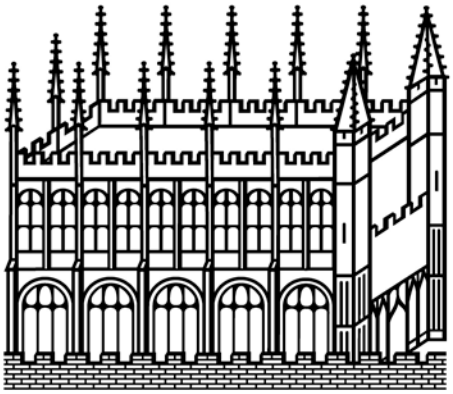
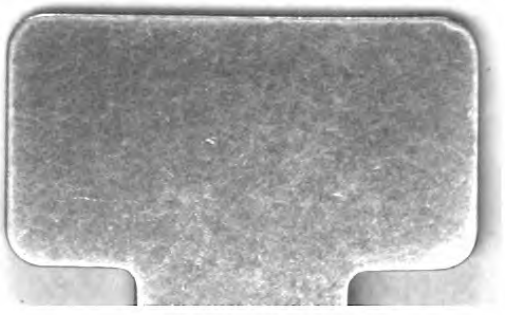


THE CHILDREN'S Picture Book OF USEFUL KNOWLEDGE



USEFUL KNOWLEDGE.

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SUGAR MILL.

See page 44.

THE

CHILDREN'S PICTURE-BOOK

OF

USEFUL KNOWLEDGE

BY THE AUTHOR OF

"THE CHILDREN'S BIBLE PICTURE-BOOK."

LONDON:

BELL AND DALDY, 186, FLEET STREET.

1862.

PREFACE.

In the "Children's Bible Picture-Book," I told my little friends about God; how He made the world, with every living thing upon it, and sent His Son, Jesus Christ, to live, as a man, in it, that He might at last bring us to live with Him in heaven. In the Picture-Book of great and good men, I told them about men who had done great, or good, or useful deeds. I shall now tell them something about food, clothing, and shelter; for I sometimes hear children asking questions about these things, when there is no one at hand to answer them. Here they

can read for themselves what they want to know, and when they have finished, they may, if they like, turn to the questions at the end of the book, and find out how much they remember of what they have read. For reading, without remembering, I must tell them, is of very little use.

M. J.

NOTTING HILL,
Nov. 18*th*, 1861.

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CHAPTER I.

On Vegetable Food.

MANY things are needful to keep human beings alive in this world, and make them comfortable in it. God, who has given us life, likes us to enjoy it, and has therefore provided for us, not only food and clothing, but things pleasant to the eye, the ear, and the taste. And this He has done that we may the more gladly love and serve Him. Let us now try to learn something about those things that are needful, not only to keep us alive, but also to make life pleasant.

Food, clothing, and shelter are absolutely necessary to preserve life.

Food is of two kinds, vegetable and animal. Vegetable food consists of grain, fruit, roots, and

plants, and is that upon which human beings first lived. When Adam and Eve were created in Paradise, God told them that of every tree in the garden they might freely eat, for He had given the fruit to them for food.

Animal food is the flesh of beasts, birds, and fishes; it was not eaten till after the deluge,* when God told Noah and his family, who were the only human beings left in the world, that they might as freely use these creatures for food, as they had formerly used the fruits of the field. Milk, butter, cheese, and eggs are also called animal food.

Vegetable food is most used in hot countries. There, people live almost entirely on wheat, rice, or maize, together with the milk of their flocks. In cool and cold countries, vegetables and bread are chiefly eaten *with* animal food, not in place of it. In the frozen regions, vegetable food is unknown, and people are there best nourished by enormous quantities of meat, the fatter the better. A lump of frozen whale's

* Genesis, ch. 9. v. 3.

fat (called blubber) is a treat to an Esquimaux, and does him as much good as a beef-steak would do an Englishman!

The most important vegetables are wheat, barley, oats, rye, beans, peas, potatoes, Indian corn, rice, the bread fruit, the yam, and the plantain. The first seven of these are common to Europe, the last five are found in the other three continents, and in the islands of the Atlantic and Pacific Oceans. Wheat, the noblest grain of all, is grown everywhere. Many centuries ago, Rome, then the head of a mighty empire, was chiefly supplied with wheat from Africa. Many other useful and pleasant vegetables are also used as food; carrots, turnips, and cabbages are raised in our own gardens, while in foreign countries are found dates, olives, chestnuts, the sugar-cane, the coffee and tea plants, and the vine, with others that will be mentioned in their place.

WHEAT.

When used as food, wheat is generally made into bread. The ears of grain are first ground into flour between two large round stones, called mill-stones; the flour is then passed through a sort of sieve, to separate it from the bruised husk, which is mixed up with it in the grinding; and the next process is to add water to it, with a little yeast and salt. This is well stirred up and left to stand; presently air-bubbles are seen rising in the mass; the whole is then well kneaded together, and again allowed to stand until divided into loaves, which are baked in an oven. This is the bread used in England, and other parts of Europe. In the East, bread is chiefly made of mere flour and water, baked in thin cakes—such cakes as Sarah baked for her angel guests, under the oak in Mamre. We only use this mode when we wish it to keep for a very long time, as in making the bread, called biscuit, which our sailors take with them on long voyages.

Yeast is a frothy substance skimmed off the surface of fermenting liquors, and it produces those air-bubbles in the dough which make the

bread light and spongy after it is baked. It is a very wonderful production of nature, for it is in reality a plant, of an exceedingly small kind; and its spreading so rapidly through the flour and water, changing them into what we call dough, is caused by its finding in this mixture a suitable food upon which it can live and grow; just as other plants draw food from the soil in which they are placed.

The Italians use a great portion of their wheat-flour, kneaded with water only into a very tough paste, which is afterwards dried, and cooked, by boiling, or steaming, as it is wanted. They grow a particular kind of wheat on purpose to make this paste, which is called macaroni, or vermicelli, according to its shape. The grain, which is of a very hard kind, is ground as usual, then mixed with soft water, and the paste is kneaded and worked about with great force, until it becomes elastic and exceedingly tough. To give it its shape, it is forced through small holes, whence it issues in long fine strings, several feet long; this is called

vermicelli. Macaroni is larger in size, and hollow, like a pipe; it is made by being forced through large holes, each one of which has a wire fixed in its centre, and the paste travelling through these of course comes out hollow, as well as round. Among the lower classes of the

MACARONI.

Neapolitans—those are the people who live in Naples—it is thought rather a feat to swallow these strings of macaroni in long lengths whole; for ordinary use, they are broken into suitable pieces.

Both the mixing and kneading of bread are sometimes performed by machinery where large

quantities of it are required, and this is cleaner and less laborious than the old method.

Bread is not always made of wheat: sometimes it is made of oaten flour. This is used in some parts of Scotland, and the North of England, and is not disagreeable by way of change, to those accustomed to wheaten bread. Oatmeal is a very nutritive, that is, life-sustaining food, and beside being made into bread, is often eaten, boiled with water into a porridge, or, with boiling water, or broth, simply poured upon it. We should think either of these dishes very poor fare, but a Scottish ploughman thinks very differently of them. Barley and rye flour are also used in the making of bread; but it is of a coarse sort, and very little eaten in England; for we English people of all ranks live better than any other nation in the world. Rye, in its unripe state, furnishes an excellent green food for sheep.

BARLEY.

In addition to the *use* of wheat flour, we have one mode of wasting it; that is by converting it into starch, which is employed to stiffen laces, muslins, and other articles of clothing. In former times, starch, ground very fine, was plentifully sprinkled upon the heads of ladies and gentlemen, when they wished to be particularly well dressed. Now, this hair-powder, as it is called, is only worn by the men-servants of people of rank.

Starch is made by mixing water with wheat flour and kneading it under a stream of water, as long as the water that runs off looks at all milky. The liquid is then allowed to stand for a certain time, longer in winter than in summer, not only to allow the powdery part to settle at the bottom of the vessel in which it is exposed, but for a sort of fermentation to take place which rids it of some matter not wanted in the starch. The starch is then again washed upon sieves, which allow it to pass through, leaving fragments of the husk and such things behind. This operation is twice

repeated; after the last, the starch is well drained in a box pierced with many holes, then cut into squares, and finally dried in an oven, where it splits into the odd shapes, that starch always exhibits when not powdered.

Barley and rye are also used in the making of certain drinks. Malt, from which we brew beer, is barley wetted and heaped together till the moisture and warmth cause it to sprout. It is then dried in a sort of oven called a kiln, bruised, and steeped in warm water, to which hops are afterwards added. The liquor is then boiled, and when a little cooled has yeast poured into it. This causes what is called fermentation, and when the process is completed, that which was mere malt-tea is changed into beer. Hops are added not only to give a pleasant taste to the beer, but to make it keep better

HOPS.

than it otherwise would. When first used, it was fancied that they were unwholesome; so a fine was imposed upon those brewers who put them into their beer. Now, the bitterer the beer, the more highly we think of it. Hops grow chiefly in Kent and Surrey, where the

HOP GARDEN.

graceful, climbing plants, twined round poles like vines, make a beautiful appearance in their season.

In the olden time there was, in one part of England, rather a droll law for the punishment of those who brewed bad beer: they were

allowed to take their choice between paying a fine of four shillings (a large sum in those days) and being plunged over head and ears in a pool of dirty water!

Vinegar is made from malt somewhat in the same way that beer is, only it is allowed to ferment longer, until it becomes acid (that is, sour), and of course no hops are wanted in it. Rye yields whisky and gin by a process called distilling, which we shall presently describe.

Oats and beans are used as food for horses as well as for human beings: grass, and hay—which is dried grass—would not make them strong enough for very hard work. Those who work hard, whether men or beasts, ought to have plenty of good food. And even a pint of beer is sometimes particularly agreeable to a hot tired horse!

OATS.

Wheat, rye, oats, and all the other grains we have mentioned are called annual plants; that

is, the seed of them has to be sown every year. Towards the end of the year you may see the labourer with his plough breaking up and preparing the land, upon which the seed is then sown; it is afterwards covered up by a large rake, called a harrow, that it may strike its roots deep

WHEAT FIELD.

enough to draw from the earth its proper nourishment. Soon the green blade pierces the soil, and with God's rain and sunshine upon it, the stem, the ear, and the precious grain in the ear succeed each other, until in the autumn bands of reapers

with their crooked sickles cut down the corn, bind it in sheaves, and carry it home in waggons; when after being threshed, to clear it from the husk, the wheat is stored up for the miller to grind into flour, that we may have bread to eat.

The picturesque windmill with its light far-extended sails, looking like wings, formerly ground all our corn for us; but machinery worked by steam power is now much employed instead. Among its advantages is this notable one, that the miller can get up his steam at any time he chooses; the wind he sometimes had to wait for.

The potato, which is the common food of the lower classes in Ireland, was brought to us from North America, it is said, by Sir Francis Drake; while Ireland is supposed to be indebted for it to Sir Walter Raleigh in the year 1610. It is a poor food when eaten alone, very large quantities of it being required to sustain life; an Irish labourer we are told will eat nine pounds of potatoes in one day. In its wild state, it is a small bitter-tasting root; cultivation has made it into the fine floury vegetable that we see upon

our tables. When first introduced into England it was sometimes served up with wine and sugar!

The cabbage, which is eaten both by men and beasts, was formerly thought to possess very little life-sustaining power; but modern science has discovered that it abounds in nutriment of a kind similar to that in wheat. The poor Irish labourer in his cabin has no science, but his taste leads him to beat up potatoes and cabbage together, and thus, without knowing it, to mend his fare by a dish which is really as sustaining as meat and potatoes. This mixture of his seems an odd one, so far as taste is concerned, and yet what is more common than to see ladies and gentlemen take potatoes and greens upon their plate at the same time? The cabbage came to us from Holland.

Turnips and carrots owe their value as food to cultivation. In their wild state they are poor, miserable, good-for-nothing vegetables. They contain a large proportion of water, and are therefore, for their bulk, less life-sustaining than grain and many other vegetables; but they are useful as affording variety in food, for variety is

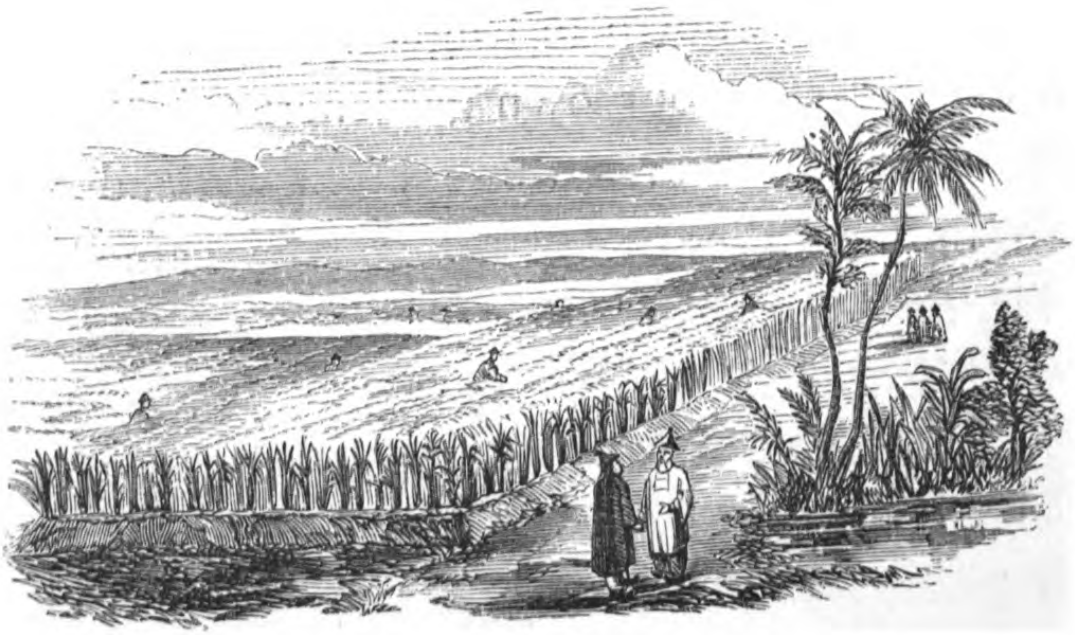
essential to the proper nourishment of human beings. Even horses, cows, and sheep cannot live on the same diet every day in the year; dry food must sometimes be changed for green.

Peas, as to their power of sustaining life, are the very opposite of all watery vegetables. They abound in nutriment, and fortunately are uncommonly pleasant to the taste as well. They are often grown in fields, but those cultivated in gardens are much better, owing to the superiority of garden soil, which is more carefully prepared than that of the large inclosures, called fields. Peas were first known in England in the sixteenth century. Before our own gardeners raised them, they were brought from Holland, and were thought "dainties fit for ladies, they came from so far, and cost so dear."

CHAPTER II.

On Vegetable Food.

THROUGHOUT Asia, rice is the principal food of the common people. It requires a very wet soil; indeed, after the seed is sown, the fields are completely covered with water, a process that would



RICE FIELD.

destroy our European grain, but which agrees

wonderfully well with the health of the rice plant. It is a native of Hindostan, where it is still found wild, and in this state its produce is more valued than that of the cultivated plant. After the crop is gathered in, various contrivances are resorted to, for the purpose of freeing the grain from its hard chaffy husk. One of these is to grind it between revolving stones, set so far apart as to rub away the husk without bruising the grain. Rice is a simple food; and in its native country is eaten boiled, sometimes seasoned with pepper enough to take the skin off the mouth of a European; or, more rarely, served up with a little bit of mutton, or a morsel of fish. The best rice is grown in Carolina, in the United States: it is larger in grain and more glutinous in quality than any other. That word *glutinous* means, sticky!

RICE PLANT.

Among our vegetables we must not forget tea and coffee; because the drinks that we make from the leaves and berries of these plants are not only very agreeable when taken either with or after our meals, but are actually useful through their causing people to require less solid food than they would do without them. It is the daily wasting away of our bodies that compels us to take food to make fresh bone, and sinew, and muscle, in the place of that which is worn away. Now, the drinking of tea and coffee causes this waste to proceed more slowly than it would otherwise do, so that though they are not exactly food, they in some degree supply the want of it. Our breakfast tables would look rather dreary without these liquids, yet little more than two centuries ago their use was almost unknown in England. In Queen Elizabeth's days, even a fine court lady would sit down to breakfast on beef and ale.

The tea plant is chiefly grown in China. It is an evergreen, bearing a small white flower, like the wild rose; and the plant, which very much resembles our camellia, requires careful tending

and weeding for three years after it is sown, before its leaves, which are the parts used for making tea, are fit to be gathered. The plant is allowed to grow, which it does slowly, from about seven to ten years, when it is cut down, and has its place supplied by new shoots from the old root. The leaves are plucked three times in the year, in March, April, and June. The first gathering is very precious, and sold at a high price to the great folks in China: they do not send us any of it: the second is less valued; the third, least of all. These leaves when gathered are dried in shallow pans over a fire, stirred about, and rolled between the hands to produce the curled or twisted appearance that our tea has; it is then spread abroad to cool, the faulty leaves are picked out, and afterwards it is packed in boxes lined with thin leaden plates, to be sent to foreign

TEA PLANT.

countries. The decayed leaves, little bits of wood, and other matters picked out during the manufacture, are, together with a plentiful allowance of dust and dirt, diligently swept up, pressed hard in moulds, and then sent into Tartary, under the name of brick tea. A piece of this is chopped

TEA PLANTATION.

off with an axe, broken up, and then boiled with a flavouring of salt and fat! One would not like to take tea with a Tartar.

Teas are called black and green; the green is the more delicate in flavour, but in England it is

rarely drunk alone; it is chiefly used for mixing with the black. It was supposed that the green tea consisted of the youngest leaves of the plant, but it is now believed that the difference between black and green tea is caused by the way in which they are prepared; the green being dried rapidly as soon as the leaves are gathered, while for black tea, the leaves are allowed to lie till soft, and are then dried very slowly. The natural colour of green tea is a dull olive, but to suit our English fancy a mixture of Prussian blue and some yellow powder is rubbed in among it, which gives to the leaves a beautiful blue-green appearance.

The finest kind of green tea, called gunpowder from its looking like grains of gunpowder, is composed of the young tender unopened leaves; and from its being dried more carefully, and with less heat, it is thought to possess more of the true taste and colour of the plant than any other kind.

Tea is drunk largely by the Chinese, who present it to their guests, much in the way that we do wine. They do not add milk and sugar to

it, as is the custom in England. Australians in the bush—that is, in the country where they pasture their huge flocks—are, however, perhaps the greatest tea-drinkers in the world. It is the most refreshing liquid they can obtain when camping at night after the hard labours of the day.

It is said that the first tea brought to England, about the year 1660, was sold at fifty shillings the pound. A cup of tea, in those days, was indeed "a dainty dish to set before a king!"

Coffee is also the product of an evergreen plant, which grows in Arabia, and other parts of Asia, and in the West Indies. But it is the fruit, a round red berry, that we use, and not the leaves. When ripe these berries are gathered and dried in the sun; the outer husk is then removed, leaving the inner seed of a yellowish green. This is afterwards roasted till it is of a deep brown colour. When they are to be used, the berries are ground to powder, in a small mill for the purpose, or, as in the East, bruised with a pestle and mortar; boiling water being

then poured upon it, the liquid is ready for drinking, as soon as it has become clear. Indeed in some countries they do not wait for that, but swallow down the infusion, grounds and all; a plan which we are assured gives the drinker the benefit of much nourishment from his cup of coffee, he would also gain from his cup of tea, if he would only be content to munch up the leaves as well! The Turks, and Arabs, who use great quantities of coffee, drink it just as it is, without the addition, as in England, of sugar and milk, which are generally taken with it.

COFFEE PLANT.

The coffee tree is supposed to be a native of Abyssinia, in Africa, and to have been thence carried to Arabia; Mocha, in that country, produces the best coffee that we have. It was introduced into the East and West Indies from

the produce of a single plant, raised by Van Hoorn, the Dutch governor of Batavia, from seed which he had obtained from Mocha. This precious nursling was sent to the Botanical Gardens at Amsterdam in the year 1698; from it, other plants were raised, and these in about twenty years afterwards served to stock both the East and West Indies.

Coffee was first brought into England in the year 1652, by a merchant trading with Turkey, whose Greek servant understood the manner of preparing it. It was brought, as now, in the dried berry, and sold at four or five guineas the pound. Our climate is too cold to allow of the growth of the plant in England.

Cocoa and Chocolate are half food, half drink; as, though liquids, they have some power of sustaining life, which is what we mean when we call an article food. They are prepared from the fruit of the cocoa-tree, which is a native both of Central America and the West Indies, though like many other trees and plants it has found a home in other countries. The bloom of this

tree is very beautiful; the seeds are contained in a long yellow pod, twenty, thirty, or more in each. To make cocoa, they are roasted and ground, like coffee. For chocolate, after they are roasted and ground very fine, they are beaten into a paste, with sugar and water; a little flavouring of some kind is then added, and the mass is pressed into cakes for use.

COCOA TREE.

The cocoa-tree, whence we have cocoa and chocolate, must not be confounded with the cocoa-nut tree. This is a beautiful species of palm, found in very hot countries; its stem will grow from sixty to ninety feet in height, without a single leaf upon it, save at the top, which bears a sort of crown of huge depending leaves twelve or fourteen feet long. The nuts are about the size of a child's head, and grow in clusters of a

dozen or so, near the top of the tree. The shell, which is inclosed in a thick husk of loose texture, is hard, the white kernel lines the inside of it to the depth of three-quarters of an inch, and it contains a quantity of sweet, milky liquid. The cocoa-nut palm is a tree of all-work to the natives of those countries where it is found. The kernel and milk of the nut supply them with food and drink, the shell is converted into drinking cups and other vessels, sometimes curiously carved and polished; the fibres of the husk, when pulled asunder, make strong ropes and coarse cloth; the trunk furnishes timber for boats, houses, drain-pipes, and other purposes; the leaves are used to thatch their houses, as well as for making baskets, buckets, and other household implements; and the centre rib of the leaf is often used as an oar, or, with one end of it bruised, as

COCOA-NUT PALM.

a brush. The cocoa-nut palm abounds in the Brazils (in South America), in the islands of the Pacific Ocean, and also in Ceylon, on whose south-west coast, about forty years ago, it was supposed that ten millions of these beautiful trees were growing.

The nuts come to us cheaply enough, because they are used on shipboard as wedges to steady barrels and such like packages in the hold. They are brought in the husk, which, when sawn in two, makes an excellent scrubbing-brush for the house-maid. The stalk end of the cocoa-nut, deprived of its husk, is very like the face of a little grinning monkey.

The yam, and the plantain or banana, are, in the hot countries of which they are natives, as useful as bread and potatoes are to us in England. The plantain grows to the height of fifteen or twenty feet, the stem being crowned like the cocoa-palm, with excessively large leaves, nearly a yard broad, and more than two yards long. The fruit, cucumber-shaped, grows in great bunches, weighing forty pounds or more, and

being exceedingly sweet when ripe, is then eaten at dessert. But its chief use is as a vegetable, before it is quite ripe. The rind is then taken off, the plantain is roasted, and it serves very well in place of our potato, or of bread. There are various other ways of cooking this fruit, which is much used both by the natives of South America and the negroes in the West Indies.

THE PLANTAIN.

The yam is also a very important vegetable. It is a great, clumsy-looking root, shaped somewhat like the leg of a man. But the usefulness of a thing is not to be judged of by its appearance. Boiled, or made into a kind of flour, the yam is an article of food that would be sorely missed in those countries in which it is common. The negro slaves in the United States, and the free negroes in the West Indies (for we English have no slaves now), are very

fond of this root. A single yam will sometimes weigh thirty pounds.

The date, which is brought to England dried, in boxes, and eaten as a sweetmeat, is in Arabia and some parts of Africa the chief sustenance of the people. The hardy Arab of the desert, on his fleet horse, is content with a mere handful of dates for his day's food. On such slender diet, it is no wonder that he is so skinny a fellow. His horse is as thin as himself, but he would starve rather than let it do so. The date grows on a species of palm, whose large leaves are carried by the people of Rome in procession on Palm Sunday, in commemoration of the palm branches borne by the Jews, to do honour to our Lord when He rode into Jerusalem, only a few short days before He was put to death upon the cross! The tree is a fruitful one:

DATE PALM.

it sometimes produces between two and three hundred pounds' weight of dates in one year; and though other crops may be destroyed by drought, the date palm still yields its ample store of pleasant and nutritive fruit; while, amid the burning sands of Africa, its tall stem and feather-like crown of leaves gladden the heart of the traveller, not only as promising food and welcome shade, but as pointing out where the precious water-spring may be found. The wood, fibres, and sap, are all highly useful: the latter is drawn from the living tree, and either drunk fresh, or made into a fermented liquor, called, by the natives, Toddy. Even the stones of the fruit, ground down, will support that hard-living beast the Camel.

Sago, which, as it is seen in England, is often mistaken for a seed, is a substance *manufactured* (that means, made by the hand) from the pith of another species of palm, growing in the Eastern Archipelago, and called, on account of its peculiar produce, the Sago Palm. The tree, just before the appearance of its flower bud, is

hewn down near the root, and the part cut off is divided into lengths of five or six feet. From each of these a slice is taken off lengthways; the remaining portion is then cut across, at a little distance from each end, so that when the pith is taken out, a sort of long box is made of it. Into this the pith, having been well beaten up with water, is returned, and the mixture being allowed to stand, gradually separates, leaving the fibres floating on the surface, while the valuable powder which is to form sago sinks to the bottom. This is afterwards dried, and made by the natives into a cake, or sort of bread. For our use, it undergoes some further treatment. The flour, being moistened, is passed through a sieve into a shallow iron pan, placed over a fire, where the heat speedily bakes it

SAGO PALM.

into the seed-like form in which it is brought to us. A single tree will sometimes produce five or six hundred pounds' weight of sago.

The bread-fruit is another vegetable production of very warm countries. It is about the size of a French roll, and being plucked before it is ripe from the tree upon which it grows, is roasted as you would roast a potato. When cooked enough, its thick skin is peeled off, leaving the inside white and spongy, like bread; it is from this that it has its name of *bread*-fruit. Unlike bread, however, it is best when eaten fresh. It abounds in the islands of the Pacific, where it feeds the natives for eight months in the year. They do not live upon it, however, entirely; sometimes they have a little fish with their bread-fruit; and, on great occasions, a pig baked

BREAD FRUIT.

whole in a pit made in the earth, and lined with stones, which are heated by having fuel burned within them. When quite hot, the burnt fuel is cleared out, the pig is popped in, and being well covered, first with leaves and then with earth and stones, is in due time cooked in a way even to satisfy Europeans—provided they are hungry. People who are not hungry, are apt to find fault with everything set before them, whether well or badly dressed.

INDIAN CORN.

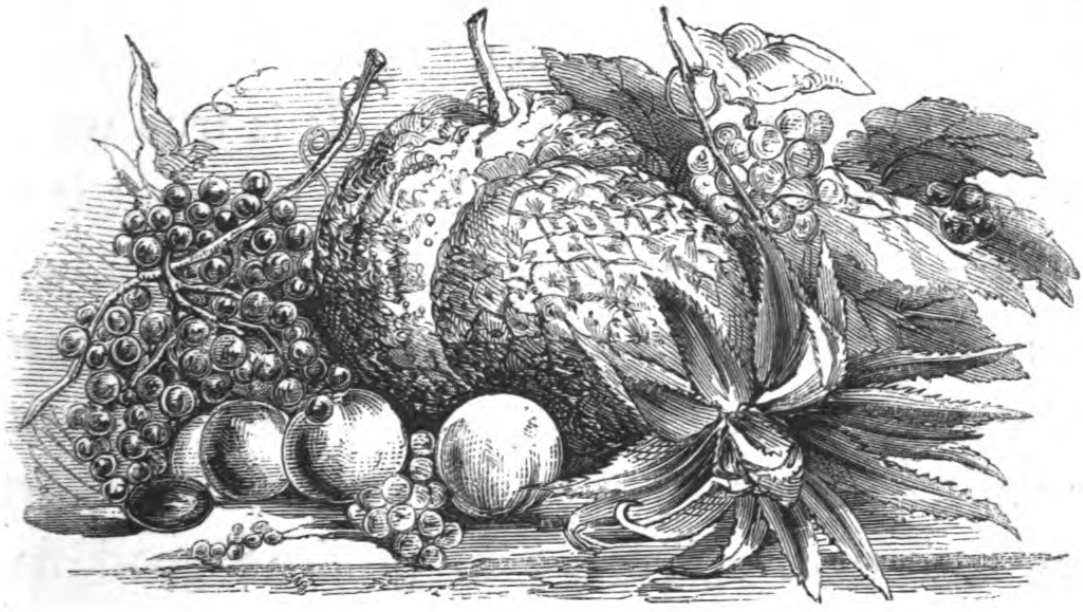
Indian corn, or maize, also grows in very hot countries. It is composed of a number of kernels, set clustering about the top of each corn-stalk. The ripe grain is boiled, or ground into flour, for bread, puddings, or cakes. In its unripe state it is sometimes boiled whole, and eaten as a green vegetable. This is reckoned a delicacy. Maize is a most valuable plant, for it not only

produces two crops a year, but, when sown, multiplies itself in a most surprising manner. From one single seed will sometimes grow up a plant whence four hundred ripe seeds may be gathered. The leaves are used as fodder for cattle.

CHAPTER III.

On Fruit, Wine, Sugar, &c.

WE have now described some of the most important articles of our vegetable food. Fruits of all kinds are used more for luxury (that is, enjoyment), than to sustain life; though in Eastern



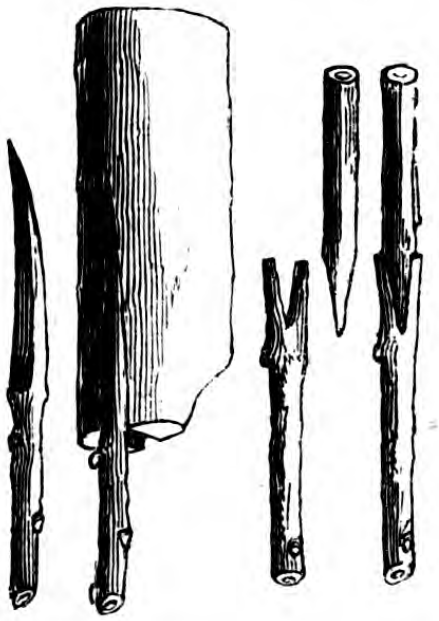
GRAPES, PLUMS, APRICOTS, MELON, AND PINE.

countries, where the mild warm climate renders

a very nourishing diet less needed than it is in a cold one, they frequently serve for food as well. We have mentioned how an Arab will live upon a few dates.

In England we have, either in their fresh or dried state, the fruits of almost every country on the face of the earth. Our own gardens supply us with apples, pears, cherries, plums, currants, nuts of different sorts, strawberries, and, in warm sheltered situations, even grapes of a small kind. But several of these good things have been brought to us from foreign countries, their real home, and *taught* by careful cultivation to grow here. Apples were brought to us from Asia. It is true we had a sort of apple in England before this, but it was a mere little, shabby, sour crab, whose only use was to have the more important stranger from Persia engrafted upon its stock. This grafting, as gardeners call it, is a process by which worthless fruit-trees are made to produce good fruit. The gardener chooses a suitable bud from the good tree, and cutting it off with a sharp knife, places it in a slit which he has made in the stem

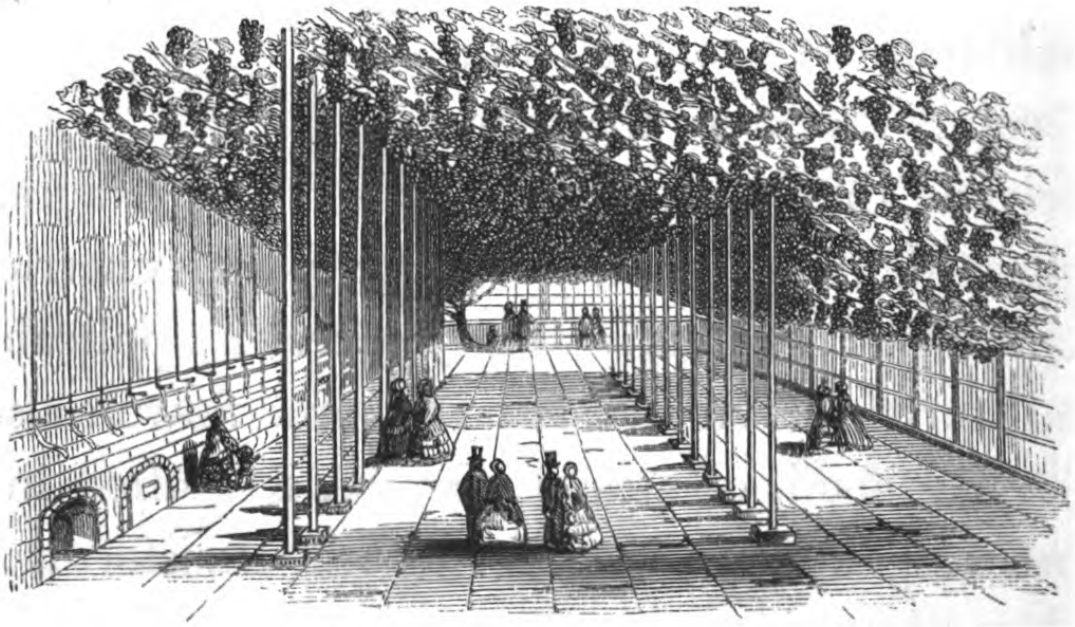
of one of a similar, but inferior kind. The wound and the lower part of the inserted bud are well bandaged up, and the sap from the worthless stock nourishes the tender graft, which in some wonderful manner, that we do not understand, repays the kind office by imparting its own virtues to its nurse. So that, in place of sour fruit, that would only set people's teeth on edge, the tree that has received the graft, afterwards bears fragrant apples, melting pears, or sweet pulpy cherries, according to its kind. This process is applicable to all sorts of fruit-trees, and to some flowers also. Miss Rosebud, of a noble family, is grafted into some vulgar briar, and forthwith transforms it into as elegant a personage as herself; blooming all over with rich, red, double roses. In this way we have got cherries from the borders of the Black Sea, in Asia Minor—they are said to have



GRAFTING.

been first cultivated in England, at Sittingbourne in Kent, about the time of Henry VIII.; pears and plums from Asia; apricots and quinces from Greece and Africa: common nuts, blackberries, cranberries, and perhaps gooseberries and strawberries, are our very own, but much improved by cultivation and training. For plants of all kinds, like children, want education to make them good for much!

Some fruits, now tolerably common among us,



VINE AT HAMPTON COURT.

require the shelter and assistance of a hot-house. This is a building made of glass, to receive and

retain as much of the sun's heat as possible, and warmed with fire in the winter, when the low level sunbeams have little power. In these hot-houses we grow pines, whose native country is South America; figs, melons, and grapes of the most exquisite kind. There is a celebrated vine at Hampton Court Palace of the black Hamburgh species, which has been known to produce more than two thousand bunches, many of them of a pound weight, in one season. The vine is a long-lived tree; even when a hundred years old it is reckoned quite one of the young folks! What age the old people reach, we really cannot tell.

Other foreign fruits come to us either fresh, such as oranges, lemons, and pines, or dried, as figs, raisins, and dates. Oranges are brought from Lisbon and the Azores: the best are from St. Michael's, one of the Azores, a cluster of islands in the Atlantic, off the coast of Portugal. The seedless oranges, which are most prized, are the fruit of young trees; those full of pips are from old ones. Lemons grow in Spain and Portugal.

Pines are brought us from the West Indies; but they are not nearly so good as those raised in our own hot-houses.

The dried fruits are gathered and dried in the country where they grow: figs in Spain, Italy, and Turkey; raisins, which are dried grapes, in Syria, Turkey, and Spain; and currants (they are really grapes) chiefly from Zante, one of a group of islands on the coast of Greece.

FIGS.

Both figs, raisins, and currants after being dried, either in the sun or by artificial heat, are pressed tight down in boxes, to take their journey over the water to us.

Grapes have another use beside that of being eaten—we drink them in the shape of wine. Wines of all kinds are made from grapes. The fruit being gathered is thrown into a large wooden vessel, called a *vat;* the juice is then pressed out, in

some places by great bare-footed men, who jump about in it, splashing the red juice in all directions. It is afterwards drawn off from the husks, and fermented, not exactly like beer, for it is able to ferment itself without the help of yeast, which, however, it produces; and after standing till per-

VINEYARD.

fectly clear, it is drunk as wine. New wine is coarse; it requires age to make it perfectly good. What is called white wine is made from white grapes; red wine from the purple ones. But the colour of the wine is caused by the grape-skins rather than by the juice; so that if purple grapes

were made into wine without using the husks, its colour would be the light brown which we call white wine. This, however, would be a troublesome and costly process, so that the two kinds of wine are usually made from the two grapes.

Wine is made in Spain, and is there called sherry; in Portugal, where it is called port; in the Madeiras and Canaries—islands in the Atlantic, opposite the coast of Africa—and is called madeira and malmsey: claret and champagne are made in France; hock and moselle in Germany. Some wines are made in England from currants, gooseberries, or dried fruits; but they are very inferior to those made in foreign countries.

Apples and pears have also their juices squeezed out, and fermented in the same way; they are then called cyder and perry.

The husks of grapes and various kinds of grain also undergo a process called distilling, and by it are made into brandy, whisky, and other spirits. The process of distilling may be thus described. The liquid to be distilled is made to boil in a closed vessel; the steam

(which is the spirit contained in the liquid) rising from it is forced into a long tube fixed in the upper part of this vessel; the other end of the tube passes through cold water, and the cold thus applied causes the steam to become liquid spirit. If you hold a cold plate so as to receive the steam from a kettle of boiling water, you will see how this happens; the cloud-like vapour will be there, but in the form of drops of water. Brandy is distilled from grapes; whisky and gin from barley or rye, and rum from sugar. Potatoes also yield a coarse spirit by distillation.

Spirits are valuable as medicines, and they are sometimes used to burn in lamps.

Sugar has long been one of our luxuries; it is supposed that it was first introduced into Europe by the Crusaders, and it is now so common, that we almost think it a necessary of life. What would become of our pies and puddings without something to sweeten them; and how blank people at their breakfast and tea tables would look if there were no sugar basin!

Sugar is the juice of a plant called the sugar-cane, which flourishes most in the West Indies. The stem, called the cane, or reed, grows ten or twenty feet high, and is surmounted by leaves and blossom. When the leaves begin to fade,

SUGAR-CANE PLANTATION.

the cane is ripe; it is then cut down close to the ground, and carried in bundles to the mill, where they are squeezed between rollers, which press out all the sweet juice. It is still only liquid. The first step towards making it into sugar is to boil it, with a little lime, or something of that sort, to clear it (as people use white of

egg to clear coffee); as it boils, the thin, watery parts fly off, the juice becomes thicker and thicker, and when it is placed to cool, soon assumes the appearance of what we call moist sugar. Being allowed to stand for a little time, the coarser, wetter portion of it drips away; this is called molasses; the sugar is then put into barrels, and exported (that is, sent abroad) to other countries.

It is still only brown sugar. Those beautiful white, sparkling lumps that heap our sugar-basins, require more labour to produce them, and the mode of doing it is called refining. The raw sugar is again boiled into syrup, filtered through powdered charcoal, which takes away its dark colour, then again boiled and poured into moulds, shaped something like the extinguisher of a candle, when, as it dries, it becomes hard and white. The contents of these moulds are called sugar-loaves; the dregs that drain from them are called treacle.

The sugar-cane has been raised in China and the South Sea Islands, time out of mind. Its

juice is so pleasant and nutritive, that various foreigners gradually carried it to their own countries; the Spaniards first raised it in St. Domingo, in 1520, and thence it has overspread the West Indies, and the hottest regions of America. The manufactured sugar is less nutritive than the fresh cane-juice; it cannot, of itself, support life: yet it can help to do so; and the general desire for it no doubt arises from this being the case, and from the fact of all our food, sour, sweet, or bitter, containing a proportion, greater or less, of sugar.

SUGAR CANE.

The leaves and upper shoots of the sugar-cane are used as food for cattle; the canes, after the juice has been pressed out, serve for fuel, and for manuring the land.

Sugar is also obtained from the maple, a tall and beautiful tree, whose autumnal foliage gives

a crimson tint to the woods of Canada, and the United States of America. In spring, the trunks of the trees are pierced, and the sap that runs from them being collected, is boiled like the cane-juice until it is solid. A single tree will yield from a pint to several gallons of sap in one day; and so far from being hurt by the operation, it appears to like it, pouring forth the more juice the oftener it is pierced.

Beet-root is in some parts of Europe used for the making of sugar. The beet is a vegetable whose root is like a very thick carrot, only that it is different in colour, being either red or white. The latter is used for sugar-making; when ground to a pulp, the juice is thoroughly squeezed out, and is afterwards treated like that of the sugar-cane, or maple. Its manufacture is, however, more costly than that of the cane. The making of beet-root into sugar, we owe to the Emperor Napoleon, who, when at war with England in the beginning of the present century, thought he would ruin us by not allowing any produce of our colonies to enter his dominions,

and as his subjects could not do without sugar, set them to extract it from beet-root. The French did not like this half so well as they did the sweet produce of our West Indian islands; so to make fun of him and his plans, his little baby-boy was represented sucking a lump of beet-root, while his nurse bade him "eat away, for his papa said it was sugar!"

CHAPTER IV.

Condiments; or, Seasonings for Food.

SPICES of all kinds serve as seasoning for food; that is, to make food less tasteless than it otherwise would be, and sometimes to make it more wholesome. We have told you to what extent natives of the East pepper their rice; and many of our vegetables require to be treated in the same way, to make them more easily digested—that is, more fit for us to eat.

If we look at the castors on the dinner-table, we shall see mustard, black or white pepper, and cayenne pepper, which is of a dull red colour; while a glance at the cook's spice-box will introduce us to rather a large family of these foreign friends of ours. For with the exception

of the mustard-pot and vinegar cruet, our castors and spice-boxes are filled from abroad.

MUSTARD.

Mustard is the ripe seed, ground to powder, of a hardy little plant that will grow wild almost anywhere, but is most cultivated in the county of Durham.

Pepper is the fruit of a creeping Indian plant, that produces clusters of small berries; these, like currants, in ripening, turn from green to red. They are gathered berore they are ripe, and when dried, are black. Sometimes the husk or outer skin is taken off to make them white; and it is this being husked, or left in their natural state, that makes the difference between the dark

PEPPER.

and light-coloured powder that we see in the pepper-castor.

All pepper fruits, however, are not round; one kind is long, something like a very little cucumber, and this is generally used in preparing pickles.

Cayenne pepper is made of the dried and powdered fruit of the capsicum; a plant whose native country is the hot East, but which is occasionally cultivated here. The pod when fresh is a beautiful crimson, and as it retains much of its colour even when dried, it is often called red pepper. It is excessively hot and biting to the taste; yet in India little European children will eat up fresh capsicums, just as in England they would eat an apple.

NUTMEG.

Nutmegs are brought from Java, Sumatra, and other islands of the East Indies. They grow upon a large tree, and when fresh are the size and

shape of a peach. The nutmeg itself is like the peach-stone; only that we eat the peach, and throw away the stone, while with the Nutmeg, we preserve the hard centre, and throw aside its soft covering. When this outer part is removed, the fruit has a beautiful scarlet appearance; the scarlet, however, is only its coat, which is stripped off, and much valued as mace. When dried for use, it loses all its beauty, and it has the yellowish brown colour that we see. The real nut, to which we have got at last, is dipped in lime water before being packed, in order to secure it from insects.

CLOVE.

The Nutmeg-tree yields its fruit two or three times in the year. The crop gathered in April is reckoned the best.

Cloves also come from various parts of the East. They are the dried, unopened flower-buds of a small evergreen tree, and are useful in medicine, as

well as in cookery. Its name clove is said to be taken from the French word *clou*, which signifies a nail; as it has been fancied that the dried fruit is shaped not unlike one. Perhaps if we were to "make believe very hard," we might see this likeness of the clove to a nail!

GINGER.

Ginger is another East Indian production. It is the dried root of a plant something like a rush. It is also made into a sweet-meat by being preserved with sugar in its fresh state.

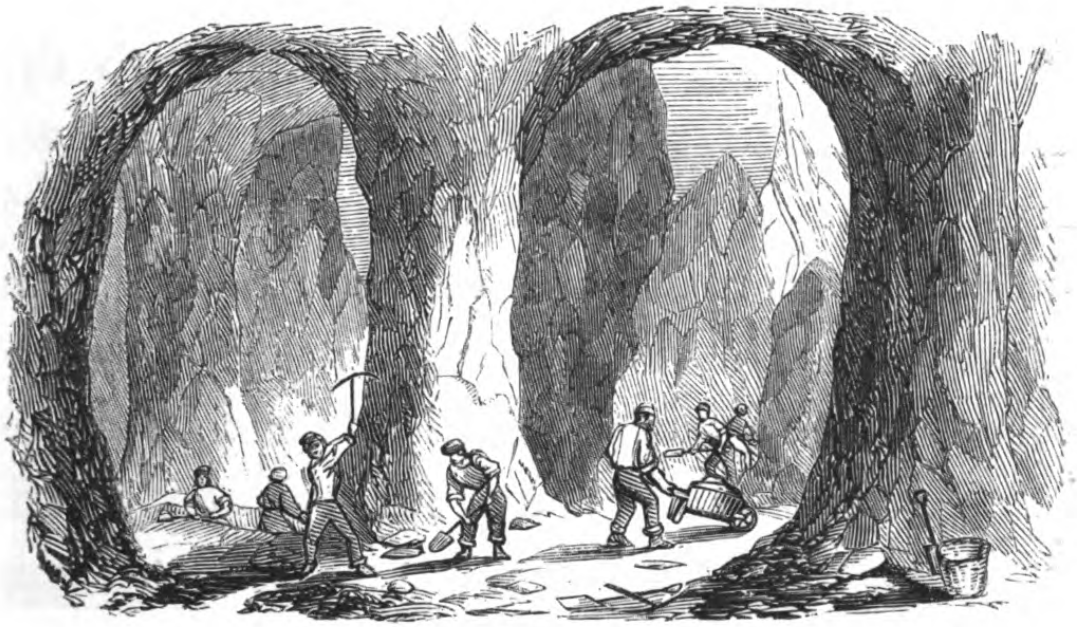
Cinnamon is the dried bark of a species of laurel, known only in the East Indies. It is chiefly cultivated in Ceylon—an island that lies so close on the extreme south-east of India, that it looks as if it had once been a part of it—and is most abundant in its south-west portion. What we call cinnamon is the bark

stripped off the branches of this tree; and the time for procuring it is from May to October. The bark, being slit up, is peeled from the branch, then cut lengthways into several pieces, and is lastly rolled up, as we see it in this country, into slender pipes, or quills. These pipes are laid one within the other, and are about three feet long. They come to England in great bundles weighing nearly a hundred pounds. Cinnamon belongs not only to the cook's spice-box, but to the chemist's stock of drugs, being used in medicine as well as in food.

CINNAMON.

There is another important seasoning of our food, that is neither vegetable nor animal, but mineral, and it is the only mineral that we do eat. This is salt. Salt is obtained from salt-water springs, and from sea-water itself, by pouring the liquid into broad flat vessels in which

it is heated till the water is driven off in the form of steam, leaving the salt behind. That made from salt water is called bay-salt. The chief salt springs of England are in the county



SALT-MINE.

of Cheshire. Salt is also cut out of the earth, in blocks, as stone or coal is cut out. In this form it is called rock salt, and the place whence it is cut is called a salt-mine. There is a very famous salt-mine near Cracow in Poland; it is of vast extent, hewn out in galleries, and passages with pillars left to support the roof. The lights, glittering upon the white transparent salt, give

it a most beautiful appearance. We have also salt-mines in England.

Salt is generally essential to the health both of human beings, and the lower animals. Domestic cattle—that is to say, the beasts that we have tame about us—often have it mixed with their food, and are very fond of it; while for wild animals it has so great an attraction that in the broad plains of North-western America, they will travel, in droves, hundreds of miles to those spots where salt naturally exists, for the purpose of eating it. These places are called salt-licks, and cattle are guided to them by the same instinct that leads them to choose their proper food: an instinct that in this instance sometimes leads to their death instead of to the preservation of their life; as in the lonely interior of South Africa, where the cunning hunter hides himself in the neighbourhood of a salt-spring, and then shoots down his unsuspecting prey at his pleasure.

It may be supposed that there is some reason for this almost universal desire for salt. There is one, and modern science tells us what it is

The blood both of men and beasts contains a certain quantity of salt, a portion of which is, each day of our lives, thrown out of the body by perspiration and other wasting processes. Now if this portion thrown out were never replaced, we should presently lose all the salt contained in our blood, which, thus deprived of one of its important parts, could not sustain life; and we, in our ignorance, should die, but for this desire for salt which bids us, without knowing why, to eat it constantly. Different kinds of food have more or less salt in them, and in proportion to this is the need for more or less salt to be eaten with it.

CHAPTER V.

Animal Food.

WE have said that animal food consists of the flesh of beasts, birds, and fishes; together with milk, butter, cheese, and eggs.

Both animals and vegetables are living creatures; the great difference between them is that the animal alone possesses intelligent life: that is, it perceives, and knows, and feels in much the same kind of way that we human beings feel; and like ourselves it has a will. These powers differ among what we call the brute creation, just as much as they do among ourselves. There is perhaps not much more difference in intelligence between an elephant and an oyster, than there is between our great Shakspeare and a Hottentot.

The name *animal* expresses this intelligent life; it is from a Latin word that signifies soul or spirit.

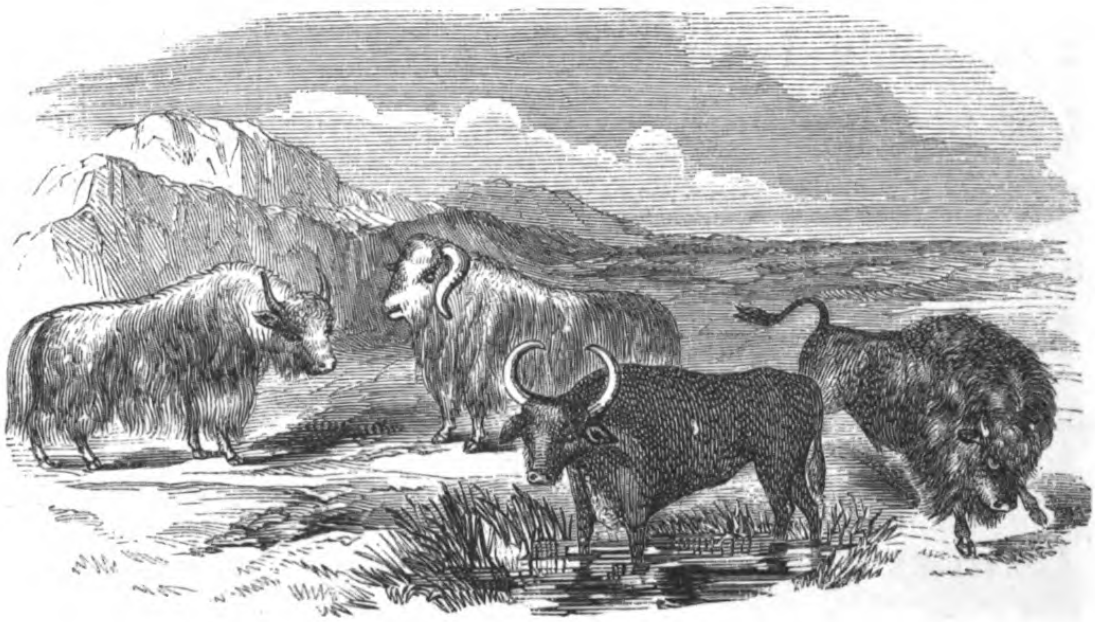
Animals are also distinguished by having the power of moving from place to place. This is called *locomotion*, from the Latin words signifying place, and moving: this power no vegetable possesses. If it be planted in a dark corner it can certainly twist and turn its stem about, to get as near the light as possible, and it will do so. But it cannot uproot itself, and cross over into the bright sunshine.

It is not, however, of the intelligence of animals that we have now to write. We all of us eat them, and we must therefore give some account of them as food.

The Ox, the Deer, the Sheep, and the Pig are the principal four-legged food-animals that we have; and they come to table (not as guests, but meat!) under the names of Beef, Venison, Mutton, and Pork. For these names we are indebted to our Norman conquerors. Our Saxon forefathers were content with one name for their food-beasts, living or cooked; just as we call a potato a potato,

whether growing in the field or steaming in a vegetable dish. Lamb and veal are only young sheep and calves. Kid, that is the young of the goat, is also eaten, not only in Asia, but in some parts of Europe.

The "Roast Beef of Old England," which is



YAK, MUSK, BUFFALO, BISON.

so highly prized by Englishmen, is the flesh of the Ox. In its wild state in Asia, Africa, and America, the Ox is chiefly known as the Bison, the Buffalo, the Yak, and Musk Ox. At Chillingham Park, in Northumberland, there are still some wild oxen roaming about, and these are perhaps

the only specimens of this creature in its wild state to be found in Europe.

Terrible fellows are these wild oxen, whatever they may be called; and indeed some of those that we have at home, tamed though we consider them, are formidable enough both from their strength and ferocity. So that the best thing for you little folks, when you meet long, sharp-horned cattle, either in the field or on the road, is to pass them as quietly as you can. Take no notice of Mr. Ox or Mrs. Cow, and then most probably he or she will take no notice of you.

CHILLINGHAM OX.

In some parts of the world there are so many more cattle than there are people to eat them, that some enterprising people have invented a singular method of preserving beef, so that it may, in the least possible compass, be carried to where it is wanted. This is by making it into

what are called Meat-biscuits. Beef is stewed and boiled, till all its goodness is in the soup, which is kept upon the fire in an open vessel until the watery part has escaped and the meat-juice is as thick as treacle. While it is still hot it is made into a very stiff paste with flour, and this being rolled out into cakes and baked, is preserved in air-tight

OXEN AND PLOUGH.

tins. When wanted for food, the biscuit is broken up into water and boiled, and soup is the result. One of these biscuits contains all the nutritive properties of five pounds of beef; so that it is a most convenient article of diet for travellers in the

wilds of America, where this mode of preparing is practised, or for men on board ship.

The Ox is not only used as food; he is a beast of burden also, that is, he draws waggons, and ploughs our fields now, as he did in the days of Elisha, who was ploughing with oxen when the prophet Elijah threw his mantle upon him, and in that manner summoned him to be his follower and successor. When the butcher has made beef of the Ox, his skin is tanned into leather, his hoofs are converted into glue, his horns, being first softened that they may be wrought, are used instead of glass in the sides of lanterns, and are made into combs, knife-handles, and such things, and the hair is mixed up with mortar to make it stick together the better.

Cows are chiefly valuable for the milk that they yield, and from which we make butter and cheese. To make butter, the milk is allowed to stand until the cream rises; this is carefully skimmed off and churned. Presently little lumps of butter are seen floating in it; these are col-

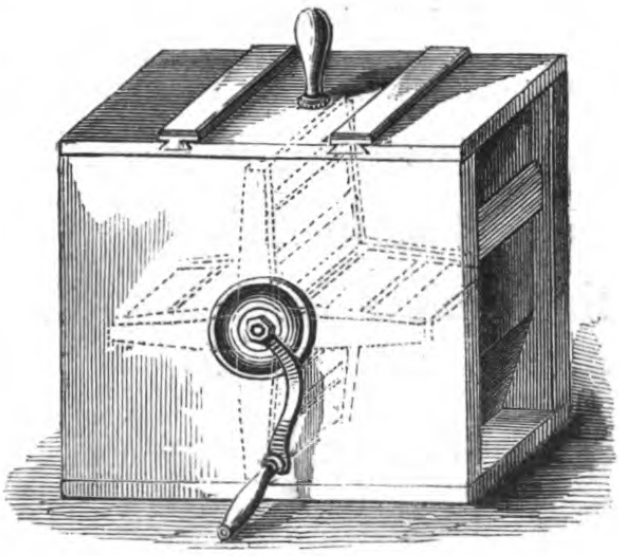
lected together, washed in several waters, and well beaten and kneaded so as to force out every drop of the milk, which if allowed to remain would injure its taste, and cause it soon to spoil. A little salt is then worked in, and the butter is divided into pieces suitable for use. This is called fresh butter.

MILKING THE COW.

But as butter is not easily made in the winter, and cows give less milk at that season, what is made in the summer is sometimes mixed with a large quantity of salt and pressed hard down in small casks, when it will keep for a long time. This is much done in Ireland, whence the butter is brought to England for various household purposes. The English, Irish, and Dutch are famed for their butter.

The churn is a wooden vessel, in which either a wheel—not unlike the paddle-wheel of a

steamer—is made to turn very quickly, or else the milk contained in the churn is well shaken about by a cross piece of wood fastened to a long handle, by means of which it is moved briskly up and down till the butter appears. The milk from which the butter has been separated is called butter-milk, and is used chiefly for fattening pigs.



CHURN.

Wandering gipsies sometimes play off a sad trick upon ignorant farm-servants who refuse to give them money: they threaten to "bewitch" the milk so that it shall yield no butter. This threat they easily make good by slyly slipping a bit of soap into the churn, after which the poor dairy-maid may work away till her arms ache, without producing anything better than soap-suds made with milk instead of water: a result that renders

her very unwilling to refuse their requests in future.

In very warm countries butter is scarcely known; it would be little better than oil: therefore an oil made from the Olive, which grows freely in Spain, Portugal, and the South of France, as well as in Asia, is used in its place. In India, the natives have a species of butter called Ghee, which is made from buffalo-milk, but it is not solid like ours.

It is not for mere luxury, or the gratification of our taste, that we eat butter with bread, and other articles of food. The human body requires a certain proportion of fat of some kind for its proper nourishment. Some foods are wanting in fat; bread is one of them, and therefore we supply the lack by adding butter to it.

Milk may be separated into three distinct substances: Cream, from which butter is made; Curd, which when pressed together and somewhat hardened forms cheese; and Whey, a thin pale liquid, which when boiled throws up a soft curd-like substance which is sometimes churned into an

inferior kind of butter. The whey, after all this bulk of cheese and butter has been taken from it, tastes not very unlike milk itself.

The county of Cheshire is famed for its large and rich cheeses; so we will watch the dairymaid at her work, that we may know how they are made.

If you look in, you will see a great vat full of new milk; possibly a hundred cows have that morning been milked to supply it. Into this a certain quantity of rennet is poured, and the whole being stirred together is left until the milk is found to be curdled. This curdling is the work of the rennet. The curd, being cut up with a wooden instrument for the purpose, is allowed to stand for a little while, and then, down on her knees, by the cheese-tub, goes the dairymaid, and with sleeves tucked up above her elbows, gradually collects the curd into one mass at the tub-side. This mass is afterwards wrapped in a coarsely woven cloth, that the remaining portion of the whey may drain off. It is then broken up again by the hand, and, still remaining in the cloth, is

placed in the round mould which gives its shape to the cheese, and put into the cheese-press, where it is squeezed very tight to force out the whey.

CHEESE-MAKING.

The mould has holes in it to let the whey run off, and through them skewers are stuck into the cheese in all directions, so that not the least drop of liquid is left behind; for on its perfect freedom from the whey depends the goodness of the cheese. This breaking up of the curd and pressing it, is repeated several times, salt being added during the process, until the solid mass that is turned out looks very like a cheese indeed. But it is not by

any means ready for eating yet. It is carried off to the cheese-room, where, surrounded by neighbour cheeses, large as itself, that laborious dairy-maid, actually with her own hands, turns the huge thing every day: a fair turn over all at once, for to rest it one moment upon its edge would entirely spoil her work. Then she examines it diligently lest it should crack, for at cracks flies get in, and ruin the cheese. If she finds the least bit of a crack, her remedy is a hot smoothing iron applied to the wound; for as you know that cheese when toasted becomes very soft, so the momentary touch of hot iron, by softening the edges of it, closes the crack.

The cheese, for a time, is supported by a bandage, called a fillet, round its broad waist, during the operations it undergoes in the cheese-room. But when it has become firm enough to bear its own weight without bulging at the sides, this is removed: it is still turned every day, and allowed to ripen by degrees.

Stilton cheese, which is much richer than any other kind, is made by adding to the new milk

the cream taken from the preceding night's milking. It has its name from a village in Huntingdonshire, where, however, no cheese is now made; the counties of Leicester and Lincoln supply us with it.

Somersetshire produces Chedder cheese, which is considered as good as that from Cheshire. Cheese is made in other counties of England, but it is inferior to those kinds that we have mentioned. In some places they skim the milk several times before curdling it; and cheese made in this way, having all the butter taken out of it, will grow so hard as to require an axe to cut it.

At cheese like this we are drolly told that "pigs grunt, and dogs bark, but they do not dare to bite it."

Rennet, which is used for curdling the milk, is prepared by soaking in warm water the salted stomach of a very young calf.

Milk is one of the most nutritive kinds of food that we possess; and is particularly suited for young children, not only on account of its life-supporting power, but because it contains a

peculiar substance called Phosphate of Lime, which has the effect of hardening their tender gristly bones. When they do not get enough of milk, as in some large towns, their bones, especially those of the leg, which have a heavy weight to carry, are apt to bend and become crooked, for want of this hardening substance. It is contained in other articles of food, but, with the exception of eggs, in none of them so largely as in milk.

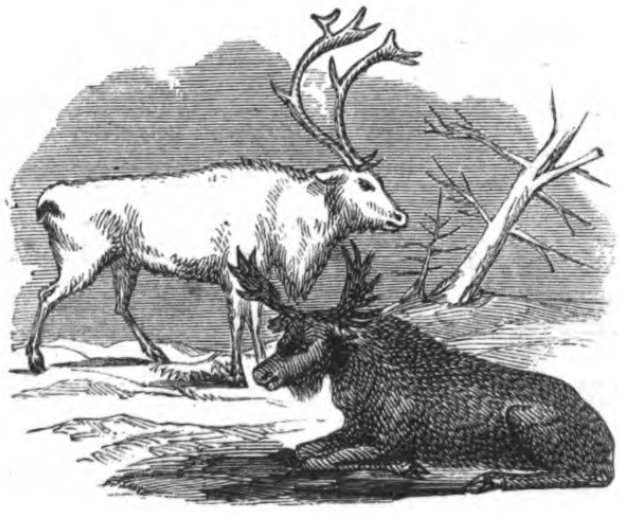
In some countries both of Europe and Asia, Goat's milk is used; and the Arabs of the desert feed upon that of Camels; while the diminutive Laplander depends upon his Rein-deer for his supply of this wholesome food.

Milk may be dried into blocks, so as to keep good for any length of time; when used, it is grated and dissolved in water, and will even then yield butter—provided there is no gipsy at hand to put soap into the churn!

CHAPTER VI.

Animal Food.

THE Deer in all its varieties is a noble animal, swift and beautiful. It has been found in almost all parts of the world, except Australia, and the south and central portion of Africa. It is differently named in different places; and its principal varieties are the Elk or Moose Deer in Northern Europe, America, and Asia; the Reindeer in the Arctic regions; the Wapiti in North America; and the Roebuck, Red Deer, and Fallow Deer,



REINDEER AND ELK.

in Europe. The Fallow Deer is also known in Asia and Northern Africa. All these species of Deer, when full grown, have wide branching horns, or antlers, which are shed every year, new ones growing in their place. The antlers are at first tender, but soon harden into bone, and then a couple of quarrelsome deer will fight desperately with them. Their sharp points render them formidable weapons against either deer or man.

ROEBUCK, RED DEER, FALLOW DEER.

The Fallow Deer is the kind that is frequently kept in English parks; where the dappled sides, picturesque antlers, and elegant movements of these animals, enhance the beauty of green turf, and magnificent forest-trees.

It is this species that furnishes our best venison; but the deer is eaten wherever he is found. The word *venison* is derived from a Latin

word *venator*, that signifies a hunter, and formerly all hunted game was thus named; now the meat of the deer is the only one called venison.

The horns of the stag are sometimes made into handles for carving-knives and forks.

It seems a great falling off to turn from this noble beast to humble mutton; and yet the sheep may vie in usefulness with any quadruped. That word *quadruped* means a four-legged animal, and is derived from two Latin words,* signifying four, and feet. The sheep is not only eaten almost all over the world, but wherever it is found, its woolly covering serves to clothe man, and the manufacture of it was for a considerable period the chief source of English prosperity. The first woollen manufactory in England was established by the Romans at Winchester, and our British ancestors were such apt scholars, that they soon rivalled their masters in this branch of industry. The sheep is said to have been brought to us from the hill country of Persia, where it is still found in a wild state.

* Quatuor, *four;* pedes, *feet.*

Sheep require careful feeding, whether they are intended for mutton, or wool. In former times, when they were just left to crop any herbage that they could find in the sheep-farm or the mountain pasture, it was four long years before they were converted into good mutton. Now, by growing crops of food for them, when

SHEEP-SHEARING.

the fields no longer yield a full supply of grass, one year is sufficient for the process. An abundance of good food also increases the length and weight of the wool; a half-starved sheep, shivering through the winter, cannot grow a

sufficient fleece either to keep himself warm, or to remunerate his owner.

Shearing the sheep is performed about the middle of June. Two or three days before this the flocks are driven to some running stream, and being plunged one by one into it, strongly against their will, for they do not like cold bathing, their long wool is well washed from all the dirt it has acquired during the preceding twelve months. They are then turned into a clean rick-yard, or field, to get dry, and when this is accomplished, their wool is cut off with great scissors, called shears.

The milk of the sheep is sometimes made into a poor kind of cheese.

The pig (or hog, to give it its proper name) is also a very useful animal to man. It is easily reared, and as for its food, the pig is amiable enough to eat anything and everything it can get, except of course the poker and tongs; these are too hard for digestion, even for a pig! But though so accommodating in his appetite, the pig, if the most is to be made of him, must be

fed more daintily as the time approaches when he is to be transformed into pork. Then he must have potatoes, not raw, thank you, but boiled; meal of various grains, with milk or whey, which is plentiful on cheese-farms. Were piggy-wiggy aware of the meaning of these fatal delicacies,

PIG-FEEDING.

his appetite for them might perchance fail him. But he is not; and therefore, with a cheerful grunt, gives himself up to the great duty of stuffing and cramming till not another mouthful will go down. The pig has been reproached

with being a dirty animal. He is, there is no denying it; and so would a horse be, if he were as much neglected as some pigs are. But the careful farmer, or cottager, knowing that his pigs thrive best when they are kept clean, bestows plenty of soap and water upon them; and though they loudly resent and resist this wholesome application, no sooner is the scrubbing at an end, than it is evident than even a pig can appreciate a clean skin.

In addition to being eaten in the fresh state, pork is often preserved by means of salting; not only for use at home as bacon and ham, but on ship board for people who take long voyages. Salting preserves meat not only by closing its pores, so as to exclude the air, but by drawing out the watery portions of the meat (there is water in every substance), and supplying their place with salt, which, united with the fibre and juices of the meat, forms a substance naturally less liable to decay than it was before. That entirely shutting out the air, should preserve either animal or vegetable substance, we can easily understand,

because air contains water, and water, we know, has the power of gradually destroying dead substances placed in it. But why such a union of salt, with the substance of meat, should be less easily affected by the moisture of the air, than the meat by itself, is one of the things that we do not know; we only know that such is the case. Beef is prepared for sailors in the same way, and sometimes by long keeping becomes so hard and coarse, that they dignify it with the name of salt-horse.

Meat preserved by salting is less nutritive than fresh meat. The juices forced out by the process contain much of the life-supporting properties of the meat; so that in the olden time, sailors who lived long on salt meats, unaccompanied by vegetables (which contain some of those nutritive matters forced out of the meat by salting), suffered from dreadful illness. Now that we have discovered that entirely shutting out the air will preserve meat as well as salting does, and that vegetables may be preserved in the same way, we save the health and lives of our

sailors, both by giving them less salted meat, and by providing them with plenty of vegetables preserved in this manner.

Meats and vegetables that are to be preserved without salting, are put into tin canisters, having a very little hole in the lid. These canisters being placed in a caldron of water, not so deep as to cover them, are allowed to boil for some time; the boiling forces all the air out of the canisters, and as soon as this is done, a dab of solder (melted lead and tin) upon the little hole in the lid prevents its ever getting in again to spoil the provisions inside.

The skin of the pig, when tanned, forms a very strong, thin leather, which is used for making saddles. The bristles are made into brushes.

Horse-flesh is eaten by some far-away foreign people—the Tartars for instance. But in England, we could not afford to eat our horses, even if we liked them, which we do not. It is only in circumstances of extreme destitution, or famine, such as we read of during long pro-

tracted sieges, that civilized people will feed upon this animal. The Tartars also prepare a species of intoxicating liquor from mare's milk.

HORSE.

CHAPTER VII.

Animal Food.

THE birds that we eat are tame birds, and wild ones. The former are called poultry; the latter, game.

The turkey, from its size and agreeable flavour, is entitled to stand at the head of our poultry. It is not a native bird; it comes from North America, but is now thoroughly domesticated with us in England.

Turkeys, when very young, are exceedingly delicate in their health, so much so, that when they "take their walks abroad," the poultry-maid must look well after her charge, lest they should be caught in a shower, which would most probably be the death of them. Perhaps it might be as well when she attends them, that she should have an armful of umbrellas and

shawls, for the protection of her interesting brood. Fortunately this period of delicacy is soon over, and those who outlive it become so hardy, that they will roost in a tall tree-top, even during a cold winter's night, without being the worse for it. The turkey-hen is an

TURKEYS, GEESE, DUCKS, AND HENS.

excellent mother, and will sit upon her nest as though she were glued to it, yet she is a silly bird, not even having the wit to teach her chicks how to pick up their food; so here again the nurse-maid—that is, the poultry-maid—must attend, to take care of them. They are fed for about six months upon boiled eggs, barley, and

oatmeal—made into a paste with milk or water—potatoes, and green food, and are then ready for what is called "cramming." This consists in mixing up fattening food into a paste, and pushing it in large boluses down the throats of the birds. We should think it was very uncomfortable, but it is said that fowls like it; at least so far as the unwearied opening of their mouths for more of these food-pills may be thought to signify their approval of them.

The county of Norfolk is celebrated for turkeys, which are brought in vast quantities to London. There the people can scarcely make their Christmas dinner without a turkey.

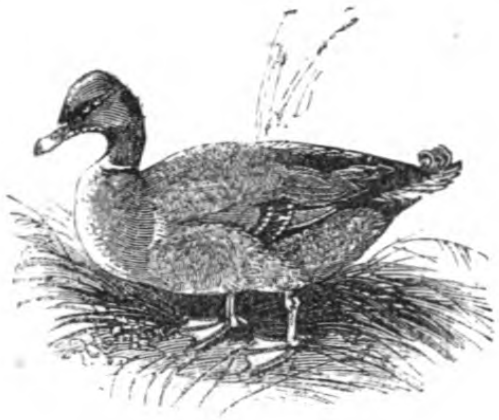
The common hen is a model of a mother: active, busy, bustling, scratching and fighting for her chicks, and teaching them to scratch and fight for themselves. If we may hint a fault on the part of this admirable fowl, it is that she has a bad habit of killing young ducks, with one vigorous peck of her sharp bill on their tender little backs. We once saw a hen in a farm-yard undergoing the punishment of what

might be called the pillory, for this very offence. There sat she, in solitary disgrace, inside a great hen-coop, which effectually restrained madam hen from carrying out her murderous designs upon the unconscious ducklings around her. Had she, however, hatched these ducklings herself, she would have treated them as tenderly as her own chicks; and it is on account of her good qualities as foster-mother, that the hen is sometimes employed to hatch duck-eggs; ducks being the most careless mothers in creation.

Patience, as well as other motherly virtues, is required by the hen, for she has to sit upon her eggs twenty-one days before they are hatched. Then the little rogues begin to peck their way out of the shell, and it sometimes takes two days' hard work to accomplish this; but they are soon running about, as brisk as ants, and, if well fed, may in three months make their appearance at table.

The hen will often rear a large brood, but as for ducks, oh, dear, dear! a mother duck will sometimes hatch nearly a dozen ducklings, and lose more than half of them before the

week is over. Off waddles she, looking neither to the right nor the left; one of her little ones gets pounded in the tall grass; another is wriggling on its back; her great splay-foot is perhaps set upon a third; but whatever misfortune befalls them, she does not trouble herself about it.



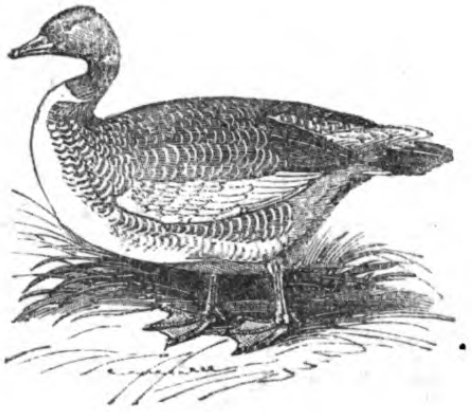
DUCK.

Little ducks look rather deplorable when they leave the shell, but being snugged in a bit of flannel by the farmer's wife, their downy bodies soon get quite comfortable, their tiny wings looking like wee-wee epaulets. Before being turned into the yard to follow their mother, a little bit is snipped off their tail-feathers, to prevent the poor little things upsetting backwards, which they certainly would do without this precaution, because they are rather over-weighted behind. The duck, like the pig, is not over particular about what she eats. Blessed with a good appetite and excel-

lent digestion, nothing comes amiss to her broad bill; slugs and snails she delights to gobble up, and is well pleased to follow the gardener, in order to pounce upon any unfortunate earthworm turned up by his spade. But if one is to judge from appearances, the height of enjoyment of which a duck is capable, consists in thrusting her bill, up to the very breathing holes, into dirty water, for the sake of picking up, or straining out, anything in the shape of food that may have found its way there. Thanks to this never-flagging, easily satisfied appetite, the duck can fatten herself, without having food pushed down her throat, like the turkey.

The eggs of the hen form an important article of diet. We have said that fat, in some shape or other, is essential for the proper nourishment of the human body, and the egg actually contains more of this than even fat beef does. In addition to all the eggs that are hatched in England, we import millions of them from Ireland and France. Eggs may be kept good for almost any length of time, by rubbing the shell over

with melted grease of any kind. This fills up the pores of the shell, through which the chick receives air enough to sustain its little life; and, as has been said, when air is entirely shut out, substances, whether animal or vegetable, will long resist decay. Pores are exceedingly small holes, often too small to be visible; and they are found in all solid substances.



GOOSE.

The goose is another of our well-known domestic birds, most savoury to eat, and renowned at Michaelmas and Christmas. Its education and rearing are conducted much like that of other domestic fowls, but it has the peculiarity of eating grass. It is not uncommon to call a stupid person a goose, but this is a great mistake, the goose being rather an intelligent bird than otherwise. In old Rome, that is, Rome before the time of Christ, geese were held in particular respect. It is related that when the

Gauls, under Brennus, attacked the city, their design was one night defeated by the quick ears of a flock of these birds, who, hearing approaching footsteps, set up such a cackling, and flapping of their wings, as woke the heedless defenders of the Capitol. Those clanging cries were as effectual as the blast of a trumpet; a sally was at once made, and the invaders driven off.

The eggs of the goose are too strong in flavour to be eaten, as those of the hen, duck, and turkey are. Its feathers, however, are very valuable, as when properly prepared and dried, they make the softest of all feather beds; and a soft bed is desirable for very old people, for very young children, and for weary invalids who cannot sleep, but lie tossing about all the night, until even a bed of down would feel hard. The quill-feathers of its wings are made into pens. Water fowl are eaten as well as land birds.

Game birds include pheasants, grouse, partridges, and others.

The pheasant is a beautifully feathered bird, about the size of a common fowl, and we owe

it, as well as our ordinary poultry, to the continent of Asia. From Western Asia, we are told, it was brought to Greece, thence to Italy, and finally on to our own colder climate, where, in the time of Edward the First, the price of a pheasant was four pence. Not the four pence of our days; in the thirteenth century this insignificant sum of money would represent at least twenty times such an amount in the nineteenth century.

PHEASANT.

The pheasant makes a rough sort of nest on the ground, and its young leave the shell in the month of May. It is not permitted by law to shoot this bird before the first of October. Even by this time the young pheasants have attained their full size, and are so foolish, as well as young, that it is said they will fly almost in the face of the sportsman, for very fear of his

dog, little thinking that the latter is the less dangerous animal of the two.

Partridges are found in every quarter of the world, north, south, east and west; and the quail is of the same family. Grouse also exist in all the four continents. Our British species are the black-cock, the red grouse, the ptarmigan, and the capercailzie, or cock of the wood, a large and beautiful bird, which, having become extinct in our islands, has been recently imported from Norway, and comfortably settled in the Scottish Highlands.

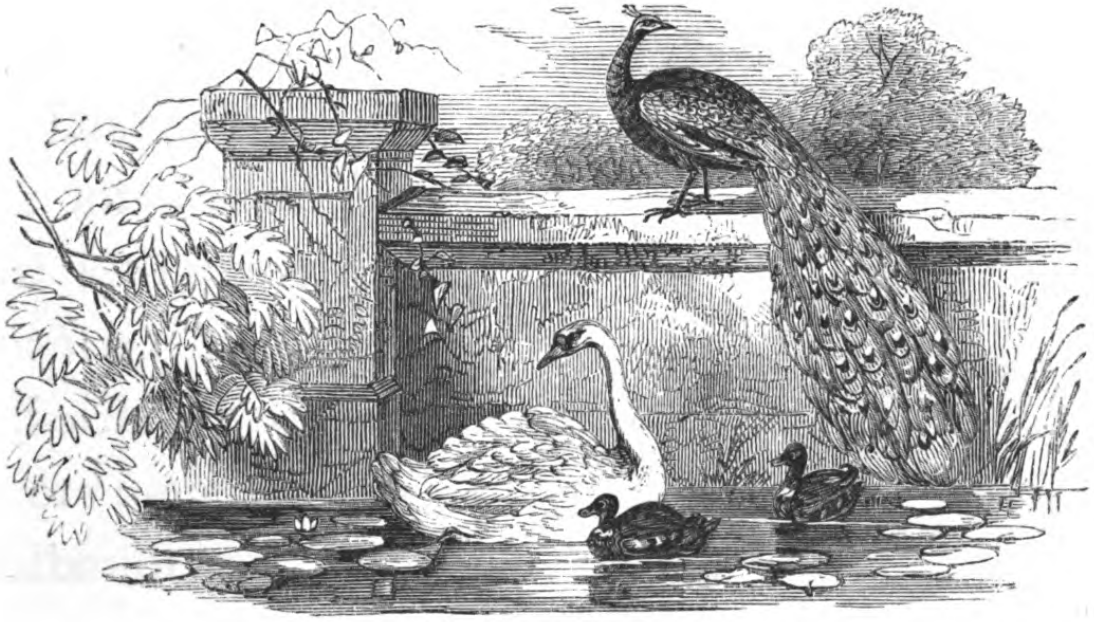
CAPERCAILZIE.

PTARMIGAN.

The black-cock is most abundant in hilly, heathy parts of the country. Its plumage shows a striking assemblage of colours, "glossy black, shot with steel-blue and purple," coal-black, and pure white; the nest consists of a little dried grass, laid as if carelessly on the marshy ground, and the young, when hatched, feed, like their parents, on insects, seeds, tender heath-twigs, and in winter, when snow covers the earth, on the buds and top shoots of various trees. The shooting of this bird is considered to afford fine sport to those who are fond of killing creatures for amusement. They are not, however, allowed to "pop" at it all the year round. Peace and quietness are allowed the poor black grouse, by law, from the 10th of December to the 12th of August. In Devon, Somersetshire, and the New

BLACK-COCK.

Forest, it enjoys a holiday for ten days longer. For eating, the capercailzie is brought here from Norway. Peacocks and swans are also eaten, but very rarely in modern times. In the middle



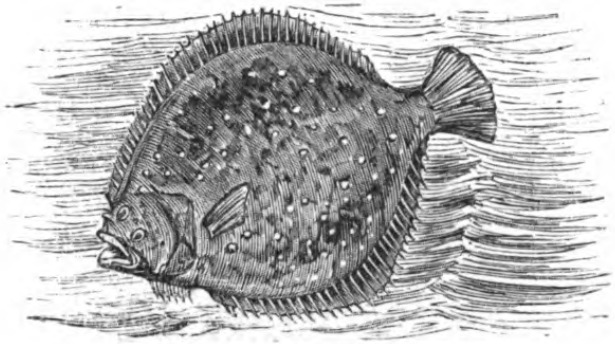
PEACOCK, SWAN, AND DUCKS.

ages the peacock was brought to table, and eaten with great ceremony; chivalrous knights making their vows before "the ladies and the peacock."

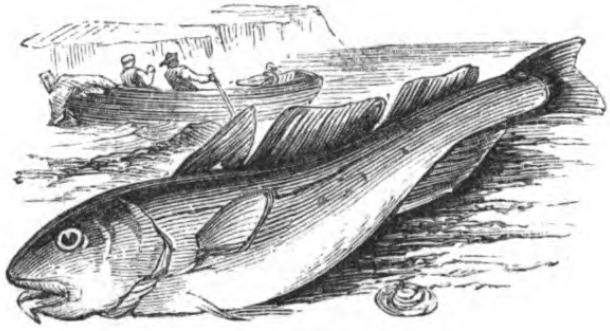
Fish is a less life-supporting article of food than either birds, or the meat of four-footed animals.

The principal salt-water fish eaten in England, are the turbot, the cod, the sole, the haddock, mackarel, and the herring.

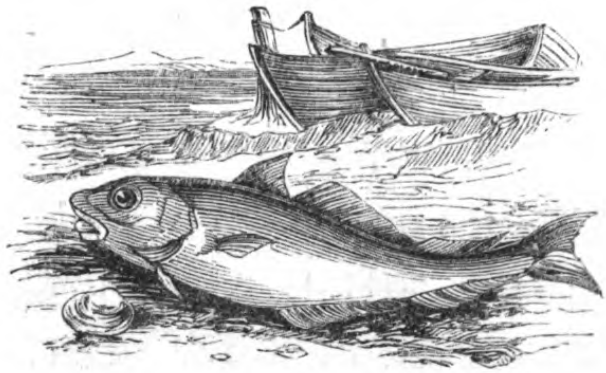
The turbot, a broad, thick, flat fish, is taken on the south coast of England, and on that of Holland. The Dogger Bank, a long sand bank at the bottom of the sea between England and Holland, is the fishing ground for fresh cod, vast quantities of which, dried or salted, come to us from Newfoundland. It is taken with lines and hooks, as it lives in water too deep for the use of nets. The haddock is a sort of poor cousin of the cod, being very like it, but of inferior flavour. The sole, a long, flat fish, is caught on various parts of our coast; the best



TURBOT.

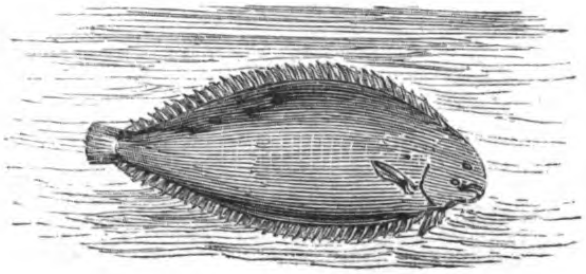


COD.

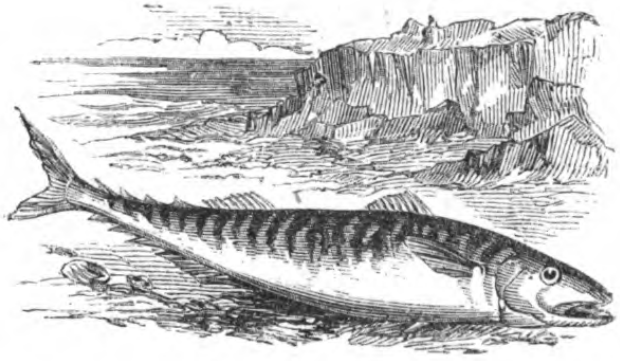


HADDOCK.

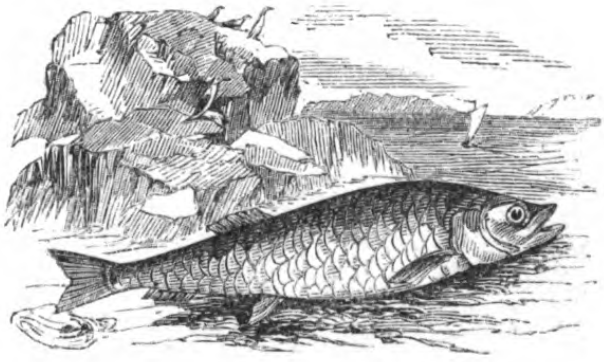
are from Scarborough, in Yorkshire, and Dover. The mackarel is a lovely coloured fish, not of the flat species, but shaped like a herring. In spring and early summer all our waters abound with it; it spoils by keeping sooner than any other kind of fish, and is on this account permitted by law to be sold on Sunday. The name of the herring literally is "legion," for it is said to be taken from a Dutch word, signifying numbers, and at certain seasons it absolutely swarms in our seas. It is eaten salted, as well as fresh.



SOLE.



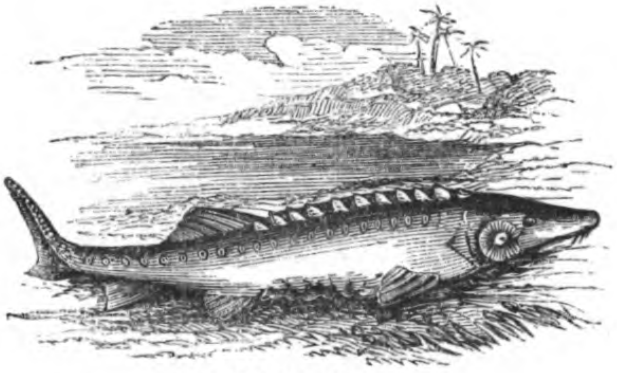
MACKAREL.



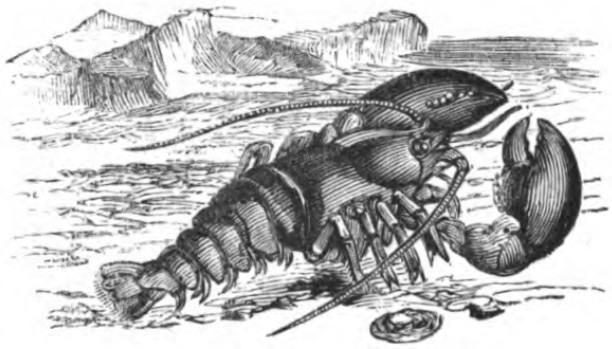
HERRING.

The sturgeon cannot be called an English

fish, yet it is sometimes seen in our rivers. Occasionally one finds its wandering way into the Thames, where it is duly caught and eaten. It is said to be not unlike veal, a sort of fish and flesh rolled into one. Its chief home is in Northern Europe. It abounds in the Caspian Sea, and those rivers that empty themselves into it.



STURGEON.

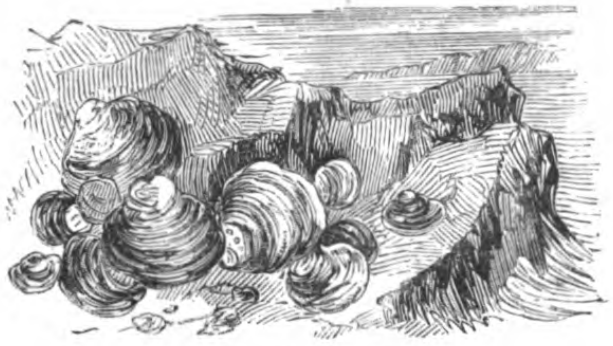


LOBSTER.

CRAB.

Our shell-fish comprises lobsters, crabs, oysters, mussels, and some other inferior kinds. Lobsters are caught in a sort of wicker basket, called a lobster pot, on several parts of our own coasts, and great numbers

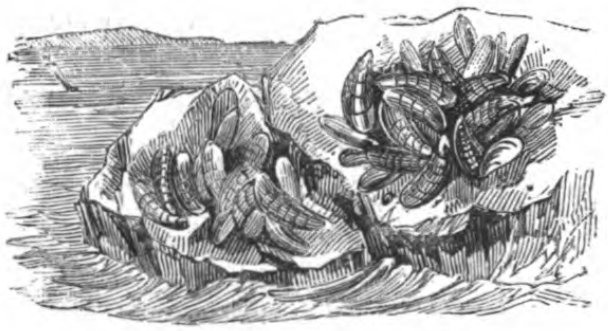
are brought to us from Norway. Where they are found, crabs are not far off. They are caught in the same way as lobsters. Oysters keep close in shore, and are fond of anchoring themselves to the rocks. They are taken by means of a net, that scrapes them off, and tumbles them into a proper receptacle; and as this sweeps off young as well as old, the mere infants are carefully deposited in some shallow bed of water near the shore, where they may be found again when wanted, that is, when large and fat enough to be eaten. There are very extensive oyster beds, or nurseries, we might call them, on the east and south coasts of England.



OYSTERS.

The Mussel also is a small shell-fish, that loves to fasten itself by tiny cables thrown out from its body to the rocky shores where it is found. It has a long, pointed, purple-tinted shell, and is extremely agreeable to the taste;

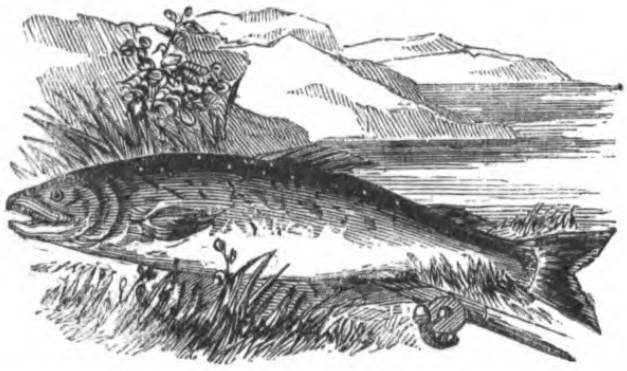
but as mussels are apt to make those who eat them exceedingly ill, it is better to let them alone. The humble Cockle is round and dumpy in figure, with a shell marked by deep furrows. It burrows in the sand, whence it is dug by a bent fork, and may be eaten without fear. When the cockle wants to change its place, it sets itself on edge, sticks out a sort of foot, and works itself along, making a groove in the sand. Others of this species, that is, fish inclosed between two shells joined by a hinge, get along by opening and shutting the shells briskly.



MUSSELS.

The Turbot in salt water, and the Salmon in fresh, are the most valuable fishes that we have. The salmon is taken in rivers, more especially in those communicating with the sea, which it visits from time to time. Perhaps it might most properly be called both a salt and a fresh-water fish. The Tay in Scotland, the Severn in

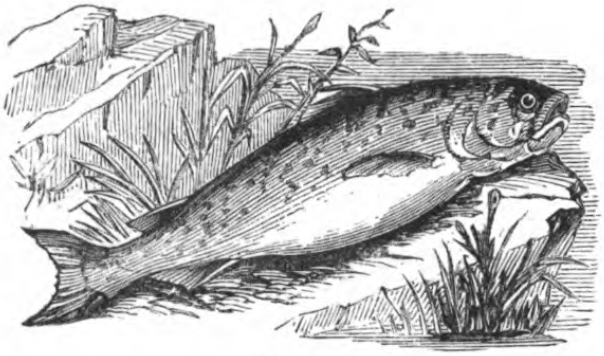
Gloucestershire, and the Ribble in Lancashire, are famous for their salmon. That from Ireland is less valued. The salmon is generally taken in nets, or weirs, on its leaving the sea. It spends the summer in the sea, and changes its quarters into fresh water during the winter. In the North of England, it is sometimes caught by spearing, while anglers delight to catch it in the rivers with hook and line. It is a particularly strong, vigorous fish, so that hooking it to land is thought no small exploit.



SALMON.

The Trout, a beautiful little fish, of delicate flavour, is found in most of our English lakes and rivers. Country boys will catch trout by sliding the bare hand and arm quietly into the water, where the fingers are kept gently moving. This has some strange attraction for the fish ; it approaches, and ends by gliding tranquilly over

the very hand, which is instantly closed upon it. This mode of capture is, in country phrase, called "tickling for trout," and doubtless takes rank with the snaring of game, which is considered a very vulgar kind of poaching indeed. The term poaching is applied to the taking of game by those who have no right to do so. In the Lake of Ulswater in Cumberland, and Loch Neagh in Ireland, a very large species of trout is found, sometimes weighing as much as twenty-five pounds.



TROUT.

There are several other kinds of fresh-water fish, such as the red mullet, the carp, the John dory, perch, tench, eel, and so on; but we have not space in which to describe them. We have said nearly enough of the eatables and drinkables, and must pass on to something else; first, however, having one word about the chief drinkable of all, water.

Water, though a liquid, is composed of two gases, called hydrogen and oxygen; by weight, there are eight parts of oxygen to one of hydrogen; by measure, one of the former to two of the latter. Skilful chemists can compose water by putting these two gases properly together. Water is a fluid (that word means something that flows) that abounds in all nature, not only in the shape of seas, rivers, streams, and rain, but even in the texture of solid substances. Our own muscles, bones, and sinews contain so much water, that if it were all withdrawn, there would not remain much more than a fourth of their present weight. Breathing and perspiration are continually carrying off some of the water contained in the substance of our bodies, so that if we did not take in more, we should soon be dried up to mummies. We are, however, continually taking it in, not by drinking alone, but in every article of food that we swallow, and the air that we breathe; for air is stored with moisture, ascending silently, but restlessly, from seas, and rivers, and streams, and from

the damp surface of the earth, which, wet with the "rains of heaven," thus gives up a portion, to be again returned to it in life-giving dew and showers.

And now, having seen how human beings are fed, we must in the next place learn how they are clothed.

CHAPTER VIII.

Clothing.

THE first clothing used by mankind consisted of the skins of beasts; since that time, convenience and luxury have furnished us with a great variety of dress, which differs much in its style in different parts of the world. In the East, flowing garments have always been worn; Europeans have a close-fitting costume; many savages still content themselves with a few stripes of paint.

In very cold countries the skins of beasts, prepared with the fur on, are still much used as clothing; in milder climates, such as that of England, furs are principally worn as additions to our winter dress, of which woollen is the chief material.

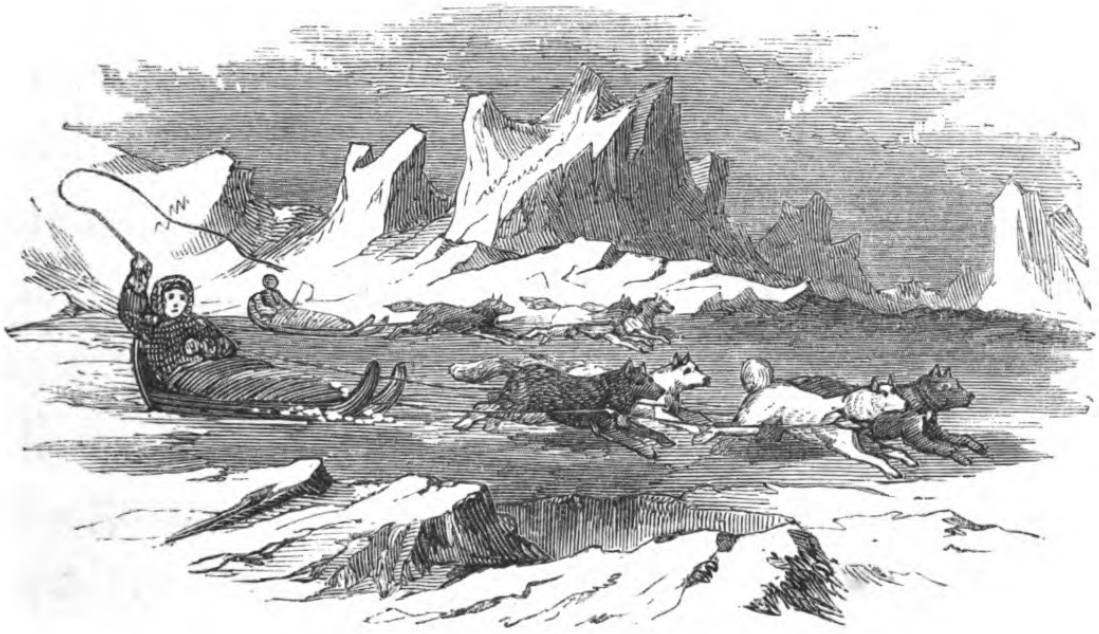
The furry skins of the bear, the deer, the buffalo, and the sheep, wrap up the North Americans, the Russians, the Laplanders, and others; while more rare animals, such as the sable, the ermine, the marten, the white fox, and the delicate little chinchilla, furnish the ornamental furs both of this country, and others farther north.

WHITE BEAR.

The Bear—there are several kinds of bear, white, black, and brown—is found in Northern Europe, America, and the Arctic regions; just where his warm coat is wanted by human beings, who, after they have stripped

BLACK BEAR.

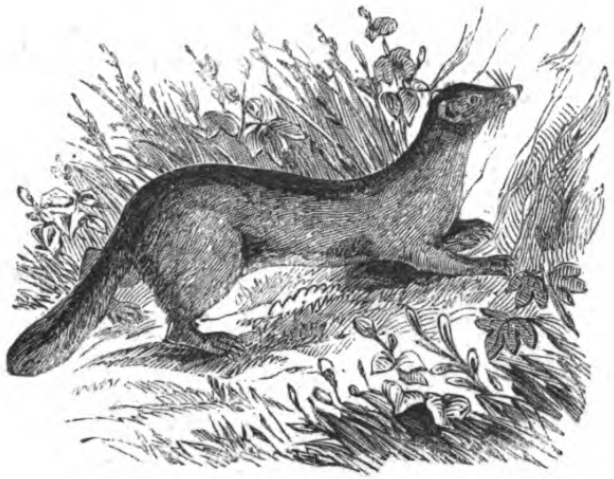
him of it, eat him up. The Buffalo is found in countries, such as North America, which are very cold in winter, and very hot in summer. It is also common in India, where they have little need of warm clothing, but



ESQUIMAUX.

the people manage to make him useful for all that. The dirty Arab has his sheepskin, as well as the frozen Russian; indeed it is singular that in some very hot countries warm clothing is worn to keep out the heat, as it is elsewhere to keep out the cold. The reason

of this is, that warm clothing causes people to perspire, and it is considered that heat is less oppressive, as well as less dangerous, when the skin is moist, than when it is dry.

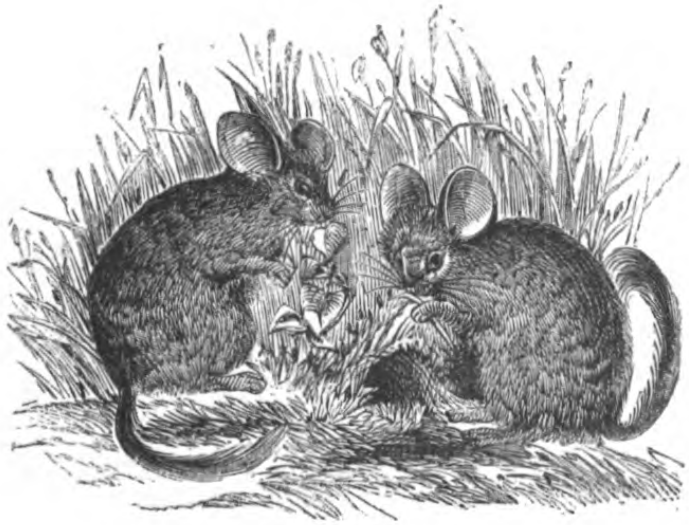


SABLE.

Sable is a very valuable fur, of a dark, shiny brown; and is the coat of a little animal of that name found in Russia, and in some parts of North America. To avoid injuring its skin, the sable is caught in traps; and even in Russia it fetches a high price. The Ermine is also a small animal, a species of weasel; its fur, in the winter, which is the time for hunting it, is pure white, with the exception of

ERMINE.

the tip of its tail, which is jet black. These tails are arranged by the furrier upon the white fur by way of ornament. It is found in Russia, Norway, and Lapland. Ermine is much used for the robes of our nobles, and also for that of the sovereign. The Marten, whose fur is a sort of tawny black, is, like the ermine, a little beast of the weasel family. Canada and Hudson's Bay, in North America, furnish us with this fur. The Chinchilla has a beautiful silky blue-grey fur; this delicate little creature is found in South America, where it is caught by boys with dogs. Chinchillas belong to that class of animals called *Rodents*, from a Latin word, signifying to gnaw, or wear away; they receive the name from the peculiar formation of their front teeth, which enables them to divide



CHINCHILLA.

very hard substances by continually gnawing at them. Rats and mice are Rodents; we all know how they will gnaw wood; and their teeth are the same as those of the chinchilla, whose body is in other respects formed very like theirs.

The dressed skin is not by any means the only article of clothing afforded by the Sheep. We have mentioned the shearing of this animal for the sake of its wool, which is manufactured into a great variety of useful articles. The word *manufactured* literally means, made by the hand, and we still use it, though machinery now does most of our handywork. Broadcloth, blankets, flannel, felt, carpets, stuffs, shawls, stockings, and some light woven fabrics, are all made of wool. The fleece, after being cut off the sheep, is cleaned and sorted; it is then oiled and combed, to separate the fibres, and lay them regularly. Afterwards it is spun into a sort of thread called yarn, and this is woven by machines, worked by steam, into the various woollen fabrics that we have mentioned. Some

of these afterwards undergo the process of fulling, which consists in their being steeped in soap and water, and beaten with heavy mallets. This thickens the cloth so considerably, that on its coming out of the mill, it is nearly one half shorter and narrower than when it went in. Some woollen cloths are dyed after they are woven; for others, the yarn itself is dyed. After the weaving, the cloth is brushed over by a sort of frame stuck full of the heads of a species of thistle, called the teasel, whose sharp, elastic points pull up the little ends of wool to form the *nap* of the cloth. In broadcloth, that is, the cloth of which men's coats are made, this is afterwards pressed, so as to form a smooth, glossy surface.

Australia is now a great wool-producing country, and sends large quantities to England. The fine woollen stuff called merino was formerly prepared entirely from Spanish wool, but the kind of sheep that produces it has now for more than half a century been naturalised in Germany.

Yorkshire is famous for its woollen cloths of every kind; the best blankets, however, are made at Witney, in Oxfordshire. Shawls of most delicate and costly manufacture, which were at first brought to us from India, are now made in England, from fine wool. These India shawls, which sometimes cost two or three hundred guineas, were first imitated about seventy years ago at Norwich; and Paisley, in Scotland, afterwards took up the manufacture.

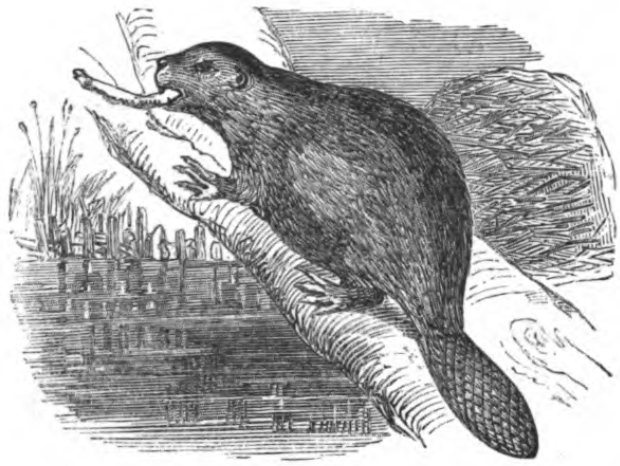
Carpets are chiefly woven at Kidderminster, Wilton, and Worcester, in England, and at Glasgow and Kilmarnock, in Scotland. The curious looped surface of the Brussels carpet is produced by the yarn being passed over a wire, which is placed across the *warp*, that is, the long threads of the carpet, in the process of weaving, and afterwards withdrawn. The Wilton carpet, which looks like worsted velvet, is made in the same way, but the loops are cut before the wire is taken out. The warp of both these carpets is of strong linen. As late as the twelfth century, even great people were content to have their

floors strewn with fresh straw or rushes; for in England the carpet is rather a modern luxury.

Wool is also used in the making of men's hats. To make the framework of the hat, wool and rabbit's fur are mixed and worked together, in a damp state, until the fibres are so thoroughly entangled with each other, that they form a sort of stiff cloth. This is called felt, and the process of making it is called felting. The nap of the hat is composed of a similar mixture of beaver's fur, with some of a common kind; when the felting of this is about half completed, it is applied to the wool felt, just described as the groundwork of the hat, which has been previously damped, and then the two are again felted till they are perfectly united. The material thus prepared is brought into the shape of a hat, by pinching and bending it, this way and that, and finally pressing it with a hot iron upon a wooden block. The nap is afterwards raised, and laid in one direction, by brushing and ironing. To make the hat black, it is dyed with logwood

(a foreign wood from Honduras, in Central America) and copperas.

The Beaver is a little animal, that lives both in the water and on dry land. It is found in Asia, Europe, and North America, and as its fur is costly, silk, worked in the same way, is often used in its place, to form the nap of hats.



BEAVER.

Before hats came into use, men wore hoods and caps. We are told that in 1449 Charles the Seventh, of France, made his public entry into Rouen in Normandy, wearing a hat and plume; and the new head-dress was so much admired, that it was soon adopted by others. Of course the shape of hats has varied from time to time, sometimes low-crowned and wide-brimmed, and then, as they are now, tall-crowned, with a narrow brim.

The covering for the head is not the same in all countries. In many parts of Asia the turban is worn; this consists of a shawl, or large kerchief, wound round the head, or round a conical red cap, which just shows itself above the folds of the shawl. The Bedouin, or Arab of the desert, has for a head-dress, an ample, three-cornered white cloth, kept in its place by a band of woollen, or camel's hair, passed round the head, and which, by the way in which it shades his face from the burning sun of Arabia, gives him very much the appearance of a country woman in her old-fashioned mob-cap; while the Persian ambassador, at the recent opening of Parliament, made his appearance in a tall, steeple-crowned fur hat, without a brim. Among the ancient Egyptians, huge frizzed wigs were worn; it is supposed, as a light and yet effectual protection from the heat of the sun.

Stockings are woven of woollen yarn, in a machine called the stocking frame. This was invented about the year 1589, by a clergyman

of Cambridge, named Lea. Like many other inventions, however, people did not care about it at first; very likely they thought it would injure the stocking knitters, and so did not like it on that account. Mr. Lea, finding himself and his machine neglected in England, went to France, where Henry the Fourth, who was always anxious for the well-being of his subjects, had the wit to see its value, and under his protection the Englishman set up his stocking manufacture at Rouen. The murder of that great king, in 1610, and the disturbed state into which the kingdom was thrown by so sad an event, however, ruined poor Mr. Lea a second time, and he soon afterwards died, in poverty, at Paris.

STOCKING FRAME.

Stockings are also made of silk and of cotton. Silk stockings, three centuries ago, were a present for a king. That amiable boy, Edward the Sixth, had a pair given to him by Sir Thomas Gresham, and set great store by them; while in the poorer kingdom of Scotland, it is told that James the First, on some grand state occasion, *borrowed* a pair from one of his nobles, whose wardrobe was better furnished than his own; and —oh, horror of horrors!—wore them quite out with dancing in them! Queen Elizabeth was especially delighted with her first silk stockings; she declared them to be "marvellous delicate wear;" and vowed she would wear cloth ones no more: for before the invention of knitting, stockings were clumsily made of cloth, cut and sewed into shape. Henrietta Maria, the queen of our unfortunate Charles the First, it is said, made black silk stockings fashionable in England. Her husband, and son Charles the Second, so entirely entered into her taste, that they rarely wore any other kind.

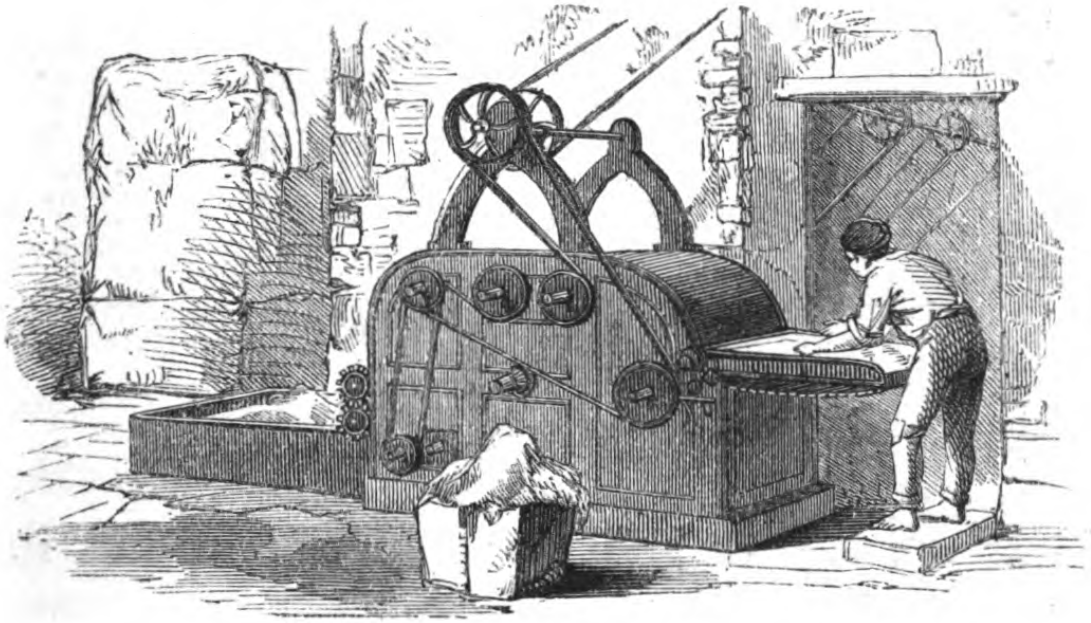
At the present time stockings are chiefly made

in Leicestershire, Nottinghamshire, and Derbyshire. In the first of these counties woollen stockings are made; in the second, cotton; while from the third we get almost all our silk stockings. It was in Derby that the first machine for the manufacture of silk was set up in 1719, by Sir Thomas Lombe, whose brother had, at the risk of his life, brought it over from Italy, at that time the only country where this art was understood. Cotton stockings are also made in Saxony from English yarn.

COTTON PLANT.

Cotton cloths, of which we manufacture such immense quantities, are made from a downy material lining the seed-pods of what, from this product, is called the cotton plant. This is a shrub, or small tree, that grows in various warm countries, but to the greatest perfection in the coast parts

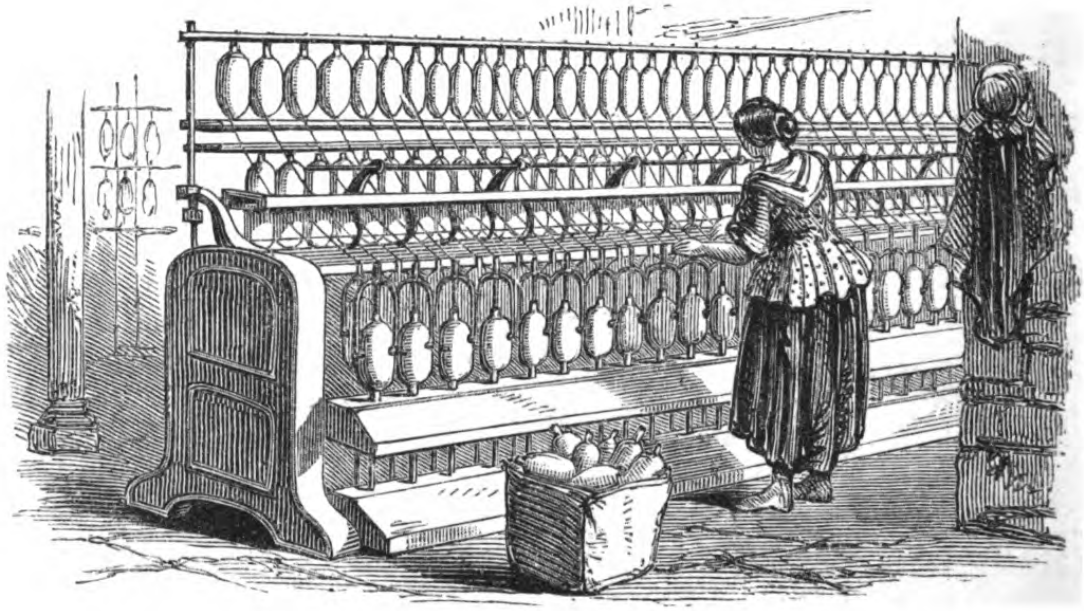
of Carolina and Georgia, in North America. When the seed is ripe, the pod opens, and then the cotton picking begins. The seeds and down are separated by means of a machine called a *gin*, the invention of an American, and it is sent to England and other countries, to be first spun into yarn, and afterwards woven into cloths of various kinds.



CLEANING COTTON.

The process of cotton spinning is much too complicated to describe in a book like this. The best way of understanding it would be, if you should ever visit Lancashire, or the cotton-spinning

districts of Scotland, to get some one to take you to a cotton mill, and explain it to you by means of its most wonderful machinery. We can perhaps give some idea of the different processes through which it passes. The first is to render the cotton



COTTON MACHINE.

of one quality or goodness throughout, and this is done by laying the contents of many cotton bales equally one upon another, and then by an instrument for the purpose tearing the mass in two from top to bottom. The scutching machine next opens and separates the tangled cotton, and frees it from any seeds or dirt it may still con-

tain. One portion of this machine turns round more than sixteen hundred times in a minute. The carding machine combs out and lays the fibres evenly side by side; the drawing frame completes this, and then the roving machine gives the slight material just twist enough to make it hold together. Drawing out, and tighter twisting by means of machinery, finish the manufacture of cotton yarn, nearly two hundred and twenty miles of which have actually been spun from a single pound of cotton. This extraordinarily fine yarn was afterwards woven into a muslin dress for the Queen; and like Queen Elizabeth's silk stockings, it must have been "marvellous delicate wear" indeed.

All these machines are worked by steam. No human hand could, either for skill or quickness, compete with the iron fingers moved by boiling water.

Cotton yarn is afterwards woven into calicoes, long-cloths, muslins, and other fabrics, chiefly by steam-worked machines, though the hand-loom is still sometimes employed.

Wherever you see cotton mills, weaving sheds are sure not to be far off. Ask to see one of these, and then you will, if it is properly explained to you, understand weaving better than you could from any written description.

Cotton has been known and used for making into clothing from a very early period. The Hindoos and Chinese wore it hundreds of years before the birth of our Lord. The Egyptians were acquainted with it in the days of Joseph. The Saracens grew this plant, and manufactured its produce, in Spain, and the island of Sicily, so far back as the tenth century; the Italians were also early in the field; from them the art passed into the industrious Netherlands, whence, in the seventeenth century, we in England derived it; but at that time a warp of linen was required in the weaving of cotton goods. In 1769 the improvements in machinery made by Richard Arkwright, enabled him to use cotton alone, both for warp and *weft* (the weft is the cross threads), and from that time Great Britain has rapidly become the greatest cotton spinning and manufacturing

country in the world. Our English woven cottons clothe even the natives of Africa, while the exquisitely fine muslin, for which India was formerly celebrated, is now rivalled by English and Scottish looms.

Sewing cottons are made by twisting, in a machine, two or more threads of the yarn, until they are sufficiently united into one. Silk and linen are prepared in the same way.

CHAPTER IX.

Clothing.

FOR our linen we are indebted to the Flax plant, a pretty little annual, with a slender stem from one to two feet in height, and bearing a delicate blue flower. It is supposed to have been originally a native of that part of Egypt which is yearly overflowed by the river Nile, and where its peculiar use was early discovered, the ancient Egyptians being celebrated for their linen. Pharaoh, we are told, arrayed Joseph in "vestures of fine linen," and the prophet Ezekiel

FLAX PLANT.

speaks of "fine linen with *broidered* work from Egypt;" so that we may suppose the Egyptians skilful with their needles, as well as their looms. You may still see decaying fragments of this Egyptian linen, possibly of the time of the Pharaohs, wrapped round some brown and battered mummy. The part of the plant used for making linen, is the dried fibre of the stalk.

The flax plant is found in every part of the world; we do not, however, grow a sufficient supply of it for our own linen manufacture in England; Russia, Prussia, Holland, Belgium, and even France, are all laid under contribution for it.

When the plant is fully grown, it is pulled up by small handfuls, which are laid carefully to dry; afterwards it is gathered into large bundles, and piled up, something like wheat sheaves, to dry more fully. When this is done, the seeds are first stripped off, by drawing the flax through iron teeth, fixed upright in a block of wood, and then the flax is steeped in water, to separate,

through the process of decay, the fibrous from the remaining portions of the stem. This steeping is not a pleasant process, the odour of decaying vegetable substance being neither agreeable nor wholesome. However, it has to be done; and when sufficiently steeped, the bundles are opened, and spread out to dry. Various means are afterwards employed to separate the silky fibre entirely from the woody part of the stem, and when this is effected, the flax, looking something like bundles of fine hair, is ready for spinning into yarn, to be woven into linen, strong or fine, or worked up into lace. The seeds, commonly called Lin-seed, yield an oil which is used by house-painters, to mix their colours with. They are also useful in medicine. If you get a few, and sow them in your garden, or in a flower-pot in a sunny window, you will soon see what a pretty little plant the flax plant is.

Neither linen nor cotton is, directly after weaving, of the beautiful white that we ordinarily see them. This is produced by bleaching,

which changes the natural pale brown of the fabric to a pure white. Bleaching used to be performed by simply exposing the wetted cloth to sun and air, for some weeks; now, it is accomplished in a very short time, by the application to it of certain chemical substances. The cloth, wet from bleaching, is dried by a singular process. It is put into a cylinder, or hollow wheel, which is whirled round with such amazing rapidity—thirty-three times in a second—that the moisture is flung out, through holes made for the purpose, and the cloth made nearly dry in less than one minute.

For lace making, the yarn must be spun extraordinarily fine. It is then wound on a number of small reels, or bobbins, and a pattern for the lace being drawn on parchment, pins are thrust through it (into a cushion upon which it rests) in such a manner as that when the yarn is passed between and twisted around them by means of the reels, the lace is formed according to the pattern, the threads keeping their place when the pins are withdrawn. This is a little

process which it is difficult to understand from mere description.

Buckinghamshire, and Honiton in Devonshire, are the principal parts of England where lace is made. But lace from Valenciennes in

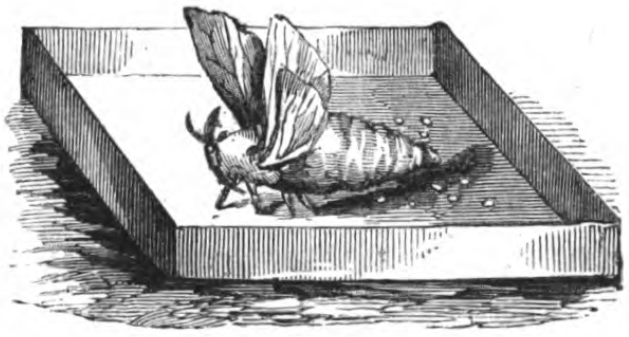
PILLOW LACE MAKING.

France, and Mechlin in Belgium, is the most highly esteemed of all.

Another very beautiful manufacture from flax, is that species of table-linen which is called damask. The silky appearance of the pattern upon this kind of cloth is produced by a peculiar manner of weaving it, which it would not be easy

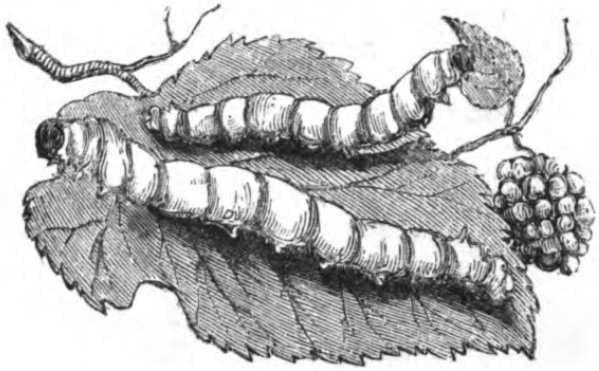
to describe. This peculiar mode of weaving was first invented at Damascus, a city of Syria, and from that place the cloth has its name. Linen was not commonly used in England before the year 1253. Previous to that time, woollen under-clothing was worn.

Our glossy silks and satins we owe to a moth, from whose eggs come the sort of caterpillar called a silkworm. In Europe this curious moth is found in Italy, the Levant, and the south of Spain; in Asia it is common in China, and the East Indies; and in these countries therefore, what is called raw silk (that is, silk before it is manufactured in any way) is produced. The moth lays about two hundred eggs at a time, and these being placed in proper receptacles, are carefully tended until they are hatched. When the caterpillar, or silkworm, comes out, it is well fed with mulberry leaves for

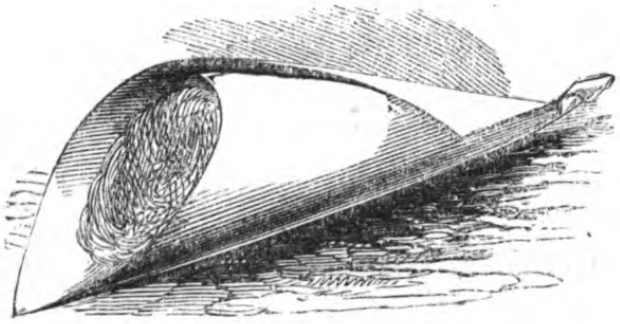


SILKWORM MOTH.

about two months, when it ceases to eat, and prepares for its chrysalis state, out of which it is to come a moth. Being supplied with little bundles of heath or broom, it selects one of these, and begins spinning (out of its body, like a spider) a silken web, in which it entirely incloses itself. When this is done, it rests from its work for two or three weeks, and then, if people did not want silks and satins, it would quietly eat its way out, and become a moth like its mamma. To permit this, however, would spoil the silk, as it would be cut up into little bits too short to be of any use. So just before the time that the chrysalis would come out, if it had its own way, the cocoon (that



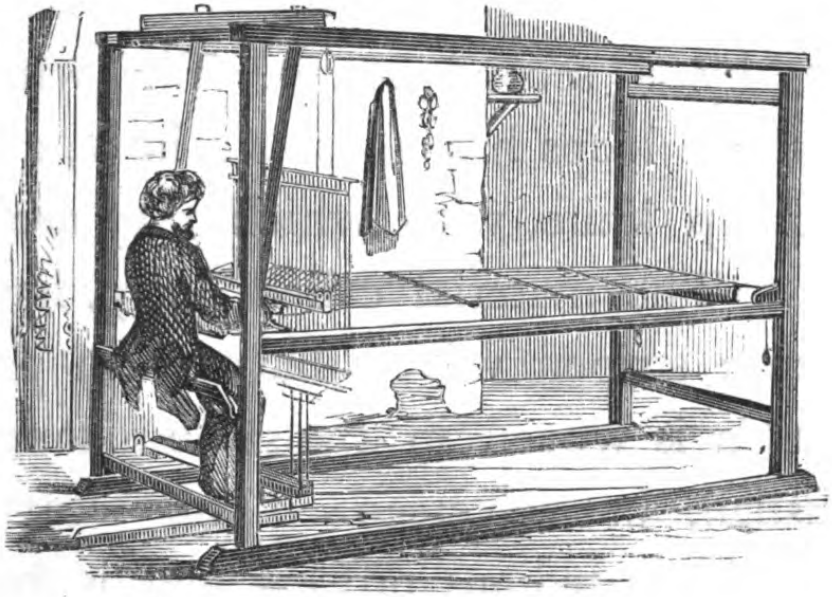
SILKWORM ON LEAF.



COCOON.

is the name given to the silken web) is plunged into hot water, the poor grub inside is killed, and then the silk is carefully wound off. One cocoon will yield from two hundred and fifty, to three hundred and eighty yards of silk.

The silk is afterwards spun, like cotton and



SILK LOOM.

flax, into a yarn, which is woven principally by hand, into pieces of silk of various kinds, plain and figured. The smooth shininess of satin is caused by a large proportion of the warp being uncovered by the weft, and by its being finally polished up by heated cylinders. Some silks are interwoven with gold and silver threads, but

these are not much worn by Europeans, except in ribbons.

Velvet is also woven from silk; and the sort of fine short nap, or fur, on its surface, is produced by little loops being formed in the weaving, somewhat as they are in a Brussels carpet, only that in it the loops are formed by the weft, and in velvet, by a second warp. The wire that supports these loops has a groove in it, and this guides a sharp knife, with which they are afterwards cut. The material called Terry, has these loops uncut; striped velvets have them partially cut. Cotton is woven in the same manner, and called fustian, or velveteen. The weaving of velvet is a slow, tedious process, and is paid for at five times the rate for plain silks.

The silkworm was first turned to use in China. In Europe, silk was first spun, it is said, in Cos, one of the islands of the Greek archipelago; but centuries elapsed before it was known how this valuable substance, imported from the East, was produced. At length, in the sixth century, two Greek monks travelled into China,

and there, finding out the mystery, managed to get some of the moth's eggs, concealed them in a hollow cane, and brought them to Constantinople, then the capital of the Roman empire, where they were successfully hatched, and served to stock those parts of Europe that now supply us with silk; for our English climate does not allow us to rear the silkworms ourselves.

The manufacture of silk was introduced into England in the fifteenth century, and received a great addition both to its extent and value, in 1685, by our kindly reception of the persecuted Protestants of France, who were driven from their homes and country by their cruel king, Louis XIV. Fifty thousand of these took refuge in England, and numbers of them, who were silk weavers, settling in Spitalfields, in London, caused that place to become celebrated for its manufactures of silk. Cheshire and Lancashire now successfully compete with it. French silks are, however, still the most highly esteemed; and Lyons, in the south, produces the very best of these.

Silk is also woven, mixed with wool and cotton, into various fabrics, thick and thin, for dress. The Irish Tabinet, which is particularly lustrous, is a mixture of silk and worsted, which is the coarser part of the wool. *Challis* is a thin fabric, the warp silk, and the weft wool. Silk and cotton are also mixed together in a similar way. But the most curious mixture of silk is that with glass, which, by the art of the glass-blower, being drawn out as fine and almost as flexible as a hair, is afterwards woven with silken threads into what is called glass tissue, a glittering fabric, that is too costly for common use.

Silk and velvet (cut and shaped in some one or other of the many devices that ever-changing fashion dictates) are also used for the making of ladies' bonnets. But the most interesting manufacture for this particular purpose, is that of the straw-plat. Who first invented straw bonnets we do not know, but it appears that in the early part of the seventeenth century, an English traveller in Italy reports that "delicate" hats of this kind were worn in that country both by men

and women. They must have been long used there, as in the sixteenth century the platting of straw for bonnets was practised in France, whence poor Mary, Queen of Scots, endeavoured to introduce it into her own country as a suitable employment for girls and women. In England, straw-platting is a comparatively new art, not dating more than seventy or eighty years back.

The straw used for platting is that of wheat. In England we grow wheat for bread, but in Tuscany they sow it simply for the straw; accordingly it is reaped while the ear is still soft and milky, the grain having previously been sown so close, as to cause it to spring up short, and thin in the straw; when cut, it is dried in the sun, stacked for a month, and then again spread out in the open air to bleach, under the united influence of sun, wind, and dew. As in hay-making, it is frequently turned during the bleaching. When sun, air, and moisture have done their utmost upon it, the lower joint of each straw is separated from the upper part, this latter being alone employed for the plat, after

being steamed, and exposed to the fumes of burning sulphur, to whiten it still further.

Our English growth of straw being larger and stronger than that of the Italians, and therefore less fitted for fine plat, is split before being used for this kind of work. But unless these split straws are managed with uncommon skill, their effect is not equal to that of the entire ones; because in the process of platting, first the bright, polished outside is brought up, and then the duller, paler inside. Plat made in this way is not so durable as it is when the whole straw is employed.

The straws, split or whole—for we import the Tuscan entire straw to work up here—are either platted into narrow bands, which are sewn together into shape, as in the English and Tuscan bonnets, or woven curiously one into another, so as to form one even sheet of straw work, as in those from Leghorn. In both cases the straw is well damped with water, to make it less brittle in the working.

Bedfordshire, Buckinghamshire, and Hertford-

shire, are the three English counties in which this manufacture is most extensively carried on.

Feathers are not unfrequently worn in bonnets as well as head-dresses; ladies who go to court *must* have feathers on their heads! These are obtained from the Ostrich, a huge bird that stalks about the deserts of the East, and has the much coveted white feathers in its tail and wings; the latter being more for ornament than use, as it does not fly.

OSTRICH.

To prepare the feathers, they are first washed and bleached; while drying they are shaken from time to time, to prevent the delicate fibres sticking together. These are afterwards curled a little, by having the edge of a blunt knife drawn over them, as you curl a slip of paper; and when the mid-rib has been scraped with a piece of glass, as well to polish as to render it

more flexible, the feather is ready for use. After these various operations have been gone through, if a fine lady does not look well under her plumes, it certainly is not the ostrich's fault, nor ours! The feathers worn by military men are furnished by our own common farm-yard cock, a bird whose beauty would be highly prized were it obtained with difficulty in foreign countries, instead of being abundant in our own.

From the head we drop down at once to the feet, and shall say something about Boots and Shoes.

ROMAN SANDAL.

In some countries the shoe is a mere sandal, (that is, a sole, or piece of wood or leather, to keep the foot from touching the ground), fastened to the foot and ancle by straps. In civilized countries, however, we have upper as well as under leathers to the coverings for our feet, and these are made of the tanned skin of

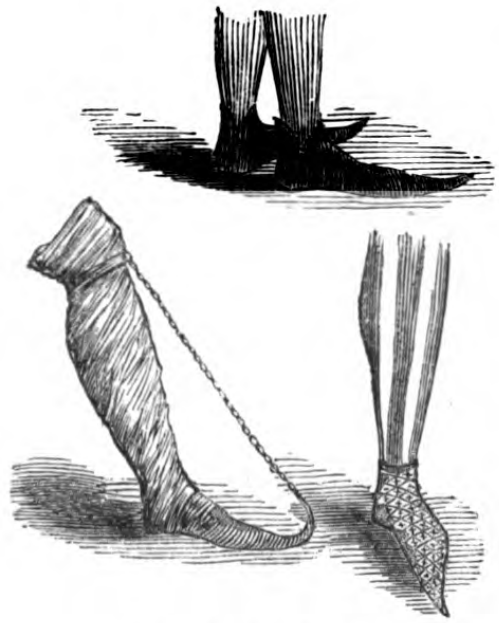
some beast; ox-hide for the sole, calf-skin for the upper part.

This tanning is to prevent the skin from decaying, as it would otherwise do; and it consists in steeping it, after the hair has been removed, in a strong solution of oak-bark, or something of the same astringent nature. *Astringent* means to dry up and tighten, and this tanning liquid acts by drying up the moist skin, and closing its pores, while at the same time it also produces what is called a chemical change in its substance, which renders it less liable to decay.

The making of a boot or shoe occupies several hands. One makes the sole, another shapes the upper leather, a third stitches the leather together; sometimes they are fastened by tacks or rivets; then there are the lining, and the bindings; in short, there are more than a dozen processes gone through, before it is complete.

The shape of boots and shoes differs from time to time, almost as much as that of our hats and bonnets. Sometimes we go with pointed toes, sometimes with square ones; but neither of

them so pointed or so square as those of the fifteenth century, when at one time the points were so long, that they had to be fastened, by ornamental chains, to the knee, lest my lord should tumble over his own toes; and then presently grew so very broad, that they were at length forbidden by law to be more than six inches in breadth. In the East, the shoes of ladies of rank are often richly embroidered with gold and silver; they are made to turn up a little in front, like a pair of skates. In that part of the world, taking off the shoes implies the same sort of respect, that taking off the hat does in Europe.



POINTED SHOES.

There are various kinds of leather beside those we have mentioned as being used for boots and shoes. That prepared from the skin of the sheep is used, among other purposes, for book-

binding, whip lashes, bags, gloves, the covering of chairs, and carriage linings. Kid, that is, the skin of the young goat, is employed in the making of gloves, and light shoes; horse-hides, which are skin, are used by the harness-maker: while the tanned skins of dogs, lambs, deer, and the seal, all have their uses as leather. Japanned leather—that is, the bright, polished leather of which boots and shoes are made that never require blacking—is produced by laying successive coats of a certain varnish on the surface of the tanned skin, and afterwards hardening it by heat, much in the same way that glass is treated, and which is called annealing. Morocco leather is dyed goat-skin. Chamois, is the prepared skin of a little animal of that name, of the antelope family, that is found among the mountains of Switzerland, and bounds

SEAL.

so fleetly from crag to crag, that the catching of it is no easy matter; nay, the life of the man is sometimes given for that of the beast, for some unfortunate hunter of the party not unfrequently falls down a precipice, and gets killed.

CHAMOIS HUNTING.

CHAPTER X.

Houses.

THE Bible contains the earliest records that we have concerning human beings, for it is the oldest book in the world; and as God Himself told the writers of it what they should narrate, we know that it is all true.

What might be the earliest shelter adopted by men to protect themselves from wind and weather, after being driven from the garden of Eden, where neither of these injured them, we know not. But in the Book of Genesis we are told that Jabal, the great grandson of Cain, was the "father of all those who dwell in tents;" from which we are to understand that he was the first who constructed dwellings that could be carried about from place to place, as the wandering life

of those who then tended cattle might require; the flocks and herds, when they had eaten up one pasture, being driven forward to another. These tents were most probably made of the skins of beasts. In the days of Moses, we read of

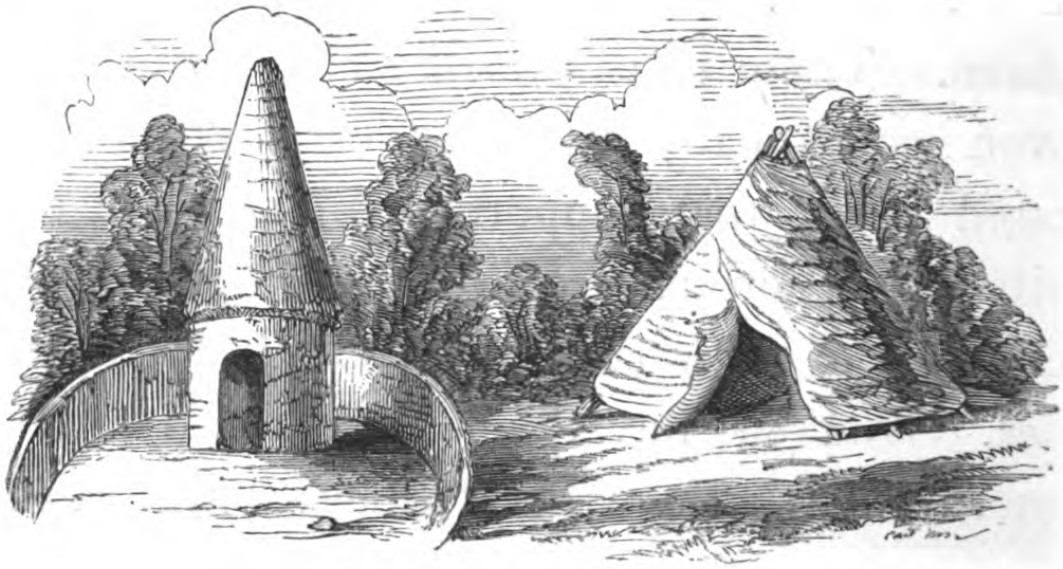
ANCIENT TENTS, FIRST DWELLINGS OF MAN.

skins being required for the erection of the Tabernacle, which was a great tent, wherein the ark of God was lodged, while the people of Israel were wearily travelling to the Promised Land.

In later times tents, in the East (which was the first portion of the earth that was peopled), were made, as they still are among the wandering tribes of Asia, of goat's hair, prepared by the women. These tents consist of a covering of woven goat's hair, thrown over upright, and crossed poles, that support it. They are ordinarily eight or ten feet high, and are upheld, according to their size, by from three to nine poles. And so unvarying are the habits of Eastern life, that we may believe it was in such tents as these that the patriarchs lived, and at the door of which Abraham sat, under the shade of a tree, when God Himself came to him, under a wonderful appearance of angels, and acquainted him with the fearful doom then overhanging the wicked inhabitants of the cities of the plain.

Our British ancestors were content to live in *wattled* huts, that is, huts composed of the boughs of trees interwoven together, and quite good enough for people who wore a coat of blue paint! The Esquimaux build houses of

blocks of ice, cut out, and fitted one to the other, in a circular dome-like fashion. The Australian savage, when camping for the night, used

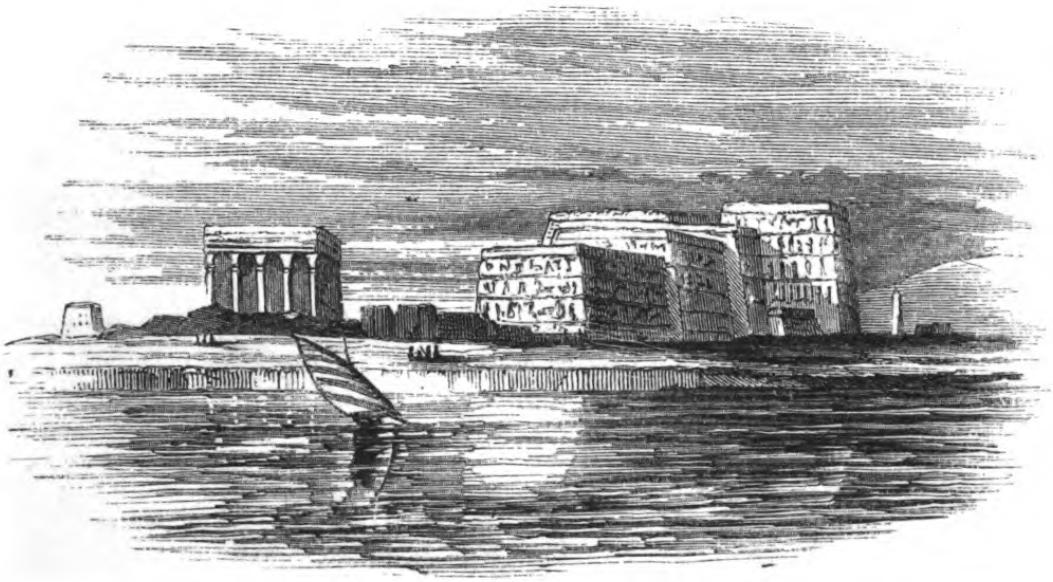


WATTLED HUTS.

to set up a large piece of the bark of some neighbouring tree, to screen his shivering body from the wind, and that was his best notion of shelter. There is a great difference between these kinds of protection from weather, and the heavy stone masonry of old Egyptian, Greek, and Roman dwellings; still more between them and our modern brick and stone built houses.

The first thing about building a house is to

plan it; that is, to settle how many rooms there shall be, how they shall be arranged, and where the doors, windows, chimneys, and staircases are to be placed. The man who does this is called an architect; and after he has set it all

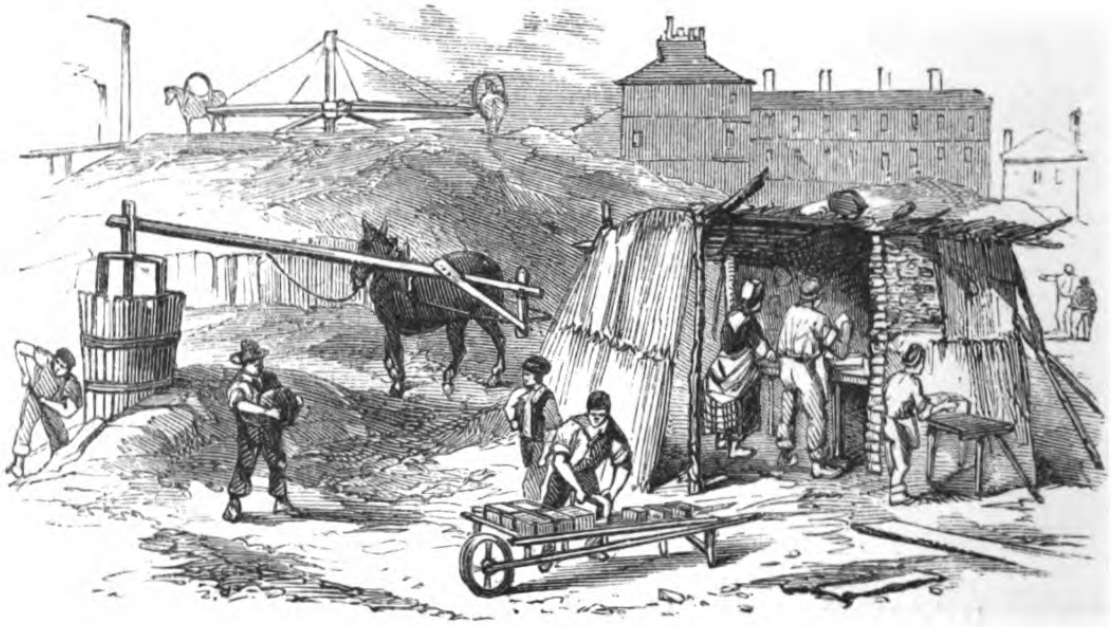


EGYPTIAN TEMPLE.

down upon paper, the builder takes it in hand, employing a whole regiment of workmen of various kinds; labourers, to dig the foundations (for the walls are begun below the surface of the earth, not on it), and carry materials about; bricklayers, to lay the bricks; masons to do the stone work in window-sills, copings, and steps; carpenters to frame the timber roof and lay the

floors; joiners for the finer woodwork; and lastly, plasterers, glaziers, painters, and paperers to put in the windows, and finish the walls, ready for habitation.

Bricks are made of clay, a very tough, sticky kind of earth, which is well worked with water,



BRICK-MAKING.

and then pressed into moulds, to shape it properly. When turned out of the mould, they are piled up to dry in the air; afterwards they are built up, in a great square or oblong block, called a kiln, underneath which fire is kindled,

that in two or three weeks burns them quite hard. King Alfred is said to have first introduced brick-making into England, wood being used for building before his time, as indeed it chiefly was for many centuries after. Stone is cut out of quarries (these may be either pits, or sides of

STONE QUARRY.

rocky mountains), in blocks of various sizes. Both they and bricks, when used in building, are joined together with mortar, which is a composition of lime, sand, and water, that speedily hardens. When the walls are built up, they are

covered in with slates, or tiles, supported on large pieces of wood, called rafters, which are placed slanting from the top of the walls to the centre of the roof. The wooden part of the roof is first put together on the ground, in the same way that it is finally upon the walls, to the top of which it is carried in pieces.

Slates are the thin slices of a peculiar kind of stone, that naturally splits in this way, and is found chiefly in Wales, the north of England, and some parts of Scotland. They are fastened to the roof by pegs driven through holes that have been drilled in them, and are placed with the lower edge of one overlapping the upper edge of another, like scales. This arrangement is to prevent rain getting in at the joining of the slates. Tiles are made of brick-clay, moulded in thin, flat pieces. Sometimes the roof is covered with thatch, that is, long bundles of straw, tied together, and to each other. This is chiefly used for small houses in the country, and it is said to be warmer in winter, and cooler in summer, than either slates or tiles. It is

however rather troublesome to keep in repair, and woe betide the inmates in case of fire!

Some roofs are covered with lead, especially if they are flat ones, as lead best excludes the rain with such a form of roof. Very large sheets of lead are used for this purpose, and they are made by casting, in the same way that iron is cast; or by rolling, in which process a block of the metal is squeezed between steel rollers until it is spread out to the requisite size and thickness; the edges of the sheets are joined together, when needed, by solder, and the workman who does it is called a plumber.

Lead is also used for gutters, which are long troughs, to collect and carry away the rain that falls upon the roof, and for pipes to convey water and gas to different parts of the house. Gutters are made by bending up the sides of a strip of lead; pipes either by wrapping sheet metal round an iron rod, and soldering the edges together, or by casting and drawing. To make pipes in this manner, an iron cylinder is prepared, with a smaller one inside, fixed so as not to touch it;

in the space between the two, which must be greater than the thickness of the intended pipe, melted lead is poured. When cold, the pipe is taken out, and drawn through a series of holes, small, smaller, and smallest, in a steel plate, until it is reduced to the required size and thinness.

Lead is the softest of all metals, and this of course makes it very easy to work, the pipe being readily bent, and curled in any direction that is needed, either to bring water from the large wooden or stone tubes through which it passes underground; or to convey gas from the iron tubes (also sunk underground) in the streets, to all parts of a house, upstairs or downstairs.

Lead was used by the Greeks and Romans for water-pipes just as we use it now; our own lead mines, which are very considerable, were worked by the latter. Like iron, it is rarely found *native*, that is, free from mixture with some other substance; the ore has to be crushed and smelted, to obtain the pure metal. Even after this process has been gone through, it still invariably contains a little silver, though usually in too small a quan-

tity to pay for the labour of extracting it. Our principal mines are in the south-west and north of England, in Wales, and in four counties of Scotland. It is also found in Derbyshire and Shropshire. The neighbourhood of a lead mine is very prejudicial to animal life; neither dogs, nor cats even, which are said to have nine lives, can stand it.

In Russia, the roofs of the houses are covered with thin plates of iron, often painted green or red, which gives them a lively appearance.

The floors of an English house are made of wood. Large beams of timber support them, and smaller lengths of wood are laid across from side to side of the room, and upon these, fla pieces, called boards, are laid, so close to each other, as to form a solid wooden floor; the boards are forced into this close contact by an iron implement very much resembling a dentist's tooth-key, only of course very much larger; about large enough to draw a tooth for that German giant who sat "picking his teeth with the kitchen poker." In France and Italy, glazed

tiles, or unglazed bricks, are generally used for floors instead of boards.

THE PINE.

THE FIR.

The wood most commonly used in building is that of the Pine, or Fir, large quantities of which are brought from Norway and Canada, though it is a tree that grows in our own country; this wood is called *Deal.* From the pine, turpentine, rosin, and tar, are obtained. Turpentine is the sap, and is procured by boring a hole in the living tree, to allow it to run out; when this is distilled, a thick sediment is found, which is rosin; the poor sapless trunk is then cut down, and on being burned, a dark, sticky substance

proceeds from it, and is called tar. Tar is used to coat any wood or metal which is exposed to the action of water, as it has the effect of preserving them from the decay which moisture occasions in almost all substances. Our ships and boats of all kinds are painted over with it.

The pine is a tall, straight tree, that grows to a great height, as much as a hundred and fifty feet, so that it is much used for the masts of vessels, as well as to floor and roof our houses.

The rough brick walls of the rooms, as well as the wood-work that forms the top of them, called the ceiling (from a French word signifying *heaven*, which is above and over all the world), is smoothly plastered over with a fine preparation of lime and water, and when this is dry, the walls are ready for painting or papering, and the ceiling for white-washing. Whitewash is a liquid preparation of lime and water, with a little size, and is laid upon the plaster with a large flat brush. It seems very easy work to go

slap-dash with a great brush on so smooth a surface; but like many other things that appear easy, it requires both care and skill to do it properly. A workman who left his ceiling streaky and wavy, which would be the result of an ignorant application of the brush, would scarcely secure a second job.

Lime, which is used for mortar and white-washing, is prepared from a peculiar kind of stone called limestone. When this stone is burned in kilns, its nature and appearance are both altered; and on water being poured over it, the mass first gives out a great heat, and then falls into powder. In this state it is called *slaked* lime.

We must not forget that our modern houses have chimneys in them: once upon a time a hole cut in the roof of the one-storied dwelling was the only mode of getting rid of such portions of the smoke as thought proper to escape through it; the rest curled gracefully about the heads of the inmates. Our chimneys are narrow channels, built up in the outer walls of the house, one

from every fire-place, and smoothly coated inside with a particular kind of plastering, which more effectually preserves the brickwork from fire than the ordinary mortar would do. Chimneys are not built straight up to the top of the house; at least they should not be, except by those who prefer a smoky room; because a perfectly straight chimney would allow the wind to blow down it, bringing the smoke with it. The slight bend to one side, which is needful to allow the chimneys from the lower fire-places to be carried past those on the upper floors, is generally sufficient to prevent this. In England, our fire-places are open, with grates of iron-work to contain the fire; but in many other parts of Europe, the rooms are warmed by closed stoves; that is, iron or brick boxes, in which the fire is shut up; giving out, it is said, more heat, but not looking so cheerful as our bright, open fires.

The chimney-piece, or mantle-piece, as it is often called, because it *mantles*, or spreads over, the fire-place, is usually of stone or marble, which

is a peculiarly hard, fine sort of stone, variously coloured, that takes a high polish. Marble of a common kind is brought both from Wales and Derbyshire; the very best comes from Italy, and of it chimney-pieces are sometimes made, exquisitely sculptured or carved.

Glass windows are another modern luxury, horn or oiled paper previously fulfilling their duty of keeping out the cold, and letting in the light. They were not in common use till about two centuries ago. The windows of that time opened and shut like a door, instead of sliding up and down as ours do; and the panes of glass in them were lozenge-shaped, set in a framework of lead.

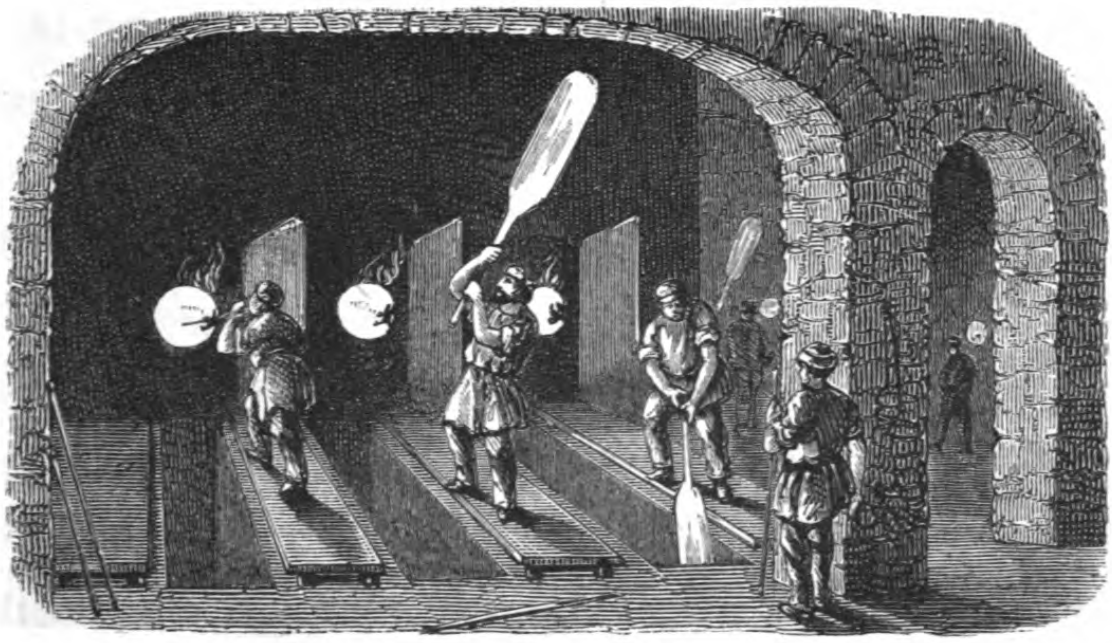
The first glass windows in England are said to have been brought from the Continent in the fourth or fifth centuries, for some of our churches. They were brought from France or Flanders in the seventh century. Even so late as the latter end of the sixteenth century, glass windows were so costly and rare, as to be found only in great houses, where, when the family were away, the

windows were taken out of their frames, and put by till wanted again.

Glass is a composition of flint, or sea-sand, and various kinds of alkalies, such as potash and soda, which, being put into a proper vessel, is melted, by exposure to intense and long continued heat, into the transparent substance we call glass. Pliny, a celebrated Roman statesman and writer, who was born in the year 23, tells us that it is to accident that we are indebted for this wonderful discovery. Some merchants, who were shipwrecked on the coast of Syria (then called Phœnicia), lighting a fire on the sea-sand, used some lumps of nitre, with which their vessel had been laden, to prop up their cooking pots; the fire burned both sand and nitre, and glass was produced by their mixture. We do not know when this occurred, it is so very long ago; but it is known that the Egyptians, more than three thousand five hundred years ago were acquainted with the manufacture of glass, and that at the very time when the children of Israel left that land, vases of this material were used

for containing wine. The Romans attained high excellence in the making of glass, an art which had been introduced into Italy, France, and Spain, even before the time of Pliny. The ancients, however, were not acquainted with glass for windows; they used it for cups, bottles, mirrors, imitations of precious stones, and for other articles of ornament. One of the most beautiful productions of these very olden times, is a small dark blue vase, with figures in white enamel, called the Portland vase, because it belonged to the Duke of Portland, who placed it in the British Museum. No one knows how old it is, but it is supposed to be of Grecian manufacture, and the people of Greece were celebrated for their skill and taste in art. This vase was found about three hundred years ago, in the tomb of a Roman emperor, Alexander Severus, who died in the year 235, being killed together with his mother, who was buried with him, in a mutiny of his soldiers. The application of glass to the purpose of windows, we owe to the Italians.

After the glass is made, it is worked into various forms by blowing and casting. Taking up a long iron tube, the workman dips one end of it into the melting pot, the contents of which have been allowed to cool until the liquid glass



GLASS-BLOWING.

has become of a pasty consistence; a sufficient quantity of this is collected upon the tube, and being re-heated, is blown into from the other end, which is in the man's mouth, until it expands into a thin flask-shaped body. This may perhaps be moulded into a cup or bottle,

or cut open with shears, and spread out for common window glass; but for the best window glass, it is, while still soft with heat, whirled rapidly round, growing broader and flatter by the process (just as the strings of which a mop is composed, spread out when it is twirled), until it is converted into a large, round plate of thin glass, from which panes of the proper size for windows are cut, by a sharp fragment of diamond, the hardest of all known substances.

Plate glass, which is a very superior kind, is made, not by blowing, but casting. The liquid glass is poured out on a metal table, and instantly levelled by the passing of a roller over its surface.

After the glass is blown, or cast, it is *annealed*, to render it less brittle. This annealing consists in baking it in an oven for the purpose, and its effect is produced by the heated glass being allowed to cool gradually, instead of quickly, as it does in the blowing and casting process. When properly annealed, the glass is ground

with fine powdered flint and emery, and then polished up.

The window-frame is made of wood, with crossed bars, between which the glass is fitted, and fastened with putty, a mixture of pounded chalk and linseed oil, soft at first, but soon hardening by exposure to air. This is the glazier's work.

Within the last twelve or fourteen years glass has been put to an entirely new use. As you walk along the streets of large towns, you may see slabs of it placed over cellars, where iron gratings were formerly used, or let into the pavement, to give light to some dark, underground room. It is also used within doors, as flooring, with the same intent. Glass for this purpose is prepared from a quarter of an inch, to an inch and a half thick, and is so strong, that people may step upon it without any danger of its breaking. It is used in its unpolished state.

Looking-glasses are made by covering one side of a plate of glass with a mixture called an

amalgam of mercury (that is, quicksilver) and tin. The word *quick*silver literally means *living* silver, quick being an old English word for anything that has life. Thus we speak of a *quick*set hedge, that is, one made of living shoots or twigs; and mercury has this name of quick, or living silver, because, from its peculiar nature, it moves about as though it had life. The ancients used polished metal, steel or brass, for their mirrors: they were first made of glass at Venice.

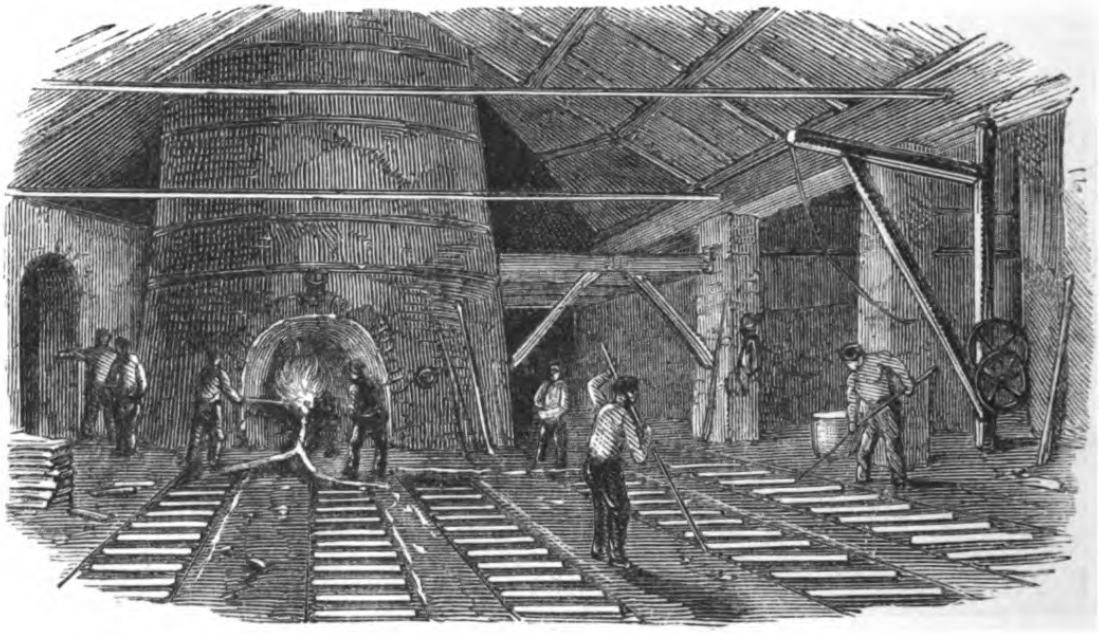
CHAPTER XI.

Iron.

THE iron work about a house comprises bars, locks, fire-grates, ovens, and nails; and for the furnishing of it, fire-irons, knives, and some other smaller articles.

Iron, in its native state, is a species of stone, or rather, we should say, is so mixed up with stone, as to require various processes to separate it, and convert it into the metal that we call iron. In the first place the iron-stone, or ore, is broken up, and heated in a kiln, an operation that drives off some of the matters mixed up with it, such as water, sulphur, and arsenic, and reduces it somewhat in weight. This ore is then mixed up with coke,—that is, coal from

which the gas has been extracted by fire—and limestone, which assists in making the metal liquid. It is afterwards placed in a furnace, a sort of huge oven, intensely heated, where in about twelve hours it is thoroughly melted. The fur-



CASTING IRON.

nace being then "tapped," out rushes the burning fluid, like a stream of fire, into moulds in the bed of sand which covers that part of the melting-house floor. This process is called smelting. Cast iron is this same smelted iron heated again, and run into moulds shaped accord-

ing to the different articles desired, such as grates, wheels, portions of machinery, and the like. Forged iron is cast iron, made, not merely red hot, but heated to a much greater degree, and then beaten with large hammers, worked by steam. This hammering makes it closer in grain, and tougher in texture, so that forged iron is used wherever great strength is required; it bends more easily than cast iron, but does not break so soon.

Steel is a mixture of iron and charcoal, converted into one substance by a peculiar process. The bars of iron are placed in a case, with a bed of charcoal underneath and between them; the whole is then plastered thickly over with a certain kind of clay and put into the furnace, which is bricked and plastered over. The fire being lighted, is allowed to burn at its greatest heat for six days, when one of the bars, so arranged that it may be withdrawn without interfering with the rest, is taken out as a specimen of the extent to which the converting process has been carried. If the

bar is perfectly changed into steel, the fire is heaped up with small coal, and allowed, undisturbed, to burn itself out; after which it takes fourteen days for the furnace to become cool enough for its contents to be removed. Some recent inventions will have the effect, if they come into general use, of greatly shortening this tedious process.

The *tempering* of steel, that is, the making it as hard as possible, is effected by heating it intensely, in a vessel of mercury, or oil, nearly three times hotter than boiling water, and then suddenly plunging it into cold water.

Swedish iron, which is the finest, is preferred for converting into steel. Steel is used for all kinds of cutting instruments, as well as for ornamental iron-work, as in steel fire-irons, grates, and such articles.

Iron is found in almost every part of the world, and is the most useful of all the metals; without it, for spades and ploughshares, we could not even cultivate the ground successfully, and the various minerals that lie buried in the earth,

gold included, might lie there still. England is celebrated for its iron mines and its iron. The smelting of it was carried on when the Romans were masters of our country; and in Saxon times, the working of iron, and even steel, was noted among our manufactures, as it is now.

The immense power gained by working machines with steam, enables us to do wonderful things with iron. A sheet of iron, an inch thick, will be cut with shears as easily as though it were a piece of paper; and in making holes in plates of iron that are to be riveted together for boilers, ship-sides, bridges, and various railway purposes, a punch, worked by steam, passes through them just as you might thrust your finger through the paste rolled out by the cook for a pie; it does not look at all more difficult; while sharp steel knives, passing over an irregular surface of iron, cut off shavings in the same manner that the carpenter's plane cuts wood. Amid the many uses of iron, we have recently found out that of building ships with it, and even giving them, like a knight of the olden time, a

coat of armour of the same metal. Galvanized iron is the name given to plates of iron which, by a peculiar process, are covered with tin, to prevent their rusting when exposed to the air. These tinned plates are much used for building purposes, not only to roof houses, but to build them up entirely, walls, roof, and everything. A house of this kind may be made in England, packed in a box, and sent to the other side of the world; for the plates being cut out, are numbered, so that, though packed side by side during their journey, they may, when taken out, be joined accurately, and built into a cottage, or church.

Nails, screws, door-locks, and hinges, are made of iron. Nails are made in various ways; some are made by hand, each nail being separately forged from a slender rod of iron, and these are the best. The great nails called bolts or rivets, for joining plates of iron, are also made in this way. The workman seizes with his tongs a rod of iron, about the thickness of the parlour poker, and heating the end red-hot,

gives it, at such a distance from the end as will make the rivet the proper length, two or three strokes with his heavy hammer, on the edge of the anvil. This prepares it to break in that place, which is accomplished by popping it into a little hollow, just large enough to receive it, leaving half an inch out, and snapping the rod off. That little projecting half-inch "catches" it with a vengeance; down comes the big hammer, with such force as instantly flattens it, so as to form the end of the bolt; then a jerk of a lever, and it is sent spinning out, a perfect rivet, rapidly followed by others made in the same way.

Cut nails are made by machinery in very much the same way that combs are cut. A strip of sheet iron, whose width is equal to the intended length of the nail, is placed beneath a cutting instrument, of a chisel-shape, which comes down upon it, in a slightly slanting direction, so as to cut off a piece, nail-shaped, that is, thicker at one end, which is to be the head, than it is at the point. In the next stroke the direction of

the cutting tool is reversed, the point being cut from the side that furnished the head of the preceding nail; and in this manner, the slant of the cutter being changed with every nail, the whole strip of metal is equally worked up.

Cast-nails, though pretty to look at, are too soft to be of much use, save for tender woods.

Screws are cut by machinery which it would be almost impossible to describe.

Knives and forks are made of steel. Sheffield is the most noted place in England for the manufacture of these articles. Though, up to the time of Queen Elizabeth, our best knives were brought from foreign countries, we now send them there. Forks were little known in England till the reign of James the First, when a traveller, of the name of Corryat, introduced them from Italy. Previous to that time, people ordinarily ate with their fingers, though a few high and mighty personages had forks as articles of luxurious magnificence; and in carving, the carver either laid hold of the projecting bone of the joint, or held it fast by a skewer stuck in it.

The oldest carving-fork known is that of Henry the Fourth of France, which is still preserved at Pau, his birth-place. The manufacture of steel forks is a very unhealthy one, for as they are shaped and ground on a dry stone, the metal and stone-dust is drawn into the workman's lungs, which are so injured by it as to shorten his life. Clear air, that is, air unmixed with foreign bodies, is required for health, as well as fresh air, but every one cannot get it. Perhaps the extensive use of silver, and electro-plated forks, which we are apt to consider a mere piece of luxury, may be the means of saving some lives, by diminishing the number of steel-fork grinders.

Common pokers and tongs are made of forged iron; superior ones of steel. Steel also furnishes a beautiful material for drawing-room fenders.

CHAPTER XII.

Paper and Paint.

WHEN the plastered walls of a house are quite dry, they are ready for papering, or painting.

Paper-hangings, as the ornamental papers pasted on the walls of a room are called, have only been in use about two hundred years. Formerly the bare walls were concealed by woollen cloths, or leather, hung up against them, whence our printed papers that supply their place, get the name of *hangings*, although they are fastened to the wall. These old-fashioned hangings were often very beautifully embroidered, and, like glass windows, on account of their value, were carried about from house to house by the great people who

alone could afford to have them, and who, wealthy as they were, were still not rich enough to have more than one set of these costly comforts. At Bayeaux, in Normandy, there is a very remarkable specimen of this sort of embroidered hangings —it is called tapestry— said to be wrought by the needle of Matilda, wife of William the Conqueror, and representing various incidents in his conquest of our island. That formidable king, her husband, must have felt highly flattered by the pains that she took to celebrate his great deeds.

HANGINGS FOR WALLS.

Paper is made from linen, cotton, or hempen rags, according to its quality. The best writing-paper is made exclusively of linen; paper upon which books are printed is made of cotton as well as linen; hempen rags suffice for coarse

paper; while ends of old rope, and strange fragments of fustian and corduroy garments, make the strong, tough, brown wrapping-papers.

A paper-mill is an interesting place, though in some of its departments not a very clean one. Vast bales of old rags of all sorts and sizes, and often fearfully dirty, are brought in, having been collected, not in the British Isles only, but in Italy and Germany. These are assorted according to their quality. That tattered bit of shirt goes to the place of honour, where materials for writing and printing paper are accumulating; that morsel of an Irish boy's frieze jacket, with one button upon it, is flung (after the button has been carefully removed, because buttons don't make paper) into the corner destined to furnish such ordinary paper as we wrap parcels in; while half untwisted scraps of rope are heaped up in their proper place, to be converted into what may be literally called *brown stout*, so dark-coloured and tough is the paper that they produce.

The sorting ended, the various bundles are

delivered to women and girls, who sit, each one before a block of wood, in which a short, stout knife is fixed in an upright position. Their dusty duty is to cut the rags to a somewhat uniform size, by drawing them over the edge of the upright knife. This done, the various bundles are washed, either by steam or water, and all the colouring taken out by means of a chemical substance called chlorine, which is much used in bleaching. They are then placed, with water, in a machine, in which a cylinder, furnished with numerous teeth, or cutting points, working into similar ones placed beneath it, is made to turn round with such rapidity, as in the course of a few hours to reduce the rags and water into a fine pulp. This fluid is seen at one end of a long piece of machinery, something like a series of dining tables, with a few ups and downs in them, and the top of which is covered with felt. Upon the felt the pulp is poured, so as to spread itself evenly to the width of the intended sheets of paper; by means of wheels the felt travels onward with its load, the mois-

ture being gradually absorbed, until at the other end the soft but now tenacious pulp is wound off on a large cylinder, heated by steam, and on being released from it, is found to be paper. It may be made in this way miles in length.

Writing papers are made by hand; moulds of the size of a sheet of paper, being dipped into a vat of pulp, and the quantity withdrawn gently shaken until it spreads itself evenly over the wire-cloth that forms the bottom of the mould, and through which the water escapes. The paper is then taken out, and placed upon a piece of felt; another felt is laid upon it, which receives a fresh sheet, and thus the heap is filled up, alternate paper and felt, until as much as six or eight quires (a quire is twenty-four sheets) is accumulated. The whole is next put beneath a

PAPER-CUTTING.

powerful press, which presses out the remaining moisture; next it is hung up to dry perfectly, and finally it is *sized*, that is, it is washed over with water in which cuttings of parchment and sheepskins have been boiled, and the effect of this is to prevent the ink running when the paper is written upon. Blotting-paper of course is not sized.

Paper that is to be printed upon has the size mixed with the pulp; printer's ink, which is composed of a black powder called lamp-black, and linseed oil, being less liable to run than writing ink.

Room papers do not of course require the finest kind of material. The patterns are printed upon them by means of wooden blocks upon which the design is carved, and laid with colour to be transferred to the paper. If the pattern be of one colour, one block is sufficient; but if it contain more than one, as many blocks as there are colours are usually required. Commoner room-papers are printed as cotton cloths are, by means of a cylinder, on which the pattern

is engraved, and charged with all the colours required. Steam power rolls it along—for boiling water does most of our wonders now-a-days—and out comes the flowery, or feathery, or stiff-lined device that is to make the walls of our rooms cheerful.

The paper-hanger fastens the paper upon the wall. He first cuts it into suitable lengths, then, laying it face downwards on a table, brushes the back of it well over with a sticky paste of flour, water, and size, and, supporting the long, limp fabric upon a piece of wood shaped like the letter **T**, applies it to the wall. It requires no little dexterity to manage the damp, dangling paper, yards long, and to make the pattern, which is perhaps half on one strip, half on another, join neatly, but it is accomplished at last; one end is attached close to the cornice, and the hanging portion being adjusted, is dabbed with soft cloths till it adheres firmly to the plastered wall.

The first manufacture of paper was among the

Egyptians, who prepared it from a species of rush called papyrus, whence we have our name paper. Egyptian paper of this kind, made two thousand years before the birth of Christ, is even now in existence. Alexandria, the ancient capital of Egypt, and situated at the mouth of the Nile, was the most noted place for its manufacture; for on its banks this plant then abounded, though now it is said not a single one is to be found in the whole land of Egypt. In the year of our Lord 95, the Chinese were known to have fabricated paper from cotton, as well as from silk. From them the Arabians received this invention, and passing it on into Africa, and Spain, where cotton as a native plant was unknown, but flax was cultivated, it was there first made of linen, as it was afterwards in France, Germany, and England. In our own country we first hear of paper mills in the sixteenth century, and the manufacture received great improvements in 1713 from the thoughtful skill of Thomas Watson.

Paper can be made of other substances than

those that have been named. Vegetable fibres of almost any kind may be used, but nothing that has yet been tried is found equal to linen or cotton rags. The strong, thin paper upon which bank notes are printed, is made of new linen, not of rags. Paper pulp, either from the vat, or made from bits of coarse paper, boiled, and beaten up with size, is pressed into proper moulds, and thus converted into various useful and ornamental articles, which are afterwards japanned and painted. It is called papier maché.

After papering comes painting, which is done not only for beauty, but for use, as it preserves the woodwork inside and out of a house. Paint is a mixture of white lead, various kinds of colouring matters (according to the colour required), linseed oil, and spirits of turpentine, with a little sugar of lead to make it dry quickly. We know what turpentine and linseed oil are; white lead is made from the soft grey metal of that name, by holding it over hot vinegar, the steam of which eats into the lead,

and turns it to a white powder. The proper name of this is carbonate of lead, as it is a chemical combination of lead and carbonic acid. All carbonates consist of this chemical union of carbonic acid with some other substance, according to which it is named; as, for instance, carbonate of soda.

White lead, mixed with oil and turpentine, forms white paint; for coloured paint it is mixed with various colouring matters, which consist of earths ground fine, and sometimes burnt to change the tint; preparations of metal combined with other substances; and certain animal and vegetable substances, such as burned bones and indigo. If the paint is to look bright and polished, which it should for the outside of the house, very little turpentine, or none at all, if the oil is boiled, must be used. The inside paint is generally preferred looking dull, that is, with no gloss upon it, and this is therefore mixed either with very little oil, or with turpentine alone. Round brushes, great and small, are employed to lay on the paint, which, like white-

wash, must be applied so smoothly and equally, that no mark of brush shall appear. For imitating the grain of various woods, as mahogany, rosewood, and maple, a number of curious little tools are necessary, some looking like coarse combs.

House-painting is not healthy employment, as the workman cannot avoid breathing the fumes of his white lead, which are poisonous. It looks so easy, that children, as they stand watching, sometimes think it must be as pleasant as play. There was once a little girl who thought so, and whose mamma at length granted her earnest request to be allowed to paint a room herself. She was overjoyed at the permission, and set eagerly to work; but long before she had finished the room, she was convinced, as thoroughly as ever she was convinced of anything in her life, that so far from being mere play, house-painting was one of the most fatiguing occupations in the world; while to do it well required no small skill and practice, as her streaky doors and windows abundantly

testified. A lesson of this kind is a very useful one; for not children alone, but some grown people also, think too highly of their own powers, and can only be taught modesty by failing in their rather presumptuous undertakings.

CHAPTER XIII.

Fuel and Lights.

WE have now built up our house, and learned something about the materials employed in it. But there are many things still wanting inside, without which we should be anything but comfortable. Fire, furniture, and lights have now to be provided, for we cannot sit in the cold, nor eat our food raw; and though we certainly *might* squat, and lie upon the floor, we prefer chairs, and beds, and even tables to eat off, with vessels to hold our meat and drink; and, further, we do not choose to remain in the dark from sunset to sunrise. To some of these things we have already alluded by the way. The others must now claim our attention.

First and foremost is fire. To produce this various substances are employed. In almost every part of the world except the British Isles, wood is chiefly used as fuel, but throughout them coal is universally burnt, save in some

CUTTING PEAT.

marshy, rural districts, where peat, or turf, takes its place.

Peat is a dark-brown, somewhat spongy substance, dug out of the earth, and is composed of the remains of partially decayed vegetable matter, long steeped in water, and squeezed together, either by its own weight, or a layer of soil

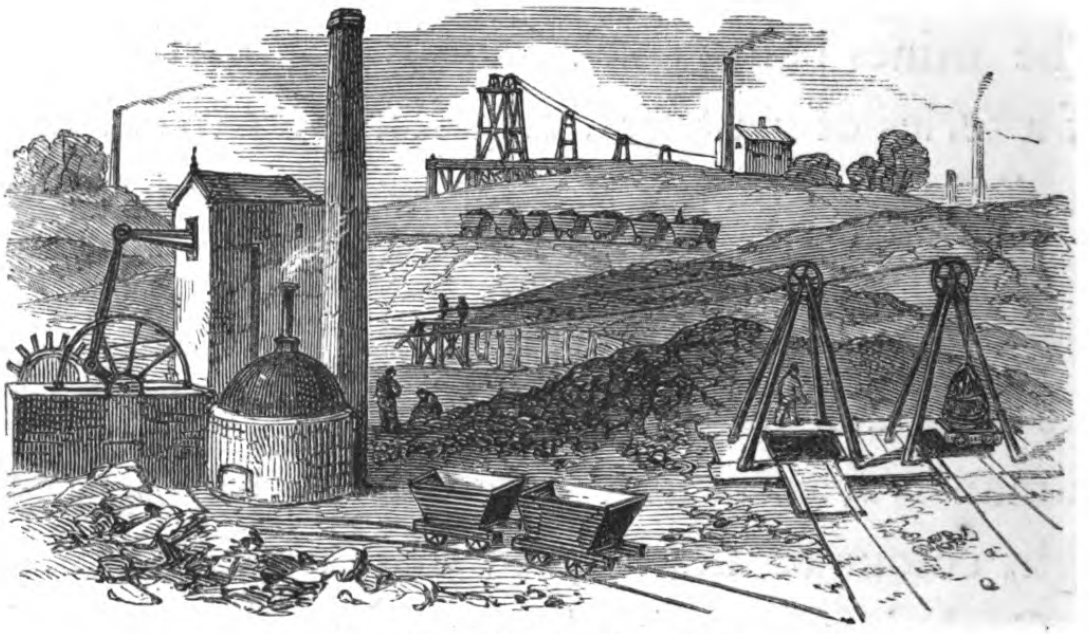
above. It is cut out in slices with long, narrow spades, divided into squares, spread out to dry, and then stacked for use. It is almost entirely used by the poor, whom it furnishes with a useful, though not cheerful fire, as it burns in rather a smouldering fashion, and throws out a strong odour in the process.

Coal is a mineral *now*, but it was not always so. "Once upon a time," and it is a long time ago, so long that no one knows when, it was vegetable, and it has gradually been turned into mineral, after it was buried in the earth whence it is now dug, by some wonderful process of nature that we do not understand. This curious fact has become known through the discovery of trees and plants in the substance of coal, of which they evidently form a part; and from the impressions (in the mud or stone that separates the layers of coal) of others that have perished entirely as plants, becoming mineralized into a mere mass of coal. Some of these traces of vegetation are of a kind similar to those now found upon the earth's surface; others are of a

totally unknown kind, belonging apparently to those early periods of the world's history, of which no record has ever come down to us. They are called coal-plants. The late Professor Buckland describes some very beautiful impressions of this kind, in the coal-mines of Bohemia. The mines being sunk deep in the earth, consist of a series of passages, or galleries, carried along in different directions, as the coal may be of the best quality, or most easily worked. The roofs of these galleries are covered with the most exquisite and delicate foliage, of forms unknown to human eye, and whose jetty black is set off by the light colour of the rock to which they cling.

Coal is found in layers, sometimes, as has been said, at a great depth in the earth, and it has to be got out by mining. In the first place, what is called a shaft is sunk through the ground, or rock, as far as the uppermost layer, called a "seam," of coal. This "shaft" is a great hole, like a well, the sides of which are bricked round, to support them, as the work proceeds. When the coal is reached, passages, twelve or

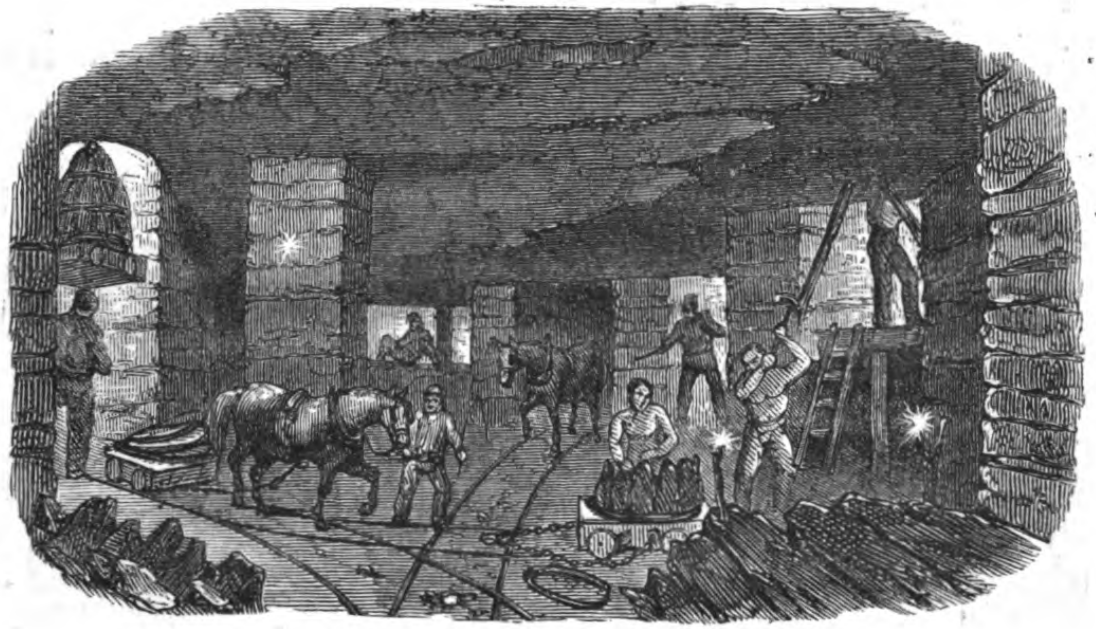
fourteen feet wide, and as high as the bed of coal is thick, are made on each side the shaft, extending in the same direction as the coal, and along these the miner works his way, cutting out the mineral with his pickaxe, which has one arm



EXTERIOR OF A COAL-MINE.

shorter than the other, the short one having a hammer head instead of a point. When the seam is very thick, the operation of *blasting* saves him much labour and time, in detaching great blocks of coal. Blasting is performed by cutting with the pick a narrow channel around (or as nearly so as possible) the piece to be removed, and

filling this channel with gunpowder, which, being fired from a safe distance, breaks up the coal into fragments, and forces it out of its place. The coal is afterwards drawn up to the pit's mouth, through the shaft, in baskets, which

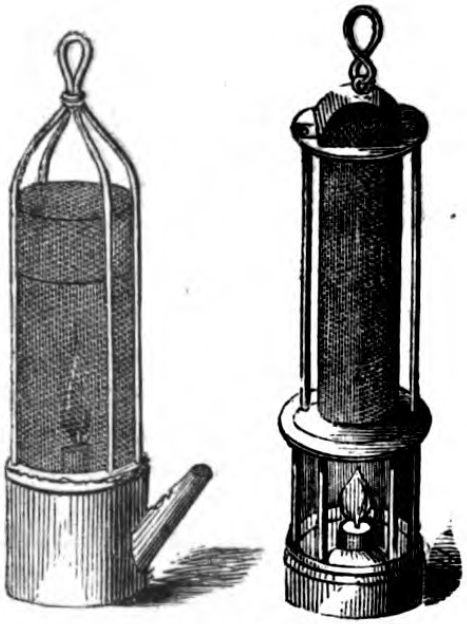


INTERIOR OF A COAL-MINE.

are worked up and down by means of a windlass; that is, a thick roller, by whose revolutions a strong rope is wound and unwound. The miners travel down to their work in these same baskets. The lower seams of coal are reached in a similar way, by carrying the shaft further downwards. In proceeding along the galleries,

the coal is not entirely cut away: if it were, the roof would fall in; so, to prevent that, great masses are left standing, which, like pillars, support it.

Coal-mining is a most laborious and exhausting employment. Not only must great force be employed with the pick, but the heat in these long, narrow, underground passages is sometimes so great, that the miner can scarcely endure the least clothing. A candle stuck into a lump of soft clay ordinarily lights him at his work; but in pits where fire-damp exists, that is, a sort of gas that blows up like gunpowder, if it comes in contact with fire—a peculiar kind of lamp is used, called a safety lamp. This is an oil lamp surrounded by exceedingly fine wire netting in place of glass. Through the net unlighted gas, that is, fire-damp, may find its way, but it does



DAVY'S LAMP.

so harmlessly, as no flame can pass back again through its minute meshes. The gas may take fire within the net; and when its dim blue light is seen there, it indicates that without this simple defence, an explosion would take place, not only periling, but possibly destroying all the living creatures within the mine. The lamp was invented by Sir Humphrey Davy, whose name it bears.

Coal is found in most parts of Europe, and in some parts of Asia and America, but nowhere so abundantly as in Great Britain. It is conjectured by those who understand these matters, that the beds of coal in South Wales alone would provide fuel enough for all the vast manufactories, as well as the household fires, of England, for at least two thousand years. The advantage given us by steam power, for which we are indebted to our coal, may be understood when we find that it annually supplies us with that which is equal to the strength of sixty-six millions of men more than those actually employed. There is one very beautiful species of coal

found in some parts of the Continent, which, from its fine colour and hardness, is carved into various sorts of ornaments. It is called jet. Our English cannel coal, found in Lancashire, much resembles it, and is sometimes used for the same purpose.

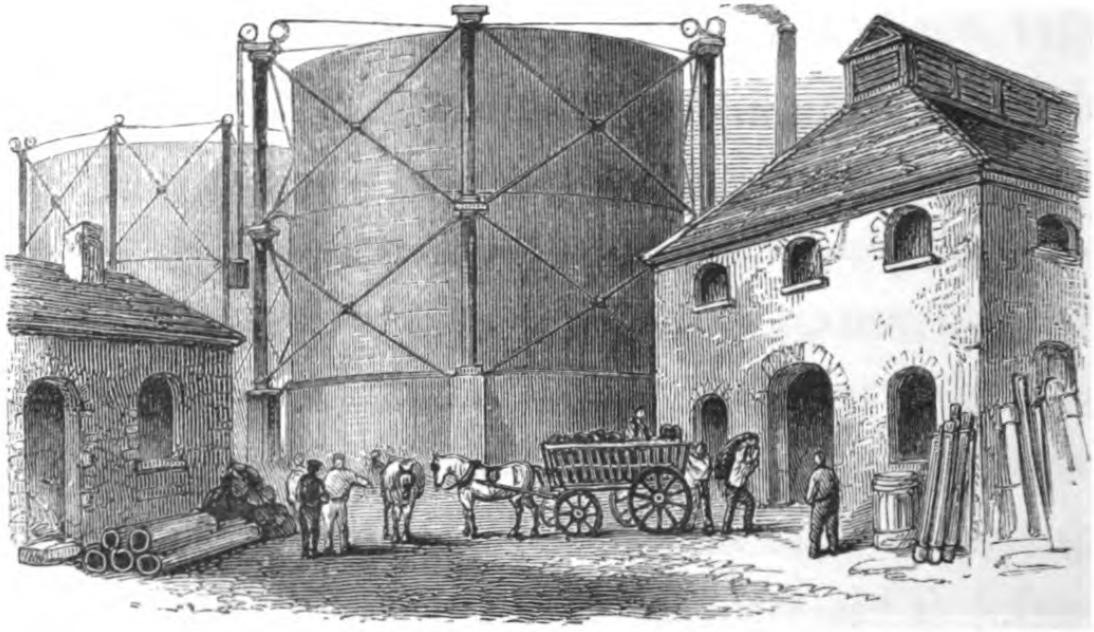
Coal for furnaces and steam engines is not used in the state in which we have it for household fires. It is first burnt, either in the making of gas, or in large ovens, as the kind of hard cinder left by this process gives out a more uniform, intense heat, and less smoke than raw coal. After this burning, it is called coke.

Gas, with which we light our streets and houses, is obtained from coal, by burning it in a perfectly closed vessel. These vessels are called retorts: they are of cast iron, longer than broad, round at the top, and flat at the bottom, and large enough to hold two or three bushels of coals. Being filled, they are placed in a species of oven, the heating of which fires the coal, so as to make it give out its gas; this is carried away by a winding pipe, situated close behind

the mouth of each retort, into a very large pipe, a general receiver for the gas in its first stage. For it is now very impure, being mixed with the various products of the coal, which would seriously interfere with its power of giving light, were they suffered to remain. The tar and water easily dispose of themselves, but there still remains mingled with the good gas, a very bad sulphureous one, and this is separated by the gas being compelled to pass through a vessel containing lime and water, the lime uniting chemically with the bad gas, and suffering its more valuable companion to escape in a very much better condition than that in which it entered the purifying vessel. This process is repeated three or four times, and after its last dose of lime and water, the gas is reported fit for burning.

It next has to be stored up for use. This is done in a large iron vessel called a gasometer. It resembles a huge, round cake-tin, turned upside down, and is hung upon ropes and pulleys, in a correspondingly large cistern of water, in which it works easily up and down, according as

it fills or empties itself of gas. Two tubes pass into this gasometer through the water, the one to convey gas into it from the purifiers, the other to carry it off to the miles upon miles of small pipes, that feed the burners of some large



THE GASOMETER.

town. When the gasometer is empty, it sinks low down in the water, but as it fills it gradually rises; when quite full, and standing out as high as possible, the weights attached to the ropes or chains that suspend it from the pullies, and which balanced it so nearly, that the entrance of

the gas sufficed to raise it, are made lighter. Upon this being done, the heavy iron vessel begins at once to descend, and in doing so, presses out the gas into the pipe that carries it off for consumers. And so, up and down it goes, filling and emptying, in a regular course. Some of these gasometers are large enough to hold a hundred thousand square feet of gas.

About two years ago, the quantity of coal burnt for making gas throughout Great Britain, amounted to about three million and a half tons in one year.

Gas lighting is of very modern introduction. About seventy years ago, that is, in 1792, a person of the name of Murdock, living at Redruth, in Cornwall, thought he would turn what was known of the lighting property of burning gas to some account; and setting up the needful apparatus on a very small scale, he made enough to light his house and place of business, first in Redruth, and then, in 1797, in Ayrshire, in Scotland, whither he had removed. It did not attract much notice at the time; but gradually

attention was drawn to the new method of lighting, as being very superior both in brilliancy and cheapness to the oil lamps with which manufactories and streets had before been lighted. In 1807 Pall Mall was lighted up with gas, and for some years was the only street in London where the old dim oil lamps did not reign supreme. At length others followed the *bright* example; out went the oil lamps, everywhere, till now even in villages, and down by the sea-shore, the vivid specks of light are seen dotted around, and guide our steps safely alike by the yawning village ditch, and over the shingly beach.

The use of gas in dwelling-houses is of still later date; but now that it is in, it is not likely to be driven out again by any kind of candle, or lamp, however improved these may be in their construction; gas is so much cheaper, and burns with so much less trouble than any of them. It is however by some thought injurious to health, and it certainly has the inconvenient habit of occasionally "blowing up," a thing of which neither

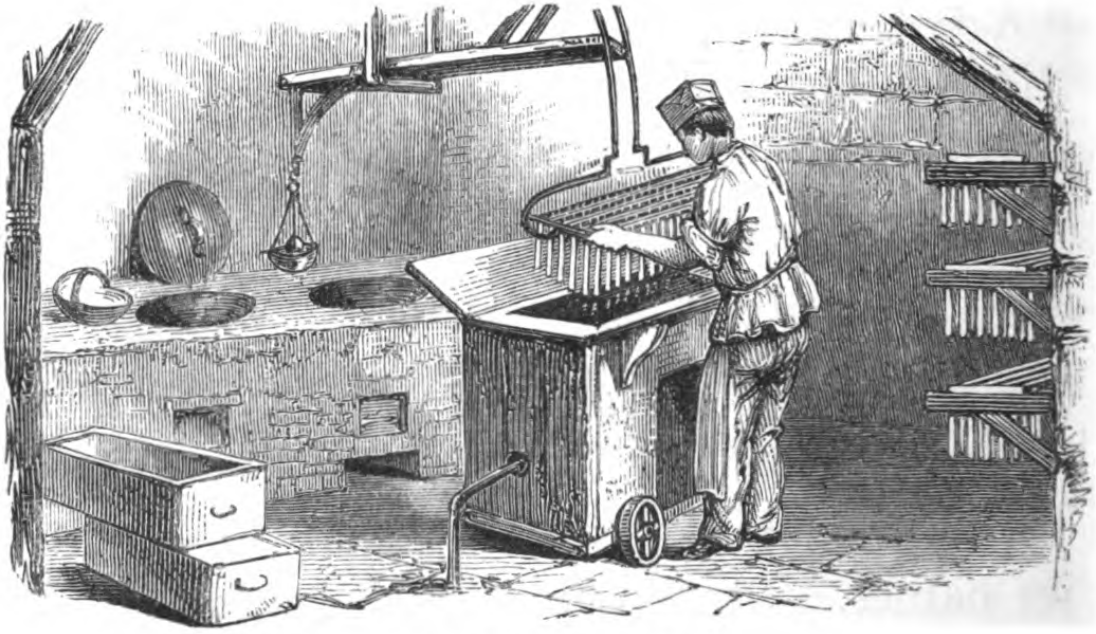
candle nor oil-lamp was ever known to be guilty. Proper care might always prevent this, but the misfortune is, that there are so many careless persons in the world, that we cannot have the safety that we otherwise might.

Gas is manufactured from oil, as well as from coal; the oil, in a slender stream, is conducted into a red-hot retort, containing pieces of coke, or brick; and the vapour, that is, the gas, that rises, passes off into the gasometer in the same way that it does from coal. Oil gas is more costly than coal gas, so that it is less used.

Candles are made of wax, spermaceti, palm-oil (which in this country is solid), and animal fat of various kinds, called tallow, stearine, and by other names. Stearine is simply the hard part of the fat, separated by a chemical process from the oily portion.

The common tallow candle is made by dipping a number of cotton wicks (which are suspended by their loop end from a stick) into a vessel of liquid tallow. The dips are repeated until the candle attains its required thickness. Mould

candles are cast in a pewter mould, the wick being kept steady in its place within the mould, by means of a wire. It is important that the wick should be in the very centre of the mould, as, if it gets at all drawn to one side during the casting, the burning of the candle is injured.



DIPPING CANDLES.

Wax candles are made in a different manner. The wicks, properly prepared, and hung over a vessel of liquid wax, have ladlefulls of it poured over them, from top to toe, until they are sufficiently coated, according to the size of the candle.

Afterwards they are rolled upon a smooth slab to make them perfectly round, and finally they are polished.

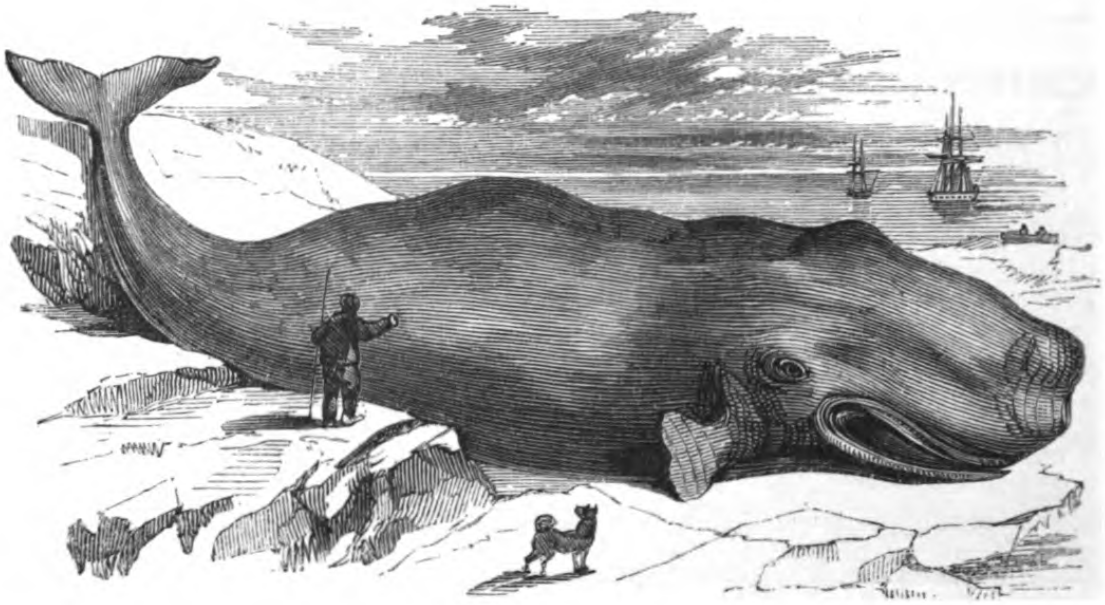
Formerly, the wicks were composed of straight fibres of cotton; now they are frequently plaited in such a way as to prevent any accumulation of the snuff, or burned part of the wick, which disperses itself as fast as it is made.

The wax of which we make candles is brown, common bees-wax, purified, and bleached, or whitened, after being first melted into water. Bees-wax is a substance produced by the insect's own body. Spermaceti is a liquid found within the immense head of the sperm whale, and it becomes hard on being taken out. One head will yield as much as a ton of spermaceti. The sperm whale is chiefly found in the Southern seas.

Before the invention of clocks and watches, time was frequently measured by the burning of candles. It is said our great King Alfred invented lanterns, to protect his candles from the action of the wind, which blew the flame about,

so as to cause them to be consumed irregularly, and thus to mark time unequally.

Lamps are of so many different kinds, that it is quite impossible to describe them. They are chiefly constructed to burn oil of various sorts,



THE SPERM WHALE.

animal or vegetable; some of them burn spirit of turpentine, which is always spoken of under its French name, *camphine*. Their general principle is the same; a cotton wick, supported in *fluid* fat, as the candle has its wick fixed in solid fat, or wax, which only becomes liquid in the

act of burning; and the many varieties of them arise out of different modes of regulating the admission of air to the flame, and the supply of oil to the wick.

Lamps are said to have been first invented by the Egyptians.

CHAPTER XIV.

The Furniture of a House.

FURNITURE, such as chairs, tables, and beds, is made of woods of various kinds, home-grown and foreign.

In Eastern countries people sit and lie upon mats, and, if they have tables at all, have a small round one, standing about a foot from the floor, and around which they sit upon the ground, with their feet tucked up under them. We prefer high tables and chairs, and often four-post beds also, so that we find plenty of employment for the cabinet-maker, whose office it is to make these things.

The ash, the elm, the beech, the fir, the yew, the walnut, and the oak, with some less important timber trees, are all the growth of our own

woods and forests, and are used for making common furniture; the two latter, from the beauty of their grain, and capability of taking a high polish, being also employed for many of its most elegant articles.

The ash is a large, graceful tree, with long, slender leaves, and a light-coloured bark. Its wood is particularly tough; the knights of old, who dealt in hard knocks, liked to have their lance-staves of ash on this account. The beech is also a well-shaped, handsome tree, and in addition to the usefulness of its wood for chairs, bedsteads, and such things, it yields, while living, wholesome food for pigs, who greedily devour a sort of nut that it bears, and which is called *mast*. This same name, *mast*, is also given to acorns, which are the fruit of the oak. Billets (those are small logs) of the wood are used for

MAST.

fuel, and charming fires they make, either for those with whom coals are scarce, as they are on the Continent of Europe, or for those among ourselves who like an extra blaze on a cold winter's night. The bark of the beech tree is as light as cork, and does duty for it, to float fishing-nets.

The elm grows rapidly, and thrives even amid the smoke of large towns, whose neighbourhood is beautified by this fine tree. It rises sometimes to ninety feet in height, and has a broad waist four or five feet in girth. Like the oak, it lives to a great age. The wood of the elm is hard and fine in grain, and not so easily injured by water as that of other trees, so that it is much used for making water-pipes and pumps, and even in ship-building. The bark of the tree is *medicinal*, that is, it is used as medicine.

The fir is a very near relation of the pine, which has been already mentioned. Indeed, they used to be considered of the same species, but are now known to be distinct, though much resembling each other. The shape of the fir is

different from that of the pine; the branches of the former standing out most where they first spring from the stem, and becoming shorter, so as to give the tree a pointed shape, as they approach its top. This is what is called pyramid-shaped. The leaves of the fir are also set on in a different manner. The larch-fir, which is our principal British tree of this species, finds that a cold climate and a poor soil agrees best with its health; accordingly it flourishes in Scotland, where it clothes the bleak hill-sides, and when cut down, furnishes excellent timber, not only for common household purposes, but for the use of the shipbuilder. One species of this fir has an exceedingly beautiful appearance in spring, from its tall cones being of the finest crimson tint.

The yew tree is a dark evergreen, of solitary habits, strangely preferring to grow either quite alone, or with trees of other species, not with those of its own family. It takes about a hundred years to attain its full height, when it generally suspends its labours, and, satisfied with what it has done, will live for hundreds of years without

increasing its bulk. The yews at the beautiful ruin of Fountains Abbey, in Yorkshire, are believed to be twelve hundred years old; and at Ankerwyke, near Staines, is a magnificent one, known to be of older date than the signing of Magna Charta, in the days of King John. The tallest specimen of this species of tree in England, is said to be at Harlington, in Middlesex. The wood of the yew-tree was especially esteemed for making the bows of our old English archers.

The walnut is known for its fruit as well as its elegant wood, which, long neglected for the produce of foreign shores, in the shape of mahogany and rosewood, is now more highly prized than either of them. Walnut occupies the drawing-room, but the other woods that have been named have to be content with less showy, if not less important parts of the house. Walnut is also used for the making of gun-stocks.

The oak is the glory of our islands; strong, sturdy, vast, and beautiful. Its timber is so hard, close-grained, and enduring, that it has long been

used for building ships, as well as houses, though now iron bids fair to drive it out of the water. Westminster Hall is roofed with oak, and that stands well after the wear of nearly nine hundred years. The oak is a bushy, spreading tree, with crooked branches, and deeply indented leaves. The crookedness of its limbs makes it especially fitted for some of the curved portions of a ship, as in shaping them, the timber can be worked up in its natural form, which renders it much stronger than if it had been bent by art to the requisite curve. In bending timber by art, the fibres on the outer side of the curve are stretched, those on the inner side squeezed together, so that the strain upon them is unequal, and that weakens the timber.

The oak attains a great age; at Ellerslie (near Paisley), the birth-place, about the year 1270, of William Wallace, an almost branchless trunk remains of one in whose once abundant foliage he and his followers are said to have concealed themselves from the enemy. Another, standing in Clipstone Park, is supposed to be fifteen hun-

dred years old ; and it is said that under its leafy roof Edward the First once held his parliament. The fruit of the oak, called acorns, supplies food for deer and pigs; its bark is valued for tanning ; charcoal is made of its smaller branches, so that the whole tree is highly useful. In the olden time oak was often used to cover the walls of rooms, carved in panels and various devices ; many of these still remain, dark and polished with age. Along the wall of one such panelled room, runs this legend, cut in rude letters in the wood,—" Love God, Fear God, Dred God, Above all things." When oak timber is new, it is of a light-brown tint. It is now chiefly made into furniture for dining-rooms and libraries.

The poplar, the lime, the box, the holly, the willow, the sycamore, and the plane, all have their appropriate uses in and about a house. The poplar affords a light, white wood, which is made into vessels of various kinds. One species of poplar, called the aspen, is known by the constant trembling of its leaves. The cause of this is said to be the unequal balance of its leaf,

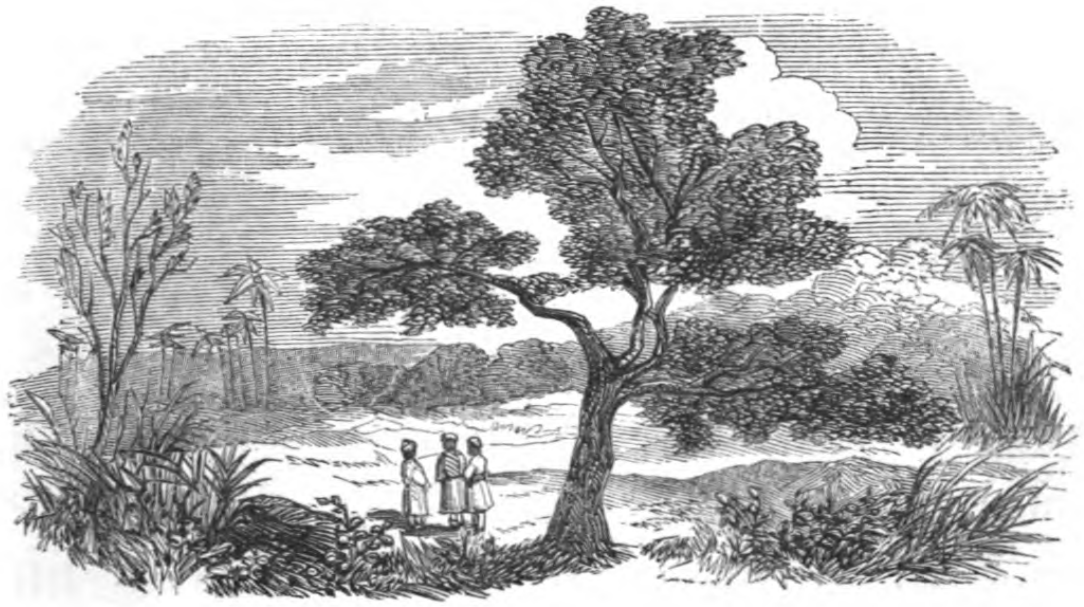
which has its mid-rib not exactly in the centre; the least breath of wind will therefore cause it to flutter. The graceful lime is prized by workers in wood, turners and carvers, for its softness and durability, as well as its tough, light character. The box is valued because it is very hard, and fine-grained; pegs, chessmen, and other articles requiring a fine, hard wood, being cut out of it. From the tough fibres of the bark of the lime, ropes and mats are made. The holly is exceedingly white, as well as hard, and is used by mathematical instrument makers, as well as by cabinet-makers for small, ornamental articles. The willow is flexible and tough, and among its other uses, are those of making hoops for casks, and of being woven into baskets. The kind of willow chiefly grown for basket-making is called the osier. The sycamore and the plane are beautiful trees, but not so useful as some of their less showy neighbours; the former, though light and tough, being only fit for coarse work; while the fine, hard wood of the latter, is too brittle for any joiner's work where strength is required.

Mahogany is one of our foreign friends. It is a tall stately tree, growing in the West Indies, and some parts of South America. The best is brought from the Spanish settlements on the American coast, and yields a rich harvest, a single

MAHOGANY TREE.

tree being worth many hundred pounds. Its foliage is a beautiful dark green, which sets off the deep yellow and red of its flowers. It was unknown in England till about the close of the year 1700, when some of its wood being brought over as ballast in a ship, was offered by the

captain to his brother, who was building a house. Its extreme hardness, however, resisted the carpenter's tools of that date, so that it was thrown aside and forgotten. At length, another attempt was made to work it, and the first appearance of



EBONY TREE.

wrought mahogany in this country was in the humble shape of a box for candles. The box looked so well, that its owner next determined to have a cabinet made; and this accomplished, the fame of its tint and polish soon spread abroad, and brought the new, unknown wood

into general use for articles of furniture. About thirty-eight thousand tons of mahogany reach England every year. Rosewood is the timber of a tree found in South America and Jamaica.

Satin-wood, ebony, and cedar, are also used for ornamental furniture. The first is a deep yellow wood, that, as its name implies, takes a high polish. The tree is a native of the East Indies. Ebony is jet black; the wood that we use is procured from the very core of the tree, the surrounding portion being light-coloured and worthless. The living tree is very fine in growth, and beautiful in appearance. It is found in Central Africa, as well as in the East. Du Chaillu, the latest traveller in that little-known portion of Africa, describes it as one of the greatest ornaments of the dense African forests. The smooth, dark stem shoots up, branchless, fifty or sixty feet, at which height its massive limbs are thrown out, supporting graceful clusters of dark-green foliage. Old trees alone produce the black wood; young ones are white throughout, and therefore are not cut

down. The beautiful cedar-tree is an evergreen, a species of fir, which, originally flourishing in the East, has been naturalized in our own country for about two centuries. Its name, cedar, is said to be derived from the brook

CEDAR TREE.

Cedron, whose bed (now generally dry and dusty) winds by the eastern walls of Jerusalem. It attains a great size and age. Some of the "cedars of Lebanon" spoken of in Scripture, are still existing, and are held in great veneration by the native inhabitants of the East. In Eng-

land, the oldest and finest cedars are supposed to be those in the grounds of Lord Herbert, at Wilton; their trunks measure from five to ten yards round. Cedar wood has a sweet smell, and is very indestructible. The pillars, beams, and roof of King Solomon's temple and palace, it will be remembered, were of this timber, sent to him in ships from Lebanon by Hiram, king of Tyre. The wood is too soft to bear a polish.

The tools used by the cabinet-maker, in cutting out and putting together the various pieces of furniture, are planes, chisels of different shapes, some broad, some narrow, a variety of boring instruments, hammers, and nails, with lathes, for shaping wood perfectly round. The glue-pot is also one of his very important implements. Glue is a thick, jelly-like liquid, that hardens in drying till it is like horn. It is made by boiling cuttings of ox-hides and hoofs in water.

The more valuable woods are not always used in solid pieces; they are often cut by means of

machinery into exceedingly thin, broad slices, which are firmly glued down to the surface of any article of furniture, such as a table, or side-board, made of inferior wood; this is called veneering, and it is done so neatly, as almost, if not quite, to escape detection. The object of it is to lessen the cost of the article, but it does not wear so well as if it were solid.

Delicate wood-carving is done by different-sized, pointed tools, a little bent at the sharp end, so as to pick and peck their way through the intricacies of the pattern. If the cat could only be taught to carve wood, her claws would be found just the right sort of tool for her work.

The fine, glassy polish of our furniture is chiefly produced by the application of a sort of varnish called French polish. Even common deal, which is a soft, white wood, when stained a darker tint, and polished in this manner, presents, in articles of furniture, a beautiful appearance, almost equal to that of Walnut. Varnishes are made by dissolving different kinds

of gum, in spirit, or turpentine; in drying, the spirit flies off, leaving the gum as a hard, shiny surface on the object to which the composition has been applied. A brush and beeswax diligently used, produces a beautiful polish on wood, but it takes much time, and much labour.

CHAPTER XV.

Pottery.

WE have described various kinds of food and drink which are used in different parts of the world. We must now say something about the articles used to contain them. Among some savages a large leaf for a dish, and a hollowed-out gourd (that is, a vegetable something like a melon), to hold liquids, are all that is required for the convenience of eating and drinking. Others have been less easily satisfied, and we find that earthen vessels, dried in the sun, or baked by fire, have been used in almost all countries, and from the earliest times, to contain food and drink. Of course, vessels so made are not all of equal excellence; they may be rude enough in construction among

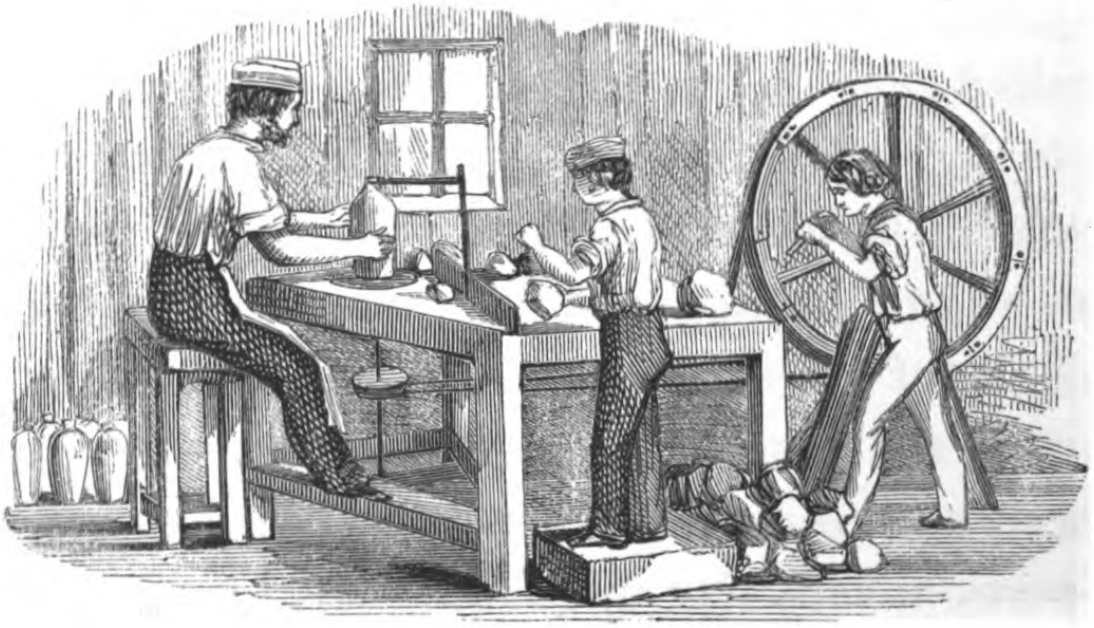
uncivilized people; while others, of great antiquity, are of such exquisite beauty, that we moderns, clever as we think ourselves, and really are, deem it a great achievement to produce a tolerable imitation of them.

Our cups and saucers, plates and dishes, are earthen vessels; and all articles made of earth, or clay, are known by the general name of earthenware. Earthenware is of three kinds, the rough coarse ware for mugs and pans, and chimney-pots, called pottery; the common blue and white, or otherwise-coloured ware in ordinary use, called earthenware; and the fine, delicate, half-transparent ware usually called China, on account of its first coming to us from that country, but whose proper name is porcelain. This latter partakes of the nature of glass, and according to its composition is known as *hard* china, and *soft*.

The earth, or clay used in the making of earthenware, is of a finer, whiter kind than that of which bricks are made, and it is mixed with powdered flints; sometimes also with finely

ground granite, of some kind or other. The flint is burned in a kiln, and then *slaked*, to make it fall to pieces; afterwards it is ground and sifted, to render it a perfectly fine, smooth powder. It, as well as the clay, is well stirred up with water, and when the two are mixed, they are of the thickness of cream. This mixture is called *slip*. It is next boiled in a large caldron, or boiler, until it becomes solid enough to be moulded, previous to which, however, it undergoes a great beating and banging, to drive every particle of air out of the mass. When quite smooth and tough, it is handed over to those whose business it is to shape the different vessels. A portion, sufficient in quantity for the particular vessel to be made, being taken, it is placed upon a small, round table, which is turned round with great rapidity, while the workman, with his hands, first forms the clay into a tallish, circular mass, then into a cake, until he has a perfectly rounded lump to work upon. Still keeping it whirling round, he gradually, by pressure of his thumbs, opens the mouth of the vessel, so as to

make it hollow, while the outside is by degrees moulded by his hands, or suitable pieces of wood, to the required shape. Of course, nothing but skill, and much practice, could enable a man to turn out anything handsomer looking than the



POTTER'S WHEEL.

dirt pies we used to make when we were children; but with skill and practice, the most shapely vessels are thus constructed upon the "potter's wheel." A wire is passed beneath the bottom of the finished article, to separate it from the wheel, and it is put aside to dry. If the

vessel be a round one, such as a cup, basin, or mug, the next process, when it is dry enough to bear it, is to make it perfectly smooth, and of uniform surface, by *turning* it, with the same sort of instrument that wood-turners use. The outside is then well polished up, by being rubbed with a piece of steel, called a *burnisher;* and if a handle or spout is wanted, as for jugs and cups, this is first made in a plaster mould, and afterwards stuck on with slip. Raised figures are also first moulded, and then united to the vessel, by being moistened with water. Articles that are not round, are shaped by moulding; so are flat ones, such as plates and dishes.

The baking is performed in an oven, the earthenware being inclosed in boxes of a peculiar kind of clay, that will bear any amount of fire without injury. These boxes are called *Saggers.* When cool again, they are opened, and their contents, now called *biscuit*-ware, carefully examined; cracked, or misshapen articles are thrown away, while the perfect ones are transferred, according to their quality, to the printer

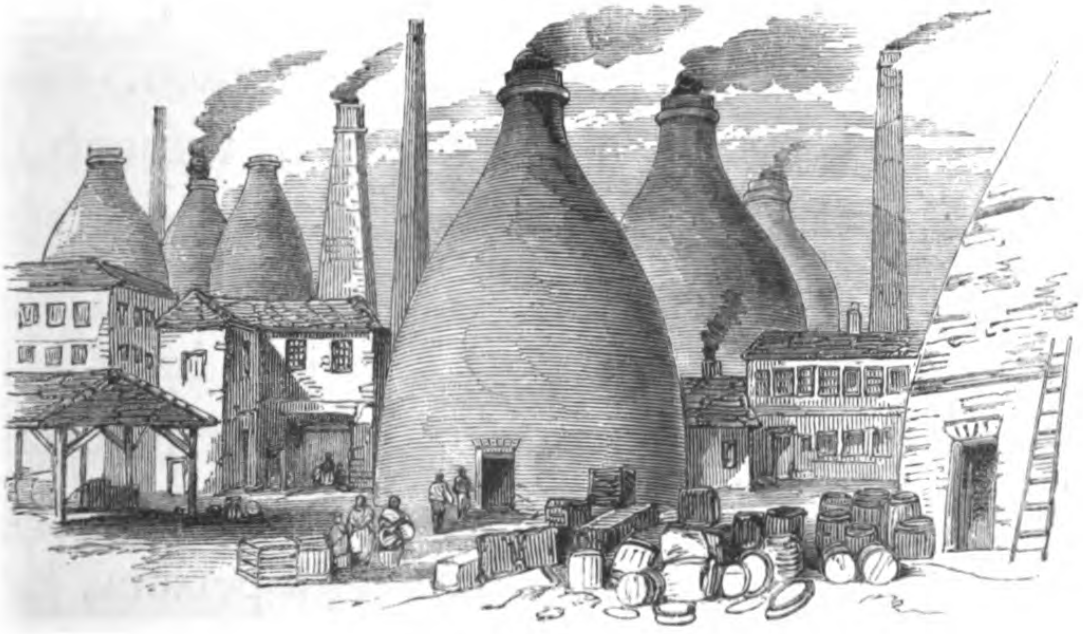
or painter, to receive the pattern, or device, that is to ornament them.

Common earthenware has the pattern printed upon it, in the following manner. The device being first engraved upon a metal plate, is printed off on a very thin kind of paper, called tissue-paper, that has been prepared with soap, to prevent the colour sticking fast to it. This paper is then placed, colour-side downwards, upon the dull, porous biscuit-ware, well rubbed all over with a woollen rubber, and afterwards put into water, where a sponge, lightly applied, washes off all the paper, leaving the pattern entire upon the biscuit. This is again heated to fix the colour, and get rid of the oil with which it was mixed. Glazing comes next; the printed biscuit-ware is dipped into a mixture which, when exposed to the action of fire, forms a sort of glass upon its dull surface, and there stands your cup, or jug, or plate, complete.

Porcelain is painted by the hand, with colours obtained from metallic substances, and so pre-

pared, that when baked in the kiln, they turn to glass. Gilding is baked on in the same manner, and then polished till it shines again, with the burnisher.

The chief manufactories of earthenware in



POTTERY WORKS.

England, are in Staffordshire; horribly smoky places they are, in the pleasant country amid which they are situated; but they supply not only our own country, but all parts of the world with these useful and beautiful productions of earthenware and porcelain. A century ago, this

was not the case; we English were indebted to foreign countries for all but the commonest articles of earthenware, which we managed to make at home; and for this change we have principally to thank Josiah Wedgwood. Wedgwood was a Staffordshire man, born in 1730, in a very humble rank of life; but who, by the force of his own genius and application, raised himself to wealth and consideration, through the improvements which he effected in the manufacture of earthenware.

Sevres, in France, and Dresden, have long been celebrated for the beauty of their porcelain. You may sometimes see a small coffee or tea service, just large enough for two persons, kept carefully under lock and key, in a box, and valued at one, or even two hundred pounds! That is only fit for a king and queen to drink tea out of, is it not?

Wood, pewter, and tin have also been used for making cups and dishes, but they are not so cleanly as glazed earthenware. At Christ's Hospital, in London, founded by King Edward the

Sixth, the boys have, down to our own days, eaten their dinners off square pieces of wood, instead of plates. These wooden plates were called trenchers.

Pewter is a mixture of tin and lead; four parts of tin to one of lead. The very finest pewter is made of tin, antimony, and a little copper, and is a bright, shining, white material, when well polished.

Tin is a whitish coloured metal, which, in England, is chiefly found in Cornwall. The Phœnicians, a maritime (that means sea-faring) people, who, centuries before the birth of Christ, were settled on the eastern coast of the Mediterranean Sea, were wont to come to Britain for the produce of its tin mines. Like other metals, it is, in its native state, mixed with stony matter, from which it is separated by smelting, a process that has been already described. Tin is not often manufactured into useful articles in an unmixed state. What is called tin-plate, is thin, sheet iron, dipped in melted tin, of which it retains a coating. These plates are afterwards

cut to the required shape, joined by soldering if needful, and beaten into form by a wooden hammer, or mallet, upon a block. Superior articles are finished off with a polished steel hammer, upon a metal block, and ornamental portions are stamped by steel moulds, called *dies*. Iron is tinned in this way to prevent its rusting. The inside of iron vessels is tinned, by pouring in melted tin, after they have been heated, and moving them about until the fluid metal has quite covered the surface.

Tin-foil, which has been mentioned, as, together with quicksilver, forming the backs of looking-glasses, is pure tin, hammered and rolled into very thin sheets.

Copper is a very ductile metal; that means, one that is very easily drawn out lengthwise, or into wire; and is reddish in colour. It is not easy to break a copper wire, as an exceedingly thin one will bear a weight of several hundred pounds without breaking. This is why it is called a *tenacious* metal, for tenacious means *holding fast*, and we see that the portions of

copper of which the wire is composed, are not readily pulled asunder.

Copper is found in all parts of the world. In England, chiefly in Cornwall, Devonshire, and the island of Anglesey. South Australia produces the richest copper ore in the world; the principal mine is called Burra-Burra. Copper is worked by casting and rolling, much like other metals. Plates of this metal are used for engraving pictures, which are afterwards printed off with printer's ink. Copper, melted with tin and zinc, is used for the casting of bells, and in this state is called bell-metal. Antimony is also a metal. In the ore it is not unlike lead. When freed from impurities, it has a silvery-white colour.

CHAPTER XVI.

Silver and Gold.

TEA and coffee pots, as well as cups and saucers, were formerly made of earthenware and china; but they are now, except for very common use, generally made of metal, because this preserves the heat of their contents better than earthenware does, and by so doing, draws the strength out of the infused tea and coffee more effectually. The reason of this is, that though all bodies receive heat, and throw it out again, they do so in different degrees, according to their nature. Dull, dark bodies, after they have received heat, throw it out again quickly and strongly; light-coloured, brightly polished ones, throw out little,

and slowly. This throwing out of heat is called *radiation*, because heat comes out in straight lines, like rays from the sun.

The metals used for tea and coffee pots are, silver, and a compound of tin, copper, antimony, and brass, called Britannia metal, which bears a high polish.

Silver is, next to gold, the most precious metal that we have. It is found in all parts of the world except Africa, where hitherto none has been discovered, but is most abundant in South America, where it has been dug up in huge pieces weighing many hundred pounds. The mines of Peru, which have long been famous for their silver, were first worked by the Spaniards about the year 1550, but silver was abundant in Asia from almost the earliest times of which we have any account. The wealth of the great patriarch, Abraham, consisted not only in flocks and herds, but, as we are told, in much gold and silver. In Europe the principal mines are those of Russia (among the Ural mountains), Austria, Hungary, Norway, Saxony, and Spain. Our

English lead-mines also yield a small quantity of silver, though not always enough to repay the cost of separating it from the lead ore. Silver however is not unfrequently found in a pure state, bright and shining, and ready to be at once worked up into articles of use. It is a soft metal (you might cut it with your pocket-knife), softer even than copper, so that when coined into money, a portion of copper is added to it, to render it sufficiently hard. Herodotus (a Greek, who lived four hundred years before the birth of Christ, and was the first writer of history, except those who wrote history in the Bible), tells us that in his day gold and silver, though used as money, as they are now, were not coined; each was melted in one mass, from which a bit was separated as it was wanted. The mode of preparing it was by pouring the hot, melted metal into an earthen pot, which, when its contents were cooled and hardened, was broken, leaving the gold, or silver, in a solid lump. Coined money, however, was not unknown even at that remote period; Greek coins, in silver, about two

thousand seven hundred years old, are still in existence.

To make silver suitable for articles of use, such as tea-pots, coffee-pots, trays, boxes, spoons, and the like, a still larger portion of copper is added than it receives for coining. Indeed, for inferior articles there is sometimes more copper than silver. When thus prepared, the metal is rolled out into sheets of the proper thickness, and these are stamped, or hammered on a mould into shape. What is called *chasing*—which is a portion of the surface thrown up rough and dull in a pattern, as ornament—is performed by placing properly shaped steel instruments, called *punches*, against the inner side of the metal, the outer side of which is gently hammered upon them, till it acquires the same figure as the face of the punch. Engraved silver has the pattern cut upon it with a sharp tool.

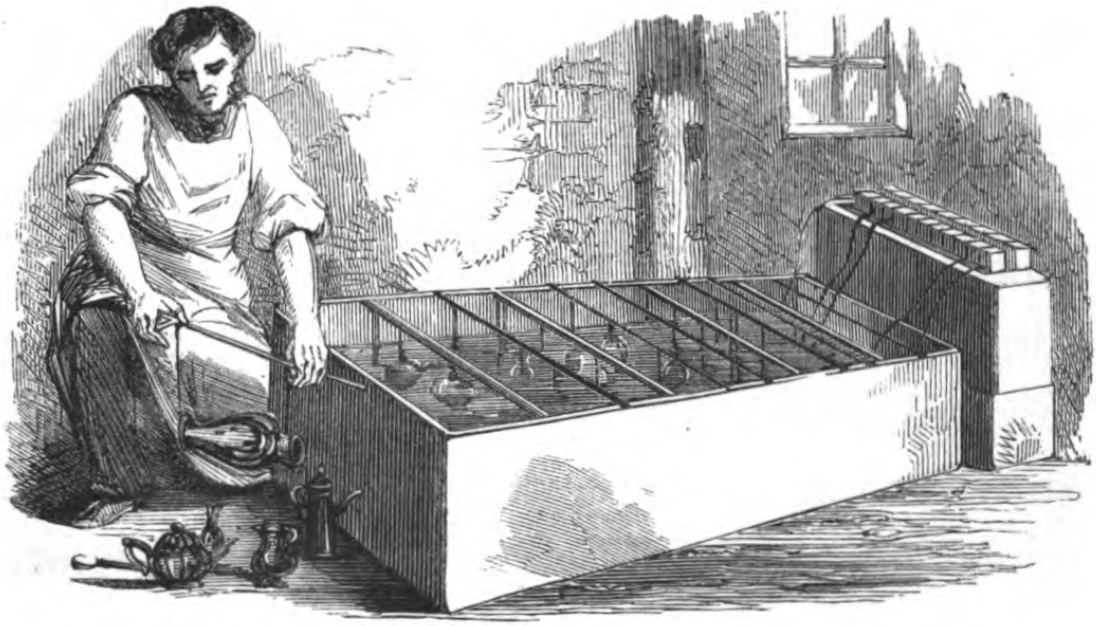
What is called plated silver is made by uniting a thin sheet of silver to one of a cheaper metal—iron, copper, or Britannia metal. But the most beautiful and durable articles of this kind are

now prepared by a process called *electro-plating*.

Certain liquids obtained by chemical processes have the property of dissolving any metal placed in them. If a current of electricity is then passed through the dissolved metal, it is at once separated from the liquid in which it is dissolved, sinks to the bottom of the vessel which contains it, and there hardens into a thin sheet of pure metal. If it sinks down upon a flat surface, it becomes a flat sheet of metal, if upon a variously figured one, it hardens into a variously figured sheet. This is the process of electro-plating: the word signifies plating by means of electricity.

When any article (suppose a tea-pot) is to be made by electro-plating, it is first shaped in some inferior metal, it may be copper, or Britannia metal; it is then hung in a liquid preparation of silver, chemically dissolved; an electric current is next passed through the liquid, and the silver which it contains is equally deposited (that is, laid) upon the metal tea-pot, the surface of which is thus covered with pure silver. This layer of

silver may be made thinner or thicker at will, according as the solution has much or little silver in it, as the electric current is strong or weak, or as the tea-pot may be kept a long or short time in the liquid. Some articles are made of solid silver by the same process. A model, made



ELECTRO-PLATING.

in wax, of the article wanted, is placed in a chemical solution of copper, which, being separated by electricity, entirely covers the model, so that, when the wax is melted out, the model remains in copper, the inside presenting the surface which it is wished to produce in silver.

The outside of this model is then covered with some substance upon which the remaining part of the process has no effect; it is afterwards placed in the silver solution, and the silver, on the electric current being passed through it, settles in a hard plate, and to any degree of thickness required, on the inside of the copper mould. The copper is lastly destroyed by some acid that does not affect the silver beneath, and the article then remains of solid silver, which may be burnished, and finished off as usual. Gold-plating may be produced in the same way.

Electro-plating has one disadvantage—that as pure silver only is employed, the articles made by this process are more easily scratched and defaced than those made in the old way, either of solid or plated silver, which always, as we have seen, received a portion of hardening composition.

Britannia metal is very soft, and is worked into shape by stamping with dies, pressure on a model, or turning with a lathe. Besides being used for tea and coffee pots, Britannia metal is often formed into common candlesticks. Anti-

mony, one of the metals of which it is composed, when separated from the ore is a silvery-white shining substance, and has the effect of making the compound more brittle than it would otherwise be. Some preparations of it are also used in medicine. Like some other useful medicines, it may be taken to a poisonous extent.

Brass is a mixture of about two-thirds of copper to one-third of zinc. It is a bright yellow metal, that takes a high polish, and is much used for musical instruments. The brass spoken of in Scripture, in the book of Job, is supposed to be copper. Zinc is a bluish-white, particularly hard and tough metal. It is sometimes called *spelter*.

Plates, dishes, cups, and flagons, are made both of silver and gold; but the latter are so costly, that they are only fit for very great people indeed, and are, after all, scarcely so beautiful as polished silver, enriched with engraving or chasing.

Gold may be called the very queen of metals. It is sometimes found pure, but more frequently mixed with other substances, from which it is

separated by a variety of processes—washing, grinding, or by what is called *amalgamation.* This consists in adding quicksilver to it, and then heating the compound until the quicksilver runs off, carrying the impurities with it, and leaving the gold pure. Gold is capable of being beaten and drawn out to a greater extent than any other metal; a single grain may be made into a wire nearly a hundred and seventy yards long; while when it comes to be hammered, its extension is still more wonderful. A little piece of the metal is rolled, by machinery, till it is no thicker than the eight-hundredth part of an inch. That seems thin enough, but it is by no means done with yet. It is cut up into pieces an inch square, placed between slips of exceedingly fine membrane, of a much larger size, and these being piled up one on the

GOLD-BEATING.

other, till there are a hundred and fifty little parcels (gold sandwiches we might call them), are enclosed in vellum and parchment cases, and then beaten with a heavy hammer on a block of marble, until the gold within is beaten out to the size of the membranes. The parcel is then opened, the bits of gold again divided into four parts, and again enclosed, this time six hundred of them, and beaten as before. A third operation, eight hundred in one bundle, completes the process, after which the metal, now called gold leaf, is so thin, that between thirty and forty square yards of it would only weigh one ounce. This gold-leaf is used for gilding picture-frames, and other articles of wood, the edges of book leaves, china, and glass.

GILDING PICTURE-FRAMES.

Wood is gilt by first applying to it a mixture of whiting and size, then a kind of varnish called

gold-size, upon which, while damp, the gold leaf sticks so firmly, that it afterwards bears polishing, called burnishing, by a peculiar kind of stone, called agate, or by a dog's tooth, set in a proper handle. If the gilded wood is to be exposed to the weather, or designed to be very durable, oil gold-size is used. This is called oil-gilding, and though it lasts much longer than the water gilding, it is not so beautiful, nor will it bear burnishing.

The edges of book leaves are gilt by covering them with a composition—Armenian bole, sugar-candy, and white of egg—of a slightly sticky nature, and then, by means of a soft, broad, flat brush, laying on the gold-leaf, which is afterwards burnished as before.

The gilding of china we have described as being done by baking-in the leaf gold, after it has been applied. Four hundred ounces of leaf gold are used in London every week. That is, twenty thousand eight hundred ounces in the year.

Metal articles are gilded either by electro-plating, or by applying to them an *amalgam* (that

is, a mixture) of gold and quicksilver. The amalgam is made by heating gold in five or six times its weight of quicksilver, pouring the boiling fluid into cold water, and then forcing it through chamois leather, when it is found as thick as clay. To a proper quantity of this amalgam are added three or four spoonfuls of a chemical liquid which has the property of causing the amalgam to adhere firmly to the metal. This is put into a deep, glazed earthen pot, the articles to be gilt follow it, and the whole is well stirred up with a stick, until every part of the metal is covered with the mixture. They are afterwards exposed to heat, which drives off the quicksilver, leaving the gilt surfaces bright and firm, and only requiring to have their complexion "heightened" (to improve their beauty), by being kept moving for some time longer in the heat.

Steel and iron are gilt by being placed in a peculiar solution of gold, prepared with spirit, or sulphuric ether. As soon as the iron comes in contact with this, it has the effect of separating

the spirit from the gold and firmly attaching the latter to itself. The balance springs of chronometers have been gilt by the electro-process in order to prevent their rusting. A chronometer is a very superior kind of watch, or timepiece: its name signifies *time-measurer*.

Gold lace, which glitters on military uniforms, is made by wrapping excessively fine gilt wire round the silk threads of which the lace is composed. The gold used for this purpose is in the thinnest state of which it is possible to conceive, ten times thinner than ordinary gold leaf. It is made by coating a rod of silver with gold, and then drawing it out into exceedingly thin wire, every part of which retains an equal share of the gold, of this wonderful thinness.

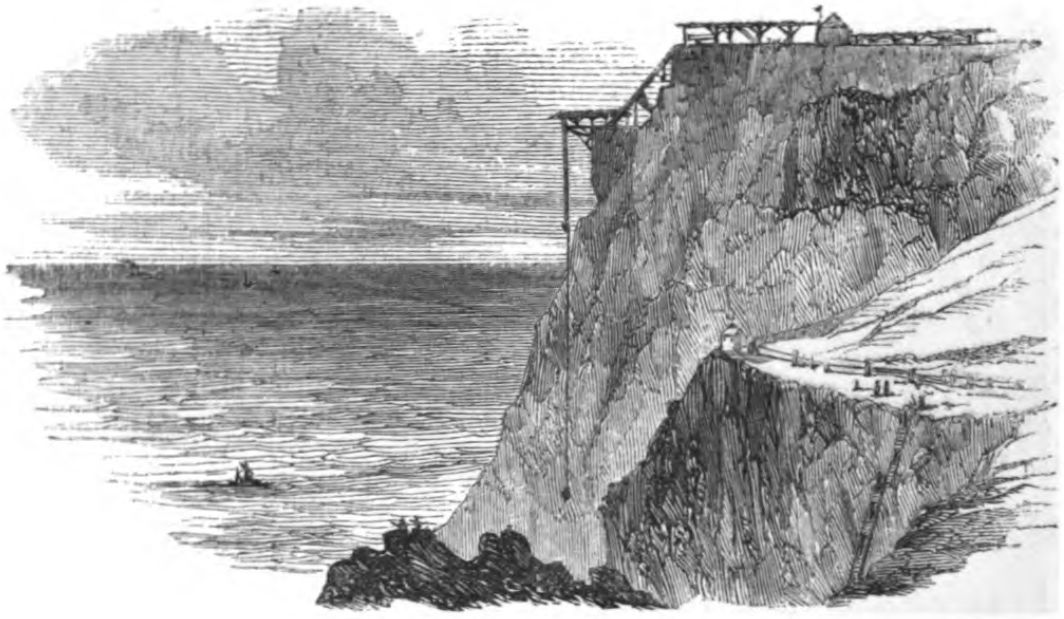
Gold is found in almost every part of the world. We used to look chiefly to South America for our supply of this precious metal; but in 1848 it was found in immense quantities in California, in North America, and in 1851, still richer fields and mines were discovered in our own Australian colonies. Large lumps of

gold, called "nuggets," weighing perhaps an ounce, perhaps a hundred pounds, have been brought to light by the pick and the spade. In consequence of this vast supply, it has been calculated that the amount of gold, throughout the

GOLD-DIGGERS AT A CREEK, AUSTRALIA.

world, had in 1858 reached the enormous sum of eight hundred and twenty millions of pounds in money value! that is, two hundred and five million ounces in weight. Out of this, we in England each year use for manufacturing purposes more than fifty thousand ounces, that is, upwards of

four thousand pounds weight. In this same year, 1858, gold was also discovered in British Columbia, one of our English possessions in North America.



EXTERIOR ENTRANCE TO COPPER-MINE.

CHAPTER XVII.

Bells.

WE have spoken of the composition of copper and tin, called bell-metal, of which our bells are made. Such a composition has the property of giving out a clear prolonged tone when struck, and this is why we use it for bells. It was formerly supposed that the exceedingly sweet tone of some bells was caused by the addition of a little silver to the other materials; but this is quite a mistake.

Bells of some kind or other are of very ancient date. The first time we hear of them is in the Bible, where Moses was commanded to make small bells of gold, as part of the ornaments of the high priest's robes: bells of bronze have been

discovered among the ruins of the mighty city of Nineveh. Hand bells, that is, small bells fastened to a handle by which they were rung, were in use among the Greeks and Romans; and in various countries from an early period bells have been fastened to the necks of horses, cattle, and sheep, as we sometimes see them now; and for the purpose either of ornament, or use, to detect them when straying.

Church bells are said to have been first made and brought into use about the year 400, and an Italian bishop has the credit of being the inventor of these instruments; sweet, or doleful, according as they are rung in merry chimes, or tolled sadly for a funeral. They are spoken of by the venerable Bede (an admirable monk of the English Church) as being in use among us towards the close of the seventh century. House bells, which we now reckon things of course, were two centuries ago little known in England, and are even still scarcer than is comfortable on the Continent of Europe.

A bell is a hollow piece of metal, shaped like a wine-glass turned upside down, and having a

rod of metal hung inside, (suspended from the top,) called the *clapper*. The striking of this clapper against the side of the bell brings out its sound, whether the bell be shaken by means of a handle from its upper part, by a wire attached to it, and carried to a distance, as in house bells, or by having the clapper only moved, as in great church bells, which are too large to be moved themselves.

BELL-RINGING.

Bells are cast in a mould, a process which, when they are large, is one of much difficulty. A vast caldron of boiling metal is sometimes a little unmanageable, and there is always a danger of some portions of it cooling more quickly than others, when poured out into the mould; an accident that would spoil the work. If safely cast, and got out of the mould, the bell is next tuned to the note it is intended to give out. This is

effected by removing portions of the metal, either at the lower part of the bell, or that where the hammer strikes, according as it is desired to make the tone higher or lower.

One of the most famous church bells is that of Moscow, in Russia, weighing above four hundred thousand pounds, and measuring sixty-seven feet round; this is the largest in the world. A huge bell, at Christchurch, Oxford, called "Great Tom," weighs seventeen hundred pounds; a brother Tom at Lincoln is comparatively a baby bell, weighing only about ten thousand pounds. The great bell of St. Paul's Cathedral, which is never tolled except on extraordinary occasions, weighs between eleven and twelve thousand pounds. That at York Minster weighs about twenty-seven thousand pounds. The most wonderful achievement of modern bell-casting is that of the great bell of St. Stephen's, Westminster, in 1856. This enormous mass of metal weighed more than fourteen thousand pounds. It was cast at Norton, near Stockton-on-Tees, in the county of Durham,

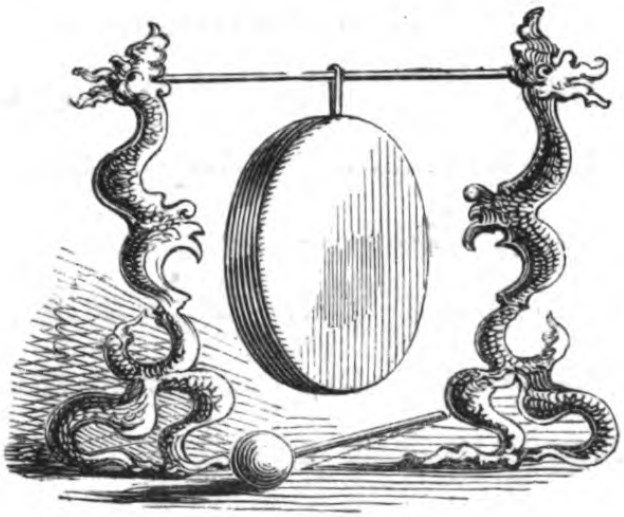
and was brought to London by railroad and ship, to be hung up in the bell-tower at Westminster. But, alas! St. Stephen's bell was an unfortunate one! It rang out clear and beautiful for a short time, and then cracked, when it speedily found its way to the melting pot again.

The curfew bell had its name from the design of its ringing: that of making people put out their fires at eight o'clock in the evening, lest their houses should take fire: for, ten centuries ago, when the curfew took its rise, houses were built of wood. The name is from the French, *couvre-feu*, that is, cover-fire, as you put out a candle with an extinguisher. In these free days we may please ourselves as to the time at which we put out our fires: we may keep them burning all night if we like.

In some parts of the north of England a number of hand bells, properly tuned, are used as a musical instrument; and in skilful hands produce sweet music.

The Chinese gong is a species of bell. It is shaped like a great saucer, turned sharply up at

the edges, and when struck with something like a drum-stick, produces the most horrible sound possible. Some people in England like to summon their household to dinner by means of this harsh, disagreeable instrument. Its only recommendation is, that the peculiarly disagreeable din which it produces is heard to a considerable distance.



CHINESE GONG.

It has been mentioned that small bells of bronze have been found in the ruins of Nineveh. Bronze is a metal of a beautiful brown, or greenish-brown tint, compounded of copper and tin; more copper and less tin than for bell-metal, but the proportions vary according to the different purposes for which the bronze is required. It was a compound known to the ancients. Homer, the first Greek poet, who lived about a thousand years before the birth of Christ, describes the

arms and armour of his heroes as being made of bronze, or copper; for copper alone, or mixed in this way with tin, was known and used long before iron became common.

Bronze is generally melted and cast in moulds. Its beautiful green tint is acquired either by exposure to the air (which produces a species of rust upon it), or by its surface being washed with some acid. In modern times it is chiefly used for works of art, statues, medals, and small ornamental articles. It has also been used for the manufacture of cannon.

QUESTIONS.

CHAPTER I.

WHAT things are absolutely necessary to preserve life?
How many kinds of food are there?
What are they called?
Of what does vegetable food consist?
What is animal food?
When was it first allowed to be eaten?
Where is vegetable food most used?
Where is animal food most used?
What are the principal vegetables?
Which is the most important vegetable?
How is it prepared for eating?
How is wheaten flour wasted?
How is vinegar made from malt?
What are annual plants?

CHAPTER II.

What is the principal food of the common people in Asia?
How is it grown?
Why are tea and coffee useful?
Where is tea chiefly grown? Describe the plant.
How are the leaves prepared?
When was tea first brought to England?
What part of the coffee-plant is used?
How are the berries prepared?
When was coffee first brought to England?
What are cocoa and chocolate?
What is the cocoa-nut tree?
What are its uses?
What other vegetables are much used in hot countries?
What people make dates their principal food?
What is sago?
What grain produces two crops in one year?

CHAPTER III.

What is the principal use of fruit?
What fruits grow in English gardens?
How is a worthless fruit tree made to produce good fruit?

What is a hot-house?
In what state are foreign fruits brought to England?
What are the principal foreign fruits? and from what countries do they come?
What liquid is made from grapes? and how is it made?
How is spirit distilled? and what is its use?
What is sugar? and how is it made?
Is sugar made from any other plant than the sugar-cane?

CHAPTER IV.

Why are spices used?
What is mustard? what is pepper?
Describe a nutmeg.
Why are cloves so named?
What is ginger?
What is cinnamon? and where is it chiefly cultivated?
Why do people require salt with their food?

CHAPTER V.

What is the difference between an animal and a vegetable?
What are the principal four-legged animals used as food?

What is beef? Is the ox used for any other purpose?
What was Elisha doing, when the prophet Elijah threw his mantle over him? and what did the prophet mean by so doing?
What other uses is the ox put to, after he is made into beef?
For what are cows chiefly valuable?
How is butter made? What is a churn?
Why do people eat butter?
Into how many substances may milk be separated?
Why is milk particularly suited for young children?
Is any other milk used beside that of the cow?

CHAPTER VI.

Where is the deer found? and what kind furnishes the best venison?
What does the word quadruped mean?
What other use has the sheep, beside furnishing food for people?
What is sheep-shearing?
How does salt preserve meat?
Why is salted meat less nutritious than fresh?
What other method is there of preserving meat?
For what is the tanned skin of the pig used?
What people eat horse-flesh?

CHAPTER VII.

What are tamed birds, kept for eating, called? and what wild ones?

Is the Turkey a delicate bird?

What sort of mother is the hen to her chickens?

How may eggs be preserved? and how does this mode act?

What are pores?

Can you name any game birds?

From what part of the world did pheasants first come?

In what way was the peacock eaten in the middle ages?

Is fish as life-supporting as other animal food?

What fish is allowed to be sold on Sunday? and why?

Is salmon a salt, or fresh-water fish?

CHAPTER VIII.

What was the first clothing of mankind?

What furry skins of beasts are worn?

Do you know anything about these beasts?

To what class of animals does the chinchilla belong? and why have they their name?

How is wool manufactured? What does the word *manufacture* mean?

How is Brussels carpet made?
Of what are men's hats made?
With what does the Bedouin cover his head?
Who invented the stocking-frame? and when?
What king borrowed a pair of silk stockings, and wore them into holes?
From what are cotton cloths made?
From what country did the English receive the art of manufacturing cotton?
What Englishman made great improvements in this art?

CHAPTER IX.

From what is linen made?
What sort of plant is the flax plant?
How is it prepared for being spun into yarn?
Is the seed of any use?
How is linen made white, after it has been woven?
What are the principal places in England where lace is made?
What is silk?
Where was the silkworm first turned to use?
When was the manufacture of silk introduced into England? and what circumstance has made us particularly skilful in it?

Where were straw hats first used?
What bird furnishes plumes of feathers from its tail and wings?
Why are the skins of animals tanned?
What is tanning?

CHAPTER X.

Who is supposed to have invented tents?
What is he called who plans the building of a house?
Who first introduced the making of bricks into England?
What are slates? and for what purpose are they used?
Why are some roofs covered with lead?
Which is the softest metal? Tell me something about it.
From what tree are turpentine and tar obtained?
What is done to the rough brick walls of a room?
How long have glass windows been in common use in England?
Where were they first used in this country?
Of what is glass made?

CHAPTER XI.

What is iron in its native state? and how is it made into the metal that we use?

Can you tell me how iron is made into steel?

What county is celebrated for its iron mines?

Can you remember any instance of the wonderful way in which steam-machines work in iron?

When was the use of forks brought into England? and from what country?

Why is the use of silver forks useful, as well as luxurious?

CHAPTER XII.

What is paper made from? Can you tell me how it is made?

Who first manufactured paper? and why is it called *paper?*

Why is wood-work painted?

Why is house-painting unhealthy work?

CHAPTER XIII.

When a house is built, what more is required to make it habitable?

What is used for fuel?

What is peat? What is coal? How do we get it?
Where is coal most abundantly found?
From what is gas obtained? and how?
Of how many materials are candles made?
What is bees-wax?
How was time frequently measured before the invention of clocks and watches?
What is a lamp?

CHAPTER XIV.

What are the principal trees used in making furniture?
Can you tell me anything about them?
How did mahogany first come into use in England?
Are any of the cedars of Lebanon mentioned in the Bible, still living?
Where are the oldest and finest cedars in England?
What tools does the cabinet-maker use?

CHAPTER XV.

Has earthenware been long in use?
How many kinds are there?
Why was porcelain called China?
How is a round earthen vessel shaped?
Do you remember how earthenware is printed?

Where are its chief manufactories?
Who greatly improved the manufacture?
What is pewter? tin?
What people came to Britain for tin?
What kind of metal is copper?
Where is it found?
What is the meaning of *tenacious?*

CHAPTER XVI.

Why are tea and coffee pots best made of polished metal?
What is meant by radiation?
Which is the most precious metal?
Which is the next in value?
Where is silver found most abundantly?
Where are the principal silver mines in Europe?
How old is the most ancient Greek coin that we know
Is silver ever found pure?
What metal can be beaten, or drawn out to the greatest extent
Can you remember anything of the making of gold leaf?
When was gold found in California; in Australia; in British Columbia?
How is gold wire made?

CHAPTER XVII.

What was formerly supposed to cause the sweet tone of bells?

Was this idea correct?

Where are bells first mentioned?

Who first made and brought church bells into use?

What is the meaning of curfew bell?

Of what metal does Homer tell us arms and armour were formerly made?

Who was Homer?

What is bronze now chiefly used for?

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