flying and wireless, have abolished distance. To-day a man can talk on the air to any other man anywhere, and he can travel round the world in less time than a man could go from Calais to Paris in the days of Napoleon. The world is now one as never before, one vast household, with plenty for all if men in their Sovereign States can learn to cease from war and live in peaceful co-operation. How rapidly the world has changed in recent times with the coming of flying and wireless, how closely intertwined to-day are the fortunes, good and ill, of all the world's peoples, can be seen by the changes in our own island.

1 *The Times*, 7th February, 1941.



Children at work in mine (19th century)

"In the earlier stages of the Industrial Revolution (which began in Britain) our trade supremacy was unchallenged; now Britain is one among several rivals. Lancashire cotton goods used to supply the needs of most of the world; then they had to compete all over the world with the goods of Japan. Nor has Britain the same monopoly in the newer industries—such as electrical and chemical—which she once had in the steel and engineering trades. Again, the use of oil—early in the twentieth century—instead of coal for sea and land transport has badly hit the great coal producing areas of Britain . . Among the most important newer industries is the making of motor-cars, which provides work for tens of thousands of people. The light high-speed petrol-engine, which has transformed the mechanical vehicle, was invented by the German engineer, Daimler, in 1865. . . . .

"In 1909 Blériot made his first cross-Channel flight from France to England. . . Wireless came at the end of a century which saw more scientific triumphs than any other. . . And in 1902 Signor Marconi sent his first wireless message from Cornwall to Newfoundland. With the Great War of 1914 came the supplementary invention of Broadcasting which has altered the outlook of millions of lives."[1]

The nineteenth century was in some ways a hard age. The overworking and ill-treating of children in mills and mines and in chimney-climbing is one of the darkest pages in our history. The Industrial Revolution made England a wealthy country, but it built the crowded cities and slums where conditions of labour and life were disgraceful. But the public

1 *History of Britain* (*Chapter* XLV), Carter and Mears (Oxford University Press).

conscience gradually awoke, and in more recent years the campaign against overcrowding, dirt and disease and suffering has been actively pursued. Three great Social Services—the School Medical Service, National Insurance, Maternity and Infant Welfare—have been of enormous benefit to national health.

The expectation of life a century ago was 41, now it is 63. The disposal of sewage has been vastly improved. Cholera struck England in 1849, 1854 and 1866, for sewage in London was still discharged into the Thames and the London main sewers were not laid down till 1860–70.

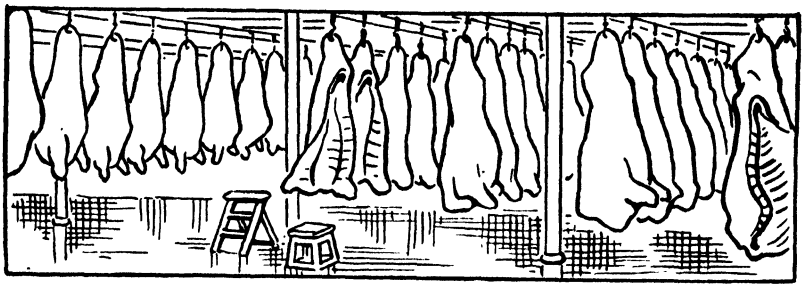
The fight against disease followed on the researches of great scientists. Florence Nightingale's insistence on cleanliness in hospitals had already reduced the death-rate. Dr. Simpson's discovery of the effects of chloroform (1847) lessened the burden of human suffering. The researches into the nature of bacteria or "germs" made by the French chemist, Pasteur (1822–95), led to the practice of inoculation. The German scientist, Koch (1843–1910), made researches in Egypt, India and Africa, and by his work on tuberculosis and cholera he ranks with Pasteur as the founder of the science of bacteriology. The great English doctor, Lister, led the way (from about 1865) in the use of antiseptic surgery and so saved "more lives than all the wars of the ages have thrown away." The researches of Sir Ronald Ross (from about 1897) into the cause of that most widespread of tropical diseases, malaria, which he traced to the bite of a certain kind of mosquito,[1] "made one quarter of the globe habitable."

1 *The Anopheles Mosquito.* Its life cycle includes four stages. (1) Egg or embryo. (2) Larva. (3) Pupa. (4) Imago or adult. The first three stages are aquatic.

II

How deep and far-reaching have been the results of this scientific and industrial revolution may be seen in the modern story of Man as Food-Producer, his oldest and most essential occupation.

In the Middle Ages, when the lord of the manor seated himself at the table in his great hall to enjoy supper with his



Modern refrigeration

family and perhaps a few guests, the food that was served came from his own estate—beef, mutton and pork from the animals reared by his herdsmen; game from the woods or moorland; chickens from the hen-yard; fish from his own fish-ponds or the near-by river; vegetables and fruits from his own fields and orchard; bread and beer from his own grain crops; and honey from his bee-hives. Only salt, spices and wines would be bought from travelling merchants, or at a neighbouring fair.

With the vast improvements in transport during the last hundred years, it is now almost as easy to bring foodstuffs across the ocean as it was to take them from England to Scotland over the old bad roads of the eighteenth century. In this way, the whole world became as it were one great market and one vast "household." That is why "economic nationalism" —whereby a nation tries to be "self-sufficient" and live to itself—is outdated in these days, when the New Worlds of the Atlantic and Southern Pacific can send supplies of corn, meat, cheese, fruit and so on, which are not needed locally, to feed the thickly-populated cities of the Old World.

The great improvements in shipbuilding, in refrigeration and in the arrangements made for carrying cargoes of perishable goods, now make it possible to bring fruit as well as meat across the seas—not only bananas from the West Indies and Central America, but apples, plums, oranges and tomatoes from South Africa. Butter and eggs and cheese from New Zealand and Australia also arrive in Britain in excellent condition.

The canning industry enables pineapples, peaches and

apricots, from the warm lands, to be enjoyed at a reasonable price in countries where they could only be grown at great expense under glass. Salmon visits the rivers of British Columbia at certain seasons in such vast numbers that they can be canned and exported cheaply, and provide a welcome, useful food in countries where salmon would be a luxury.

The modern method of preparing that useful butter-substitute, margarine, from vegetable oil, instead of, or as well as, from animal fat has led to a great increase in the import into Britain and other European countries of coconut and ground nut oils from the British Colonies in West and East Africa —to the mutual advantage of the Africans and of ourselves.

Every meal we eat illustrates world economics and world geography—the world as one vast household. At breakfast we drink tea or coffee. The tea probably comes from Ceylon, India or China, the coffee from Brazil, or perhaps from Kenya in East Africa. The sugar may be cane sugar from the West Indies, or beet sugar made from roots grown in Britain. The milk will probably have come from a local farm, or was brought by milk-train from one of the dairy counties of the west or south-west of England. Bacon may be English, but is more likely to have come from Canada or one of the bacon-producing countries of Europe. If you eat oatmeal porridge, the oats may have been grown in Scotland; or you can choose one of the other cereal foods probably prepared in Britain from grain grown in America. The oranges from which the marmalade is made may have come from Spain.

For our mid-day meal we may have British beef, mutton or pork; or the "Canterbury lamb" may have travelled half-way round the world from New Zealand, while the beef may have come from the Argentine in South America. If there is a milk pudding, it may be made of rice from India, Burma or Japan; or it may be made from sago, prepared from the pith of the sago-palm in Malaya or in one of the East Indian Islands. Fruit, tinned or fresh, may have come from any part of the world; and an apple-pie may be made from apples from our own orchards and have been improved by the flavour of a few cloves from Zanzibar in East Africa. The cruet on the dinner-table contains salt from the brine springs of Cheshire or

Worcestershire. The mustard was probably grown in the Eastern counties of England; the vinegar may have been made in Britain or imported from one of the European countries; but the pepper has probably come from India or from one of the East Indian Islands. A cup of cocoa reminds us of the cocoa farms of the Gold Coast (West Africa) and of the hot dry lands of Central America.

Even a slice of cake at tea-time may be made of products from all parts of the world household—flour from British or American cornfields; currants and sultanas from Greece, or the Eastern Mediterranean islands or the Near East, or from Australia or South Africa; orange or lemon peel from Southern Europe; sugar from the West Indies; ginger from China and other spices from the East Indies.

With the alternating seasons of the northern and southern hemispheres which give one part of the world seed-time while another region gathers its harvest, and with all the wonderful inventions of modern science and engineering, there should in peace-time be no fear of famine in any civilised country. The need, or scarcity, of one part of the world can usually (*in time of peace*) be supplied by the abundant surplus of another part.

But Man must do his part—by learning to live in peace. Even in the twentieth century with all its wonders, War may bring scarcity, want and even starvation as warring nations endanger the trade routes (by which Man obtains his food supplies) or stop the exchange of goods with near-by countries. When this happens, nations are once again faced with the *oldest fear of Man*—the fear of famine. May the nations who have learned so many useful lessons in the course of the centuries, soon learn the greatest lesson of all—to live in such co-operation that without waste or want, the ample food supplies of the world may be wisely and fairly shared and enjoyed with plenty for all!

APPENDIX I

COOKERY THROUGH THE CENTURIES

The Dawn of Cookery—The Dark Age of Cookery—The Age of the Stew-Pot—The Age of the Roast—The Pudding Age—The Art of Sauces

I

We can form some idea of the methods employed in the preparation of food in the early days of civilisation by examining remains of the cooking pots, fire pits, beating stones (meat was beaten and pounded in the hope of making it more tender), etc., found in old stone hut-circles; and also from the habits of some of the native peoples of Africa and Australia at the present day.

Until Man discovered the way to make fire, he was, of course, obliged to eat his food raw.

The first method of cooking was the simple one of placing the meat on the fire and charring it. In the earliest days men lived almost entirely on flesh and fish—corn-growing and bread-making came much later.

An improvement on the "charring"—one still used in Tahiti in the Pacific, and also among American Indians—was "hot stone" cookery. Several stones about the size of a cricket ball are placed on a fire of wood. In about ten minutes the wood is burnt and the stones are hot. Then meat, fish, ripe and unripe bananas and the tops of wild arum lilies are folded up in leaves, thus making small parcels. These little green parcels are placed between two layers of hot stones and the whole covered with earth so that no steam or heat may escape. In about a quarter of an hour the food is cooked.

The next step was to cook in water contained in a pot; but first the people had to learn how to make pots that would hold water and stand fire. When this had been learnt, food could be boiled as well as roasted. At the same time men were becoming farmers and herdsmen as well as hunters. Seeds, corn and meal were added to the food supply, and milk was used for making butter and cheese and boiled with meal for porridge.

As the centuries passed the art of cookery developed—in the more civilised countries—according to the ideas of the people. The Greeks preferred simple, plain food; the wealthy Romans, in the days of the Cæsars, sought every kind of luxury and novelty in the way of food that their great Empire could provide. The Eastern kings and nobles thought that the success of a banquet depended on the richness and variety of the food. Survivals of the "novelties" are to be found in "bird's-nest soup," and "hundred-years-buried eggs"—black and tasteless—prized by the Chinese.

Quantity not quality appealed to the early Britons. Cooking was dull and bad. Stewed meat, the broth serving as drink, was supposed to be economical. Rough cakes of barley bread, and a kind of porridge made by seething corn in sheep's milk, were part of the daily fare, varied by fish, when obtainable, and an occasional roast—the meat being placed on a spit of green wood and charred in the fire. Sour, thin wine from the Continent, and a drink prepared from honey and wheat, were the only alternatives to water, for milk was little used except for cheese-making and butter-making.

The Anglo-Saxons who came from Germany were gross eaters like the Germans of to-day, and were no more refined than the Britons.

The Middle Ages might be called the "Age of the Stew Pot," but more interest was now taken in the preparation of food. A cookery book was produced by the cooks of Richard II at the close of the fourteenth century, and others followed. Fish, of course, played an important part in the menu; and for some months of the year salt meat was largely used because large numbers of beasts had to be killed at the close of the summer—for there was insufficient pasture during winter, while the use of turnips and other roots and oil cakes as cattle food had not yet been discovered.

Fewer meals were eaten. The Norman rule was:

To rise at five,
To dine at nine,
To sup at five,
To bed at nine.

The morning meal began with porridge, followed by fish, game, and boiled beef. Coarse wheaten bread and thin oat-cakes were eaten.

Supper was the great meal of the day. First there would be a mutton stew; then fish, roast rabbits and hares, a sucking pig stuffed with plums; buns, biscuits and perhaps a custard to finish. Servants joined their masters in the great dining-hall, but ate from a lower table or below the great salt-cellar at the common table—hence the term "below the salt."

After the Crusades spices brought from the East were used to a greater extent. They were useful for giving some flavour to the salt meat eaten during the winter months. The desire to reach the "Spice Islands" (E. Indies) and take part in the profitable spice trade was one of the incentives that urged fifteenth century sailors to seek a new way to the East.

The army of servants, retainers and "hangers-on" that made up the household of the fifteenth century barons led to extravagant house-keeping. When the great Earl of Warwick was at his London house, we read that six sheep were roasted every morning for breakfast, and his retainers were at liberty to enter the kitchen, cut off portions of meat and carry it to their lodgings. For a banquet peacocks, swans and cranes graced the tables of the nobles.

The use of sugar was introduced by the Crusaders, but the supply was limited until trade began with the New World (West Indies) in the sixteenth century. Honey was largely used for sweetening.

II

The Tudor Period may be termed the "Age of the Roast"—no banquet was complete without several roasts, and the turning of the spit or broaches was at first carried out by some aged servant, or even by a wandering beggar who was glad of the chance to warm himself and earn a few pence or a good meal. Sometimes a dog was trained to turn the "roaster" by running round and round the inside of a wheel. A later and more humane method was the "smoke jack," a mechanical contrivance in the chimney connected by a strap with the spit.

Coal was increasingly used as fuel, for charcoal and wood were too slow. The price of coal was 19s. per chaldron, i.e. 36 bushels; but there was less money in those days and therefore it would buy far more than it does to-day. London coal-sellers were sometimes accused of shrinking sacks and giving short measure. To economise in fuel, an old cookery book gives instructions how to roast "a chine of Beef, a loin of Mutton, a Lark and a Capon at one fire and at one instant."

Pottage (or French *potage*, soup) was the forerunner of soup. Here is an old "*Recipe for Pottage*:

Make it of Beef, Mutton and Veal. Put in first a quartered onion or two, some oatmeal or French barley, some venison pastry-crust, twenty whole grains of sweet pepper; 4 or 5 cloves and a little bundle of sweet herbs, and a store of marigold flowers—you may put in parsley and other herbs."

Pies of all sorts were in great demand and contained eels and carp as well as meat. Here is an old recipe for "Chicken Pye":

"To bake a chicken pye after you have trussed your chickens, broken their legs and breast bones, and raised your crust of the best paste, you shall lay them in the coffin close together, with their bodies full of butter; then lay upon them, and underneath them—Currants, great Raisins, Prunes, Cinnamon, Sugar, whole mace and salt; then cover all with great store of butter, and so bake it; after, pour into it the same liquor you did for your Marrow-bone Pie, with yolks of two or three eggs beaten amongst it and so serve forth." (The "liquor" referred to is white wine, rose water, sugar, cinnamon and vinegar mixed together. What taste of chicken would be left!)

During the Tudor period there was a greater variety in food, especially in vegetables and fruit. Carrots, artichokes, pippins, plums, gooseberries and cherries were introduced. The gentry dined at 11 a.m. and supped at 4 or 5 p.m. The villagers and workers dined at noon, and supped at 7 or 8 p.m.

In the Stuart period a very light morning meal was the rule—breakfast was considered neither healthy nor refined. Supper, too, was simple, consisting of broth or caudle. Tea, coffee and chocolate were coming into use as beverages, but

as late as 1658 tea was priced at 60s. per pound. Table forks were now introduced from France. The ham frill which we use to-day is a survival of the pre-fork era, when the bone had to be grasped by the carver's fingers.

With the eighteenth century came the use of turnips and other roots as a winter food for cattle. At last fresh meat was obtainable all the year. Potatoes were very sparingly eaten, and only with roast meat. Very little bread was used. Wheaten bread was reserved for the rich—except that made from the proceeds of gleaning. Barley bread and oatcake were used by the poor, but less rye bread than formerly. Very large quantities of sugar were used. The usual hour for dining was 4 p.m. It is curious to note that all the dishes were placed on the table at once—the puddings cooling while the soup and joint kept the diners busy.

This period might be called the "Pudding Age," but the most important of these, the Christmas Plum-pudding, had not yet arrived. The Mince-pie was the special Christmas dish. Plum Potage or Porridge is, however, to be found in old cookery books. Here is a recipe:

"Take of Beef soup made of legs of Beef 12 gals.; if you wish it to be particularly good add a couple of tongues to be boiled therein. Put fine bread, sliced, soaked and crumbled; raisins of the sun, currants and prunes, 2 lbs. of each; lemons, nutmegs, mace and cloves to be boiled with it in a muslin bag; add a quart of red wine, and let this be followed after half an hour's boiling by a pint of sack (wine). Put in a cool place and it will keep through Christmas."

Mid-Lent Sunday, on which the Gospel of the loaves and fishes is read in church, is often called "Refreshment Sunday." In olden days it was called "Mothering Sunday," because during that week-end apprentices and others had leave to go home to see their mother. The mother marked this festival by two special additions to the menu—a rich cake, called a Simnel Cake, and a kind of pudding known as Firmity. The latter was made of whole wheat, skinned and gently boiled, to which were added yolks of eggs, sugar and flour, currants and raisins and grated cinnamon.

Tansy pudding was a favourite dish. Here is a recipe:

" 20 eggs and 8 whites to be beaten and strained into a quart of thick cream; one nutmeg and 3 'Naples biskits' to be grated into the compound with as much spinage juice and a sprig or two of tansy (a herb) as will make it as green as grass." Then it must be sweetened to taste, placed in not too hot an oven, and when done turned out on a pie plate with scraped sugar and orange juice upon it, and garnished with orange and lemon.

Eggs were very freely used in eighteenth century recipes. An ordinary rice pudding required 6 eggs, ½ lb butter, ¼ lb. sugar and a spoonful or two of sack (wine of S. Europe).

Caudles (warm spiced gruel) were prepared for the sick or aged in a caudle pot, somewhat like a teapot, but with the handle more upright. The recipe for an elaborate caudle required 20 yolks of eggs, cream, cinnamon, wine and sugar.

In the eighteenth century supper became an important meal, and later cookery books recommended such dainties as " Hogs' ears, stuffed; pickled pigs' feet and ears; ox palates, and stuffed cocks' combs."

" To the lust of youre lord look that ye have ready
Such *sauce* as him liketh to make him glad and merry"—

such is the advice given by one John Russell, servant to Humphrey, Duke of Gloucester, in a fifteenth century MS. *The Booke of Nurture.*

He goes on to enumerate the sauces suitable for different meats. Mustard, he says, "is meet for brawn, beef, poudred (salted) mutton; garlick for roast beef and for goose; ginger sauce for lamb, kid, pig, or fawn; salt and cinnamon for quails." For pheasant and partridge he recommends mustard and sugar, and for curlew sugar, salt and water from the river.

In a sixteenth century cook-book there are recipes for no less than three hundred sauces. Little wonder that cookery was called " *the art of sauces!* " The reason for their importance, given in the old-time cookery, was that meat and game needed something to give them flavour, for the flesh was tough and tasteless compared with the meat sold to-day in butchers' shops.

The fame of French cooks dates from the sixteenth century when Catherine de Medici brought Italian cooks to instruct the

French. In the seventeenth century, the reign of Louis XIV was as renowned for the luxury and magnificence of its cookery as for other splendours. The Royal maître d'hôtel (steward), named Bechamel, was famous for his sauces. The Duc de Richelieu is said to have invented the mayonnaise, and the Prince de Soubise gave his name to the onion sauce of his famous chef.

As a proof of the importance of the cook, we find records in Domesday Book of gifts of land bestowed by William the Conqueror on his royal cooks; and of the bestowal of a manor on Robert Argyllon for the service of a dish called "de la Groute" on the king's coronation day.

In an interesting eighteenth century work, Dr. Pegge says, "We have good families in England of the name of Cook or Coke . . . . . Depend upon it, they all originally sprang from real professional cooks, and they need not be ashamed of their extraction."

Such is the fascinating story of the Art of Cookery through the centuries—what a change, you will say, from the cooking and the foods available after two World Wars!

APPENDIX II

SUGGESTIONS FOR A "PROJECT"

with open-air activities for educational and recreational institutions near parks and country areas, for Holiday and other Camps, County Colleges, Youth Clubs, etc.

LOCAL HISTORY AND REGIONAL SURVEY

The social and economic history of *every* locality, village or town, is the history of the nation in miniature, and now-a-days it is almost a miniature history of the social and economic life of much of the world. As an illustration of this point, see the modern history chapters of this book (e.g. Chapters X to XVI) and, especially the chapter called—"The World as One Household."

And again, *every* locality is a mine (for those who can quarry it) of "historical remains" and furnishes illustrations of the course of History. To encourage others, one may illustrate this from the Warwickshire village of Fillongley (on the edge of the old Forest of Arden) in which the author happens to live.

In this one village (for example) there are "remains" of a mound which was the site of the Saxon Alvi's castle and which was mentioned in Domesday Book; another castle, long associated with the famous baronial family of the Earl of Hastings, with its tilting yard (now a field of the Castle Farm) and its park drive and gates; the medieval church, with its list of Vicars dating from 1248, and in the churchyard the old Market Cross; the pound or pinfold where straying cattle were impounded; the archery "butts" long field; several old bridle or pack-horse paths; the site of the Toll Gate where an old bridle path meets the modern eighteenth century main road; the "common"; the mill (mentioned in Domesday Book); the fifteenth century Manor House (now alas! destroyed by fire), and evidence of the old "strips" (in old pasture fields not ploughed up till 1941); the old malt-house; inns e.g. the "Weavers' Arms" and the "Durham Ox"; a "Flax Field" and "Hemp Yard." There are also the site and the still functioning "Charity" of

a "Grammar School" endowed with land (so as to be "free" for "ten poor boys") in 1690 by the yeoman Ayliffe Green—one of those "Public Schools" (this still taught Latin in the eighteenth century) of which only the richer endowed or more economically successful still flourish. And to illustrate modern history and the Industrial Revolution, there are a railway station dating from 1863, a near-by colliery, and a garage. All these things and names still exist—as many of them do in villages and towns *throughout our land.*

In this village some years ago a "*History Exhibition*" was held, to which many villagers contributed, including some who belonged to good old yeoman stock (as do so many of England's farming families and shop-keepers). Among the historic "finds" that came to light from cottage and other homes were treasured patterns of eighteenth century peasants' smock frocks of fine needlework, shepherds' crooks, sickles and flails and ox-yokes. There was also the Tithe Map and Book preserved in the old oak Parish Chest in the church—all illustrating the story of Agriculture. Also flint-lock guns and old weapons used when war was a less fearsome thing than it is to-day. Tinder boxes, rush-light holders and horn lanterns told of the days before matches, oil, gas and electricity came into use; and samplers and horn-books of the old-time education. The *history of the home* was illustrated by the exhibition of wooden dining-plates, pewter dishes and goblets, sugar-cutters, an old one-handed grandfather's clock made by a former craftsman in the village, a table-cloth spun and woven by village people in 1775, and an old grocery bill of 1796, as well as pictures of old buildings and portraits of bygone men and women. Finally, there were the Parish Constable's Accounts, the Churchwardens' Accounts, and the Parish Register (dating from 1538)—valuable sources of local history. And in the Parish Registers and the old Charity Schemes (which most villages and towns inherit) may often be traced the family histories of the oldest inhabitants, some of whom these documents prove once to have been owners of land as yeomen and once rich enough to bequeath Charities to their native place.

Here indeed at their own doors in all localities is fascinating

material for children and youths and adults—here is the real romance of history, for all who love to learn of the way of life of their forefathers, their own kith and kin.

Invaluable booklets for Regional Surveys include :—

(i) *Regional Survey-Discovery : How to evolve a Domesday Book of your district* (3*d.*), from Le Play House Press, Albert Road South, Malvern.

(ii) *Village Survey-Making* (with excellent maps.) (1/-), H.M. Stationery Office.

(iii) *How to compile a History and Present Day Record of Village Life* (1/-), by Joan Wake, from the Secretary, County Federation of Women's Institutes, 3, Parade, Northampton.

(iv) *Oxford Dictionary of English Place-Names,* giving the history and meaning of the names of our towns and villages. (Consult any good library.)

LOCAL HISTORY RESEARCH

1 Historical survivals, e.g. a tithe barn, old farm buildings, old farming implements, etc. Descriptions of these and photographs or drawings can be made.

2 A study of the roads and the market towns to which they lead. Special note should be made of where the modern roads abandon the track of the old ones, and if possible the reason worked out.

3 A study of the local market and the types of produce sold there; how long the market has been held and its early history.

4 A study of place-names, including the names of fields with maps (see Chapter VII).

5 If access can be had to the Award Map made when the district was "enclosed," or to any other old maps, note how the land was divided up and compare this with the present fields.

6 Accounts of any local customs connected with farming or other industries, e.g. is there any trace of the Harvest Home rejoicings, or of extinct industries and crafts?

7 A record of food specially made in the district, e.g. the Cornish pasty, etc. Recipes can be collected.

8 In a Country or Camp School with a garden and Domestic Science centre, keep records of the geographical sources of seeds and foods together with financial accounts.

APPENDIX III

EXERCISES AND DISCUSSIONS

The *first* two exercises on each chapter can be worked after reading the text. The *second* two provide subjects for researches in local history.

I Civilised Life Begins in the East

1 Pretend to be an Egyptian or Chinese farmer of the time you have read about in Chapter I. Write an account of your life and work.
Or—Give a short account of the river valleys of Egypt and the East, showing why the earliest civilisations developed there.

2 Write a conversation (or debate) between two people, one of whom says—and the other denies—that the plough is a more important invention than the motor-car.

3 What kinds of wild plants and fruits that can be eaten are to be found in your district? What use is made of them?

4 How do farmers now store food, which they have grown, until it is wanted? Find out as many ways of storing food as you can and illustrate by drawings.
Or—How is water supplied to the farms and houses in your district? Find out what happens on the farm in a dry summer.

II "We are the Children of Greece"

1 Compare the knowledge of the soil possessed by the Greeks with that of the older farmers of Egypt and the East.
Or—Give a short account of the ways by which the ancient Greeks tried to improve their fields.

2 Write a short essay on "The Olive in the House-keeping of the Ancient Greeks."
Or—Make a list of words commonly used to-day that have come down to us from the Ancient Greeks.

3 Find out what is done nowadays on a farm or in a garden or in a park to improve the soil and make it more fertile.
Or—If the land in your area varies, that is, if some is hilly, some marshy and some flat, select one area for discussion.

4 Find out the names of some of the fertilizers used by farmers in your area, also when and how they are used.

III Our Debt to Rome and the Roman Empire

1 What do you know of Roman farmers and statesmen? What advice did Roman authors give the farmers?
Or—Give one or more examples from the *New Testament* of farm life in the Roman Empire.

2 In what ways did the Romans increase and spread knowledge about farming?
Or—Why was it a bad thing when Greek and Roman landowners went to live in cities and left their farms to be worked by slaves?

3 If there is a Roman road in your area, make a map showing it clearly, noting carefully where the modern road does or does not follow it closely. Find out where the road went in each direction after leaving your area, and for what purpose it was made.

4 Visit any other remains of Roman times—a villa, camp or baths; or if there is a near-by Museum, visit it and describe any Roman exhibits.

IV Barbarians into New Nations—The Church as Civiliser

1 Give an account of some of the peoples who migrated into the Roman Empire and formed New Nations.

2 (*a*) In what ways did the Arabs help to make the life of the Middle Ages more civilised?
(*b*) How did the Church and the Monasteries civilise the New Nations?

3 Are there any traces or legends or place-names of Saxon or Danish invaders still existing in your area?

4 Are there any traces of any ancient monasteries in your district? If so write up their history. (Consult local library.)

V The Manorial Village of the Middle Ages

1 Give an account of "Life on an Old English Manor"—telling of the villagers, their common fields, scattered strips, etc.

2 What do you know of (*a*) The Black Death, (*b*) The Peasants' Revolt? In what ways did these events affect the villagers and landowners of your area?

3 Is there any land held in common (that is, by several people) in your area? There may be a Common or allotments. Find out whether such land has been held in common for a long time, and what arrangements are now made for sharing and working it.

4 If you live in a town investigate its early history—whether it grew up round a baron's castle or a monastery, at a ford of a river, at cross-roads, etc. Had it a fair? Has it a market? What are the historic names of its streets (e.g. Abbey Street)? Had it a Charter and when?

VI THE NEW LEARNING AND THE NEW WORLD

1 Name some of the inventions, changes and discoveries of the late fifteenth and the sixteenth centuries.

2 What do you know of the English Wool Trade? What symbol of it is still to be found in the House of Lords? *Or*—Why was there much poverty in England in the sixteenth century?

3 Are there any traces of the great days of the Wool Trade in your area, e.g. charities connected with Wool-combers, Tuckers and Weavers (branches of the cloth trade); a special part of the church set apart for the use of the Gild and beautified at their expense; the name of St. Blaize (patron saint of the wool-combers), or the names of any branches of the craft still existing in the names of inns or streets or houses or people?

4 Investigate the measures taken in your district to help the poor in the olden days—gifts of food, money, etc. How are they helped to-day?

VII THE BEGINNINGS OF CHANGE TO OUR OWN TIMES

1 Describe the farming of Sir Richard Weston (born at the end of Elizabeth's reign).

2 What were the disadvantages of open-field farming? Can you think of any advantages?

3 Is there any marshy or boggy land in your district? Find out if any attempts are being made to drain it and describe

them, and if there is any land which was once marsh and has since been drained, find out what it is used for.

4 How are the fields or parks "enclosed" in your district? Find out as many ways as you can of surrounding and enclosing a field in other areas as well as your own, and illustrate by drawings. What are the advantages and disadvantages of the various methods?

VIII The Agricultural Revolution and the Coming of the Machine

1 Describe the life of Jethro Tull and his new machine.

2 Write a conversation (or arrange a debate) between Lord Townshend and a farmer who had an open field farm and wanted to improve it.

3 Make a study of one or more arable fields in your district. This will take some months. Find out how it is ploughed, sown, cared for and reaped, and whether the crop is good or poor. Note which of the methods are a continuation or development of those of Tull and Townshend.

4 Find out if there is any land in your district which did not formerly produce crops, but which has been—or is being—reclaimed for this purpose. Describe what is being done to it and what crops are being grown.

IX The "Roast Beef of Old England" and Elsewhere

1 Give an account of the work of Robert Bakewell, his successes and failures.

2 Describe the roads of the eighteenth century, and show their effect on industry, farming and food prices.

3 Investigate the roads of your area. Are there any traces of the Turnpikes or Toll Houses? Are there any old bridges with the recess for foot-passengers; any old posting houses at which the stage-coaches used to call; any names of inns that remind one of the "bad old days" of road transport?

4 What Enclosure Acts were passed for your area, and how did they affect the people? (Consult County Librarian.)

X Squire Coke and the World of His Times

1 Make a record of the life and work of Squire Coke, and

mention some great world events that took place during his lifetime.

2 Why was the work of the food-producer especially important during the early days of the nineteenth century?

3 Investigate the rotation of crops as worked in your area; and, if possible, get information about that of another area for comparison.

4 Study the various grasses growing in your area. Make a collection, mounting and naming each variety.

XI THE WORLD INDUSTRIAL AND AGRICULTURAL REVOLUTIONS

1 What new machines came into use on farms in the nineteenth century? Why did some of these machines make greater progress in America than in England?

2 Investigate the history of the Corn Laws? Why were the British farmers in such a sad plight about the year 1879? How are they helped now?

3 Visit farms where up-to-date machinery is used—motor tractors, electrical milking machines, etc., and describe and illustrate them.

4 Is there any "Corn Law History" (riots, etc.) connected with your area?

Or—How does rail and motor transport help your district? What local produce finds distant markets by such means?

XII BEASTS THAT TRAVELLED THE WORLD OVER

1 Give an account of some of the beasts that made Britain famous during the nineteenth century.

2 Investigate the Argentine Beef, Danish Bacon, Devonshire Cream and any other famous food industries, and record your findings.

3 What animals are bred by farmers in your area, and for what special purposes?

4 Visit an Agricultural Show or a Cattle Show, and make a record of your impressions.

XIII OUR DEBT TO MODERN SCIENCE

1 Summarise your impressions of the ways in which scientists have helped food-producers, and national health.

2 What can a farmer do to make the most of the soil in his arable fields?
Or—Investigate the story and value of Cold Storage.
3 Have farmers in your area suffered through any diseases of plants or animals? What was done to fight them?
4 Visit an up-to-date dairy-farm and make a record of the processes and of the precautions taken to provide pure milk.

XIV THE ROMANCE OF ELECTRICITY

1 Sketch the history of the motor-car.
2 Summarise the work of Faraday, Edison, Marconi.
3 Discover and summarise the various uses of electricity in your own town or village.
4 Describe some of the most recent advances in electric lighting, *or* in any electrically-driven machinery, with which you are acquainted or can investigate.

XV THE SOCIAL SERVICES AND STATE CONTROL

1 Make a record of the social reforms that affected industry and the welfare of workers and other citizens from the early years of the nineteenth century.
2 Compare the farms of Soviet Russia and of Denmark.
Or—Record the story of State Control in Britain, in peace and in war time.
3 Visit an old Tithe Barn and photograph or draw it.
4 If you can find an old man who worked on a nineteenth century farm, get him to tell you about the conditions of life, work and wages, and make a record.

XVI THE WORLD AS "ONE HOUSEHOLD"

1 Make a record of the modern inventions and discoveries that have in the past fifty years made the world a "one-world" and "one household."
2 Investigate and record by maps or otherwise "The Geography of Our Daily Food."
3 What happens to the food supplies of your own area that are not consumed locally? Where do they go and what transport conveys them?
4 Talk to an old person who lived during part of the nineteenth century. Record what foods were usual then, and what things we now make general use of that were not then used. Were they "the good old days"?

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MAN'S SOCIAL STORY

PICTORIAL SUPPLEMENT

POTTERY OF EARLY TIMES





Food vessels found in a barrow at Rudstone, East Riding of Yorkshire

British Museum



Athenian (Greek) two-handled vase for holding wine. About 2,500 years old

British Museum



Beaker found in barrow at Lakenheath Suffolk

British Museum



A red Samian bowl

British Museum



A Chinese vase about 3,000 years old showing mat markings

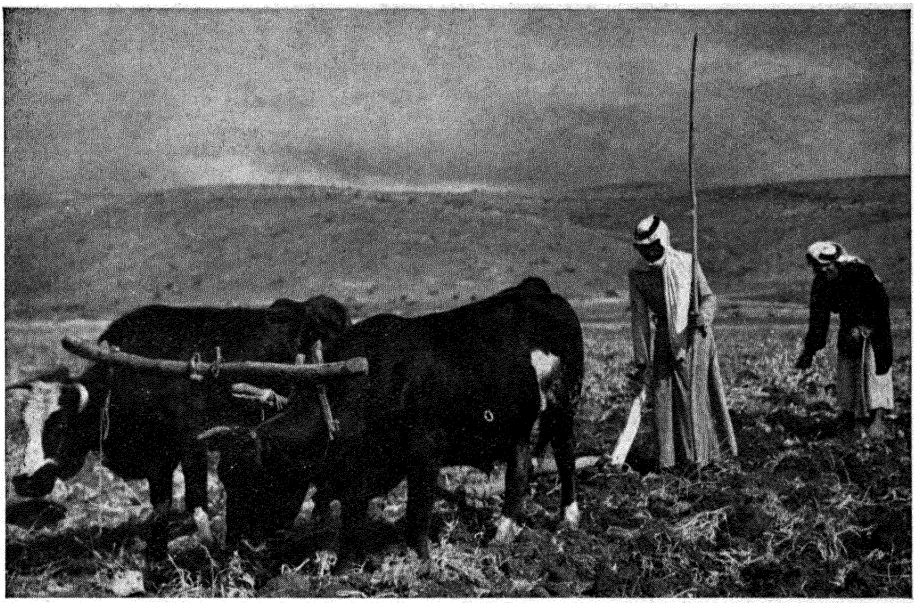
British Museum

Note: (1) A barrow is a grave-mound. (2) A beaker is a drinking-cup (the one here is perhaps 4,000 years old). (3) Red Samian ware was made in Roman Britain



Men gathering olives (Greece)
(From a black-figured vase of the sixth century, B.C.)

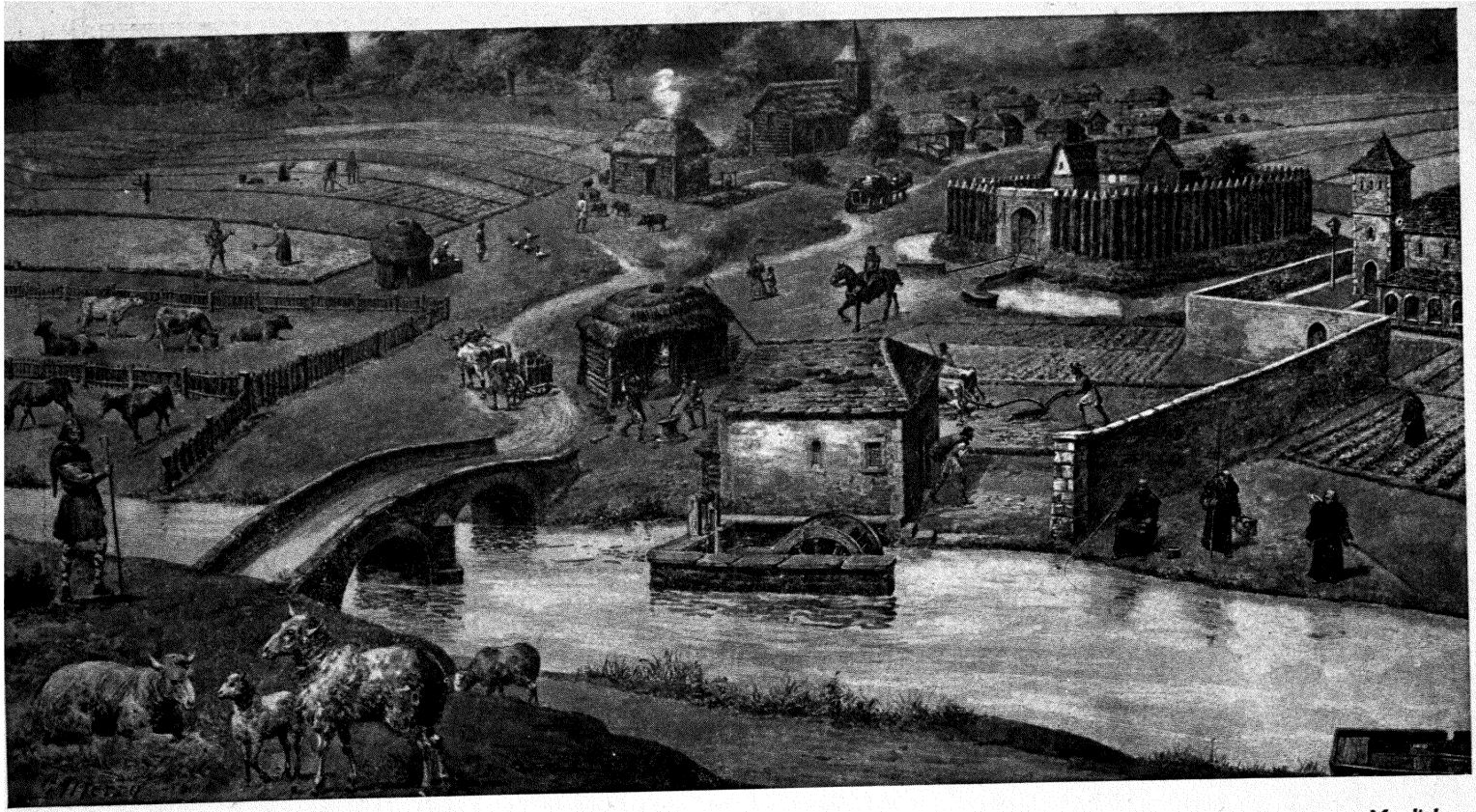
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As in Bible days, ploughing and sowing near Jerusalem



Ploughing with water buffalo (China to-day)



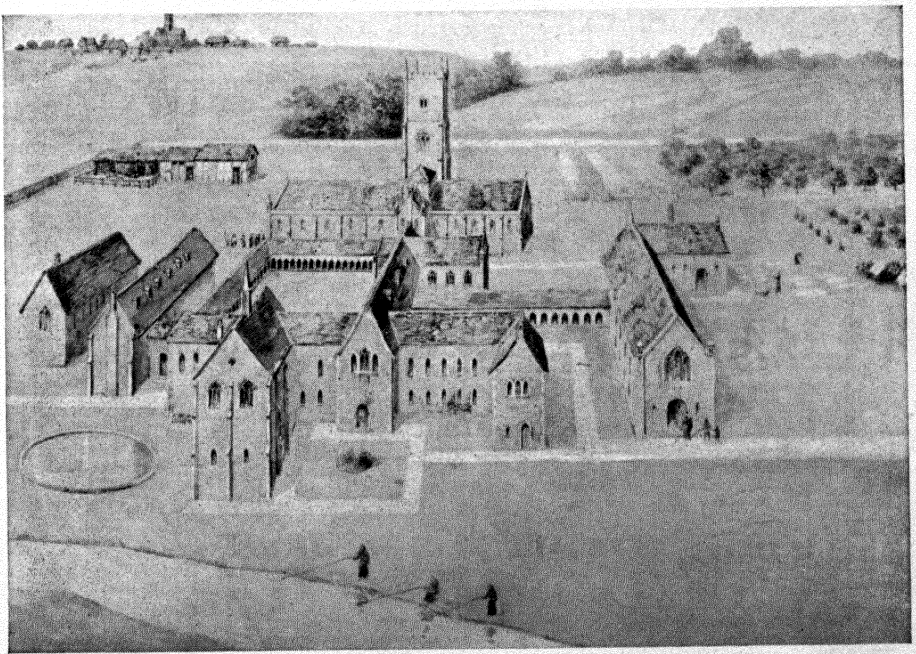
A Village in Old England

(Note the church, manor house (with fence of stakes), the monks and monastery, the land 'strips')

Mondiale



The left wing of the XVth Century Manor House, Fillongley, Warwickshire
(now fire-destroyed)



A Monastery in the Middle Ages—General View *Mondiale*

FARMING IN NORMAN TIMES



Ploughing in Norman times (from XIth Century Calendar—January) *Hutchinson*



Hay-making in Norman times (from XIth Century Calendar—June) *Hutchinson*



Harvesting in Norman times (from XIth Century Calendar—August) *Hutchinson*



Threshing in Norman times (from XIth Century Calendar—December) *Hutchinson*

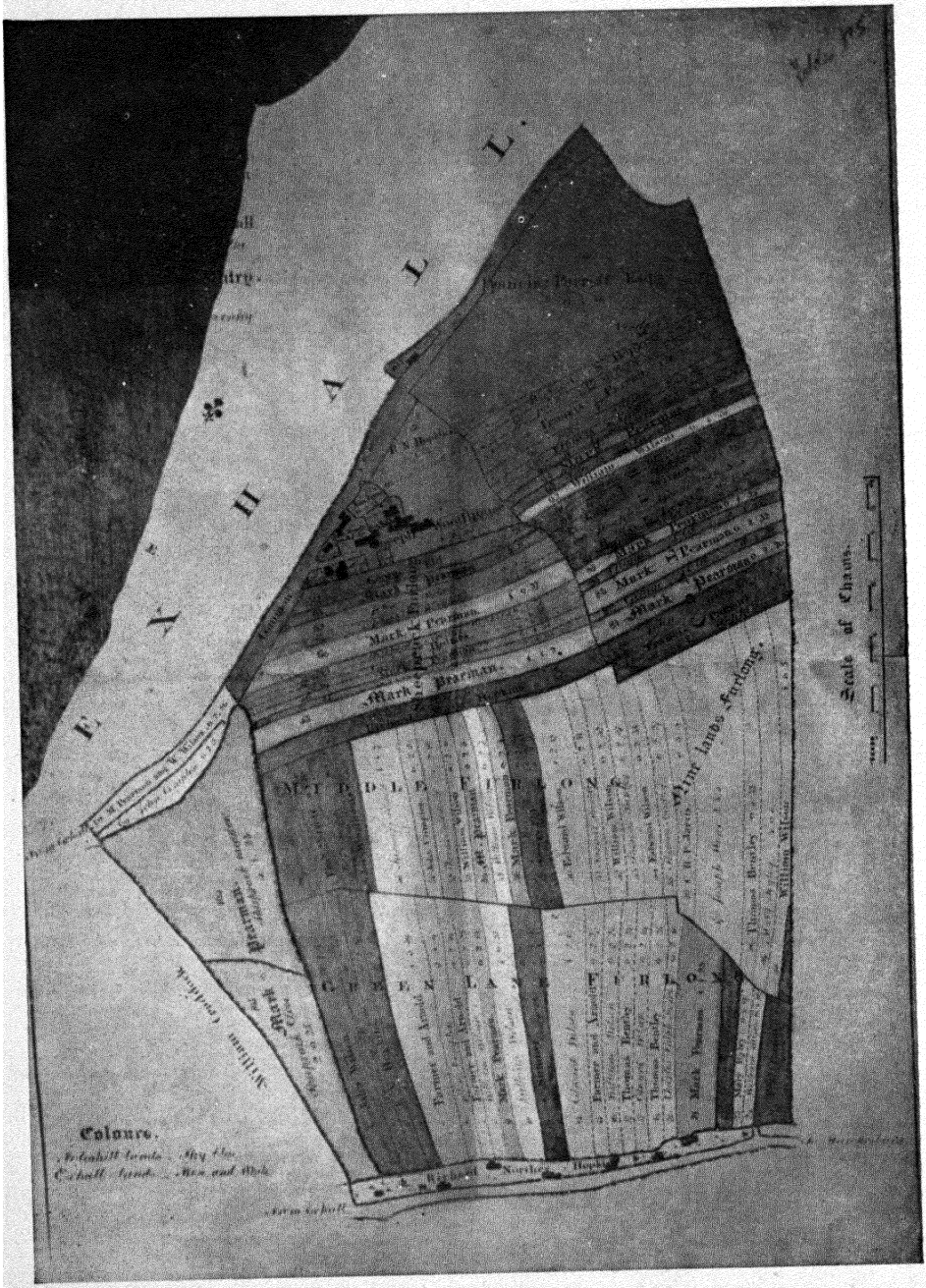
Villeins reporting for work to their lord (from a XVth Century MS.)

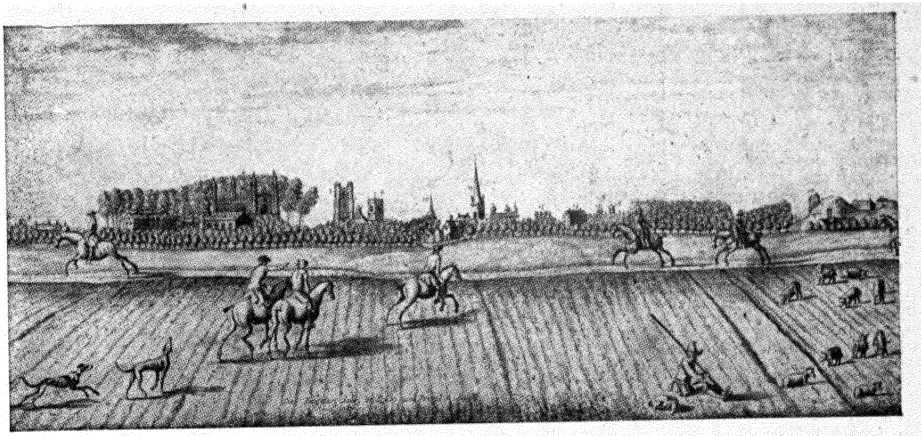


Ploughing (from the Luttrell Psalter)

Note: The Luttrell Psalter was written and illuminated in East Anglia about 1340

A COVENTRY OPEN-FIELD IN 1822


Mark Pearman
Mark Pearman
Mark Pearman



The open-field system in operation at Cambridge
(*before the time of the Enclosures*)

Risehgitz

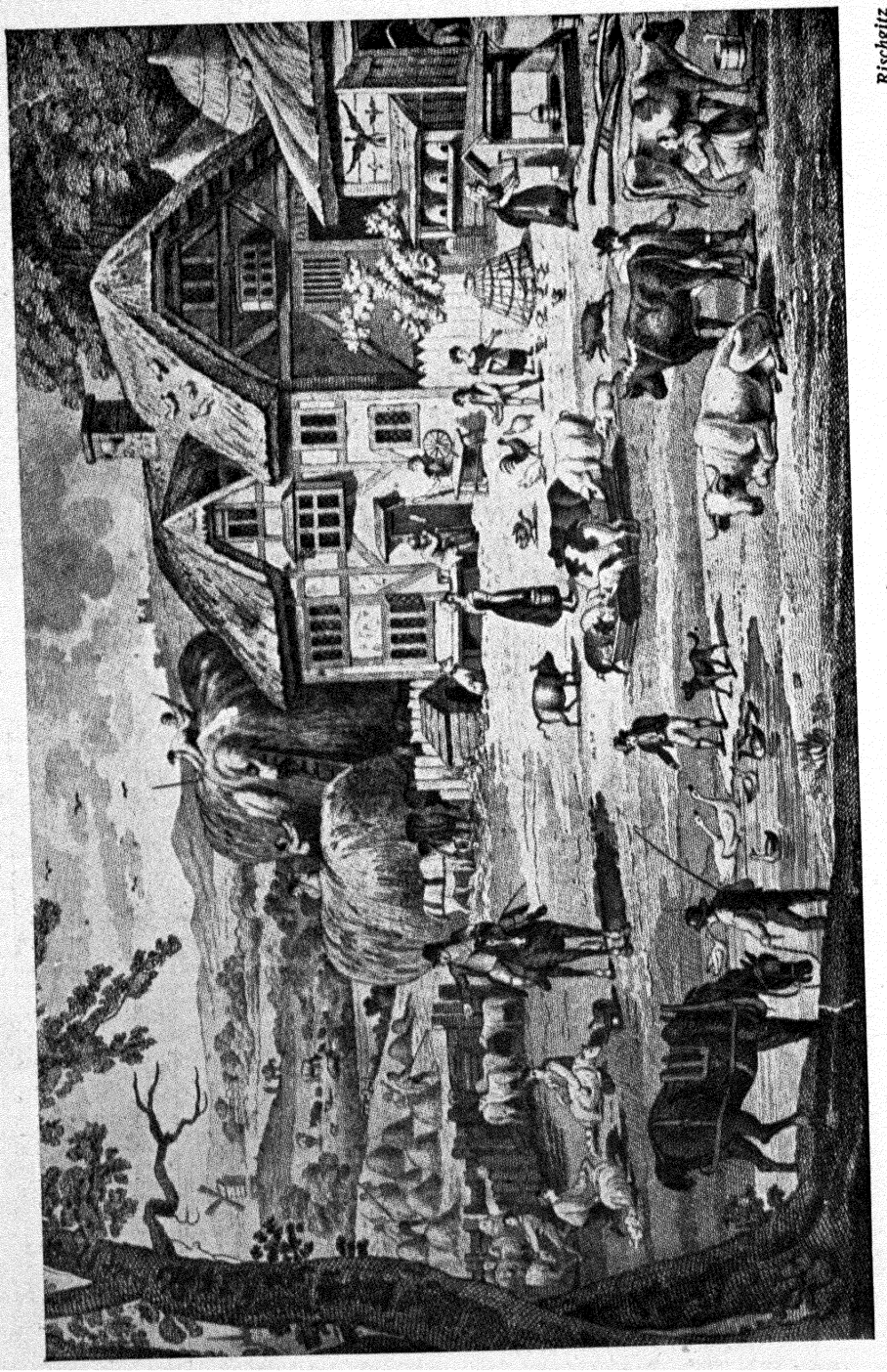


From the B.B.C. pamphlet—"Our Village"

Farmers ploughing their strips at Laxton
(*The open-field and strip system of farming can still be seen at Laxton, Notts., much as it was in the Middle Ages*)

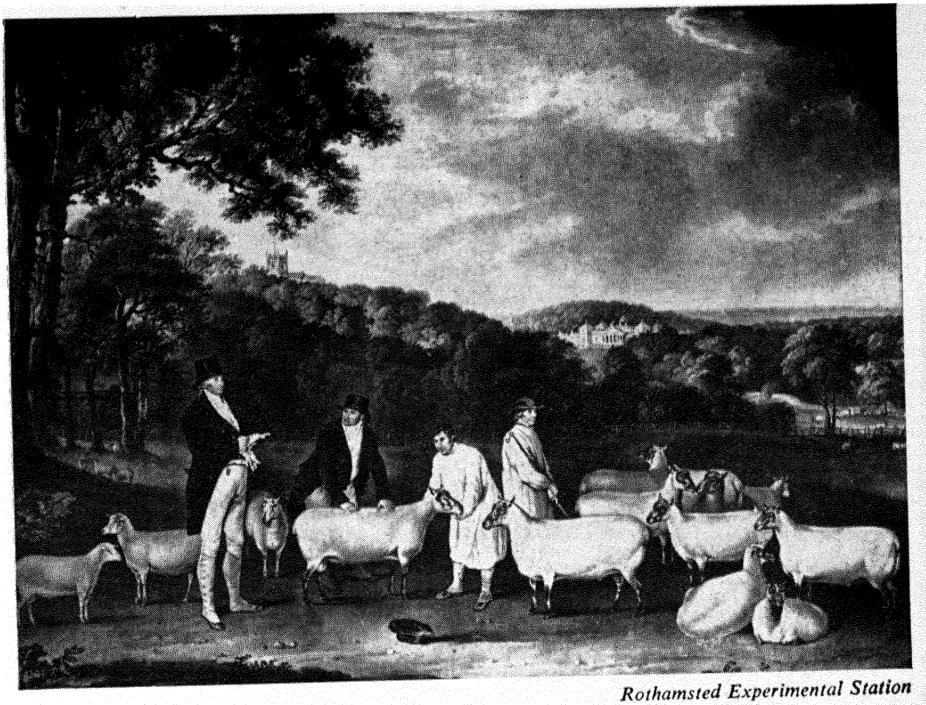
FARMING IN THE EIGHTEENTH CENTURY

(Chapters VIII and X)



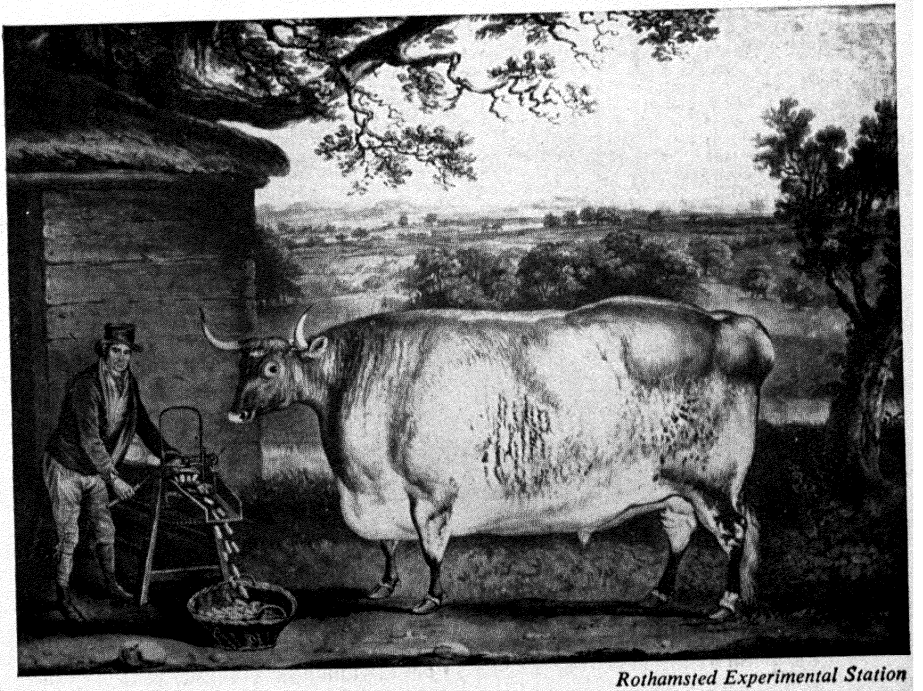
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An eighteenth-century farm



Rothamsted Experimental Station

Thomas William Coke inspecting some of his Southdown sheep with Mr. Walton and the Holkham shepherds (24th Oct. 1808)

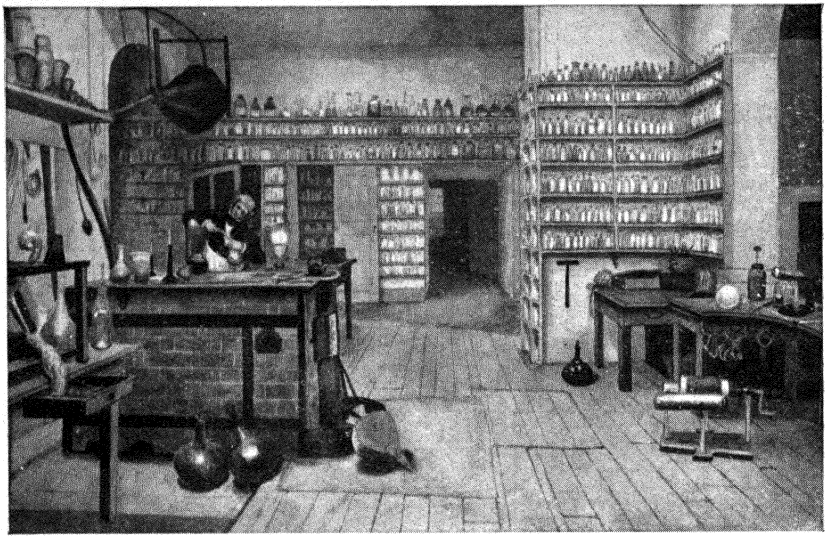


Rothamsted Experimental Station

The Durham Ox

GREAT SCIENTISTS AT WORK

(Chapters XIII and XIV)



Faraday at work in his laboratory — *Royal Institution*



Pasteur at work in his laboratory — *British Film Institute*
(*From the film The Story of Louis Pasteur*)

MODERN SCIENTIFIC AND MECHANISED FARMING

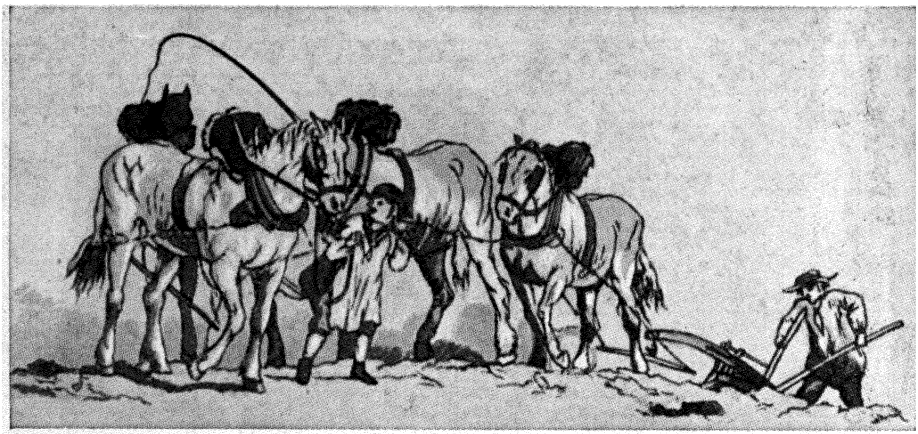
(Chapters XIII, XV and XVI)



Rothamsted Experimental Station—Inoculation of tobacco plants



Rothamsted Experimental Station—New pot culture houses



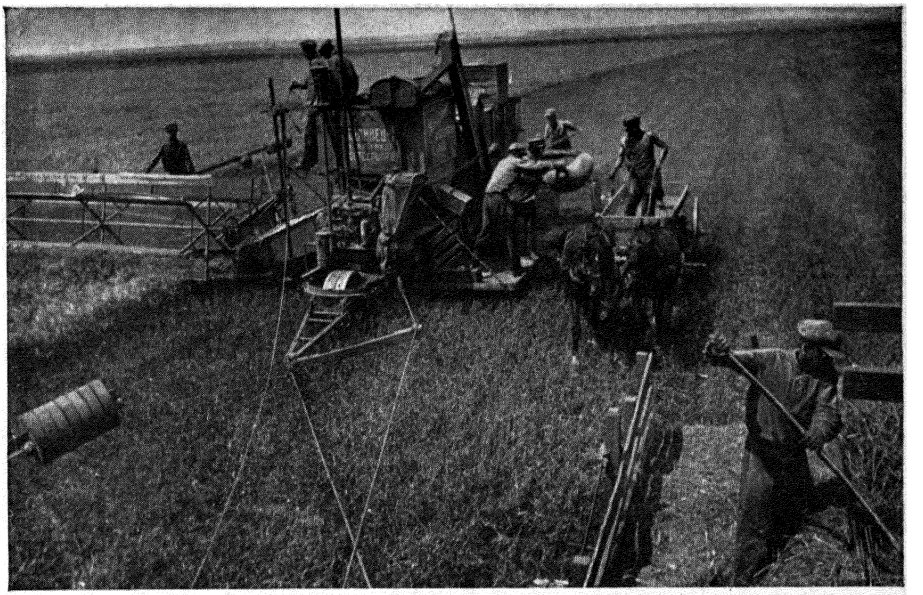
Ploughing in the XIXth Century *British Museum*



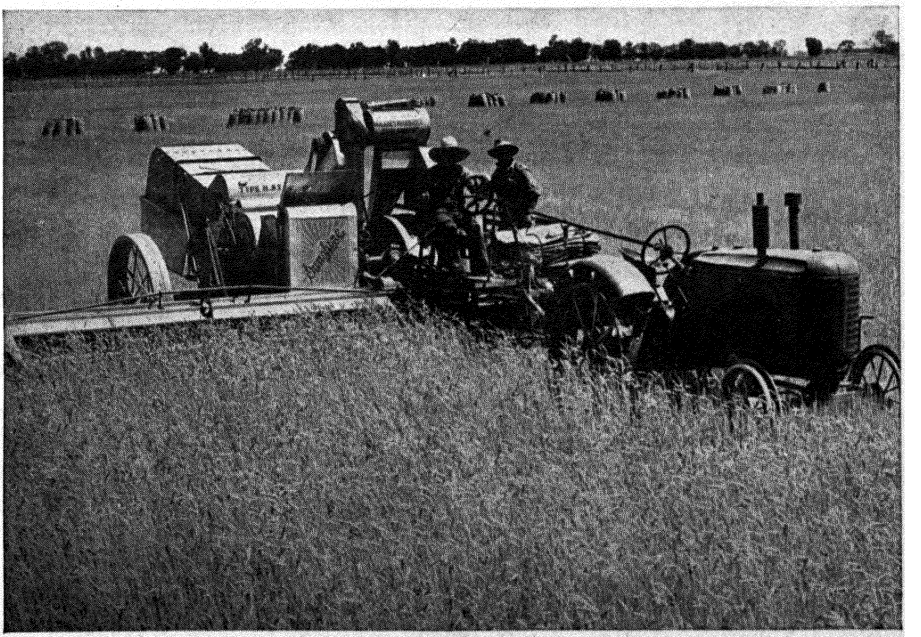
The British Shire Horse—a magnificent specimen about to be sold



Women pulling rice plants from a nursery bed and tying them into bundles for transplanting (China to-day)



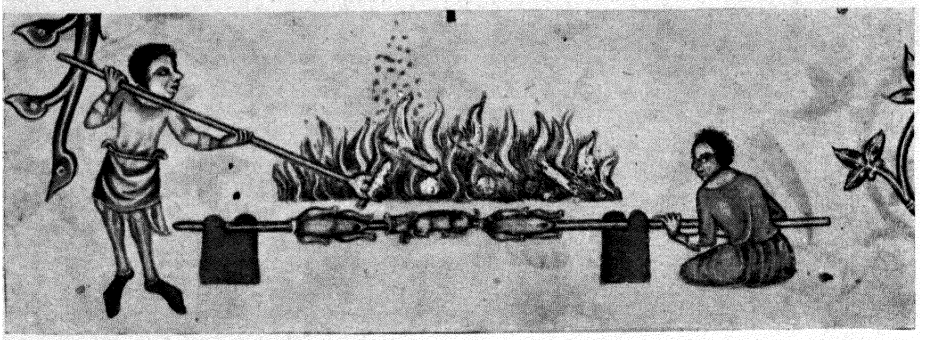
Modern methods on a Russian Collective Farm



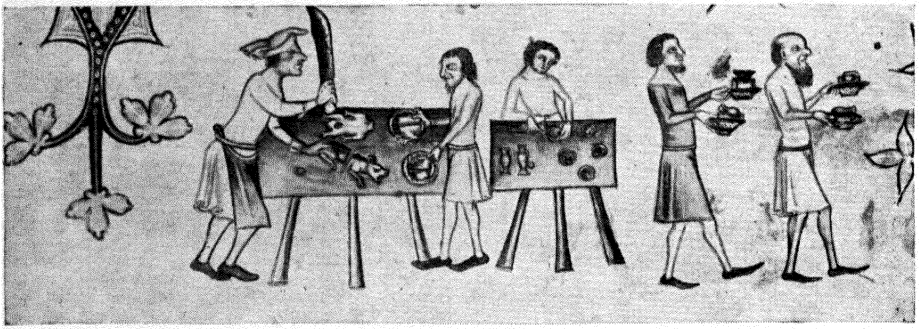
Australian News and Information Bureau

Australian Farm Machinery—Harvesting on a wheat farm in Victoria with a tractor-drawn "header," which strips, threshes and bags the wheat ready for sowing

THE ART OF COOKING (1340 and 1530)



Cooking (from the Luttrell Psalter) *Rischgitz*



Cooking and dressing meat (from the Luttrell Psalter) *Rischgitz*



The Art of Cooking
(*A painted-glass Roundel from a design by Jörg Breu the Elder* (about 1530)

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