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WHAT THE WORLD WEARS

TWO LITTLE BOYS IN GREEK NATIONAL DRESS MEET TWO LITTLE ENGLISH CHILDREN

Photo Keystone

WHAT THE WORLD WEARS

BY

R. K. AND M. I. R. POLKINGHORNE

AUTHORS OF
"OTHER PEOPLE'S HOUSES"
"WEAVING AND OTHER PLEASANT OCCUPATIONS"
ETC.

ILLUSTRATED WITH MANY PHOTOGRAPHS
COLLECTED BY
E. MANSELL

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DE IN GREAT BRITAIN AT THE PITMAN PRESS, BATH

PREFACE

THIS work is a companion book to *Other People's Houses*. Education becomes vitalized when we recognize its connexion with the desires and needs of life. Children are greatly interested in the materials and the activities which have to do with supplying man with the necessities and comforts of daily life. A study of these materials and activities leads to something still greater. It leads to the understanding of the geography of the home and the world, and of the influence of environment on the physical, social, and moral development of human life.

The study of clothing rightly begins at home, and is centred in our immediate surroundings. But in tracing the materials back to their origin, and in following the raw product through the various stages of its development, other countries have to be visited, and the world is explored with a purpose.

The experiences of the teacher and even the children will happily and profitably supplement some of the information. It is important to give *information*, but it is also important to realize that discovery through *suggestion* has its own place in education. This point has been kept in mind throughout the writing of this book, especially in the questions. The making of collections and the building up of small museums in connexion with the reading is also of interest and value. The teaching power of the pictures must not be forgotten; they are worth investigating, and will yield both information and stories. By information, investigation, experiments, and invention, one may hope to train up interested and thoughtful human beings who realize the pleasure of work.

R. K. P.
M. I. R. P.

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CHAPTER ONE

FURS

As far back in time as we can go men wore furs. First they were used only for their warmth (as they still are to-day by many peoples in the far North—the Alaskans, the Indians, and Eskimos, of North America; the Laplanders, of Europe; and the tribes of northern Asia). But they were soon used in many parts of the world not only for their warmth but for their beauty. In olden days furs were a sign of high birth or royalty—for example, the ermine cloaks of kings.

The greatest number of fur-bearing animals, and the most valued, live in the great cool forests of the temperate lands of the north, where the winters are very long, snow lies on the ground for several months, and all the streams are frozen. If you look at the map you will see where the pine forests are: in the north of Canada, Russia, and Siberia. North of the pine forests is a very cold belt, or zone, the polar regions, where trees cannot grow. In this frozen desert, or tundra, live other fur-bearing animals, such as the Arctic fox and hare and the polar bear.

In **Canada** the fur-trappers and hunters live very adventurous lives. They all have dogs to help them. These dogs are known as huskies, and are strong, fierce animals, half wolf and half dog. The huskies pull the sledges that carry the food and equipment that the hunters need for their long days in the lonely woods or Arctic wastes.

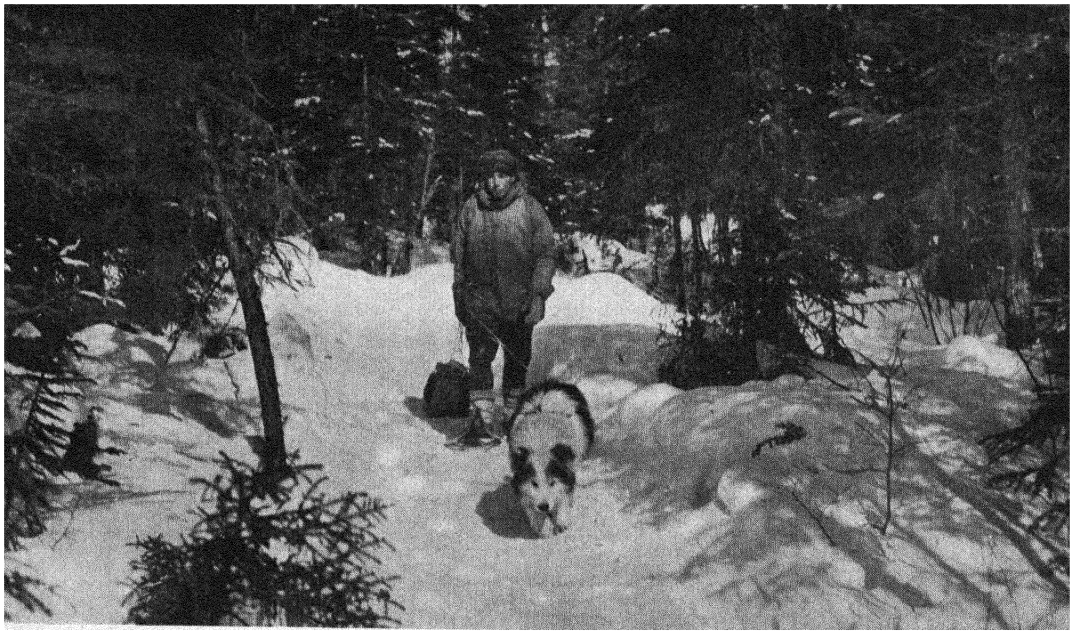
As furs are at their best in winter, the hunter sets out early in this season from his log house in some small town on the borders of the wilds of the Canadian North-west. Arriving at his hunting-ground, he chooses a spot for his camp and stores his provisions safely. Then he loads his sledge with traps, food, and anything else that he needs and goes out on a fifty-mile drive round to set his traps. He lays them in a great circle, so that when his last trap is set he is back at his camp. Then he starts out again with his sledge to visit his traps. He skins any catches he finds, packs the skins or pelts on his sledge, and moves on round his trap-line.

Sometimes when the hunter is setting his traps he is followed at a distance by a cunning animal called a wolverine, which not only eats the bait and the captured animals, but carries off the traps themselves and hides them in the snow. Another wily animal that follows the trapper and eats the fish bait he has used is called the fisher. The silent woods are really full of life. There are several kinds of foxes, many little animals like ermines, minks, and martens; big animals, such as deer and bears; water-loving animals, such as otters, musk rats, and beavers; and dangerous animals, such as lynxes and wolves.

The trapper thinks he is lucky if he gets a few marten, a silver fox or black fox (a great prize), or even a wolf. When his stock of provisions gets low he drives to the outpost of one of the great fur companies, where he sells his pelts for cash, food, or whatever he needs. Sometimes a trapper is away hunting for nine months.

An Indian trapper generally journeys to his hunting-ground with his wife and family. The hunting-grounds, of course, get more and more remote as little towns tend to spring up here and there. But there still remain areas of thousands of miles where fur-bearing animals range both on dry land and in the huge marshy regions. It is difficult to give in words an idea of the vastness of the wilds of the Canadian North-west, where the best furs are found.

The Indian, therefore, takes plenty of supplies for his long exile; a tent or tepee,



A TRAPPER SETTING OUT WITH HIS DOGS ALONG THE TRAP-LINE
Photo by courtesy of the Hudson's Bay Company

axe, firearms, tea, matches, and many other things. He often starts early, before the frosts begin, so that he can travel part of the way by canoe. When the rivers are frozen he takes to his dog sledge, drawn by a team of huskies. He is much more fortunate than the solitary trapper, because he makes his camp into a snug home for his wife and children, who help him in many ways.

He sets about one hundred and fifty traps in a fifty-mile circle, some small, for the smaller animals, and some big. He spends most of the summer making these traps. It takes the hunter about three days to visit all his traps. He may have a son of ten years or more who goes with his father to learn all the ways of hunting.

In the far north, extending up to and beyond the Arctic Circle, the Eskimos are the chief hunters. The Eskimo obtains many of his furs from the creatures of the sea —the seal, the hair seal, and the seal otter. Not only the Eskimos of Labrador, but many men from Newfoundland, go seal-hunting.

There are two big fur companies in Canada, the Hudson's Bay Company and Revillon Frères; the former is by far the oldest, dating from the reign of Charles II. Both companies have big depots in Hudson Bay. The only outlet to this bay is the long Hudson Strait, which is locked with ice for the greater part of the year. The fur steamers, strongly built for the purpose, push their way through the drift ice as soon as it is possible, because for only ten weeks is communication by sea possible. Hurriedly the sailors dump their stores at the main depots— food, ammunition, rifles, axes, and everything needed for the wilds—and reload with the precious skins so that their steamers can leave before the Strait is closed by ice.

The pelts and furs have a long distance to travel from hunters to outposts; thence to ordinary posts; from there to base posts; from base posts to depots, depots to steamers,

and then by steamers to London direct or by way of Montreal. Most of the transport is done by dog-train. In the fur country of the Canadian Rockies pack-horses are used for transport.

In the **United States** there are also many fur hunters, but, the climate not being so cold, fur trapping is less romantic than in Canada. Most of the fur-bearing animals in the U.S.A., such as the musk rat (or musquash), opossum, skunk, rabbit, racoon, are of small size; but their numbers are enormous. The basin of the Mississippi, with the swamps of Louisiana, produce myriads of these little fur-bearing animals.

Now to come to **Europe and Asia.** It is not as easy to get accurate information about the fur trade of Russia and Siberia as it is of Canada. We know the northern regions of the Soviet Union are among the richest in the world for fur-bearing animals, and one of the little animals most hunted is the grey squirrel.

The squirrel hunter sets out with a rifle, a dog, and a sledge drawn by a team of reindeer. The reindeer bring him to the edge of the forest, and then he must proceed on foot. He moves noiselessly over the snow, and his eyes are trained to pick out the silvery grey form of the squirrel against the dark branches of the pine-trees. When the hunter has shot down his quarry the dog marks where the squirrel falls, and brings it to his master. Towards sunset he makes his way back to the place where he left his reindeer and loads them with his 'bag.' Then off he goes to sell his skins, and home to his wooden house in a little Siberian village. Many of the natives who hunt furs in the far north of Asia are very like the Eskimos in appearance.

Central Asia is the region noted for Astrakhan or Persian lambskins. The trader who wants these skins has to travel in a country very different from Canada or Siberia; his is a country of camels, sand-storms, and white turbans. The trader, perhaps, has his base at Bokhara and

TRAPPER IN THE SWAMPS OF CANADA SETTING A TRAP FOR MUSK RATS

Photo by courtesy of the Canadian Government

A CAREFULLY HIDDEN TRAP FOR MARTEN

Note the trapper's snow shoes.

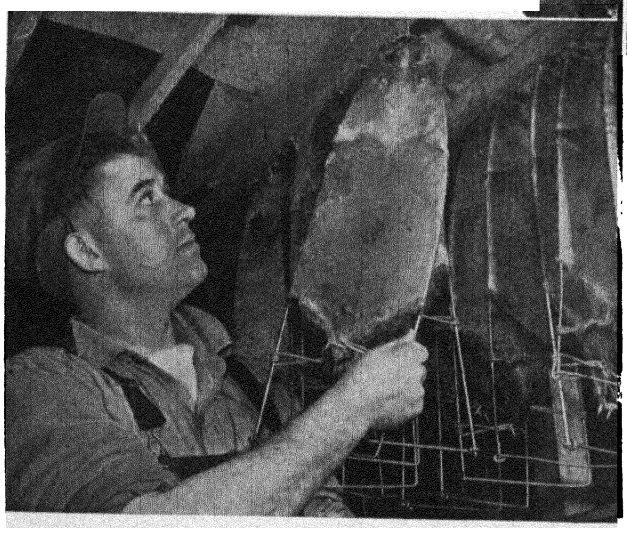
Photo by courtesy of the Hudson's Bay Company

sends out a number of small caravans north, south, east, and west across the deserts to trade in the villages with the various Turkoman tribes. The majority of Persian lambs come from Bokhara and Afghanistan. They are the young of the broadtail sheep. The lambskins are silky, with tight little curls. Persian lambskins also come from North-west India, Persia, Asia Minor, Bessarabia, and Rumania. Persian lamb got the name of Astrakhan from the port on the Caspian Sea through which it was imported into Europe.

The Chinese also wear fur-lined robes, but revolutions and wars have hampered the fur trade of China. The Chinese use an immense number of dog furs for lining robes.

Australia has become a fur-producing country in more recent times. Much of her trade in fur is due to two animals brought to Australia by the first settlers—the rabbit and the fox. Her most valued furs are those of the wallaby and opossum. Millions of rabbit skins and hundreds of thousands of opossum are in normal times shipped annually from Sydney and Melbourne to all parts of the world, especially Europe and the U.S.A. New Zealand also produces opossum and rabbit fur.

EXAMINING AND SKINNING MUSK RATS
Photo by courtesy of the Canadian Government



HANGING MUSK-RAT SKINS UP TO DRY ON WIRE FRAMES
Photo by courtesy of the Canadian Government

From Argentina, Peru, and Chile come the delicate grey fur known as chinchilla, the fur of the beaver rat (nutria), and the South American otter.

Because of the great demand for furs there are a number of fur farms, where animals such as the fox are raised for their fur. There were 9179 fur farms in Canada in 1937. From Prince Edward Island, the home of the industry, thousands of live foxes are exported to all parts of the world. Both the U.S.A. and Canada raise fox, mink, marten, racoon, musk rat, beaver, and other fur-bearing animals. Germany, France, the U.S.S.R., Great Britain, China, also have fur farms.

It would be impossible to describe all the fur-bearing animals, because there are said to be about six hundred. Here are a few of the most popular.

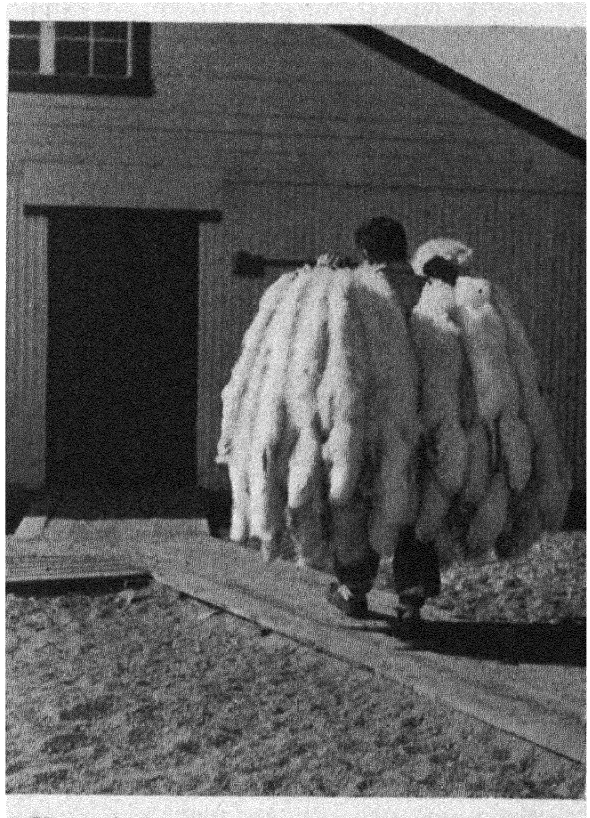
The **beaver** is the largest of the rodents. It is numerous in Canada and the U.S.A. as far south as Mexico. It is from one to three feet in length. The fur is a chestnut shade, and the under fur is grey. Its tail resembles a paddle.

Ermine is the most celebrated fur in the world. It is really the winter dress of the **stoat,** a kind of weasel. The stoat is brown in summer but pure white in winter, except for the tip of its tail, which is black in both summer and winter.

The American **martens** are very like the Russian sables. The fur of the sable is supposed to be the most beautiful in the world. The marten is often called the Canadian sable and is one of the chief prizes of the trapper. It lives in the forest and can climb trees.

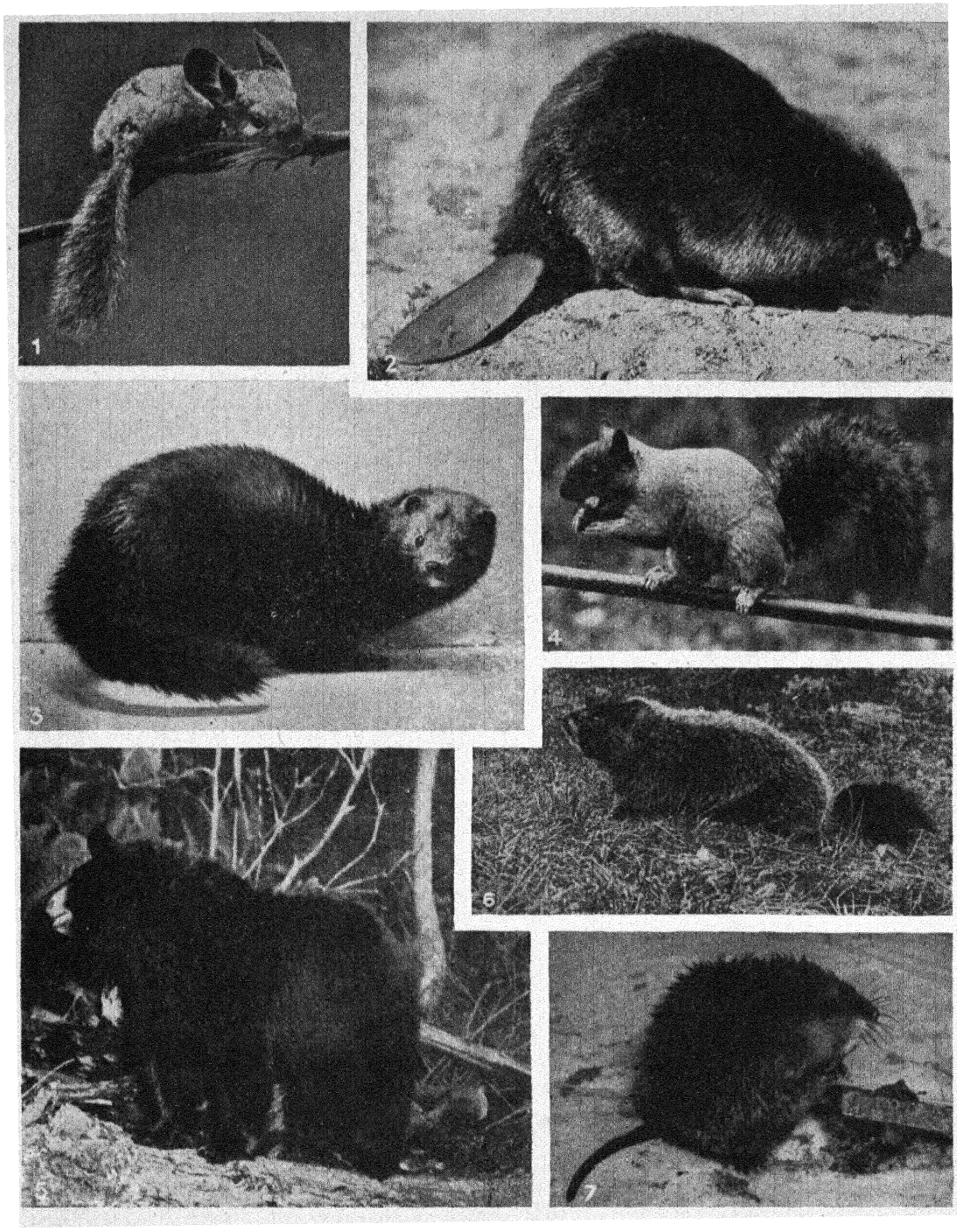
The **mink** belongs to the weasel tribe and is one of the chief fur-bearing animals of Canada. Its home is in the marshy regions. Although the **mole** is so small—about four to five inches—its skin is very useful. It is common in Great Britain, France, Germany, and throughout Europe. Although there are millions of moles in England, very few people have seen one alive, and you can guess why. Mole skins are to-day dyed all the colours of the rainbow so that the furrier can make them into beautiful and effective garments.

The **racoon** is a small member of the bear family. The coon so often mentioned in negro songs and stories is the racoon. Perhaps the rabbit is the most useful animal, because its fur can be made to imitate almost any fur you can mention. The rabbit in the fur trade is generally sold under his old name of coney; 'coney fur' sounds grander than 'rabbit fur'! In recent years the domestic cat has become of some importance in making fur garments.



HUDSON'S BAY MANAGER TAKES TWO BUNDLES OF WHITE FOX FURS TO THE WAREHOUSE

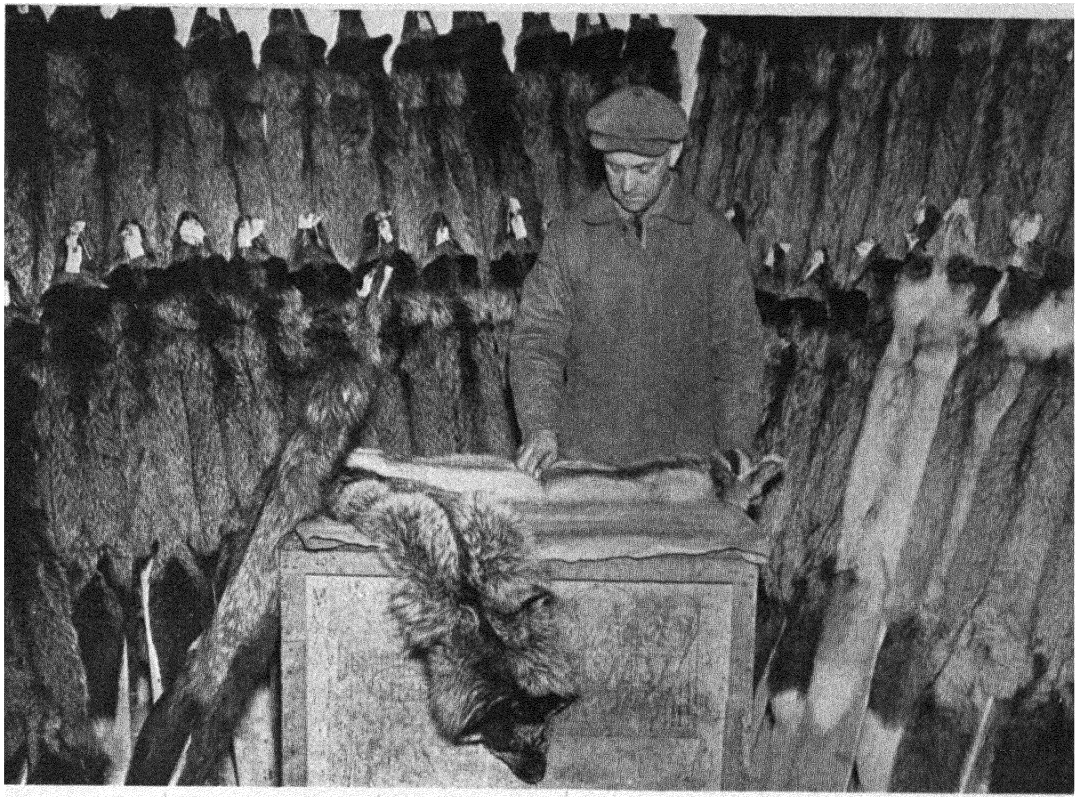
Photo by courtesy of the Hudson's Bay Company



ANIMALS WHICH PROVIDE US WITH FUR

(1) Chinchilla; (2) Beaver; (3) Mink; (4) Grey Squirrel; (5) Brown Bear; (6) Marmot; (7) Musk Rat.

Photos E.N.A. (2, 3, *and* 5), *Fox* (4), *and by courtesy of the Canadian Government* (7)



A Peltier combing out a Fox Fur
The furs shown in the picture are worth 2 500 dollars
Photo by courtesy of the Canadian Government

Things to Do

1. Make a list of fur-bearing animals. Find out all you can about each. A natural-history book will tell you many interesting facts. Look up the musk rat, or musquash, as it is one of the most important skins in the fur trade. Here are more animals: badger, fisher (a kind of marten), white hare, lynx, marmot, otter, skunk, wolf, kaolo, and wombat. Find pictures or make drawings.

2. The trees that grow in the cool forests are chiefly coniferous trees—the pine, the fir, and the larch. Find out all you can about these trees and make drawings.

3. Collect pictures of people who wear furs—the cave men of long ago, kings in ermine robes, Eskimos, Alaskans, Siberian hunters. It is interesting to cut out pictures of furs and people wearing furs from advertisements. Write the name of the fur and the place from which you think it comes under each picture.

4. Describe (*a*) fur-hunting in Canada, (*b*) fur-hunting in Siberia.

5. Tell about any furs used in your home, or furs you have seen in use around you or in shops. Notice the furs worn for ornament (a luxury) and the furs used to keep one warm.

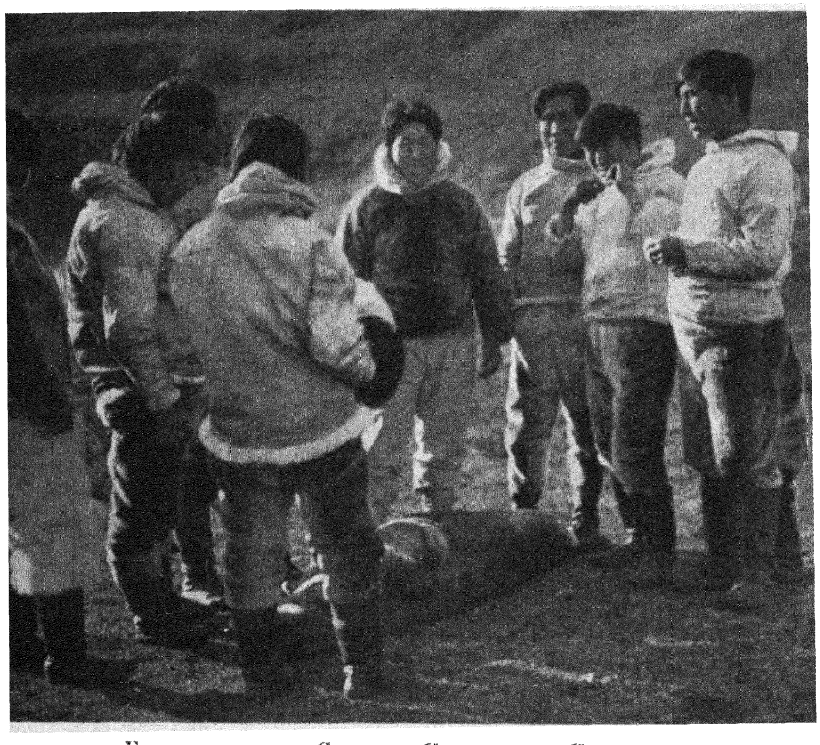
6. Find out more about the Hudson's Bay Company.

CHAPTER TWO

WOOL

THE first wool worn by man was on the skins of the wild sheep he killed for food. Woolly sheepskins made warm coverings as a protection against cold weather. In the picture opposite you can see how they are still used to-day by Hungarian shepherds far out on the plains. At night they sleep under these sheepskin cloaks.

We do not know when man first thought of cutting the wool off the sheep's back, twisting the short fibres into long strands or yarns, and weaving the strands into cloth. It must have been very, very long ago—long before the days of Christ. This discovery made sheep more important, because instead of having to kill animals to get their skins for clothing, men could cut off the wool every year and allow it to grow again. Nowadays sheep are kept in almost every part of the world both for wool and for meat. If you look around you will see how many people wear wool in one form or another—tunics, cardigans, jerseys, stockings, caps, bathing-costumes, dresses, coats, overcoats, underwear, and many other articles. It is interesting to notice that men wear more wool than women—men's suits, both for summer and winter, are generally made of wool.

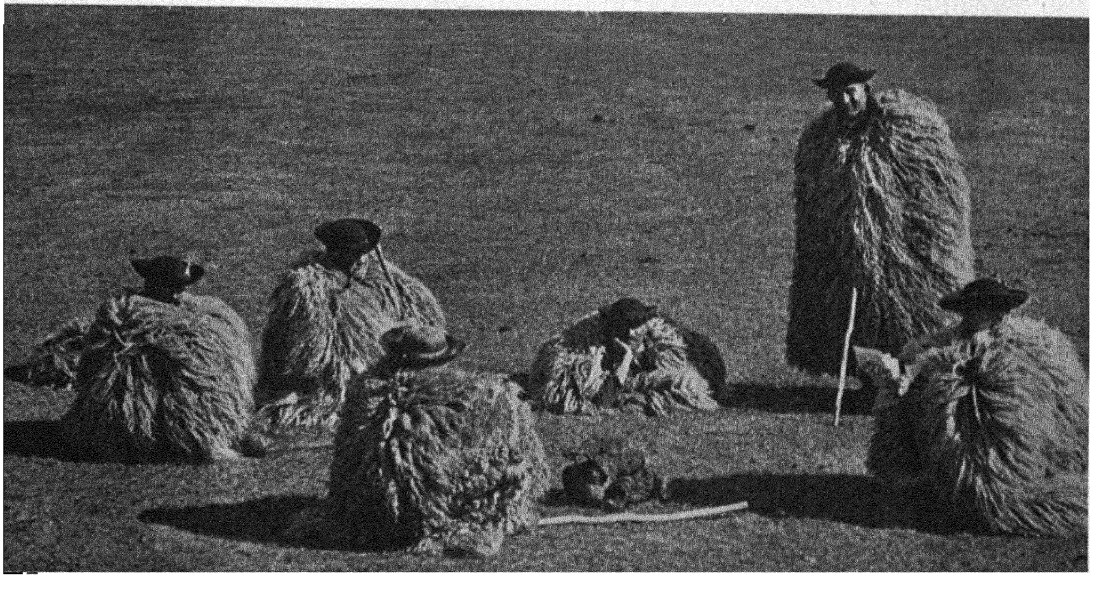


ESKIMOS IN THEIR SEALSKIN CLOTHING IN GREENLAND
Photo Paul Popper

In the twentieth century the use of **wool** began to spread to the Far East, where previously **cotton** and **silk** alone were used. To-day most Japanese wear some wool, and the children in particular wear school uniforms of wool instead of their traditional dress of cotton. In China, Korea, and Manchuria, where once only a very small number of wealthy people wore any wool, there is now a steadily growing demand for woollen clothing. But the great number of people still have to wear padded cotton garments in cold weather, because wool is expensive.

GREY BOMBAY LAMB COAT
Photo Keystone

ALASKAN SEAL COAT
Photo Keystone



HUNGARIAN SHEPHERDS, OR HORSE-HERDERS, IN SHEEPSKIN COATS
Photo E.N.A

ARAB SHEPHERDS WITH SOME OF THEIR LAMBS
Photo E C M.

One must not forget that wool is useful in warm and even tropical countries, as well as cold. Athletes and sportsmen, even in hot weather, almost always wear wool because it never feels damp or clammy. Wool has a wonderful power of absorbing moisture and keeping the skin dry. The Arab amidst the desert sands still wears a burnous (hooded cloak of wool) to protect him from the burning sun by day and from the rapid change of temperature to the cold of the desert night, just as he did long ago in Bible days.

But what is wool? You remember learning about the fur-bearing animals. Fur is the short, fine, soft hair of certain animals. It may be described as the down of the skin; this down is often kept clean by a longer, stiffer covering called hair. Horses and cows have no fur, only hair. Wool is the kind of hair found on sheep. It differs from other hair in being curly, crimpy, and soft; real hair is stiff and straight. If we look at wool under a microscope we shall see that each little fibre is covered with tiny scales rather like the tiles of a house. Because of these scales wool fibres cling together and can easily be twisted into long strands or yarn.

There are many varieties of sheep, and therefore many varieties of wool. Long, thick fibres can be twisted or spun into thick yarns, and fine fibres produce beautiful fine yarns or threads. Although there are many different kinds of sheep, there are three main groups.

Merino sheep are kept entirely for the sake of their wool, for the meat that they give is not very good. Merino wool is the finest wool for clothing. Merino sheep were famous in Spain long ago. The word 'merino' is a Spanish word (from the Latin word *major*, greater). You can see from the picture at p. 19 what a large woolly sheep the Merino is.

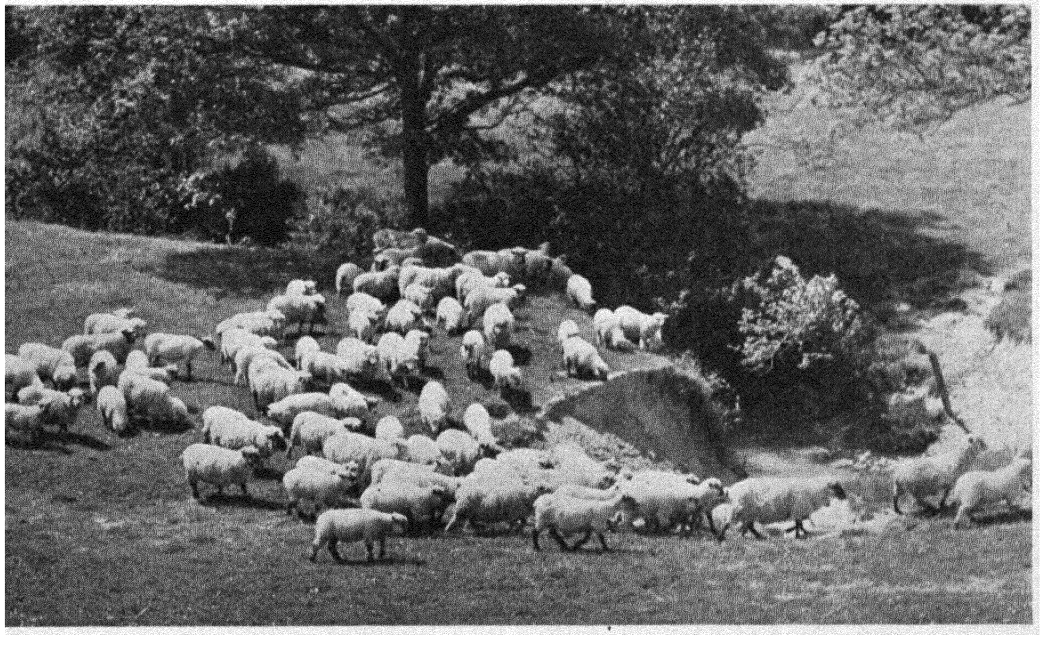
These sheep are natives of North Africa. As they come from a country that is warm and dry they will flourish in those parts of the world which are too hot and dry for other kinds of sheep. The climate and pastures of Australia and South Africa are exactly suited to Merino sheep, which like a low rainfall and bright, dry weather.

In the Middle Ages wool was the source of England's wealth and her chief export. The wool from some of her sheep to-day, called the **Original English Sheep,** is still the finest in the world. So English breeds of sheep have been introduced into many countries of the world. As well as good wool, these sheep produce good mutton.

The third variety is the **Cross-bred Sheep.** These have merino mothers, but their fathers belong to one of the English breeds. These sheep produce good mutton *and* good wool. As the climate of New Zealand resembles that of Britain more than Australia, New Zealand has most cross-bred sheep, which produce good wool as well as the famous Canterbury lamb. Australia has some cross-bred sheep, and the cross-bred sheep is the most popular in Argentina.

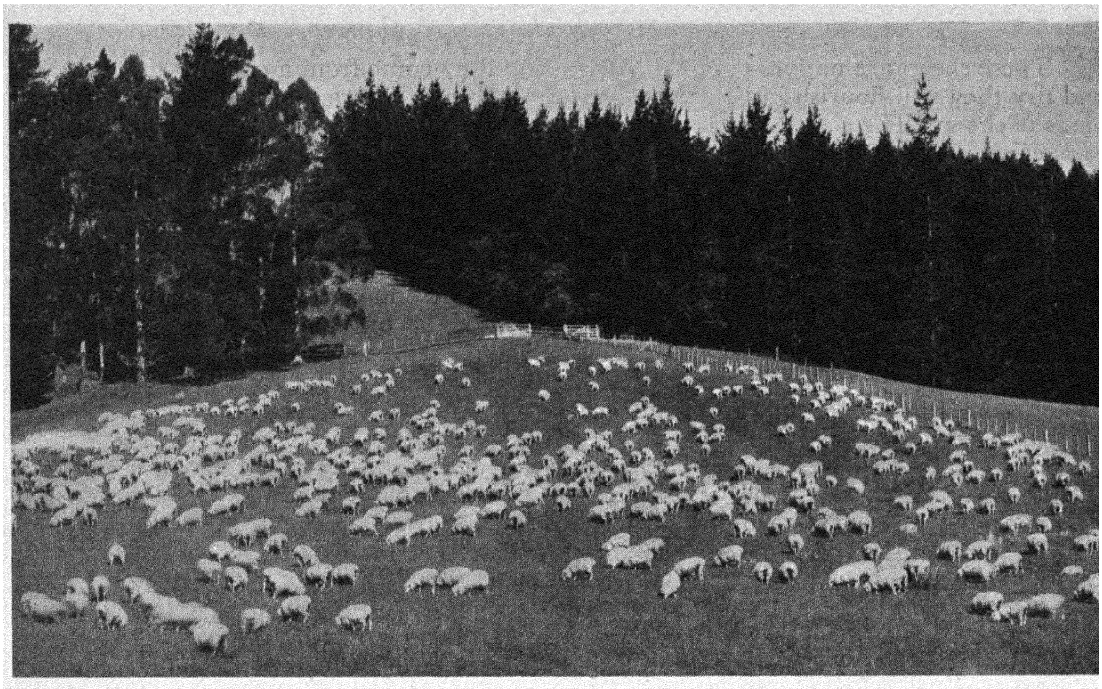
Although there are sheep as far north as Iceland, and sheep living on the Equator, producing not very good wool and hair, most of the sheep of the world are found in the temperate regions, the most important wool-growing countries being south of the Equator —Australia, South Africa, New Zealand, and South America. These countries produce far more wool than they need.

Australia has more sheep than any other country in the world, and produces over a quarter of the world's wool. Sheep-shearing, which takes place once every year, is therefore a time of great activity. On the big sheep stations of Australia sheep may have to be driven ten or twenty miles from outlying paddocks (huge fenced fields) to the shearing-sheds. A great shearing-shed is a wonderful place. Outside are large yards



A Peaceful Corner on a Farm in Surrey

Photo Keystone

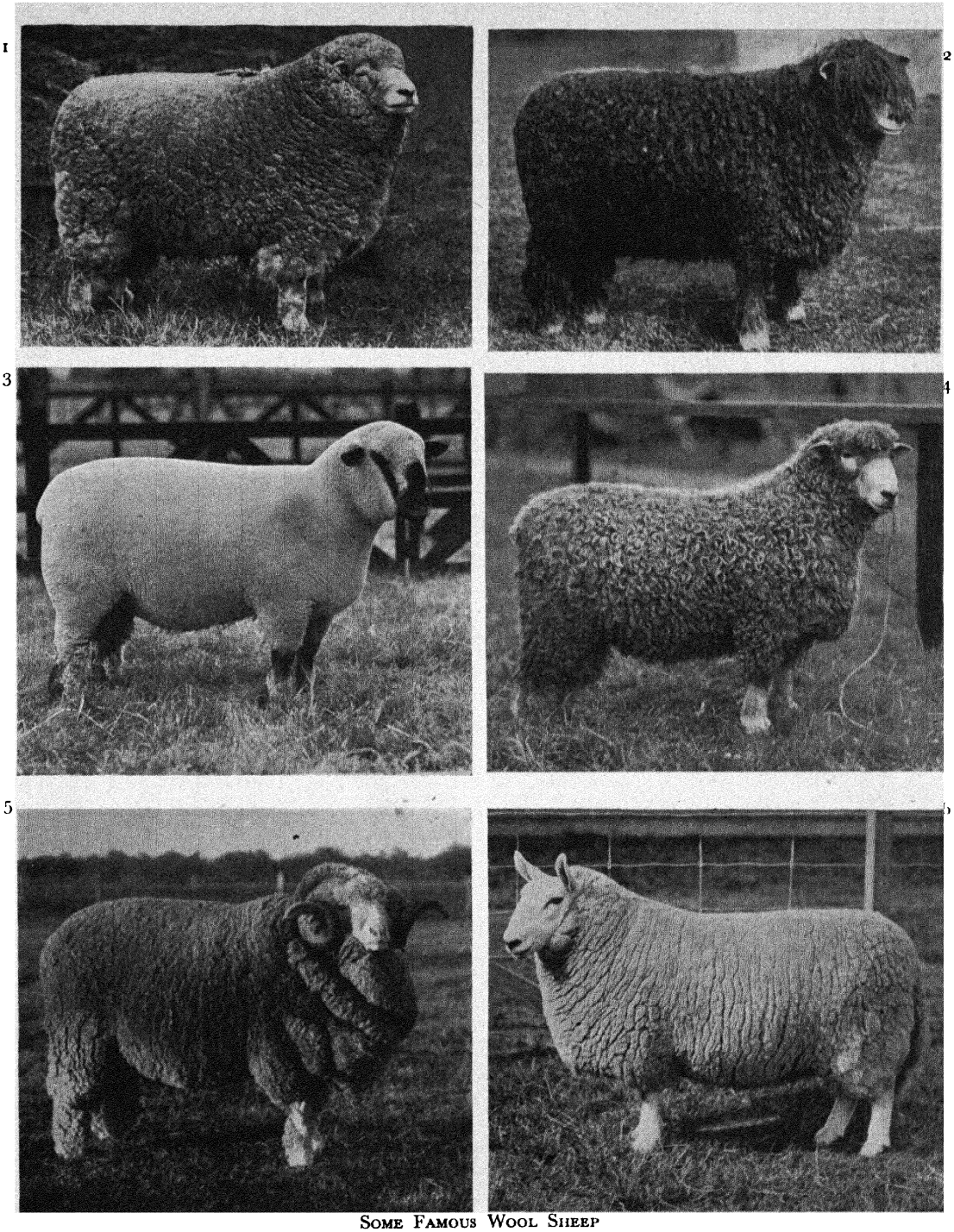


(*above*) A Pastoral Scene at Wairarapa, North Island, New Zealand

Photo by courtesy of the New Zealand Government

(*below*) Merino Sheep, Australia

Photo by courtesy of the Australian Government



SOME FAMOUS WOOL SHEEP

(1) Devon closewool shearing ram; (2) Lincoln longwool shearing ram; (3) Hampshire Down shearing ram; (4) South Devon shearing ram; (5) Merino ram; (6) Cheviot shearing ram.

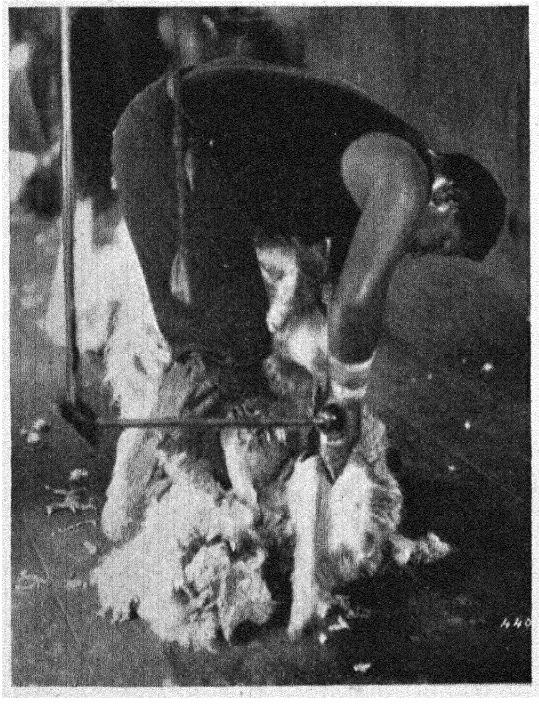
Photos "Farmer and Stockbreeder" (1, 2, 3, 4, and 6) and by courtesy of the Australian Government (5)

which will hold thousands of sheep, while hundreds and sometimes thousands have pens inside the shed, where they wait. Everything is kept very clean to avoid soiling the fleece. (The wool that is cut off each sheep is called its fleece.)

In the morning the shearers take their place on the shearing-boards, which run down the length of the shed. They may accommodate forty to fifty shearers. Above the shearing-board runs the shaft that drives the shearing machine. The power is electricity or steam, and it is conducted by tubes to which the little clippers for cutting the wool are fastened. As the shearer guides a clipper over the sheep's body two sets of knives fly back and forth at the rate of several thousand strokes a second, and cut off the wool smoothly and easily. In two and a half minutes the fleece is off and the sheep running down the chute to the open pen outside. A good shearer in one day often shears two hundred sheep. The wool from two hundred sheep weighs nearly one ton.

The fleece drops in one piece to the floor. The shearer does not touch it, but a boy called the picker-up runs forward, rolls the fleece neatly, and carries it to a long table called the skirting table. He throws the fleece on to the table so that it falls in a wide sheet. Other workers then remove any dirty pieces or ragged ends; this is called skirting. When this is done the skirted fleece is again rolled and taken to the classer, who grades the fleece. Great latticed bins stand behind him; into one or other of these the fleeces are thrown according to the fineness of the wool, length, colour, and so on.

When the bins are full the wool from each bin is placed in a great wool press, and from this it is forced by pressure into a sack of jute which, when packed, is sewn up to form a wool bale weighing three hundred pounds. Each bale is branded with the name of



SHEEP-SHEARING BY MACHINERY IN NEW ZEALAND AND BY HAND IN ENGLAND

Photo by courtesy of the New Zealand Government *Photo Sports and General*

AN AUSTRALIAN WOOL TEAM
Photo by courtesy of the Australian Government

the wool station, the type of wool, and whether from ewes, rams, or lambs. The bales are transported from the sheep station by horse or bullock team, motor truck, or railway to one of the selling centres on or near the coast—Brisbane, Sydney, Newcastle, Albury, Melbourne, Geelong, Ballarat, Hobart, Launceston, Adelaide, Perth.

Here they are stored in great buildings called wool stores, and here buyers inspect samples of the wool. The wool is sold at public auctions, and buyers attend from all parts of the world. The Sydney Wool Sale is the largest in the world. Here in one season one million bales of wool are sold. The United Kingdom buys some of the wool, and in normal times Japan, Belgium, France, the U.S.A., Germany, Italy, Poland, and the Netherlands.

In South Africa there are not so many huge flocks of sheep as in Australia, but some 35,000,000 sheep graze on the sunburnt rolling veld. Here the shearing is done by native 'boys,' or Kaffirs, who usually shear with hand shears like grass clippers. They work, therefore, more slowly than the shearers in Australia, seldom doing more than thirty to forty sheep a day.

Green and beautiful New Zealand, with its snow-clad mountains and rich pastures, has thirty-two million sheep. Here shearing is carried on as in Australia, but the average flocks of sheep are smaller. Wool sales take place at Auckland, Napier, Wellington, Christchurch, Wanganui, Timaru, Dunedin, and Invercargill.

Although Canada is larger than Australia, it has fewer sheep because the winters are

severe, and the sheep must be kept indoors and fed for several months on food which is specially grown for them or bought at a high cost. In South Africa and Australia the sheep are kept out of doors all the year round and feed on natural grasses, so their food costs nothing.

South America has almost as many sheep as Australia. Most of the sheep are in Argentina, the greatest number being cross-bred sheep, producing mutton and wool. Good wool comes from Uruguay and Peru, and Brazil also has a number of Merino sheep.

The United States produces a good deal of wool, and Europe has many sheep, but European sheep do not produce nearly as much wool as Australian sheep. One Australian sheep produces on the average nine pounds of wool, while a European sheep produces only three or four pounds of wool. Asia is not a great wool-producing continent, British India, China, and Persia (Iran) being the most important countries from the wool standpoint. China is said to have twenty-six million sheep, but most of the wool from Iran, India, China, and Mongolia is coarse wool (mixed with hair), and used for carpets.

Things to Do

1. At the Sydney Wool Sale 1,000,000 bales of wool are sold. If each bale weighs 300 pounds how many pounds of wool are sold? If the wool from 200 sheep weighs nearly one ton what does the wool from one sheep weigh?

2. A shearer in Australia is paid 35s. per hundred sheep. A good shearer often earns £14 or £15 a week. How many sheep does he shear a week? If a shearer can shear a sheep in two and a half minutes, how many can he shear in four hours?

3. Name any garments you are wearing to-day made of wool. Collect pictures or make drawings of woollen garments of all kinds. See how many you can find. Collect pictures of people wearing woollen garments in different lands.

4. The story of Jason and the Golden Fleece shows how the Greeks valued wool for the finest clothing. Read this story and some of the Bible stories about sheep and shepherds.

5. Why is it cheaper to keep sheep in Australia and South Africa than in Canada?

6. When you are in the country find out the names of some of the flocks of sheep in the district. Perhaps you may see the Southdown sheep, which produces very fine British wool. The Cheviots are a well-known north-country breed. Ask the farmer about his sheep.

7. Name the countries where there are (1) Merino sheep, (2) cross-bred sheep, (3) English breeds.

CHAPTER THREE

OTHER ANIMALS THAT GIVE US WOOL AND HAIR

We are now going to consider animals that give us hair for clothing. Hair and wool are very much alike, but, as as been mentioned before, wool is generally *curly* and soft, and hair is stiffer and straight. Some hair, however, is beautifully fine and silky. The dividing line between wool and hair is indistinct.

To find the animals that give fine silky hair or 'wool' we shall have to visit many interesting parts of the world and meet many strange creatures.

Goats thrive in the dry and almost desert parts of the world. As well as eating grass, goats are fond of twigs and the tender bark of trees. There are many goats in southern Europe, in northern Africa, in Syria, on the highlands of western Asia, and in most mountainous countries. The goat that gives the best hair is the **Angora goat,** whose home is the rocky, mountainous country of Angora, in Turkey. The hair of the Angora goat is known as **mohair,** and it is longer, silkier, and finer than the hair from other goats. It is usually white, and hangs down in long curls.

Once this goat was found only in Asia Minor (Turkey), but its hair is so valuable that it is now reared in many other countries, including South Africa, Australia, and North America. Angora goats were taken to the United States about the middle of the nineteenth century, and some 1,750,000 are found in New Mexico, Arizona, Texas, California, and Oregon.

For more than three centuries mohair has been imported into Great Britain from Turkey, but in recent years the imports from South Africa have been increasing. There are now 5,000,000 Angoras in Cape Province. Turkish mohair, however, is still the most valued.

Once mohair was very popular for ladies' dresses and cloaks, because of its fine lustre. Since dust falls off it so quickly, it is particularly useful for motoring. Rayon or artificial silk is now taking the place of mohair. But mohair is much used for linings, and for plushes, velvets, imitation furs, and astrakhans.

Cashmere is the most beautiful of the rarer wools. A cashmere shawl is as soft as the finest down; and the wool is so difficult to get that the shawls sell for very high prices. Cashmere wool is the short, fine hair which comes from the under-coat of the cashmere goat, which lives not so much in Kashmir as in the central highlands of Asia, from China to Bokhara. It is sometimes called the Tibetan goat. The cashmere goat has long hair, but close to the skin grow the soft, woolly, down-like fibres which have to be separated from the coarser hairs. It is said that these fibres are so small that one animal will yield not more than two or three ounces, and so fine that it takes ten goats to make one small shawl! White cashmere is very valuable, and even before the First World War one pound of wool was worth one pound of money!

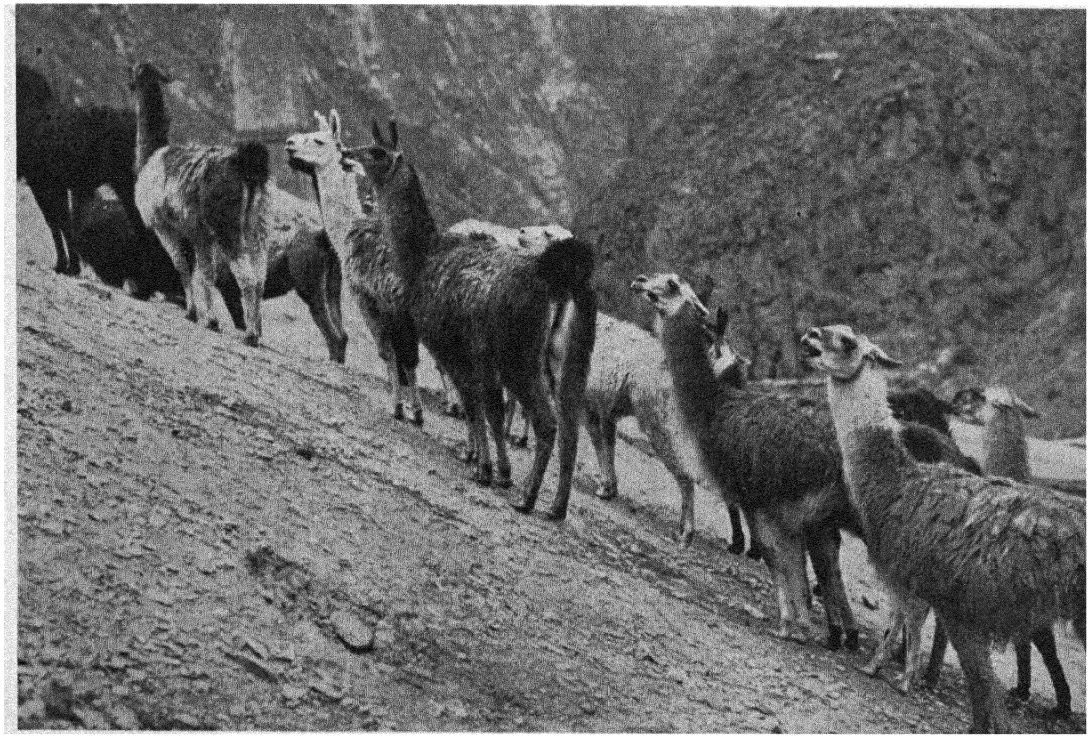
Cashmere wool, as you can see, is a luxury fibre. It forms the fleecy lining of expensive dressing-gowns, and is also used for lining gloves for winter use. The wool comes to Europe from China, where it is collected at Tientsin.

Real cashmere shawls are made by native women, who spin the wool, colour the threads, and weave them by hand. The work is so slow that it is said that it takes nearly a year to make one fine shawl. A large percentage of the cloth, vests, jumpers, and cardigans called cashmere are only clever imitations of real cashmere.

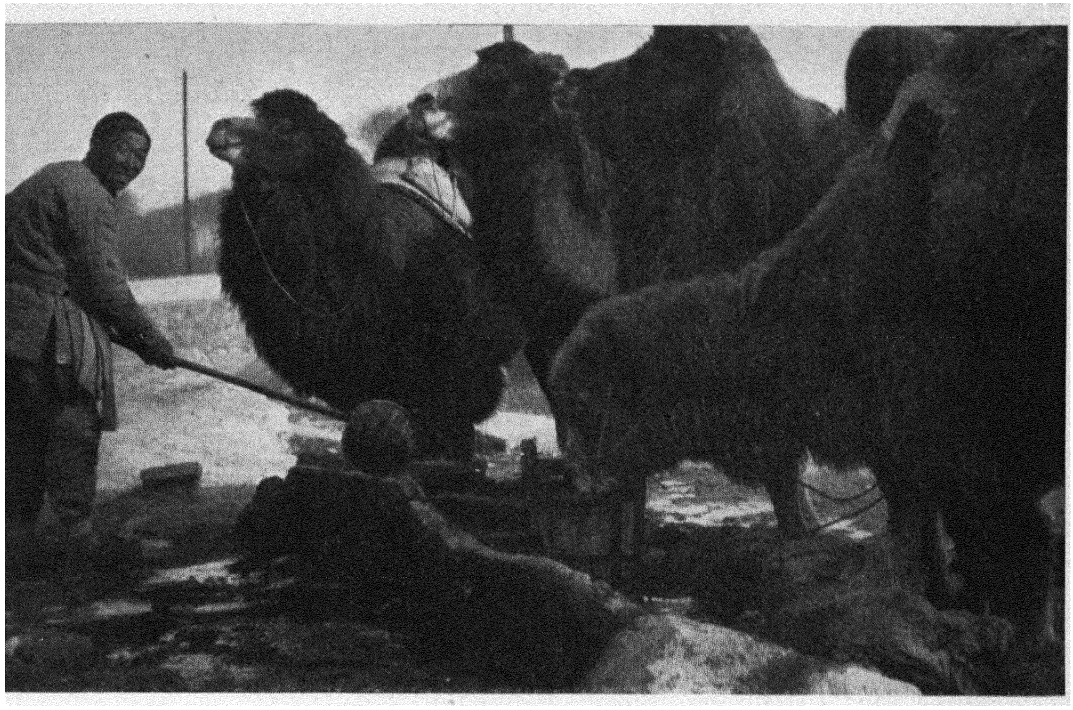
Alpacas and llamas are rather like small camels, and they might be called the pygmies of the camel family. They are not found in either Asia or Africa. We must look for them on the highlands of South America, where they are reared only on the lofty plateaux of the Andes. Great flocks of them can be seen in Peru and Bolivia, where it is so high and cold that the mountain-tops are covered with snow all the year round.

The llama is much the larger animal, and its hair is the coarser. It is used as a beast of burden, and its hair provides clothing for the Indians of Peru and Bolivia. Indian women spin this hair, or 'wool,' as they watch their flocks, and on hand-looms in their huts of stone they weave it into blankets and cloth. The llama has a head like a camel, a body like a sheep, and feet and legs like those of a deer. When surprised it pricks up its ears like a Skye terrier. It is an independent, inquisitive little beast, and will lie and sulk if at all overloaded. When beaten or ill-treated it will spit. The Bolivian Indians value their llamas. They are very useful beasts because they can climb up and down the steep mountain-sides easily, and are very sure-footed.

The Indians herd the alpacas in flocks, like sheep. They keep these animals for their meat and their thick growth of fine hair. The hair is black, brown, fawn, grey, and white. It is shorn every year and carried on the backs of llamas to merchants in the towns, who buy it and send it to Europe and North America. Alpaca is as smooth and bright as mohair and as soft as wool. It is used for dress goods, especially black goods.



LLAMAS IN THE HIGHLANDS OF PERU
This photo was taken at a height of 12,000 feet.
Photo E N.A.



BACTRIAN CAMELS
Photo Paul Popper

Bolivian Indians dress in garments made from the wool of the llama or alpaca. All the Indian boys and men have ponchos with brightly coloured stripes. The poncho is a narrow woollen blanket with a slit in the middle for the head to go through. These blankets protect them from the cold winds and the rain. The women weave the cloth for the poncho. Under his poncho the man wears a woollen jacket. His trousers and his hat are of wool too. Often he wears a close-fitting woollen cap under his hat, with flaps on each side to keep his ears warm. No matter whether you visit him in winter or summer you will always find him dressed like this.

Besides llamas and alpacas the South American Indians of the Andes keep some sheep. All the wool for their clothing comes from the alpacas, the llamas, and the sheep. At night they sleep under a llama skin with the wool left on, and are covered with woollen blankets.

Another animal, called the **vicuna,** belongs to the llama family, and is hunted for its wool and flesh. From the point of view of commerce its wool is of little importance, but it has given its name to a fabric made of a woollen and cotton mixture. The wool of the llama, alpaca, and vicuna is shipped principally from Peru.

Camels are kept in large numbers in the deserts of Arabia and the Sahara, in Egypt and the Sudan, in Persia, and in northern India. The hair of these camels is scanty and weak, and is used principally by the Arabs for making tents and wearing apparel, especially cloaks. The best camel wool and the camel wool of commerce come from the Bactrian, or two-humped, camel of the deserts of Asia. On the highlands of Asia, in Turkestan, in parts of northern China, and in Mongolia beyond the Great Wall live these huge

A Flock of Alpacas, with one White Llama in the Centre, searching for Water on the Plateau between Lake Titicaca and Cuzco, 15,000 feet above the Sea, Peru
Photo E.N.A.

A Group of Vicuna in the Andes
Photo E.N.A.

A Thirteen-month-old Angora Goat which has won Prizes worth £3000 at Shows in Most of the Southern States of America
Photo E.N.A.

two-humped camels, with their heavy fleeces of thick, soft wool. It is cold in the highlands, and these animals grow their wool in the winter. In the summer it becomes loose, and can be pulled off. It is then gathered up and used to make cloth, tent covers and other materials.

Great Britain buys all the camel-hair she needs for manufacture from the extreme ends of the desert area of Asia, U.S.S.R., and China. One must remember that it is not from the countries most associated in our minds with the camel—the Sahara, Arabia, and Persia—but from countries farther north that we get the most and the best camel hair. It is the colder climate that makes the camel hair thicker.

Part of the fibres is stiff and bristly, and part soft and downy. The former becomes the outer coat and the latter the under coat of the animal. The finest camel's hair comes from Western China, and is known as Sikau. It is collected from the far interior at Tientsin, where it is bought and graded. Other places where this material is produced are Central Asia, Turkestan, Tibet, and Egypt.

Camels' hair is used for special underwear, luxury pullovers, dressing-gowns, overcoats, and for making knitted garments. Besides clothing, it is also used for rugs and water-colour brushes. The dromedary (from Greek *dromos*, race) is a light, fleet camel, generally an Arabian or one-humped camel bred for riding. Camels used as beasts of burden are more clumsy-looking.

Another hair-bearing animal whose hair is suitable for clothing is the **yak,** which lives far above the rest of the world on the highlands of Tibet. Like the llama in South

A Native with His Yak, in Tibet
The man's clothing is made of yak hair.
Photo F N A.

America, it is a bearer of burdens, as well as a producer of fibres suitable for clothing. The llama, however, belongs to the camel family, while the yak is a kind of ox, but not like any ox we find in the lowlands.

It is about as big as an ordinary ox, and it has short, wide-spreading horns. It does not low or bellow, as our cattle do, but rather grunts like a pig. The body of the yak is covered all over with a thick coat of silky hair which hangs down something like the fleece of a sheep. It has great bunches of long wool on the forehead, and soft fur on the shoulders and hump. The people of Tibet weave the soft hair or wool into a fine, strong cloth; the stiffer hair makes ropes and material for tents.

Things to Do

1. Make as complete a collection of pictures as you can, or make drawings of all the animals that give fibres, either wool or hair, suitable for being spun and woven into cloth. Write some interesting notes about them. A natural-history book will help.

2. Find out more about the dress and homes of people who live in mountainous lands: (*a*) the Indians of Bolivia; (*b*) the people of Tibet.

3. Look at catalogues of clothing for men and women for the mention of any of the animals you have just read about. You may find jumpers and cardigans labelled 'pure Angora' and 'pure cashmere,' 'men's cashmere vests,' etc.

4. Find some of the reasons why the dress of people in different parts of the world varies.

CHAPTER FOUR

WOOLLEN YARN AND CLOTH

You remember we left the wool packed up in great bales ready to be sent off to the manufacturing countries—that is, countries that have factories or mills for changing the raw wool into yarn and cloth. There are many manufacturing countries, and their number is always increasing, but the two countries that are still the largest woollen manufacturers in the world are Great Britain and the United States. Both countries have cold winters, so that they need woollen clothing, and both of them are able to export large quantities to other countries. Some even goes to tropical lands, where at night woollen stuff is often worn next to the skin to prevent chills.

The two processes carried on in woollen factories are **spinning** —making woollen yarn or thread—and **weaving**—making woollen cloth. In primitive countries these processes are still done by hand, just as they were long years ago. But to return to the factories. When the wool arrives it is first **scoured,** or washed, to remove the grease and dirt. Nature covers every hair with a thin film of grease, to prevent it from matting. After the grease has been taken out it weighs only half what it did before, so you can see there is a good deal of grease, or **lanoline,** as it is called, in wool. However, this grease is useful for making soap and other things.

After washing the wool is very matted, so the next step is to pull the matted fibres apart to form a loose, fluffy mass. This **carding** used to be done by hand, with two flat pieces of wood fitted with fine steel teeth. Now it is done by machinery, the wool being passed over a series of big rollers fitted with a great number of very fine teeth. On leaving the carding-machine the wool is in the form of a thin, fleecy film of fibres several feet in width. This thin film holds together because of the fine scales on the fibres. Another machine, called the condenser, divides this broad film of wool into a number of narrow strips called ribbons or rovings.

Next comes spinning. Two kinds of yarn are spun: woollen yarns and worsted yarns. Spinning, whether of woollen or worsted yarns, consists of (*a*) drawing out the rovings to about the thickness of the yarn to be spun, (*b*) the **twisting** process, to give the necessary strength and fineness to the yarn.

Woollen yarn is spun from wool just as it comes off the card, with the fibres varying in length and lying criss-cross. This yarn is therefore 'hairy' and soft, not smooth and firm. Worsted yarn is not 'woolly' or 'hairy' but firmer, smoother, and finer, because the wool after leaving the carding-machine passes through another machine, called the comb, which combs away the short fibres and straightens the long fibres so that they lie parallel to one another.

The woollen yarns are woven into such things as woollens, tweeds, and blankets, and the worsted yarns into fine cloth for men's suiting, and dress materials such as serge, cashmere, crepe, and delaine.

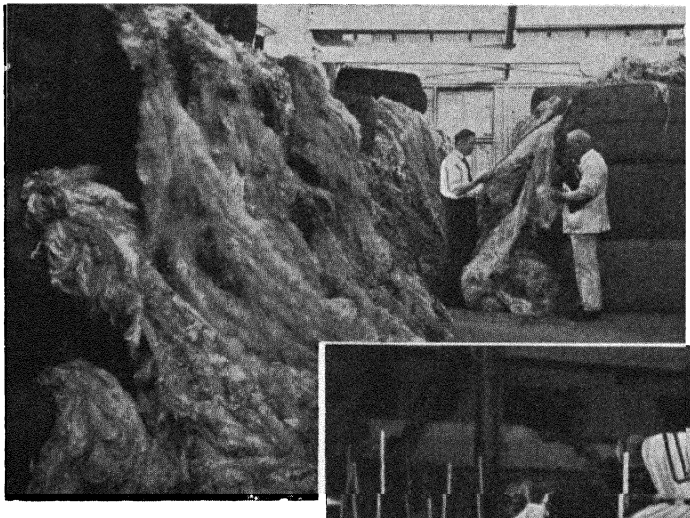
Weaving is done on large looms across which sets of threads, called the warp, are arranged in parallel lines. The warp threads pass through a series of eyes so that they can be raised or lowered alternately to allow the shuttle carrying the weft, or woof, threads to pass across, under, or over them. The shuttle is flicked to and fro mechanically. If you look at worsteds, like serge, you can often see the warp and weft threads going, one lot one way, the other lot at right angles. The finished cloth from the loom goes through

various processes, such as washing and pressing, according to the kind of cloth desired. It is interesting to collect the names of woollen clothes. Worsted is often made from Merino wool, and woollen materials, such as tweeds, from the wool of cross-bred sheep. Broadcloth used to be broader than other cloth: now it is the name given to fine double-width dressed cloth.

So many wool garments are worn that there is not enough to meet the demand, and therefore old knitted garments are torn up into fibres again and spun and woven into *shoddy*. Shoddy is warm and cheap, and very useful to those who are poor.

Now let us find the places in the **British Isles** where cloth is made. First comes the West Riding of Yorkshire, made famous by a number of wool towns. Here the woollen industry is a very old one, because of the sheep pastures on the Pennines, and the soft river water suitable for washing wool. When modern machinery was invented, in the eighteenth century, the Yorkshire coal mines were able to supply fuel, and great mills were built. The sheep on the Pennines no longer supply enough wool, so great quantities come from abroad. Bradford produces all types of fabric and is the chief centre of the worsted trade, and Leeds the chief centre of the woollen. Dewsbury and Batley specialize in the making of shoddy. Halifax specializes in hand-knitting yarns, Huddersfield in fine worsted cloth, and Wakefield in cloth and hand-knitting yarns. Saltaire specializes in alpaca. At first alpaca wool was difficult to work. A Yorkshire man, Sir Titus Salt, found out how to do it, and built the famous mills around which grew up the town of Saltaire, named partly after him and partly after the river on whose banks it stands.

In the West Country there are woollen mills at Stroud,



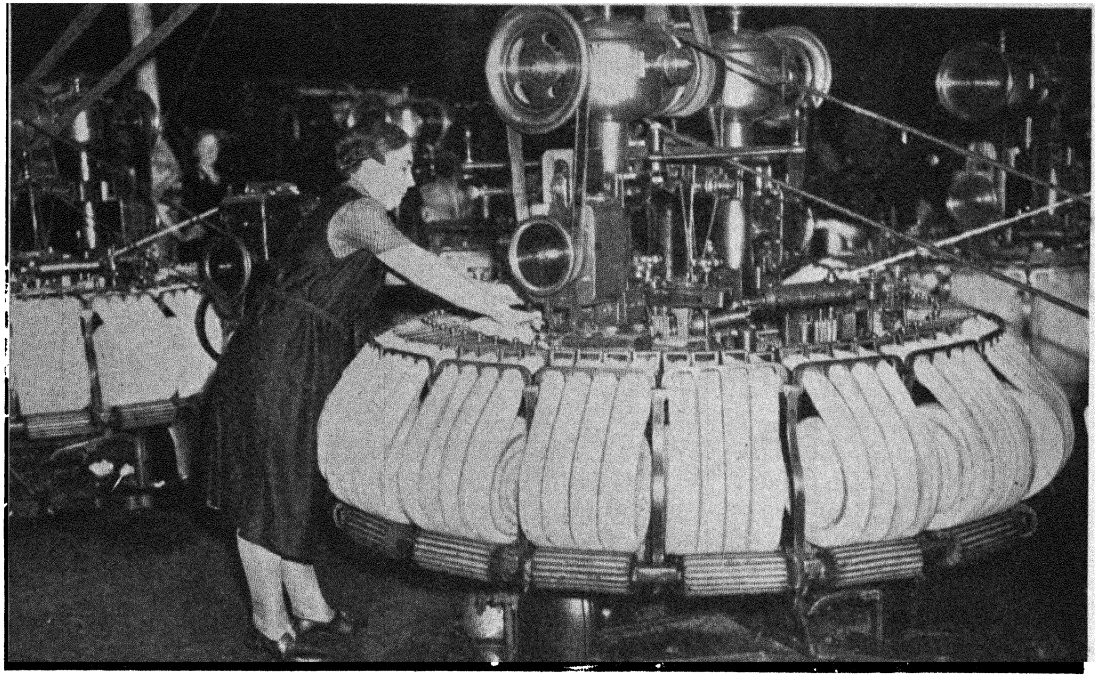
A Wool Store in New Zealand

Photo by courtesy of the New Zealand Government

Scene in a Worsted Spinning- and Weaving-mill

Backwashing, scouring carded slivers before combing.

Photo Sport and General



THE 'NOBLE COMB' SEPARATES LONG AND SHORT FIBRES BEFORE SPINNING
Photo Sport and General

Frome, and other places, reminding us that wool manufacture has gone on there for nearly a thousand years. It was of great importance in the West Country until coal became the source of power. We still get some of the finest overcoating from the West Country, and suit material, including broad cloth. In Scotland the tweeds of the Tweed Valley have been famous for hundreds of years, and fine worsteds are also made there. Then there are the hand-woven tweeds of the Highlands, and the Hebrides, and the Shetland wool and shawls. Wales is famous for her flannel. Ireland produces tweeds and special cloths.

In the **United States** the woollen-manufacturing towns are found everywhere east of the Mississippi. Sheep are reared on the mountain slopes of the West, and the wool is made into cloth in the East, where all the great towns are and most of the people live.

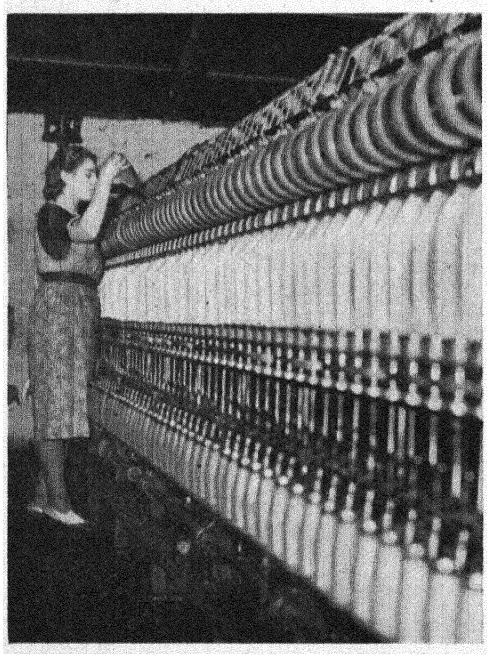
Philadelphia is one of the most important woollen towns. Other important woollen-manufacturing countries are Germany, France, and Poland.

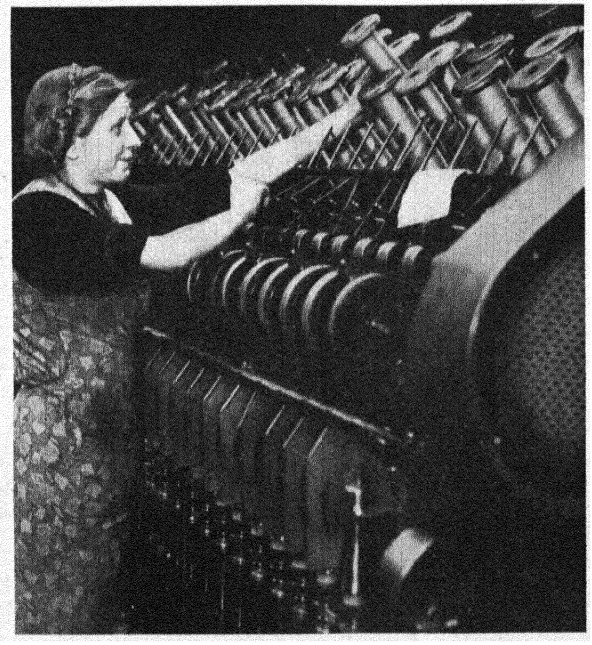
Long ago most people bought cloth and made their clothes at home. It was slow work, especially in the days when there were no sewing-machines, but the people who lived at home did not have to make their clothes at short notice. There were, however, even in the past, some people who were away from home for long periods. Sailors, for example, were absent for months, and when their ships did return to port they often only stayed a few days. They could not wait to have clothes made for them. This need on the part of sailors was one of the reasons why people began to make suits that had not been ordered. Such suits are called 'ready-made,' because we find them ready for us in the shops. In the United States it is said that the first shop for the manufacture of ready-made clothes was opened in New Bedford, Massachusetts, about 1825.

To-day most of the people of the world live in cities. Each person does some particular kind of work and has not time to make his own clothes. Even in the country men's suits are no longer made at home. Garments can be bought in shops more cheaply than they can be made at home. All manufacturing countries therefore have factories where clothing of all kinds is made.

In a clothing factory there are hundreds of workers, much machinery, and rolls of cloth from the mills. First the cloth is cleaned, shrunk, steamed, and pressed. Suits and dresses differ in appearance. That is, there are different styles. Each clothing factory has an expert to design clothes. If his designs for the year are accepted by his firm a pattern is made. In the cutter's room the cloth is cut out to this pattern. Most of the cutting is done by machinery, the cutter marking out the pattern and guiding the machine. Some cutting is done by hand—collars, cuffs, etc. The garments, too, are sewed mainly by machinery. Women's styles are often fixed by designers in Paris, and the suits for men made by London's West End tailors are worn by the well-off of almost every civilized land.

In the United States New York City is the centre of the clothing industry, but Chicago, Philadelphia, and Cleveland are also important for this industry. In Britain, London, Leeds, Manchester, and Leicester are famous. Of course, ready-made clothes are not only made from wool fibres, but from other fibres that you will learn about later. One must not forget that in some parts of the world there are no factories, and spinning, weaving, and the making of clothes are done at home.

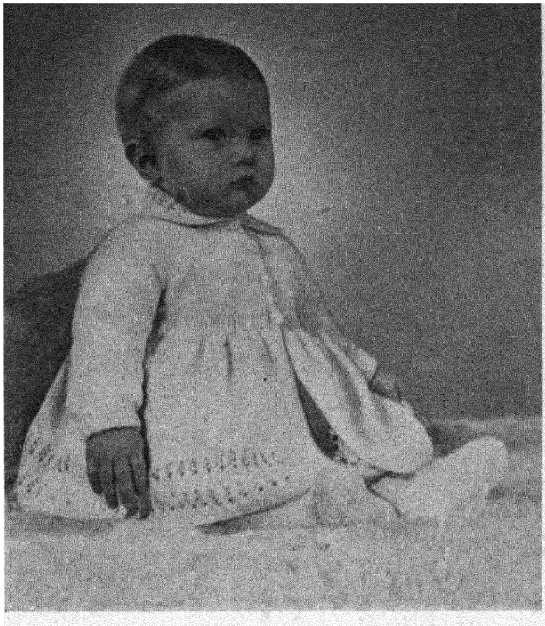


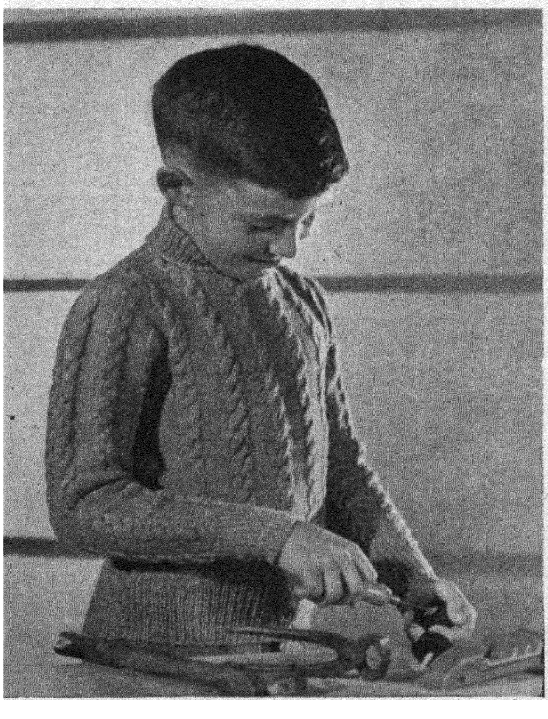


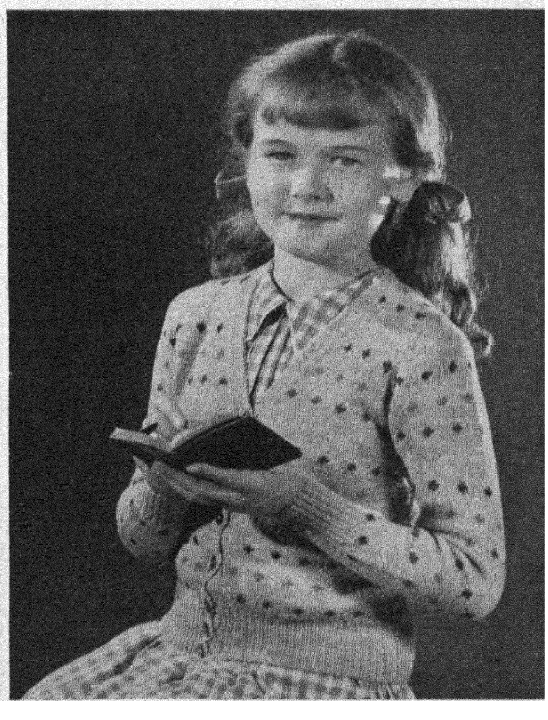
SPINNERS AT WORK

Whirling spindles in their thousands, producing yarns of every variety.

Photos Sport and General

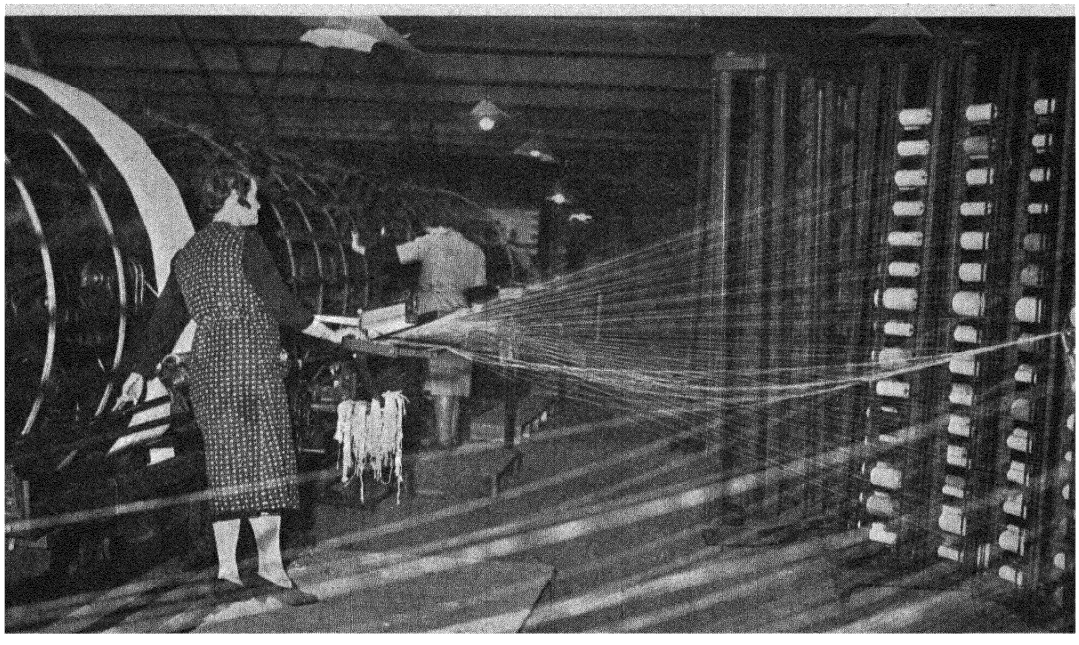






CHILDREN WEARING VARIOUS WOOLLEN GARMENTS

Photos by courtesy of Messrs Paton and Baldwin, Ltd, Halifax



WINDING A WARP

The yarns which form the warp and through which the welt is thrown on the loom have to be wound on to a beam which is placed in the loom

Photo Sports and General

WEAVING FLANNEL AT THE GELLY FLANNEL MILLS, PEMBROKE

Fox Photos

Things to Do

1. Unravel a piece of wool so that you can see the separate fibres. Make a collection of different kinds of materials made from wool. Mount small pieces in a book and write in the names, and anything else you know. You are sure to be able to get a piece of serge.

2. Look at the pictures carefully and write interesting paragraphs about each. Find out all you can about spinning and weaving long ago or in primitive countries to-day.

3. With the help of a dictionary and what you have learnt write notes about: broadcloth, worsted (called from the town Worstead, in Norfolk, once famous for the wool industry), flannel, tweed (Harris tweed, so called from Harris in the Outer Hebrides).

4. Explain the difference between worsteds and woollens.

5. Why did the woollen industry shift from the West Country to Yorkshire?

6. Look at a map of Britain for these famous woollen towns: *Bradford*, the metropolis of the worsted and woollen manufacture, whose largest factory, the Lister Mills (1871), is a great landmark for miles around and more imposing than any castle or palace; *Leeds*, a great textile city, which also uses the finished cloth in its huge clothing business; *Halifax*, the great carpet centre, more interested in worsted than in wools; and *Dewsbury*, which makes 'shoddy.'

7. It takes seven pounds of greasy wool, or three and a half pounds of clean wool, to make one suit of clothes. How many suits of clothes can be made from the usual wool bales holding three hundred pounds? How much clean wool does a manufacturer get from a bale of wool?

8. Make a list of all the places in Great Britain where woollen goods are made.

CHAPTER FIVE

COTTON

We have learnt about an *animal* fibre, wool, that helps to clothe the world; now we come to a *vegetable* fibre—cotton. The commonest material for clothing for the whole world is **cotton.** More people are clad in cotton than in wool, silk, furs, skins, or anything else. It is said that four times as much raw cotton is produced as wool. A great many people in the East dress in cotton—in Japan, China, and Manchukuo, for example. Among the natives and village folks of Africa and India cotton is widely used for their simple garments.

Every one has seen the seeds of the dandelion, with their hairs so light that they float away in the sun. The cotton plant has black seeds about as big as lemon pips and *completely* covered with beautiful white hairs or fibres, varying in length from about half an inch to over two inches. They are enclosed in round pods called bolls, almost as big as eggs. When the pod is ripe it bursts open, showing the white fluffy cotton, or lint, in which the seeds are hidden. If left to itself the lint would be blown away by the wind, carrying the seeds with it over the countryside. The cotton fibres are so soft and downy that they are often called cotton wool as well as lint.

Cotton bushes grow from two to three feet high, and are planted every spring. Their pretty flowers are large and very much like pink, yellow, or white hollyhock blossoms. When the petals drop the pods begin to form. A cotton field is a lovely sight both when in flower and when the bursting pods seem to blossom into the softest of snowballs.

Most of the cotton in the world is grown in the tropical and warm temperate lands. Nearly half of the total produced comes from the southern states of the United States.

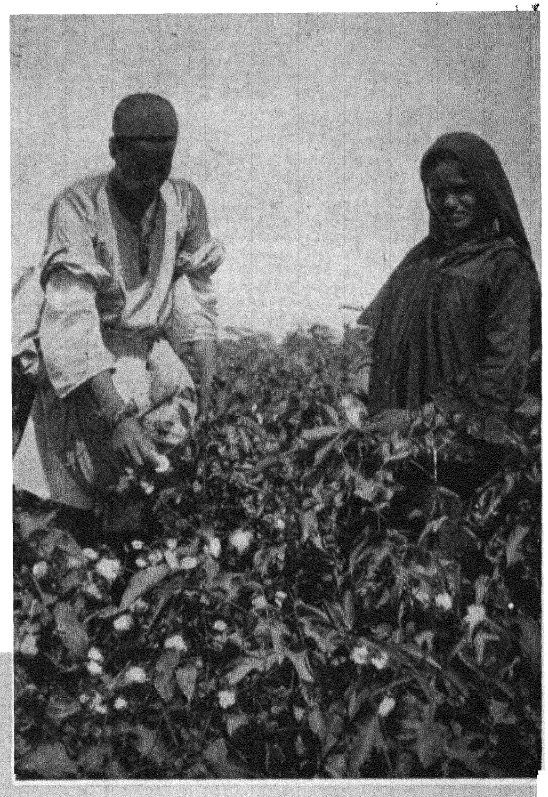
Cotton Plant

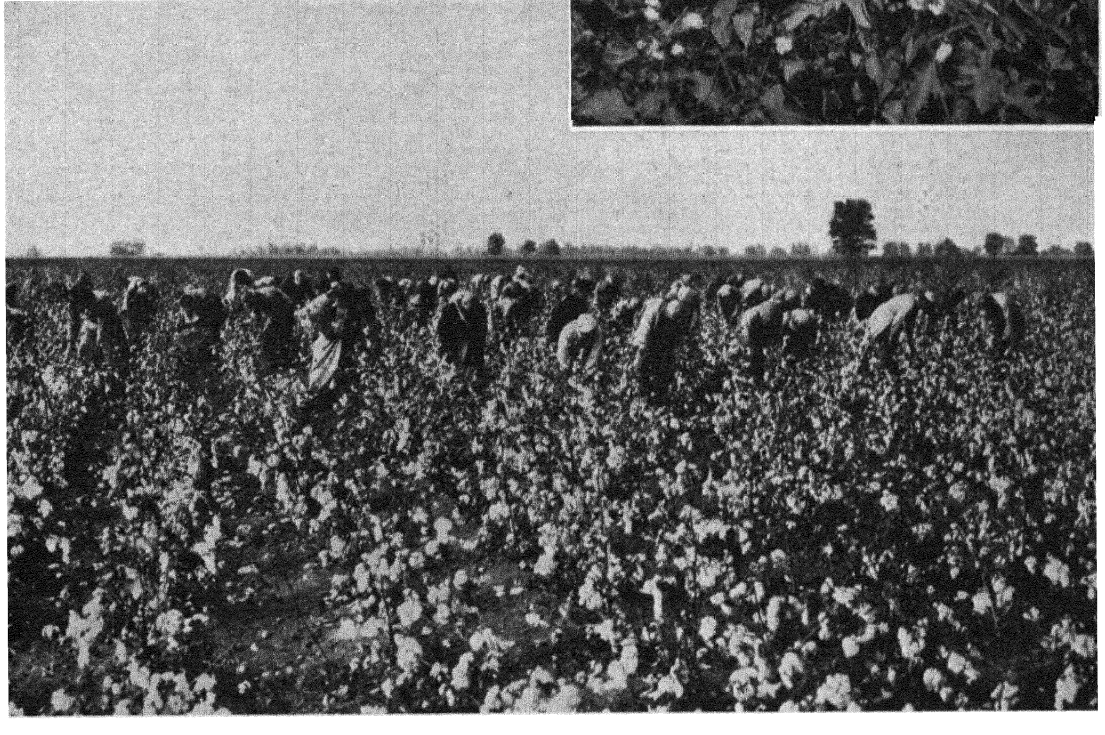
in the valleys of the Si-kiang and the Yangtze; but China exports very little cotton, so it is difficult to get accurate figures. The next biggest producers of cotton are the U.S.S.R., India, and Egypt. Cotton grows in other places in Africa besides Egypt, especially in Nigeria and British East Africa. In South America cotton is grown principally in Brazil and Peru. Other places that grow cotton are the West Indies, Mexico, Japan, the East Indies, and Queensland and New South Wales, in Australia.

There are many different kinds of cotton. The best cotton of all is called Sea Island

cotton, because it is grown on small islands off the coast of Georgia, one of the United States, and in some of the small West Indian islands. But the most cotton grown is Upland, or American, cotton.

Now let us visit a cotton-field in the United States at harvest time. It is a huge field full of green bushes covered with fluffy white cotton, so that it looks as though there had been a snowstorm. Up and down the rows are busy workers—men, women, and children, pulling the fluffy masses from the pods and putting them into baskets. The picking has to be done carefully to avoid bits of stems and leaves getting mixed with the cotton, and none of the little hairs must be left behind and wasted. The workers are negroes dressed in gay cotton garments, who sing and chatter as they work. In some places machinery is used to pick



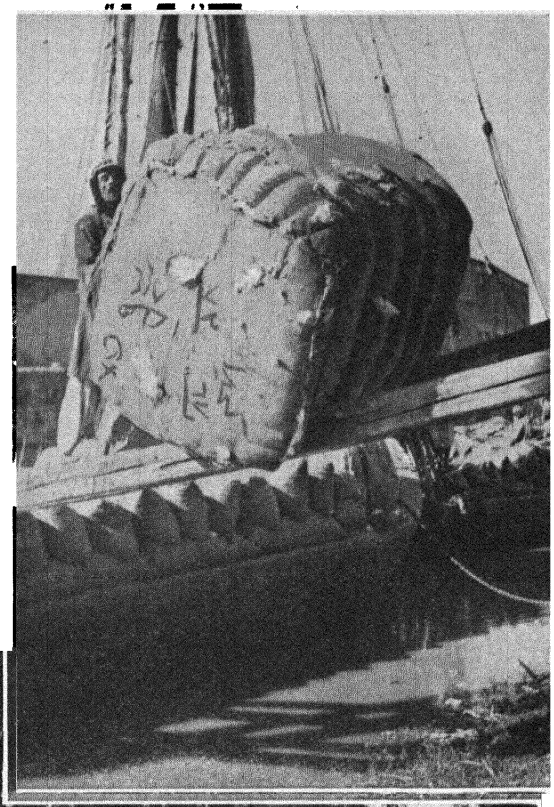


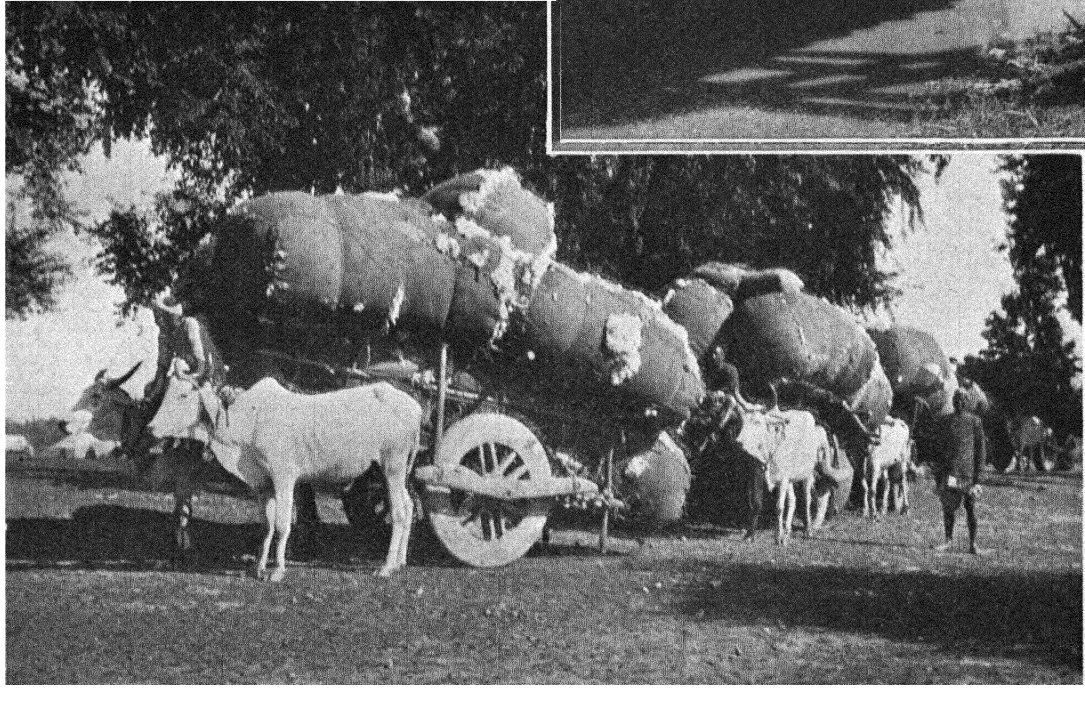
(*above*) COTTON-PICKERS AT WORK IN EGYPT
Photo Dorien Leigh, Ltd

(*below*) A COTTON-FIELD IN TENNESSEE
Photo F N A.

the cotton, but it is more usually done by hand.

The cotton brought from the fields is known as seed cotton. The first process is to separate the hairs, or lint, from the seeds. This is called ginning. Over a hundred years ago this was done by hand, and took so long that cotton growers made little profit. It was the invention of a ginning-machine in 1793, by Eli Whitney, an American school teacher, that made possible the great modern cotton industry. When a wagon-load of cotton reaches a modern ginning-mill the mouth of a long, flexible pipe is put into the cotton, which is sucked up by machinery into the pipe and carried through fans which clean it of dust. It is then dropped into the gin, which has a number of little saws that tear off the fibre from the seeds. The fibres are





(*above*) Unloading Cotton, Alexandria, Egypt

Photo Doren Leigh, Ltd

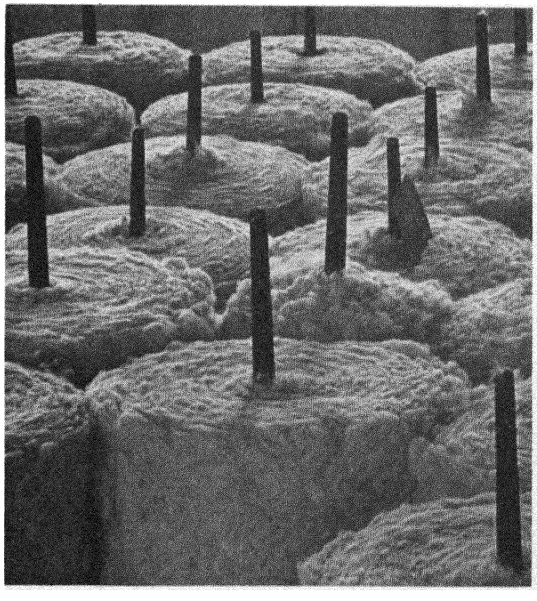
(*below*) A Cotton Convoy, India

brushed off in a great sheet of fleecy white wool which is carried by machinery into presses, where by an enormous pressure it is squeezed into bales. These bales are wrapped in sacking, bound with iron bands, and ready to be shipped to different parts of the world. The bales are about four feet square and five feet in length. In America they weigh five hundred pounds, in Egypt seven hundred pounds. All bales are tightly pressed and bound so that they take up less room and can be easily moved about. The cotton in the bales is known as raw cotton.

The U.S.A. sends most cotton to the United Kingdom. Her next best customers in normal times are Germany, France, Italy, Spain, and other countries in Europe. She also sends some raw cotton to China and Japan, although they both grow cotton, and to many other parts of the world.

Now let us follow the raw cotton to Great Britain and Europe. Up to the second half of the eighteenth century there were few factories in Great Britain or Europe, or, indeed, anywhere, for the manufacture of cotton cloth. Most cotton cloth was very dear, because it was imported from Calicut, in India—hence its name Calicut cloth, or calico. The spinning and weaving by hand of cotton fibres had been thought of by the people of India, China, and Egypt many, many years before Christ was born. The East Indians, who are perhaps among the oldest of the cotton-weaving nations, made cloth so thin that it earned the name of "woven wind."

About the beginning of the eighteenth century raw cotton in small quantities began to be imported into Lancashire. Before the century closed Lancashire became the world's workshop for cotton goods, because of the invention of wonderful machines that could spin and weave in a marvellously short time. Then Lancashire had plenty of coal to work the new machinery, and a rather moist climate, just right for cotton-spinning by machinery. Cotton fibres tend to break if the air is too dry. (Now, in modern mills, the air is



BLOW-ROOM

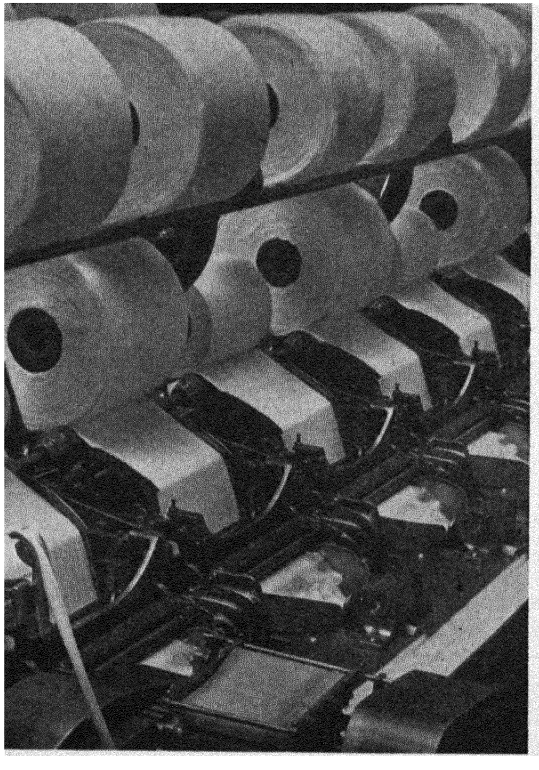
CARDING

Photos by courtesy of Messrs J. and P. Coats, Ltd

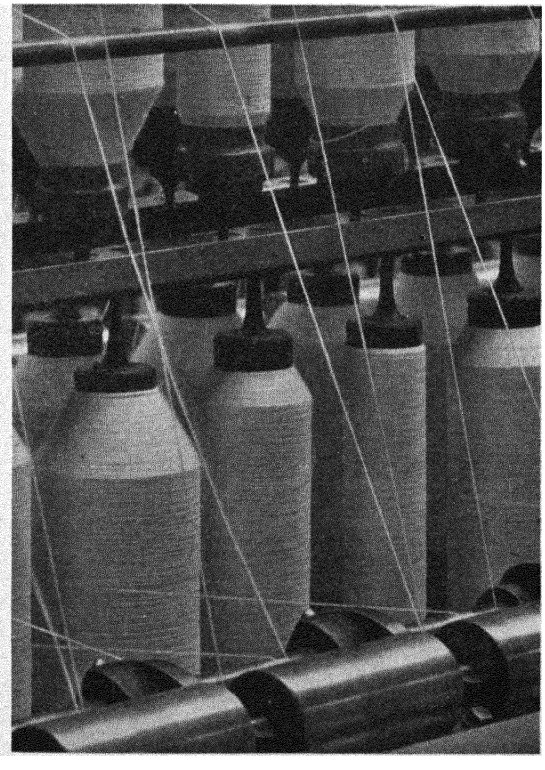
kept moist artificially, so that the question of a damp climate is no longer so importan as it once was.)

Lancashire began to produce muslins as fine as those from the East, calico, and al kinds of cotton goods. Although Lancashire still produces to-day much cotton material she is no longer the workshop of the world for cotton. There are not only great manu facturing towns in the United States and Germany, but huge modern factories have beer built in cotton-growing lands such as India, Japan, China, Brazil. Some of these lands especially Japan, not only make cotton goods for themselves, but sell them to othe countries more cheaply than Lancashire does.

It is interesting to visit the huge factories in Lancashire where cotton goods are made The cotton towns centre around Manchester, where great ships, thanks to the Manchester Ship Canal, can unload their big bales of cotton as well as at the docks of Liverpool Some towns do all the spinning—for example, Bolton, Oldham, Rochdale; some do al the weaving, like Blackburn, Burnley, and Nelson. When the bales of cotton reach the mills the tightly pressed cotton is pulled apart by machinery. Other machines remove any dust or leaves, etc. The fibres are then brushed and combed by carding-machines something like those used in woollen factories. Other machines roll the fibres over so that they cling to each other and come out a soft, untwisted rope called a sliver. The sliver is then twisted by a spinning-machine so that it



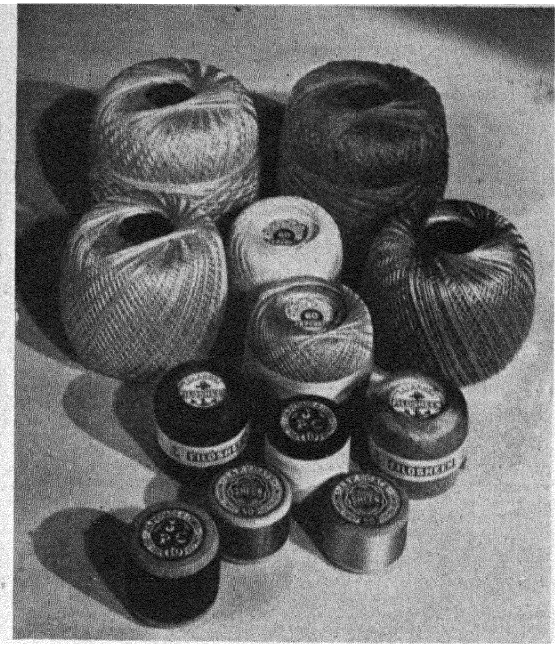
COMBING



SPEED FRAMES

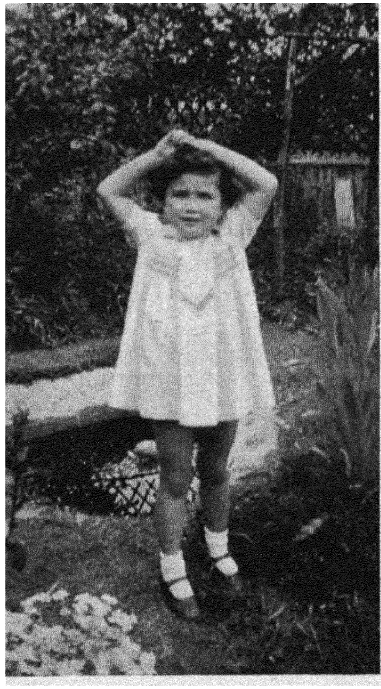
Photos by courtesy of Messrs J. and P. Coats, Ltd

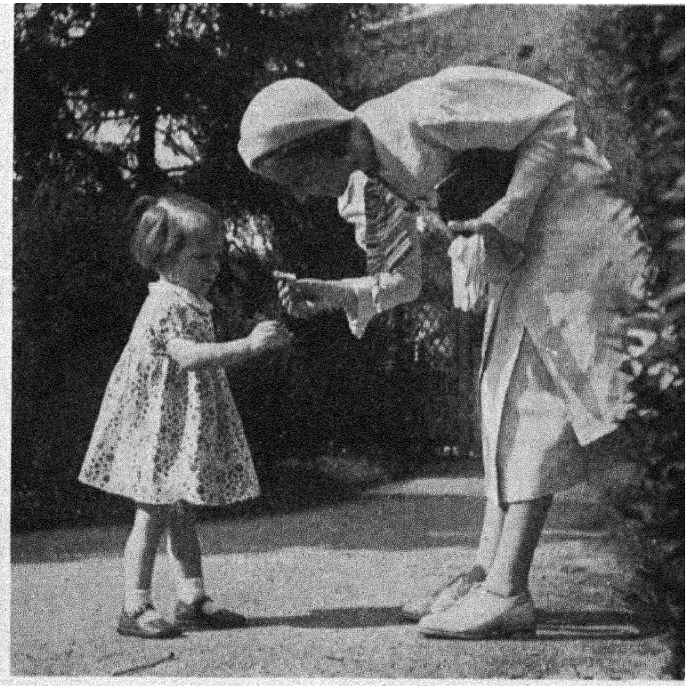
DOMESTIC THREADS



INDUSTRIAL THREADS

Photos by courtesy of Messrs J. and P. Coats, Ltd

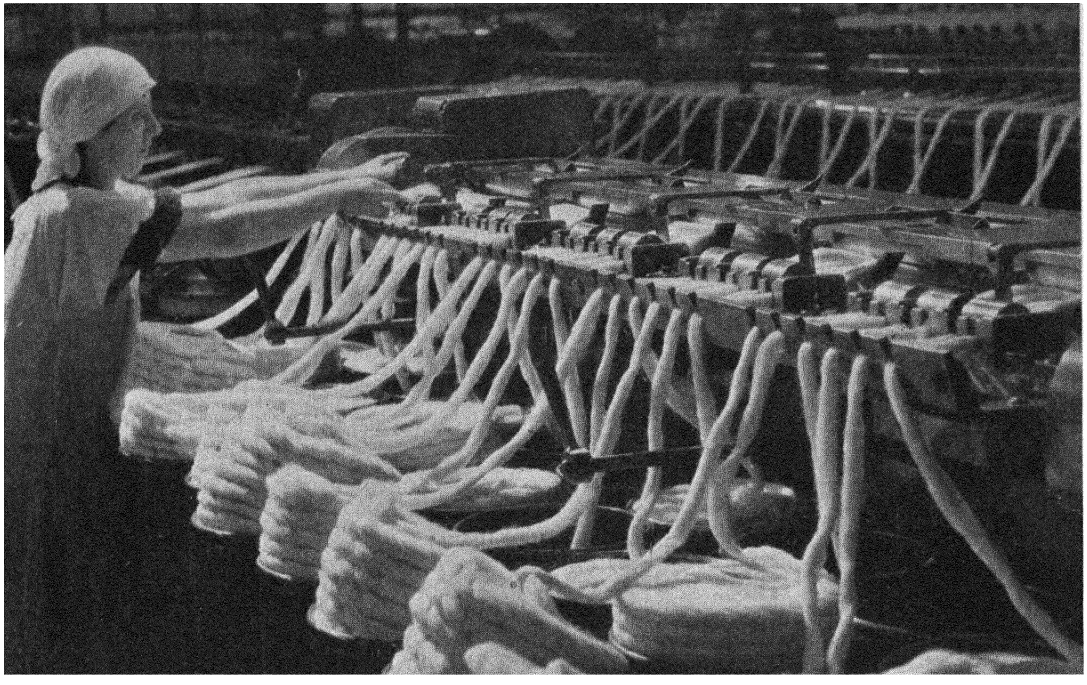




LITTLE ENGLISH CHILDREN WEARING FROCKS MADE OF COTTON

Photo Thoday

Photo Dorien Leigh, Ltd



SPEED FRAME OPERATOR
Photo by courtesy of Messrs J. and P. Coats, Ltd

becomes fine cotton yarn or thread. Cotton fibres are so much more delicate than wool fibres that many more are needed to make a thread. Cotton fibres combine well together because they have a little twist in them—formed, perhaps, by their being bound so tightly about the seed. Cotton cloth is woven by looms very much like those you read about for woollen cloth.

In the United States the oldest cotton mills are in the north-east, in New England. Great mills in Massachusetts, Rhode Island, and other places, produce vast quantities of goods. The mills in Fall River, near Boston, weave two miles of cotton every minute. The new cotton mills are in the south-east, often on the cotton-fields themselves. It is a great advantage to have the mills near the cotton-fields. On the other hand, mills that are far away from the cotton-fields are often near to people who want to buy cotton goods, or near to seaports, so that they can import raw cotton and export cotton goods easily, as at the mills of Lancashire.

Here are the names of some comparatively new cotton-manufacturing towns on or near the cotton-fields of the U.S.A.: Montgomery, Augusta, Raleigh, Macon, and Columbus.

Cotton is to some extent the rival of wool and silk, for it can be treated so that it resembles wool or silk. A great many cotton mills in Lancashire now produce artificial silk. Cotton velveteen and sateen can be bought cheaply by those who cannot afford velvet and satin made of silk. Flannelette, which is entirely made of cotton, is often used instead of flannel made of wool. Fabrics of mixed cotton and wool are much more common nowadays than in former times. Thus it is easy to see what a large part cotton plays in clothing the world.

Things to Do

1. Pull a piece of cotton wool to pieces and notice the delicate fibres of cotton. Try to measure a fibre. Draw a line about as long as a cotton fibre. Tell the story of cotton up to the time when the raw cotton is packed in bales.

2. Trace on your map the voyage of a cotton ship from one of the ports in the U.S.A. that export raw cotton to Liverpool or Manchester. Here are the names of cotton ports to look for—Galveston, which exports more cotton than any other port in the world; New Orleans and Mobile, on the Gulf of Mexico; and Savannah and Charleston on the Atlantic.

3. Write the names and collect examples of as many cotton fabrics as you can. 'Fabric' means something put together, especially woven material. Collect pictures of garments made of cotton, and people wearing cotton clothes, in different parts of the world *e.g.*—Africa, India.

SCHOOLBOYS IN NIGERIA AND SCHOOLGIRLS IN INDIA WEARING COTTON CLOTHING
Photos E.N.A.

4. Here are some famous towns that manufacture cotton goods, to find on your map. They are scattered all over the world: Bombay (India), Osaka (Japan), Chemnitz (Germany), Manchester (England, ready-made cotton clothes), Baltimore (U.S.A.), Shanghai (China).

5. To make cotton cloth Lancashire towns need besides cotton: (*a*) **Iron** and **steel,** to make machinery. These are got from the blast furnaces and steel works of Irlam and district. (*b*) **Coal** and **electricity** to work the machinery. Coal is got from pits near Wigan, St Helens, and Leigh. (*c*) **Chemicals,** for 'finishing' cotton cloth. These are obtained from the factories at Widnes and Runcorn. (*d*) **Ships** and **sailors** to bring raw cotton and take away the finished material. Ships are built at Birkenhead, and Liverpool is the port for cotton ships. Express these facts in the form of a diagram.

6. The countries that manufacture cotton goods, in order of their importance, are: Great Britain, United States, Japan, Germany, India, France, U.S.S.R., China. Suppose these numbers represent their output of cotton respectively as 10, 7, 5, 4, 4, 3, 3, 3; copy the names of the countries, and draw bolts or rolls of cotton cloth after each, according to the numbers given.

7. With the help of the pictures tell how raw cotton is spun into thread: (*a*) **Blow-room.** The bales are opened, cotton pulled apart, and the dust, leaves, and sticks are blown away. From beaters and heavy rollers the cotton comes out in a broad soft roll. (*b*) **Carding machine,** rollers with little steel teeth, straighten out tangles in the rolls and send them forth in a flat, fleecy rope of cotton called a sliver. (*c*) **Combing machine** and (*d*) **Speed frame.** In other machines the sliver is combed, twisted (on speed frames), and drawn out into fine threads; then other machines twist it and draw it out still more into yarn, some fine, some thicker.

CHAPTER SIX

SILK AND RAYON

It is a little creature called the silk-worm that gives the world one of its softest and most lovely fabrics—silk. Silk-worms are found chiefly in lands where their food—fresh mulberry leaves—can be provided in abundance, and where there are plenty of people to look after them, for the amount of labour needed to feed these little caterpillars is beyond description; they need such a huge quantity of leaves.

The countries that produce the most silk are Japan and China. In China there are millions and millions of people, labour is cheap, and mulberry-trees grow well, especially towards the south. This tree does not like the very cold countries, or the very hottest countries. Small, delicate hands are needed to look after silk-worms, so it is the farmers' wives and children who do most of the work. In Japan, too, labour is cheap, and there are many clever workers. Once China produced most of the silk of the world, but now Japan does, because Japan is keener to change and adopt new methods. Japan and China together produce more than 80 per cent. of the world's silk.

Small quantities of silk are produced in other countries. India produces silk solely for her own use. She exports none. In Europe the silk lands are chiefly in the lower Rhône valley of southern France and in the Plain of Lombardy, in northern Italy. A good deal of silk is produced also in the U.S.S.R. (Turkestan), in western Turkey, and in Cyprus. A few other places produce silk.

Silk is dearer than cotton or wool, so on the whole it is the people of the richer parts of the world that wear the most silk. A great deal of silk is worn by the well-to-do of North America (especially the U.S.A.) and Europe—silk blouses, silk ties, and especially silk stockings! But perhaps the people of the world who are most fond of gay silk clothes are the people of Burma, both men and women. Burmese women weave their brightly coloured silks on their own looms. In India lovely silk garments are to be seen, especially the silk saris of ladies. Rich Chinese and Japanese also wear silk.

But now let us visit one of the silk districts of **China,** because it was the Chinese who first found out how to weave the silk of the silk-worms into cloth. It is said that a Chinese empress made this discovery twenty-seven hundred years before Christ was born, and for hundreds of years the Chinese kept the secret of making silk to themselves. The land we visit is south of the great Yangtze River, where there are countless orchards of white mulberry-trees. The trees are not much higher than our heads, because they are cut back and trimmed every year. Boys and men are busy gathering the leaves. Nearly all the cottages in the villages around keep silk-worms, for in many parts of China, and in some parts of Japan and India, the rearing of silk-worms is still a home industry.

The silk-moth lays its eggs on sheets of white paper, from four to seven hundred eggs, and then it dies. The eggs are no bigger than pin heads, and black in colour. If the eggs are kept cool they will not hatch, and can be carried about anywhere. They are generally sold at so much an ounce.

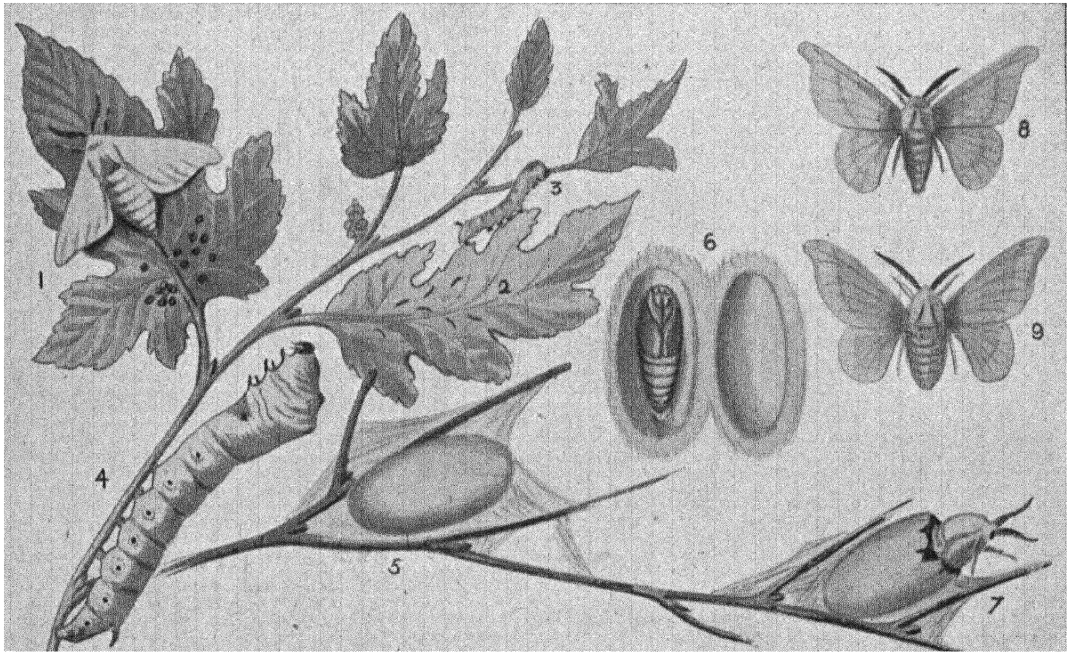
The eggs, if they are to be hatched, are kept warm; sometimes they are put into an incubator. When the little caterpillars come out of the tiny eggs they are given a meal of tender mulberry leaves, chopped very fine. As they grow older they are fed with pieces of leaves, and then whole leaves. They are enormous eaters, and must be fed at least five or more times a day, and eat most of the night. They only rest from eating to shed

their skins. The leaves are spread on trays, which have to be kept perfectly clean, and the caterpillars are handled gently if they are moved from tray to tray. We can hear them eating as we go into the feeding-rooms. Visitors must be very quiet, for the caterpillars are sensitive. They do not like strangers, noise, or smells such as tobacco and scent.

In about seven or eight weeks they are fully grown and ready to spin their cocoons. The farmer gives them a heap of straw or a frame covered with straw that they can climb up. The silk comes from two tiny holes in the caterpillar's mouth. These join when they reach the air, and form one. The caterpillar first throws the silk about loosely so that it catches hold of the straw and supports the little creature. This loose rough fibre is called floss. Then it begins to spin around itself finer silk, moving its body this way and that. In about three to five days the white or yellow cocoon is finished. It is said that the length of the silk thread spun is almost two miles, although only a portion can be reeled off as one thread; the rest is used as floss, or waste silk. The sound of all the silk-worms spinning is like gentle rain.

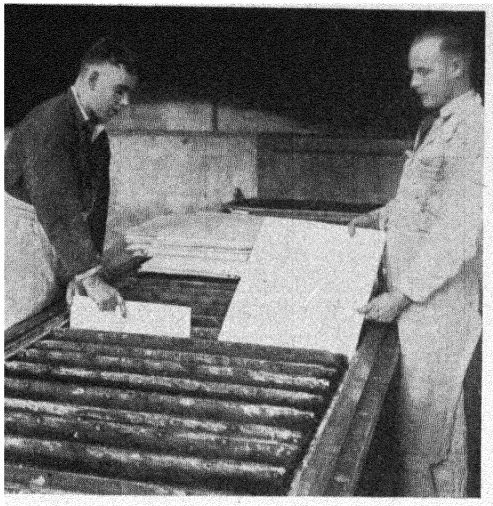
Under the microscope the silk fibre seems double. It is like a glass rod with a groove in it; and we can distinguish two strands which are twisted together as they leave the caterpillar's mouth. The fibre is glossy and exquisitely beautiful—so fine that from six hundred to eleven hundred cocoons are needed to make a pound of raw silk!

After the silk-worm has finished its cocoon it goes to sleep and becomes a chrysalis. If left to itself it would in about eighteen days make a hole in the cocoon and come out a



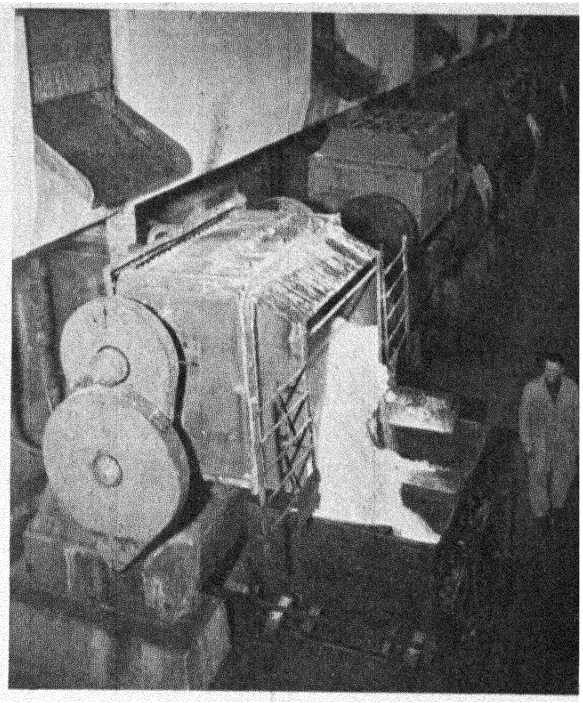
LIFE-STORY OF THE SILK-WORM

(1) Egg-laying moth on mulberry leaf, (2) Newly hatched larvæ; (3) Partly grown silk-worm; (4) Full-grown silk-worm; (5) Cocoon, (6) Cocoon opened to show chrysalis; (7) Moth emerging; (8) Male moth; (9) Female moth.



STEEPING

The wood pulp being placed in the press prior to running in the liquid caustic soda.



GRINDING

A row of Pfleiderers, one emptying 'crumbs' into the bins in which they are mercerized, or matured.

Photos by courtesy of Messrs Courtaulds, Ltd

white moth. But only a few moths are needed to lay eggs, so the farmer sells nearly all his cocoons to silk factories, where they are put into oven-like compartments to kill the chrysalises.

The cocoons are now ready for **reeling.** As the silk from one cocoon is so fine a number of cocoons are reeled off together, sometimes five for fine threads and up to twenty for coarser silk. The right number to be reeled are selected, the floss is brushed off, and they are thrown into hot water, which removes the sticky substance that protects the silk, and loosens it, so that the ends can be picked up and put through the eyelet of the reeling machine. When the right number have been caught the machine is started and the long fibres spun by several silk-worms are joined together into the strands known to commerce as raw silk. The reeled silk goes to other factories, where it is cleaned, weighed, and packed for export. It generally reaches the manufacturing countries in the form of skeins or hanks. In China a good deal of reeling is still done by the farmers themselves in their cottages. They use simple hand-wheels. Japan has many silk-winding factories.

The floss, spoilt cocoons, broken ends of silk, and all waste silk can now be spun into good thread by clever machines specially invented for this purpose. Silk threads are woven in very much the same way as cotton.

Japan has perhaps the most important silk-mills in the world. The largest are at Tokyo, Yokohama, Osaka, Kyoto, and Okayama. Japan also tends to control some of the mills in Chinese cities, such as Shanghai, Hankow, Canton, and Nanking. The silk industry is well established in India, but India uses all her silk herself.

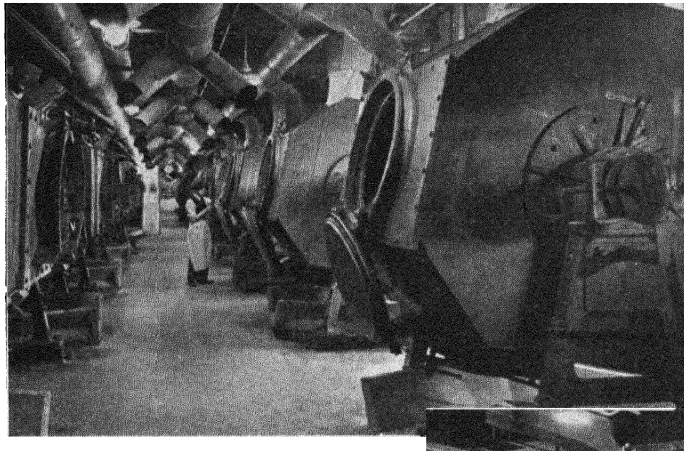
Milan and Lyons are the chief silk towns of Europe. They use local supplies of raw silk and buy silk from Japan and China. France is the most important country for the manufacture of silk ribbon.

The United States buys millions of pounds of raw silk every year from Japan and China. Paterson is the chief silk-weaving city. It is close to New York, the largest silk market in the U.S.A. In Britain the chief silk-manufacturing towns are in Cheshire and Staffordshire, at Macclesfield, Congleton, and Leek. Yorkshire has silk mills at Brighouse, and East Anglia at Norwich and other places.

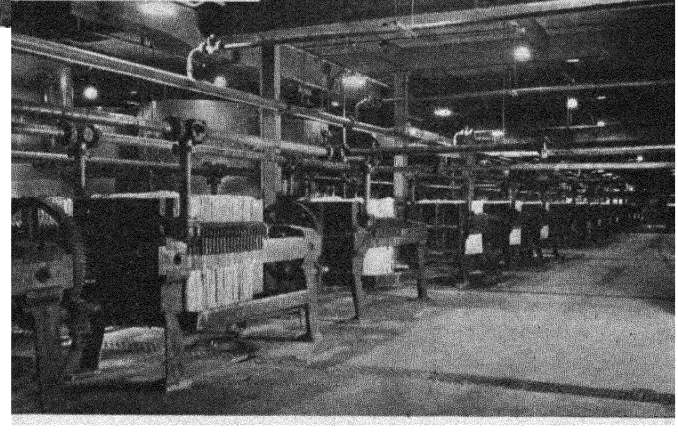
The spider also spins silk, but men have not been able to make use of it; the caterpillars of some wild moths spin. The silk, for example, of the oak-feeding silk-worms is a strong but coarse silk that is woven into tussore. Tussore is also made from the silk of other silk-worms. Japan exports tussore silk, and this silk is also made in India.

Clever inventors have now found out how to make **artificial silk.** They use all sorts of materials, but principally, perhaps, wood pulp from the coniferous forests of Canada or Norway, and cotton. There are many different ways of making artificial silk, and each maker keeps his special method a secret. Generally speaking, the material used—for example, wood pulp—is mixed with certain chemicals to form a liquid called viscose. This viscose is pumped through tiny holes and oozes out as fine threads, which when they harden are very much like the threads the silk-worms make from chewed and digested mulberry leaves. The threads are drawn together into a revolving box, and form a cake of silky thread. Later this thread is unwound from the cakes and rewound on to metal frames to form hanks of rayon.

Man-made fibres, or rayon, are much cheaper than real silk, so now all the world can wear 'silk' stockings if it pleases. The trade of the Japanese was not hurt by this invention, because they set to work to make rayon in addition to real silk. Japan is now one of the chief manufacturers of rayon in the world, and has large rayon factories at Osaka, Iwakuni, and other towns. The U.S.A.



THE 'CRUMBS' ARE NOW TAKEN AND CHURNED WITH A DEFINITE QUANTITY OF CARBON BI-SULPHIDE
We see here a typical churn-room.



THE VISCOSE CELLAR
From the mixing-room the viscose is blown along pipes to the viscose cellar, where it is 'aged' and carefully filtered This picture shows a number of storage-tanks and a battery of filter presses.
Photos by courtesy of Messrs Courtaulds, Ltd

is another important rayon-manufacturing country. She and Japan together produce about half the world's rayon.

In Great Britain many Lancashire cotton mills have turned their attention to the making of rayon, which can be spun and woven by the same machinery as cotton. This is a great boon to Lancashire, as her cotton industry is declining.

A good deal of rayon is also made in France and Germany.

Things to Do

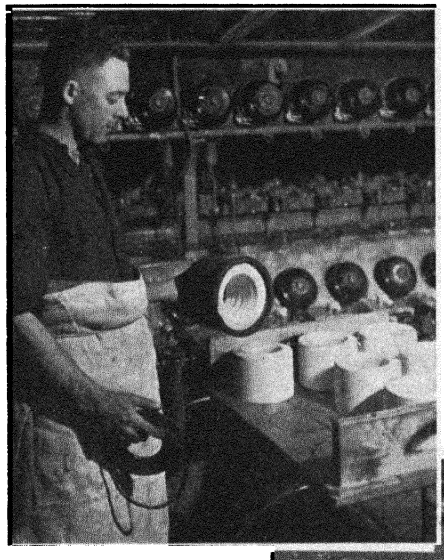
1. To feed enough silk-worms to make one pound of silk twelve hundred pounds of mulberry leaves are needed. How many mulberry leaves are needed to make one ton of silk?

2. One pound of silk-worm eggs when hatched will produce silk-worms that need about ten tons of fresh mulberry leaves. Supposing five hundred tons of silk-worm eggs were hatched in China (generally more than this are hatched). How many mulberry leaves are needed?

3. Silk manufacture was introduced into England during the reign of Henry VI (1422–1461), but not much was manufactured until skilled Flemish weavers fled to England in 1585 because of war with Spain. For about how many years has the silk industry been carried on in England?

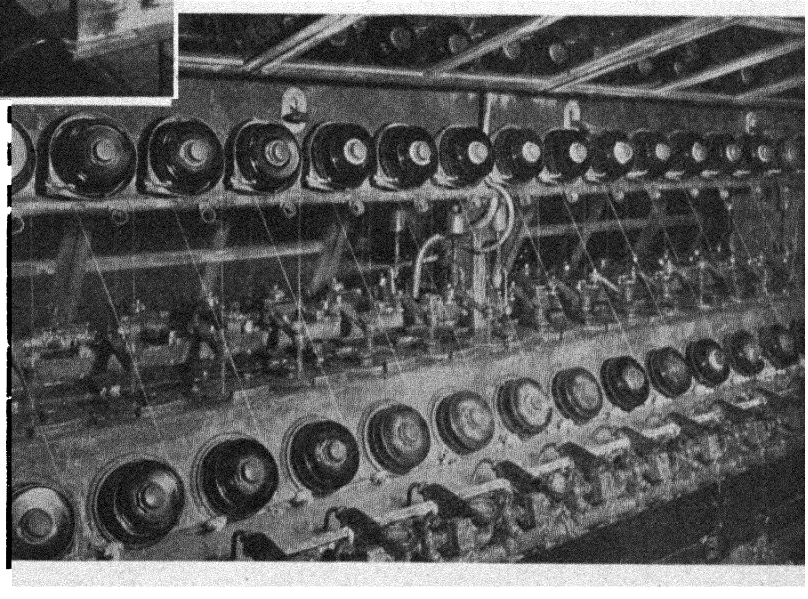
4. Find out all you can about the manufacture of rayon, and nylon.

5. Write an interesting account of the life history of the silk-worm.



A 'DOFFER' REMOVING A 'CAKE' OF YARN FROM A TOPHAM SPINNING-BOX

Note the covering lid and ring in his right hand.



A CLOSE-UP VIEW OF THE SPINNING OPERATION

The viscose is forced through the spinnerette by pump pressure into an acid bath, where the cellulose is reprecipitated in the form of a thread and collected in the Topham spinning-box.

Photos by courtesy of Messrs Courtaulds, Ltd

SILK CLOTHING: INDIA
A beautiful silk dress, elaborately patterned and with a heavy gold and coloured border.
Photo Dorien Leigh, Ltd

SILK CLOTHING: BURMA
A lady of Mandalay in her silk dress.
Photo E.N.A.

6. Make a list of things the world wears made of silk. Find pictures if possible. Collect pictures of people in other lands wearing silk.

7. Rayon produces fabrics of all kinds, many of which have no resemblance to silk. Here are some places where rayon is made in Britain to find on your maps: viscose

TWO LITTLE JAPANESE AND AN ENGLISH GIRL WEARING SILK CLOTHING
Photo Dorien Leigh, Ltd

rayon yarn is made at Coventry, Nuneaton, Preston, Wolverhampton, and Flint, North Wales; fabrics are woven at Braintree and Halstead, in Essex, Halifax, in Yorkshire, and Leigh, in Lancashire.

8. With the help of the pictures tell the story of rayon.

Note. Logs of the spruce trees of Canada and Sweden are treated in the pulp-mills there so that they become sheets of wood pulp or cellulose. These sheets are exported to rayon factories. The sheets are torn to 'crumbs' by machinery.

CHAPTER SEVEN

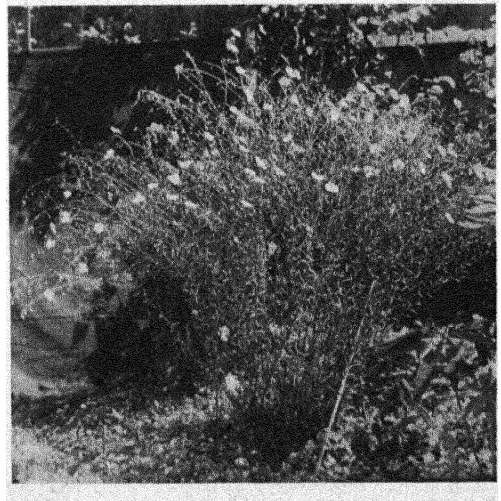
FLAX

ANOTHER plant very useful to man in making clothing is **flax.** It is from flax that linen is made. In the Bible you read how the kings and princes of ancient days wore "fine linen and purple." For hundreds—indeed, thousands—of years linen has been considered rather special. It is, perhaps, the oldest of all the woven materials used for clothing, and it is still the best for strength. Long before cotton came to Europe and our islands much flax was grown there.

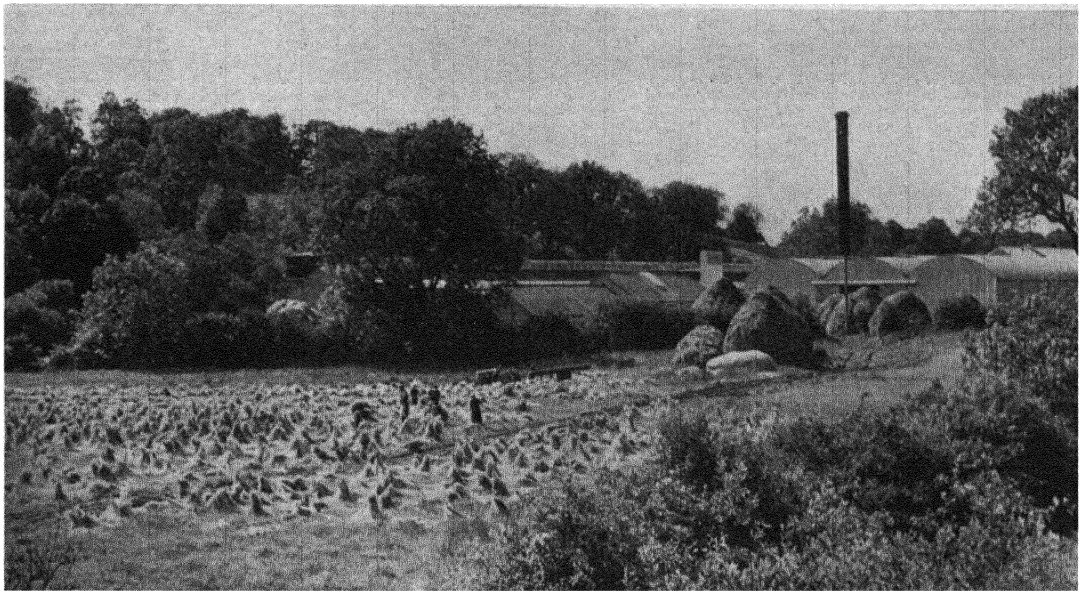
A field of flax is quite different in appearance from a field of cotton. The flax plant is a slender plant about two or three feet high, with one main stalk, small narrow leaves, and very pretty blue flowers. The seeds are planted close together, because the closer the plants can be made to grow, the finer and taller the stalks and the better the flax fibres. The slender stalks are easily stirred by a breeze, and the masses of blue flowers rise and fall like the waves as the wind passes over the field. On the great plains of the U.S.S.R., where much flax is grown, this lovely sight greets us at summer time wherever we look.

Extending up and down the stalks are long fibres that are many times longer than cotton fibres, thicker, and stronger. They are silky, but under the microscope one can see that the surface is slightly rough. This rough surface fits them for spinning, as the fibres do not slip when twisted. Perhaps it was because of the length of the flax fibres that man began to weave them before he discovered how to twist together the short fibres of cotton or wool. In the tombs of the Kings of Ancient Egypt are paintings which were made ages ago when the tombs were built, showing the men, women, and children of those times gathering flax in the fields and tying it up in bundles.

Nearly all the flax of the world is now grown in the great plain of **Northern**



FLAX PLANT
Photo E.C.M.



A Typical View of a Flax Factory, showing Retted Flax being dried in Gaits in the Foreground

Photo by courtesy of the Government of Northern Ireland

Europe—northern France, Belgium, Germany, Poland, the Baltic States, Lithuania, Latvia, and Russia, the flax belt stretching to Russia in Asia. Flax is also grown in Northern Ireland, and a little in Canada and Japan.

Northern Europe can be called the flax country as the southern part of the United States is the cotton country. Flax was once grown in Britain, but it has almost disappeared. It is a troublesome crop to grow unless the farmers have plenty of fields, as it quickly uses up all the nourishment in the soil. It also needs much labour. The U.S.S.R. has great plains, a cool climate that flax likes, and cheap labour, so it produces well over two-thirds of the world's flax.

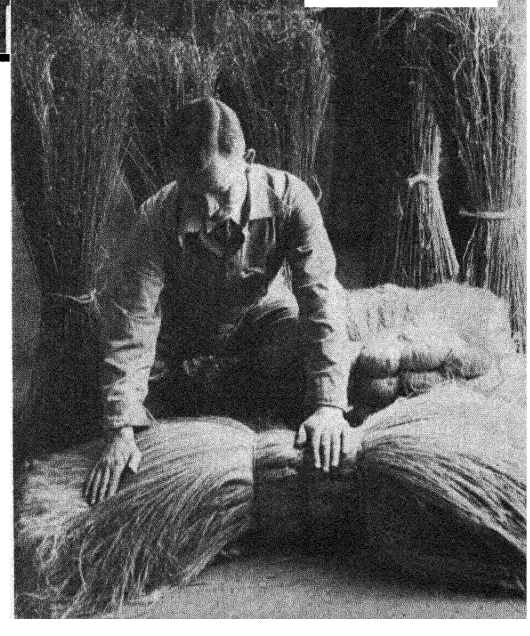
Although flax grows in the cool temperate lands, much flax is also cultivated in the warmer lands, especially in India and Argentina; but this flax is grown for its seeds, from which linseed oil is made, and not for its fibres. Flax for linseed oil is also grown in the U.S.S.R. in Asia.

Autumn is the time of the flax harvest. The flax is gathered after the flowering is over and just before the seeds begin to ripen. If it is left too long the fibres are not so good for cloth-making. The harvesters pull the plants up by the roots. They shake off the soil and tie them up in bundles, laying all the stalks straight and the same way.

The first process is called rippling. The stalks are passed through a great machine with long teeth which comb off the seeds at the top and the leaves. The second process is to steep the stems in water to rot the softer parts so that the long silky fibres can be more easily extracted. This steeping process is known as retting. Sometimes the stalks may be laid out on the grass and left to rot by the dew falling on them. In some countries flax is retted by passing steam over it. More often the stalks are placed in tanks of water or parts of a river from nine to sixteen days, according to the nature of the water and the

THE SCUTCHED FLAX FIBRE COMING OFF THE SCUTCHING-MACHINE AT THE FACTORY OF MESSRS STEVENSON AND SON, LTD, MOYGASHEL, DUNGANNON

Photo by courtesy of the Government of Northern Ireland



SOME BEETS OF GOOD-QUALITY FLAX STRAW IN THE BACKGROUND, WITH A FOREGROUND OF SCUTCHED FIBRE NEATLY TIED UP

Photo by courtesy of the Government of Northern Ireland

heat of the weather. In the river they are weighed down with heavy stones. The water of the river Lys, in Belgium, has special qualities for retting. It quickly loosens the gum which binds the fibres to the parent stem.

The flax is washed to get rid of the gummy matter, and the next process is breaking. The flax is dried and passed between heavy rollers to break up the hard woody core which cannot be retted. These rollers do not hurt the tough elastic fibres. Finally the

flax is passed into machines that scutch, or beat, the fibres to get the tiny bits of broken wood out; this is called scutching. The grey silky fibres are now tied up into bales and sent to the mills for spinning and weaving.

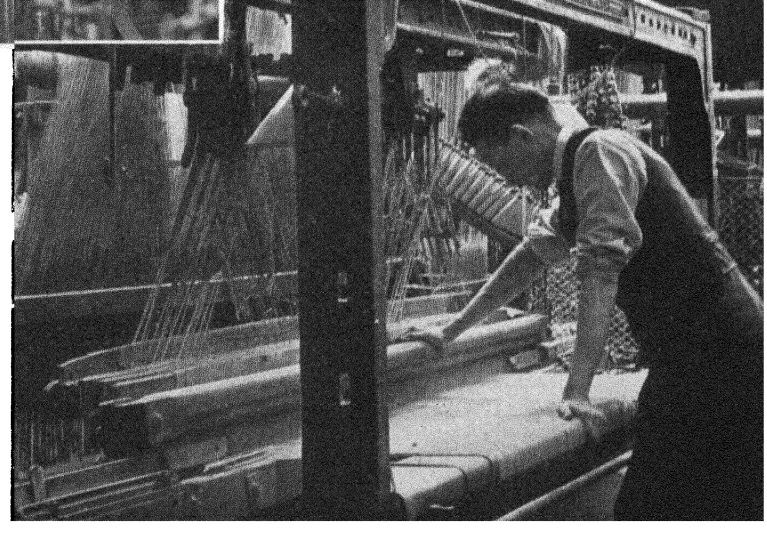
The first process at the mills is combing, or hackling, to get out the long fibres that make the best thread, the short fibres, or tow, being saved for use in inferior cloth. Flax is spun and woven by machinery very like that used for cotton.

When linen cloth is first woven it is a slightly brownish colour, and has to be bleached. There are various ways of whitening, or bleaching it by chemicals and exposure to the sun. It is a wonderful sight to see strips of linen that, put together, must be many miles long, spread out in the 'bleach-fields' near the mills in Ireland.

A Roving Frame, the Final Operation of preparing Fibre before Spinning

Photo by courtesy of the Government of Northern Ireland

The greatest manufacturing place in the world for linen goods is still in Ireland in Belfast, Londonderry, and the neighbouring small towns. The industry began in Northern Ireland long ago, when all the spinning and weaving was done by hand. At first all the flax came from Irish farms, but to-day there are so many linen mills in and around Belfast that they need more flax than Ireland can grow. Belgium sends in normal times more than three times as much flax as the Irish fields can grow. Latvia and countries round the eastern end of the Baltic Sea also send flax. If in normal times we were to visit the quays of Belfast we should see ships unloading flax from Belgium and from the Baltic



A Small Linen Loom

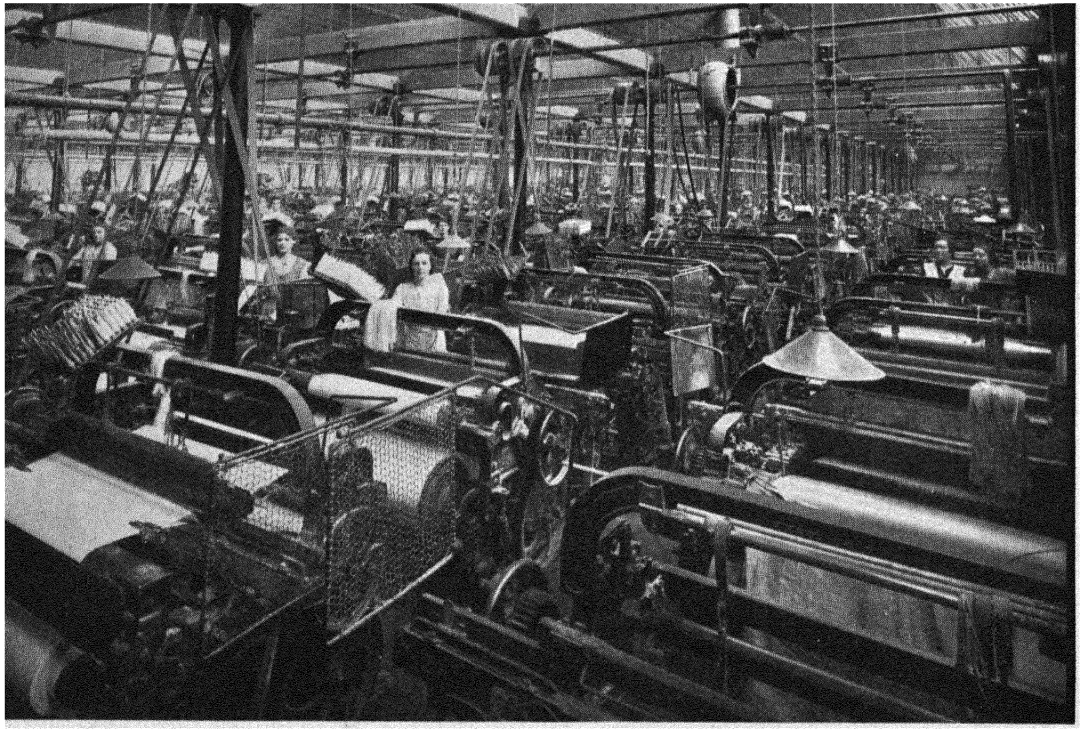
Photo by courtesy of Gwan's Irish Linen Stores Ltd

lands, and other ships taking on big cases of Irish linen to be sold in America and other parts of the world. Ireland makes the finest linens for almost every purpose.

In Scotland there are some linen mills at Dunfermline, Kirkcaldy, and Dundee. They are in a good position for importing Baltic flax, but they do more weaving than spinning, and buy most of their linen thread from the spinning mills in Northern Ireland. In England some linen cloth is made at Leeds, Bradford, and Manchester. But most of the linen woven in Scotland and England is not suitable for dress material, but for towelling and sheeting.

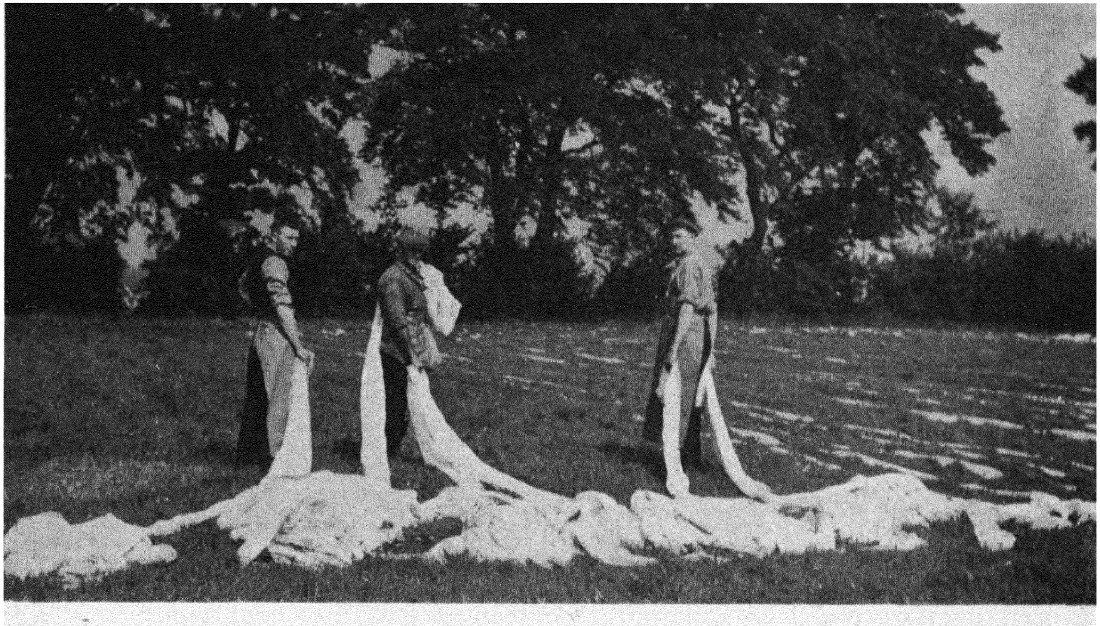
In northern France there are mills which make the finest of cambrics (called after Cambrai, where they are made) and linen lawns. Many other countries in Europe have linen mills. Belgium is famous for her linen and lace, and the U.S.S.R. weave a great deal of linen for their own people. The United States imports almost all the linen its people wear, and its only flax manufactures worthy of mention are sewing-threads. Indeed, most of the linen thread of the world is made in Great Britain, America, and France.

When we think of how flax helps to clothe the world we must not only think of linen dresses, blouses, shirts, collars, cuffs, lace, and handkerchiefs (for one is not completely dressed without a good handkerchief), but of linen thread. Although cotton clothes are far more used than linen, linen thread is more useful than cotton because it is the strongest of all threads. Tailors use linen threads to make their suits; the makers of good ready-made clothes use them because they do not break in their machines. When we



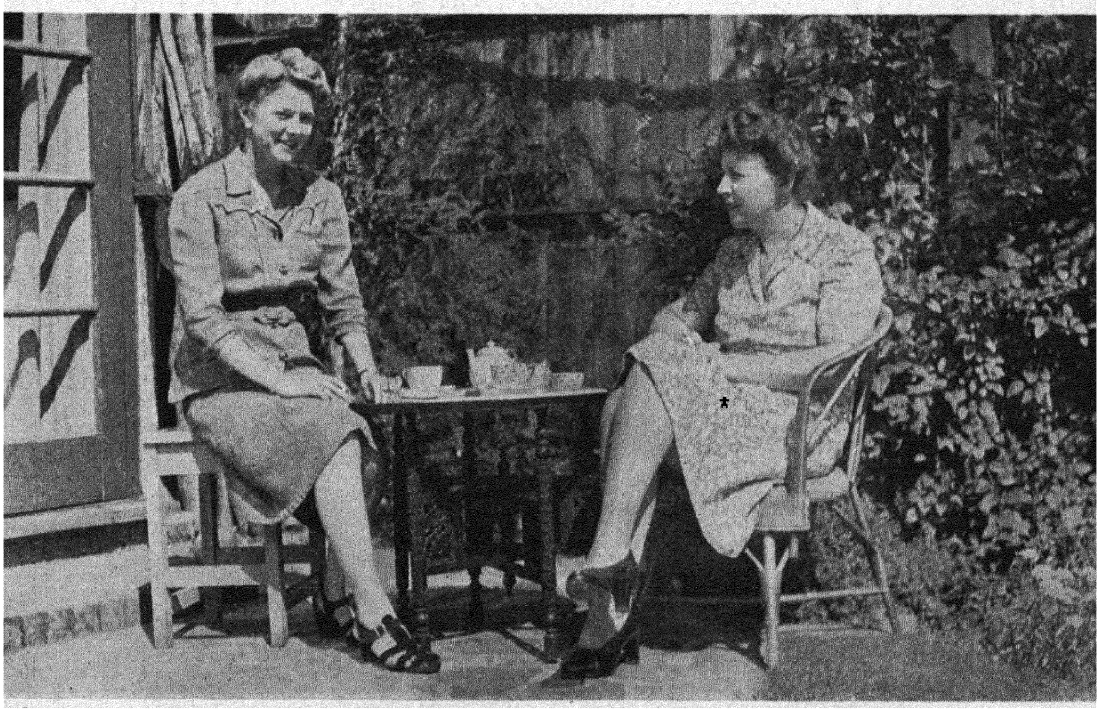
A Plain-weaving Shop at Brookvale Factory, Belfast

Photo by courtesy of the Government of Northern Ireland



BLEACH GREEN

Photo by courtesy of Givan's Irish Linen Stores, Ltd



A SUMMER FROCK AND COSTUME MADE OF LINEN

Photo E.C.M.

come to learn about our boots and shoes we shall find that linen thread is used to sew them. No substitute for linen thread has yet been able to please the boot manufacturers so well. British boots sewn with linen thread are said to be the finest in the world. Our police are clad in garments sewn with linen thread, and so too are our soldiers. Our buttons are most often sewn on with linen thread. Glove-makers too use linen thread, as we shall see when we learn about gloves. Linen threads are, indeed, used everywhere where great strength and durability are required. Linen thread is also much used for embroidery, lace, and crochets, etc., because, unlike other products, it becomes brighter after washing, its lustre being improved.

Things to Do

1. Tell the story of how the fibres in the flax stalks become linen.
2. Why are cotton and flax for fibres grown in different parts of the world? Name the parts of the world where each grows.
3. Why is cotton a more important textile material than linen?
4. Why do you think there was a drop in the production of flax and linen during the Second World War?
5. Write the names of as many things as you can which are made of linen; make drawings. Because of the long straight fibres of the flax, linen does not expand and shrink like cotton made from short twisted fibres, and is much stronger. Hence it is used for the wings of aeroplanes and sails (made especially at Dundee).
6. Write down all the uses you can think of for linen thread– sewing uniforms, gas-masks, ammunition bags, and so on.

TWO TENNIS FROCKS, CAP, SPORTS SHOES, AND SANDALS ALL MADE OF LINEN
Photo Paul Popper

7. Why is flax grown for seed cut by machinery, and flax grown for its fibres pulled up? Where is flax grown for its seed?

8. What is retting? Describe the different ways that flax is retted. What is bleaching? Why must linen be bleached?

9. Of what kind of textile products does each of these names remind you: Leeds, Bradford, Manchester, Bolton, Macclesfield, Dundee, Belfast?

10. Fill in the missing words: (*a*) The great bulk of the world's cotton is grown in one locality, ———. (*b*) Most of the flax woven into cloth is grown in ———.

11. Make a little dictionary for all the new words you have learnt to do with flax and linen—for example, *beet*, a small bundle of flax straw (see picture), *scutch*, *retting* or *rotting*, *bleach*, and *rippling*.

12. Look at your map for British flax-importing ports—*e.g.*, Belfast, Dundee, Leith, London, Glasgow.

CHAPTER EIGHT

LEATHER

We must think again of the very oldest form of clothing, the skins of animals. You have learnt about furs—the skins of animals with the hair on; but at a very early age men learnt how to get the hair off skins and change the skins into a new substance, called leather, that was soft, strong, and would last for a long time. The process of changing the skins of animals into leather is known as tanning. The Greeks and Romans knew how to make leather, and people were using it in the time of Christ, for the Bible says that when Peter came to Joppa he stopped at the house of a man who was called Simon the Tanner.

To-day nearly every one wears leather of some kind. People wear boots, shoes, and slippers of leather; hats, caps, coats, jackets, windproof suits faced with soft leather, belts, leggings, aprons, and gloves. We have parts of the ox, cow, and horse always under our feet, for their skins sole our boots. If the upper part of our shoe could speak it might bleat of the calf from whose back it came. If all the leather about us could speak what a noise there would be! Some shoe-strings might even puff like the porpoise; from belts might come the hiss of snakes or the baby-like cry of the seal. Our fancy shoes would hiss too, or grunt the horrid grunt of the crocodile. From our leggings would come more grunts, the grunts of pigs, and from our gloves, too, might come the grunting of pigs, or the barking of dogs, or the bleating of kids. The soft leather shoes of little children would baa about sheep and lambs. There would, indeed, be a neighing and lowing, a bleating and baaing, a barking, howling, and grunting, as well as other strange noises.

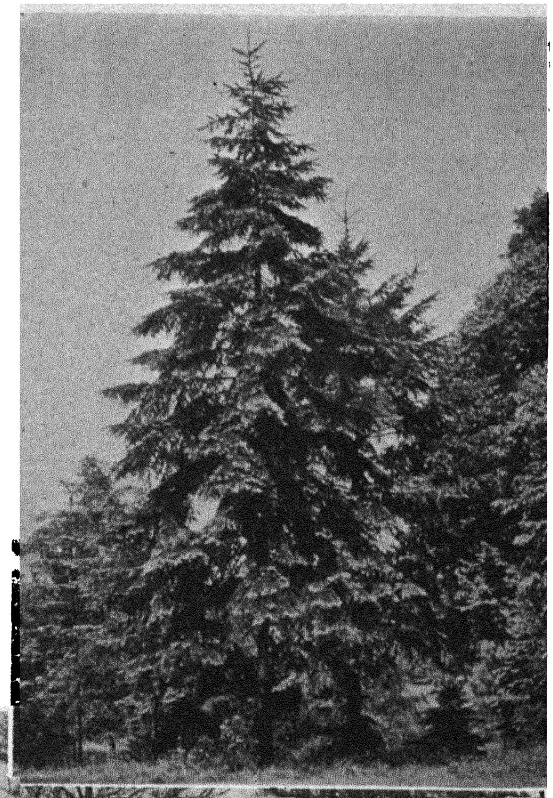
It is hard to number the many kinds of creatures that help to clothe the world in leather. It is said that ostrich skins are used for making fancy leathers for such things as ladies' shoes and bags. The skins of lizards, moles, and other small things are also used for purses and bags. The Japanese even use frog skins, from which they make pocket-books! Purses and bags are really part of our outdoor dress. Although so many creatures give the world leather, the most important and the most used leather is that obtained from cattle, horses, and sheep. We usually talk about the **hides** of larger animals, such as oxen, cattle, and horses, which make very thick leather, and the **skins** of smaller animals, such as sheep, pigs, goats, deer, calves, dogs, and rabbits. The leather industry is very much more important than the fur industry.

Most of the hides and skins of the world come from the grasslands, the great cattle-, sheep-, and horse-breeding regions of the six continents. Some countries keep cattle mainly for beef, such as Argentina and the United States, some mainly for dairy produce, like New Zealand, Holland, and Denmark; India keeps cattle for milk and for drawing carts and ploughing; but all the countries, no matter why they keep cattle, have the hides of the dead animals to sell. Sheep-skins, again, are important by-products of all sheep-rearing countries.

Great Britain produces large home supplies of hides and skins, but she buys great quantities from other countries. Most of them come from the pampas, the grasslands of South America that stretch away for hundreds of miles in Argentina and Uruguay. Other supplies come from Australia, New Zealand, Canada, South Africa, India, Eire, Brazil, the U.S.A., and the countries of Europe. Buffalo hides come chiefly from the East Indies. The United States uses enormous quantities of hides and skins. She produces great

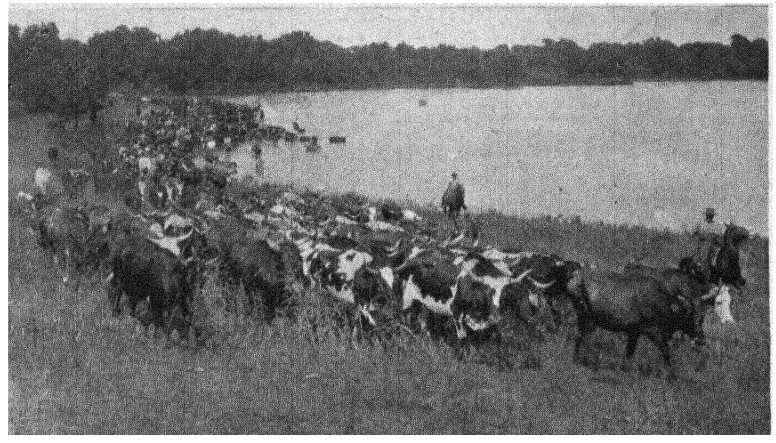
quantities herself and imports great quantities from South America and Africa. In normal times Germany is another big buyer as well as producer. Perhaps about ninety to a hundred million cattle are killed every year, so there are enormous numbers of hides to be converted into leather; but the world needs every bit of leather it can get largely because of **the boot and shoe trade.**

Now let us see how skins and hides are tanned or changed into leather. When they first arrive at the tannery they are generally dry and stiff, so first they are put in water to soften them and get rid of any salt that has been put on to preserve them. Next they are soaked in lime and water to loosen the hairs, so that they are easily removed by machinery. When the hairs are removed the flesh side of the skin is scraped to remove anything that is not really part of the skin and will not make leather. The scraping of the underside is



(*above*) HEMLOCK FIR (*below*) OAK BARK STRIPPING FOR TANNING

Photos H. Baston



CATTLE RANCHES IN (*above*) TEXAS AND (*below*) ARGENTINA, FROM WHICH WE GET MANY HIDES FOR MAKING INTO LEATHER

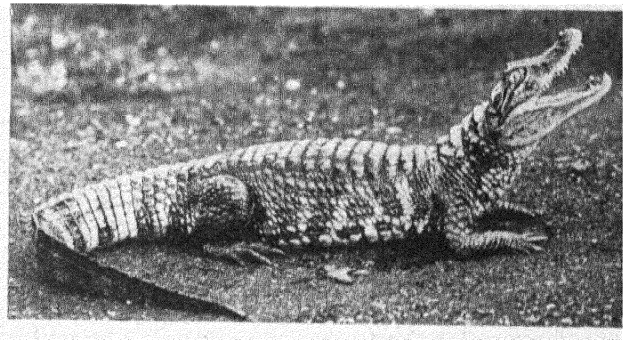
called fleshing. After being carefully washed in running water the skins are now ready for tanning.

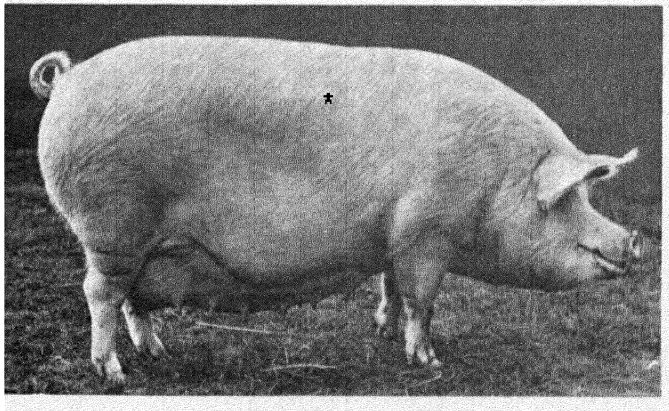
The oldest way of tanning is vegetable tanning. The bark and leaves, etc., of trees that contain tannic acid are soaked in water, and in this water the skins are placed. A great number of different vegetable materials are now used for tanning that have been slowly collected during long ages. In Britain oak bark was once solely used, but now the tanner has a wider choice. Some tanning materials are used to make hard leather, some soft. The colour of the leather also varies with the tanning.

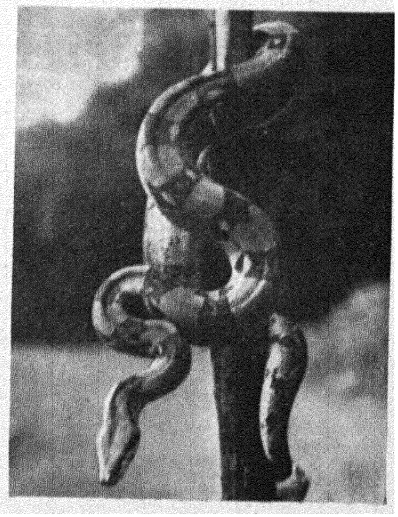
Here are some of the chief tanning materials besides oak bark: (*a*) Valonia acorn cups from Greece, Turkey, and Syria. Tannin from these cups is useful for making the hard leather needed for the soles of boots. (*b*) Oak apples or oak galls. (*c*) Sumach leaves. This shrub is especially cultivated in Sicily and the United States. Its leaves are valuable for making the finest of fancy leathers. (*d*) Wattle (mimosa) bark. Wattle-trees are cultivated in Australia and Natal. A good deal of wattle bark is exported from Natal. (*e*) The bark of the hemlock fir comes chiefly from Canada and is much used in the U.S.A. (*f*) Birch bark is popular in Russia. This bark, as well as containing tannin, has a small quantity of pleasant-smelling oil which is absorbed by the skin. It is this oil that gives the fragrant odour to 'Russian' leather. Birch bark produces a soft leather useful

for the upper parts of boots and shoes. (*g*) Tannin made from chips of the wood of the sweet chestnut in Italy and France. (*h*) Mangrove bark from the mangrove swamps of tropical Africa. (*i*) The very heavy wood known as 'quebracho' (break axe) from South America, and many other materials. Some factories buy the raw materials for tanning, such as dried bark, and extract the tannin themselves by soaking the material in hot or cold water, but many factories buy the tanning extracts ready-made. The hides are soaked in water containing tannin, and from time to time transferred to other tanks where the tanning extract is stronger. In the olden days tanning was a very long process, but modern science has shortened it. After tanning, the skins and hides become an entirely new material—leather. Tanning is really a wonderful process discovered in the dim past, perhaps by a man noticing that a wet skin left under a layer of bark for a time did not decay but became soft and pliable.

Vegetable tanning is now chiefly used for heavy leather (such as soles and belting), and **mineral tanning** has taken its place for lighter leathers, like the uppers of shoes and gloves. Mineral tanning is much quicker than vegetable tanning. The most important mineral process is **chrome** tanning, in which the skin is impregnated with chromium salts, but **tawing** is also practised—that is, treatment with alum, salt, and other agents. **Chamois** leather (once made from the skin of chamois) is made from sheep or goat skins by oil tanning, in which oil is used instead of tannin.

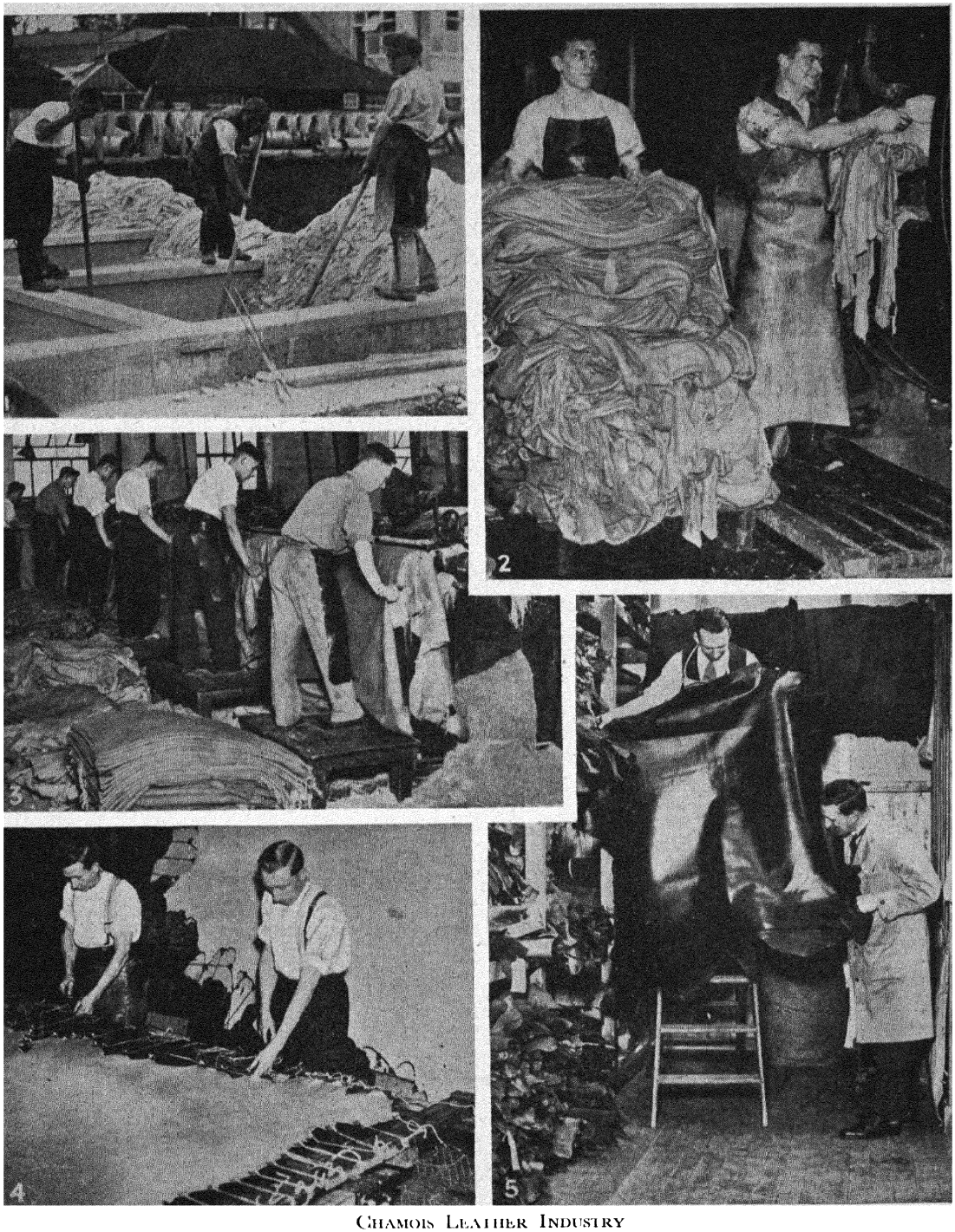






OTHER ANIMALS FROM WHICH WE GET SKINS FOR LEATHER—KID, CROCODILE, PIG, PYTHON

Photo "Farmer and Stock-breeder" (bottom left)



CHAMOIS LEATHER INDUSTRY

(1) New skins worked in the lime yard, (2) Tanning; (3) Cleaning; (4) Drying, (5) Box calf skin in skin-room.

Photos Fox (1, 2, 3, and 4) and by courtesy of Messrs W. Barratt Co., Ltd (5)

MOTOR CYCLISTS IN LEATHER CLOTHING
Fox Photos

A PILOT IN HIS WOOLLY-LINED LEATHER JACKET
Photo Keystone

After tanning the leather has to be dressed or prepared in all sorts of ways. Many of the leathers are dyed by being dipped into a bath containing the dyeing liquid, but the finest kinds are stained on the grain side (the side the hair was on) by being rubbed with the dye. Leathers are also polished and varnished. Patterns are stamped on leather so that sheep-skins can be made to resemble crocodile. Morocco leather is made from goat-skins. It is dyed on the outer side and is so finished that it has a ribbed or roughly grained surface. Long ago tanneries sprang up in places where there were good pastures for cattle (hides), plenty of soft water, and plenty of oak bark. The English Midlands had all these advantages; thus Leicester, Stafford, Walsall, and Northampton became famous for leather goods. At the present day some of the largest tanneries are at or near great ports like Bristol, London (Bermondsey), Liverpool, Manchester, Leeds, and Glasgow, where hides and tanning materials can be brought by ship from abroad easily and cheaply.

Leather-making is a most important industry in all manufacturing countries, especially the United States and Great Britain. In the U.S.A. tanneries are to be found in almost every part of the country. There are great leather manufactories in New York, Pennsylvania, and Massachusetts, also in Maine, Ohio, and Illinois. The cities of New York, Boston, Philadelphia, and Chicago are the chief markets of their products.

Things to Do

1. Make a list of all the things that people wear and carry made of leather, and make drawings of them.

2. What is the difference between (*a*) hides and skins, (*b*) skins and leather?

3. Why are hides called a 'by-product' of cattle and skins a 'by-product' of sheep?

4. Make a list of as many creatures as you can that provide the world with leather. Find pictures or make drawings of some, and write notes.

5. The tanner searches all parts of the world for his skins and hides and for his tanning materials. Make a list of vegetable materials used for tanning, and name the different countries from which they come.

6. Why do you think the leather industry is more important than the fur industry?

7. Write what you know about Morocco leather, chamois leather, Russian leather, suède leather.

8. Why did the English Midlands become famous for leather goods? Why are some of the largest tanneries to-day at or near great ports? Name these ports.

9. Name some places in the United States where there are some great leather manufactories.

10. What is the difference between a raw hide as it arrives in this country from, say, India, and the leather the shoe-maker uses?

11. What is mineral tanning?

12. Notice as many different kinds of leather as you can, and the objects made from them.

13. Make a collection of specimens of leather, and also any materials used for tanning. You may be able to get specimens from the Imperial Institute, South Kensington. These collections of specimens can be made for every chapter.

CHAPTER NINE

BOOTS AND SHOES

We have seen how the world gets its leather; now we come to the most important things made of leather—boots and shoes. Before we consider our boots and shoes let us look about the world for any footwear rather different from what we see around us.

We do not know when man first began to wear shoes. In warm lands he probably began with sandals consisting of a sole of wood or skin tied to the foot or ankle with strings. We know that the Egyptians, Greeks, and Romans all had some protection for their feet, and all through history men have worn boots and shoes of various shapes and fashions.

To-day in parts of Germany, France, and the Netherlands we shall find people wearing *wooden* shoes. In France these shoes are called *sabots*. In Holland, where the climate is moist and the ground generally damp, wooden shoes are useful because they keep out the dampness. Although they look heavy, Dutch children play about in them quite happily. Wooden shoes are useful for workers in all trades where a great deal of water is used and where the ground is generally damp and sloppy. Some workers in the Midlands and Lancashire wear *clogs*. Clogs have wooden soles about an inch and a half thick. The uppers are of leather.

Away in the far North of Canada we shall find the Indians and fur-hunters wearing snowshoes for walking over the snow. The Indians call these 'Bear's Paws.' In Tibet, on the highlands of Asia, both men and women wear high boots, some of which are made of yak's hide and others of lambskins and sheepskins with the wool on the inside. Many tie their boots at the top with wide leather strings. In the U.S.S.R. both men and women are fond of high boots made of felt and rubber. Many men seem to prefer them even in the summer. Rubber boots and shoes (Wellingtons, goloshes, etc.) are much more used in the United States, the U.S.S.R., Germany, and Scandinavia than in Great Britain. The United States in normal times used to turn out several hundred thousand pairs of rubber boots and shoes a day. (For more about rubber see Chapter X.)

Plaited straw and birch bark is another material used for shoes and sandals in some parts—for example, in the south and east of the U.S.S.R., the East Indies, Philippines, China, and Japan. In the country in Japan wooden sandals are used, held on by strings between the first and second toes, or with leather pockets at the front for the toes. On wet days in some parts the Japanese wear sandals mounted on little wooden stands that keep the feet well above the ground. They are something like our old-fashioned pattens. In China many people wear shoes made of coarse cotton cloth. The soles are generally white and the uppers made of black cloth. The soles are made thick by pasting many small pieces of cotton cloth together and hammering them so that they are flat and solid. Wooden soles are sometimes used. In Persia, Turkey, Syria, and the East shoes or slippers of bright red and yellow leather with no heels are worn.

Although we shall find boots and shoes made of rubber, felt, canvas, fur, cotton, silk, straw, wood, plaited birch bark, and other materials, the most popular of all shoes are perhaps leather shoes. With leather is combined other materials, such as nails, linen thread, and wood (for heels).

The two countries that have the largest and best factories in the world for the making of boots and shoes are Great Britain and the United States. But in all great manufacturing countries every important town has its factories where boots and shoes are made. There

are factories in France and Germany and in every country in Europe, as well as in Canada, Australia, and New Zealand, and other new manufacturing countries, like Japan. It is difficult to realize that in recent years Japan has come to rank among the greatest manufacturing countries, and India is on the road to becoming a manufacturing country. The machinery used in all these countries is very wonderful, and some modern factories can turn out ten thousand pairs of shoes a day!

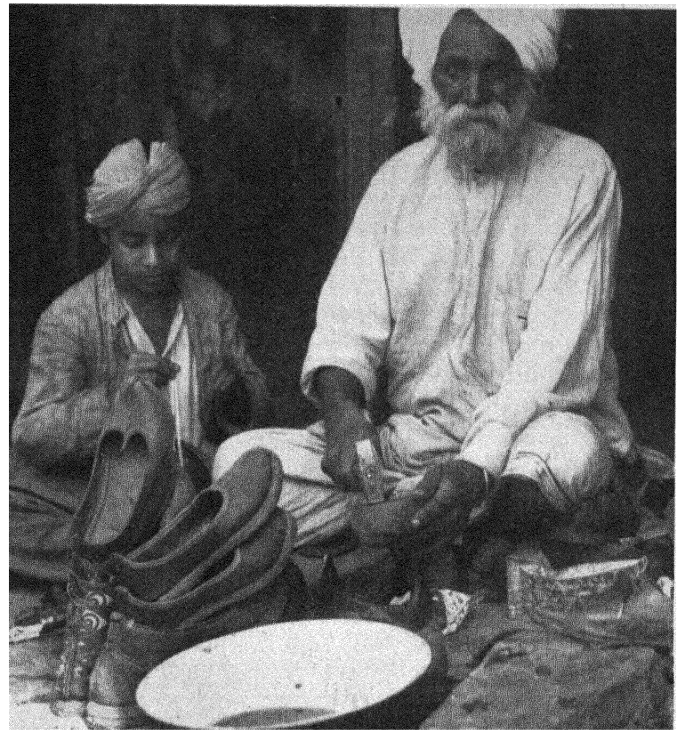
In olden days every one, even little children, knew how boots and shoes were made because they could watch the cobbler at work. They saw all the tools and things he used, the leather, the bucket of water for softening the leather, his sharp knife for cutting, his 'nice little awl' for making holes in the leather, pegs and nails for fastening, a hammer, a rasp for plying off the pegs, a solid wooden shoe called a last, on which he shaped the shoes, a stone called a lapstone that he held in his lap to beat his leather on, besides needles, thread, wax, buttons, paste, and blacking. The cobbler, wearing a leather apron, generally sat on a bench at one end of which were boxes for his knives, awls, and other

Boots and Shoes, Ancient and Modern

(1) Hunting-boot, (2) Ski-boot, (3) Cavalry boot of eighteenth century; (4) Arctic snow boot, (5) Dancing-shoe, (6) Dutch clog; (7) Football boot; (8) Modern wedge-heel shoe; (9) Roman sandal, (10) Modern sandal; (11) Court buckled shoe; (12) Modern square-toed shoe; (13) Walking-shoe; (14) Diver's boot, (15) Midland clog; (16) Dress shoe; (17) Chinese shoe; (18) Child's shoe; (19) Dress shoe (man's); (20) Balmoral boot, (21) Acid-proof Wellington boot.

Note: See the picture of the trapper wearing snow-shoes at page 9.

tools. There the children could watch him at work, talk to him, and see exactly how their shoes were made. It used to take two cobblers a day and a half, working steadily, to make one pair of rough boots. Now by the aid of machinery, a pair can be made in about four minutes!



AN INDIAN COBBLER AT WORK
He is an adept at putting on patches, which, in many cases, only last a day or so
Photo I. N.A.

The work in a big modern factory is very different and very bewildering. In one part of the factory soles and heels of stout leather are being cut out by the dozen. The machines used are really powerful presses armed with sharp cutters of the desired size and patterns. Men stand by the machines to work them, and all day long soles and heels are cut out. In another room the parts that make the uppers are being cut out of softer leather. This work is done by hand with very sharp knives and metal patterns of the different parts. The men who do this are called clickers, because of the clicking noise made by the knives on the cutting boards. The clickers are skilful workers. They know how to lay their patterns on the skin to get the most out of it, and they work quickly. All day long they cut out these parts. Machines paste, line, and sew them together to make uppers. Some machines beat out the seams, some punch eyelet holes and fasten on the eyelets, other machines stamp out toe-caps. Indeed, there is no end to the work that machines can do.

In another room the finished uppers are being fastened to the soles by machinery. The uppers are pulled over an iron last, the sole placed on it, the edges of the uppers drawn over the sole and tacked in place, and then the outer sole fastened on. In another room heels already prepared are nailed on by machinery. Lastly there come many finishing processes—trimming, smoothing, colouring, and polishing. The finished shoes are then neatly packed in cardboard boxes.

All the machinery in the factory is more wonderful than words can tell. It is said that the United States leads the way in the invention of shoe-making machinery. Some factories have as many as two hundred kinds of machines. Perhaps the most interesting machine is one that drives in nails at the rate of fifteen in one stroke. Buttons, too, can be sewn on by machines. As you can imagine, some of these machines are very expensive, so the boot manufacturer hires them from the machine-maker. Since the machines last a long time the maker finds it pays better to let them on hire and keep them in repair than

to sell them outright. Hired machines carry a disc on which is recorded the number of times they have been used, and the boot-maker pays accordingly.

For fancy shoes many different skins are used, such as crocodile, snake, and lizard. Leather can now be stamped with all sorts of patterns, so most fancy shoes are made of *imitation* crocodile skin, lizard, etc.

There are still people who like hand-made boots and shoes better than machine-made ones, so some factories have a special department for this skilled work. Hand-made boots and shoes are expensive. In Britain the chief towns for manufacturing boots are Northampton, Norwich, Stafford, Leicester, Kettering, and Wellingborough. Of these Northampton and Norwich are the oldest boot-making towns. They are in the midst of pasture lands and were famous for boots and shoes before skins and hides were imported from abroad.

In the United States the shoe industry began in Massachusetts, and especially in Lynn, about eight miles from Boston, a place which is noted as one of the chief shoe-making centres of the world. The industry soon spread to different parts of the country. In New England there are several cities whose chief business

BOOTS: CUTTING OUT UPPERS IN THE CLICK-ROOM
(*inset*) INDIVIDUAL CLICKER

Photos by courtesy of Messrs W. Barratt and Company, Ltd, Northampton

is to make shoes; the Central States, Cincinnati and St Louis, have enormous shoe factories. Boston, New York, and Chicago are important whosesale markets for all kinds of footwear.

Things to Do

1. Make a list of interesting boots, shoes, and slippers of all kinds. Write notes about each and find or draw pictures. A visit to a boot shop will help you. Here are the names of some to look for: Wellingtons (or rubbers), moccasins, plimsolls, galoshes (or goloshes), snowshoes, sandals, brogues.

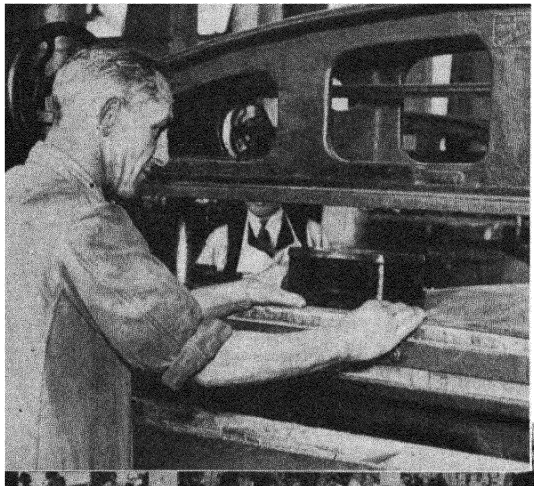
2. Name places where boots and shoes are made in (*a*) the United States, (*b*) Britain. Write notes about them. Find out from boot shops the names of any towns where boots and shoes are made.

3. Why are boots and shoes in Britain made chiefly in Northampton, Leicester, and Norwich?

4. What is a last? What does the saying 'Stick to one's last' mean?

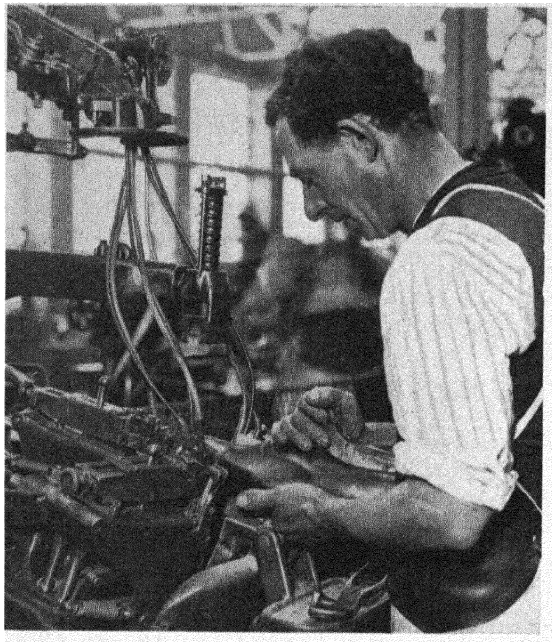
5. Make a list of the different materials used for making footwear and after each the name of one country where it is used, thus, *felt*, U.S.S.R.; *canvas*, United Kingdom (for plimsolls, tennis shoes, etc.).

6. Try to find out what different kinds of leather are used for making shoes, especially fancy shoes. Find out if the difference

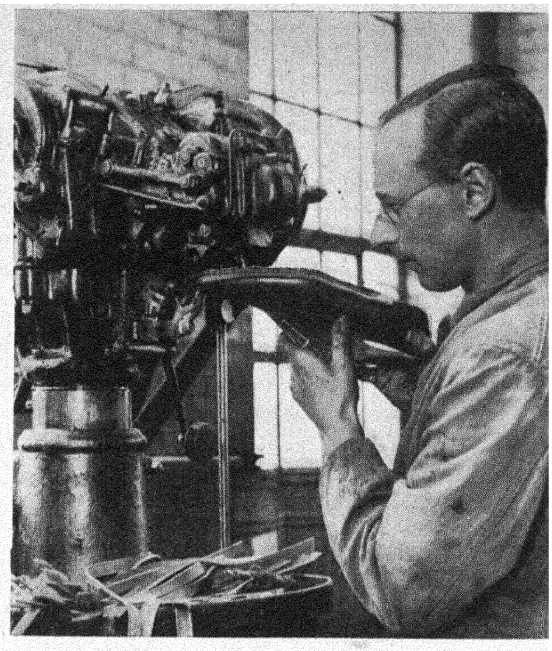


(*above*) PRESS-CUTTING OUT SOLES (*below*) CLOSING-ROOM

Photos by courtesy of Messrs W. Barratt and Company, Ltd, Northampton

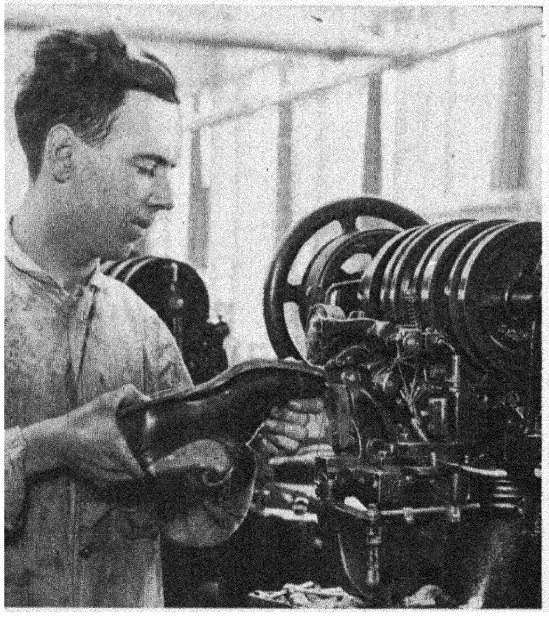


How the Uppers are pulled over the Last and are prepared to be attached to the Sole



Sewing the Welt on to the Upper

Photos by courtesy of Messrs W. Barratt and Company, Ltd, Northampton



A Stitcher sewing the Sole to the Upper through the Welt

A Heeler

Photos by courtesy of Messrs W. Barratt and Company, Ltd, Northampton

is caused by the leather coming from different animals or by patterns impressed upon the surface of the leather.

7. The population of the world is about 2,000,000,000. Suppose a factory made 10,000 pairs of shoes a day, in how many days would it make enough for the whole world? In how many years? Remember, it would then have given only one pair of shoes to each person.

8. Describe briefly the making of a pair of boots in a modern factory under these headings: (*a*) Cutting out soles and heels, (*b*) Cutting out uppers, (*c*) Sewing the uppers together, (*d*) Putting on the soles, (*e*) Heeling, (*f*) Finishing. Describe an old cobbler, his tools, and his work. Find poems about cobblers.

9. Find on your atlas map the towns in Britain famous for making boots and shoes. In what part of Britain are most of these towns?

10. With the help of the pictures tell an interesting story about the making of a pair of shoes. The **closing-room** (see picture) is where the uppers are sewn together by machines. Closing means fastening the pieces of leather together. The click-room is where the leather is cut. 'Clicker' is a slang word for cutter. You can guess why the room is called the click-room. A click is a slight, sharp noise.

CHAPTER TEN

RUBBER

RUBBER is a very interesting and valuable product and is grown in Malaya and the East Indies, Sumatra, Java, Borneo, and Sarawak.

It is just the juice of a tree, the rubber-tree, but it gives us our wet-weather clothing as well as a host of other things. Although practically all the rubber plantations are in Malaya and the East Indies, the rubber-tree grown there is a native of the forests of the Amazon, in South America. The first European to see rubber was Columbus, when he discovered the West Indies in 1492, and saw children playing there with balls of rubber that bounced beautifully.

India-rubber got the name of 'India' because Columbus thought he had come to India, and 'rubber' because it was first used and valued for rubbing out pencil marks on paper. Rubber found its way to England about 1770, and it was Priestley (the man who gave us oxygen) who learned that it would rub out pencil marks and called it 'rubber.' The Indian's name for it was *caoutchouc*, meaning 'the tree that weeps.' Nearly every language except English uses some form of the word 'caoutchouc' (pronounced koo'-chook) instead of the word rubber. The first tiny cubes of rubber cost as much as seven-and-six, so there was much money to be made by those who gathered rubber from the forests of South America.

You have all seen the common milk weeds that grow in England, small plants whose stems when broken give out a milky juice. In temperate climates these plants are small and rare, but in the tropics there are great trees that exude a milky juice when the bark is cut or damaged, and the leaves or twigs torn or snapped across. This milky juice is called latex. Remember latex is not the sap of the tree. When a rubber-tree is tapped care is taken that the cut shall not be deep enough to reach the woody part of the tree where the sap flows. The juice that pours forth from a cut is really for the purpose of healing the wound. It congeals over the cut. That is how long, long ago the Indians discovered rubber by picking the soft lumps off broken twigs or damaged trunks.

There are a great variety of rubber-trees, but the tree that gives the largest amount of rubber is the Hevea-tree, which grows in the hot wet forests of the Amazon. The rubber from these trees is called Para rubber, because it is exported from Para, a port at the mouth of the Amazon. This tree grows to a height of sixty feet, and has high branching limbs and long, smooth, oval leaves. The pale flowers change to pods containing three seeds something like nutmegs. When the pod is ripe it bursts with a loud report, the seeds shooting in all directions. This is Nature's scheme to spread the Hevea family.

All rubber-trees like damp air, heavy rainfall, and heat, so they only grow in the **hot wet forests** of the tropics. Let us look at a map for the places where the rubber-trees grow that are the sources of most of our waterproof clothes. We can trace this rubber belt round the world, keeping fairly close to the Equator. Begin with the Amazon region in Brazil, once the chief rubber-producing area of the world, but now only important as a source of *wild* rubber. Follow the belt across the Atlantic to Africa, where we come to the Congo region; the Belgian Congo produces a small quantity of wild rubber. Complete the circle by crossing the Indian Ocean, and we come to countries that have rubber plantations, or cultivated rubber—Ceylon, Sumatra, Malaya, Java, Borneo, and Sarawak. Malaya and the East Indies produce most of the rubber the world uses.

It was an Englishman called Wickham who first thought of cultivating rubber-trees and having rubber plantations. Through him seedlings of the Hevea-tree were taken to Ceylon in 1876, and to the East, and rubber plantations started there. In Malaya there were acres and acres of ground where the rubber-trees were beautifully laid out and as well cared for as any fruit trees in our land. There is a fine rubber plantation in Sumatra, where for eighty square miles the orderly ranks of trees, numbering five millions, fill the gently rolling landscape.

The plantations are generally managed by white men, while natives, or coolies, do most of the work of growing, collecting, and making the raw rubber. It is a cheerful sight to see the workers trooping out early in the morning for their day's work. The tapping, or cutting, must be done early, for the latex flows best then. In tapping, a thin narrow strip of bark is pared away with a special knife, the cut sloping like half a V. Care is taken not to cut into the wood of the tree, as this injures the tree and allows the sap to run into the latex and spoil it. When the proper cut has been made, the coolie inserts a little spout to carry the dripping latex to a little cup of metal or earthenware fastened below, as you can see in the picture.

The trees are tapped daily or every other day. At each succeeding day the tapper widens the cut by stripping off a sliver of bark one-twentieth of an inch in width. The slanting cuts gradually go up the tree until the tapper can reach no higher. Then he begins again at the bottom, completing the V-shaped marks you see on nearly every picture. When all the bark is pared from one side of the tree the tapping begins on the other side. In this way the whole of the bark is removed from the lower part of the tree in five or six years. This does not hurt the tree, because all the time fresh bark is reforming,

A Rubber Plantation: Natives collecting the Latex

Photo by courtesy of the British Rubber Development Board

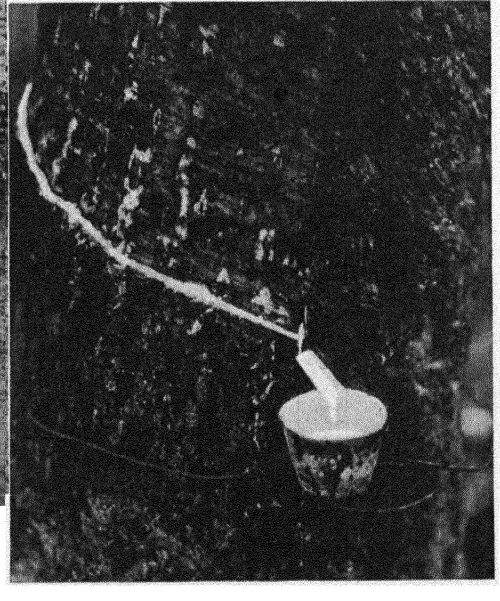
and when the tapper has finished the last side of the tree the renewed bark on the opposite side is ready and old enough to be tapped.

Later in the morning, after tapping, the workers make the rounds of the trees with large milk cans, gathering the latex from the cups. The cans are carried to a collecting-station as clean and well kept as a dairy. Here the latex is put into tanks and mixed with water. The diluted latex then flows into coagulating-tanks and is mixed with a little acetic acid (vinegar), when it sets something like a junket, leaving a clear 'whey.' The rubber, as we can now call it, is removed from the tanks and passed between light rollers, which squeeze out the water and consolidate it in sheet form. A second, smooth-faced roller reduces it to the right thickness. These sheets are then finished off by being passed through diamond or similar patterned rollers to produce ribbed marked sheets. The sheets are then hung on racks in a smoke-house to be dried. These sheets are called smoked sheets. All rubber is not smoked.

A good deal of rubber is passed through heavy machines to produce a thin strip, which is then folded twice or thrice, and again passed through the rollers several times to

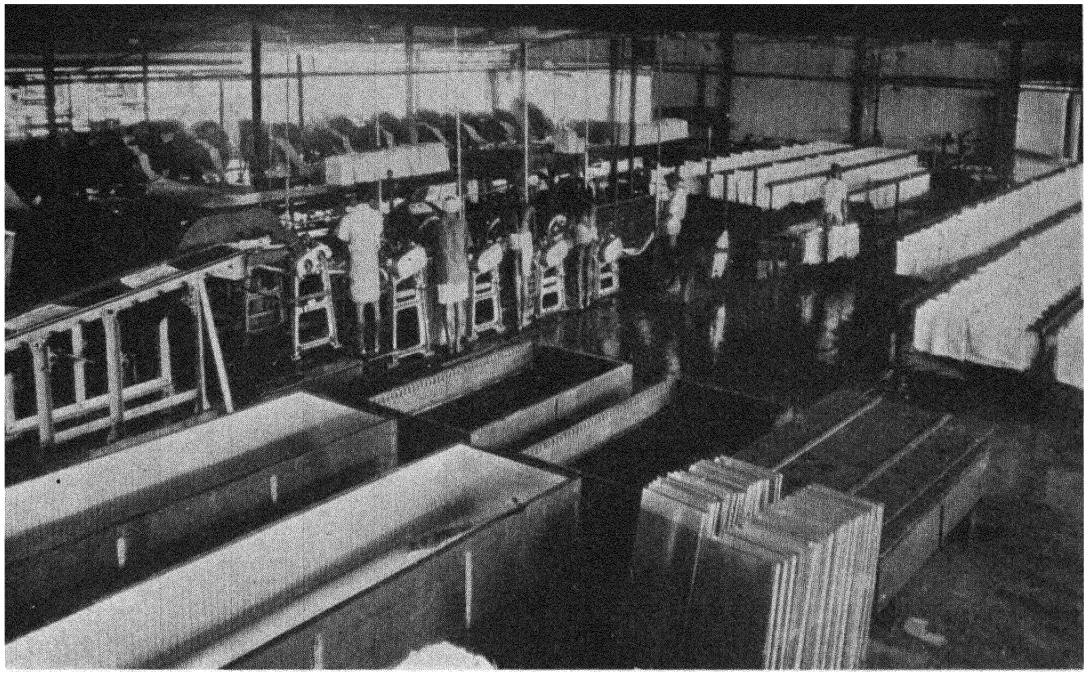
RUBBER: A NATIVE TAPPING A RUBBER-TREE ON A RUBBER PLANTATION IN SINGAPORE

Photo by courtesy of the British Rubber Development Board



A COLLECTING-CUP IN A TREE

Fox Photos



INTERIOR VIEW OF A RUBBER PLANTATION FACTORY
Photo by courtesy of the British Rubber Development Board

bring it to the desired thickness and shape. This is called crepe rubber. Crepe or blanket rubber is not smoked, but hung in the air to dry. Sole crepe is a variety made on a limited number of plantations and used, in its raw state, for soles of sport shoes. Shoes are sometimes advertised as having hard-wearing 'plantation' crepe soles. Besides raw rubber in the form of sheet crepe, or blanket, quantities of latex were shipped from the plantations in the East to manufacturers in Europe, America, and elsewhere. The famous port of Singapore is well placed for sending rubber to Europe by way of the Suez Canal and to the United States (New York) by way of the Panama Canal.

Rubber clothing really dates from the year 1823, when Charles Mackintosh, of Glasgow, found a way of waterproofing cloth by spreading on it a thin coating of rubber dissolved in coal naphtha. This was the beginning of our wet-weather clothing. Many people still refer to raincoats as mackintoshes. But the first rubber clothing and rubber shoes were not popular for long, because the rubber got hard and stiff in winter and soft and sticky in summer. It changed with the temperature and it did not wear well.

It was an American called Charles Goodyear who in 1839 made the most useful of rubber discoveries—a method of making rubber durable, firm, and elastic, in spite of changes of temperature. His method was to mix pure rubber with sulphur and heat it. He called it vulcanizing, after Vulcan, the Roman god of fire. Every firm now has its own method of vulcanizing rubber, but they are all based on Goodyear's discovery. Great improvements have been made, too, and the process is not a simple one. Vulcanized rubber can be made very hard or soft. Hard rubber, called vulcanite, or ebony, is used for making combs, breast pins, bracelets, and buttons. Hundreds and hundreds of articles

NATIVE WOMEN FOLDING RUBBER IN THE PLANTATION FACTORY
Photo by courtesy of the British Rubber Development Board

are made of rubber besides some of our clothes. But practically everything made of rubber has to go through the vulcanizing process. Plantation crepe soles are an exception.

The manufacture of india-rubber goloshes and boots and shoes is a very large industry, particularly in the United States, Russia, Germany, and Scandinavia. In Great Britain rubber shoes are used to a smaller extent, and principally by women and children, who wear a lighter boot than men. Rubber shoes and boots are made of calendered (rolled) sheet rubber. The various parts are cut out, as in ordinary shoe-making, and built up by hand on an iron 'last.' They are not sewn together, but joined with the aid of a solution of rubber in naphtha. The rubber has been previously dyed black. The shoes are vulcanized after shaping. Although a dozen or more pieces are required to build up a single shoe, they are so neatly fastened together that it looks as though the shoe were moulded from one piece. The United States used to turn out several hundred thousand pairs of rubber boots and shoes a day.

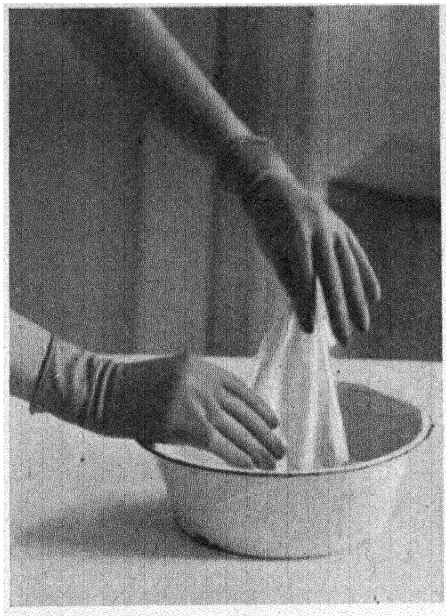
In the present shortage of rubber, old rubber is being converted into new in many factories, and men are thinking out ways of making artificial rubber. As men have copied the silkworm and learned to make artificial silk so they may be able to learn from the rubber-tree and make one day good artificial rubber. Before the war of 1939 experiments in making artificial rubber had been strenuously carried out in Russia, America, and Germany because they feared war might cut off their supplies from the East. But the

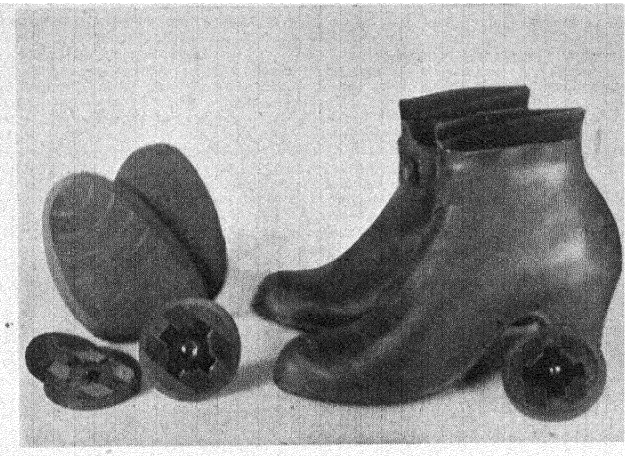
best artificial rubber at present is costly and takes long to make. It has been made from a variety of materials, including potatoes and the waste materials from oil refineries. Russia claimed before the war that she was producing annually as much artificial rubber as the natural rubber grown in the plantations of Borneo and Sarawak. She claimed to have made 25,000 tons of rubber in one year, 25 tons of potatoes being used to make one ton of rubber. This output is small compared with the enormous output from rubber plantations. Possibly new rubber plantations will grow up in India, Ceylon, and Africa, but it takes five to seven years for rubber seeds to grow into trees that can be tapped.

Things to Do

1. Write down the names of some of the things we wear made of rubber, such as

LAND GIRL WEARING RUBBER BOOTS
Photo Sport and General





ARTICLES MADE OF RUBBER

(1) Gloves; (2) Over-shoes, rubber heels, and soles; (3) Bathing-cap; (4) Rubberized macks.

Photos E.C.M. (1, 2, *and* 3), *Sport and General* (4)

clastic for hats and suspenders. Make a Rubber Picture Book. Put in the names of articles made of rubber. There are fifty thousands! How many can you name?

2. When was rubber first seen by white men? How did it get its name of rubber? What is its real name?

3. Why are some raincoats called mackintoshes? Why are some rubber heels called Goodyear heels?

4. Who first thought of having rubber plantations, and when? Where is wild rubber obtained, and where plantation rubber? Where will you look on the map for the rubber belt?

5. Describe how rubber-trees are tapped and the latex collected.

6. Trace the sea-route of rubber from Singapore to London, and from Singapore to New York.

CHAPTER ELEVEN

MORE VEGETABLE FIBRES

We have learnt about the most useful vegetable fibres for making clothing—cotton and flax—but there are many vegetable fibres employed chiefly for making rope and sacks that play some part in clothing the world and are tending to become more important. To learn about these will take us to many different parts of the world.

Hemp is the name given to a number of fibres obtained from different plants and used chiefly for the making of string, rope, and coarse cloth for aprons. True hemp is the fibre of a tall plant belonging to the stinging-nettle family, and came originally from Central Asia. It is cultivated especially in Russia, Poland, Germany, and Italy. It is also grown in India, China, and Japan, in Kentucky, in the U.S.A., and in East Africa. Like flax, hemp is retted, to loosen the fibres, and it is a very important article of commerce. It is especially used for the weaving of cloth and the manufacture of thread, fine twine, and sail-cloth. The preparation of hemp fibres for cloth is much the same as that for making coarse linens.

Manila hemp is a tropical hemp that grows only on the Philippine Islands. It takes its name from Manila, the port in the Philippines from which it is exported. Manila hemp is the fibre of a plant very like the banana plant and plantain. The fibre is obtained from the big inner leaves which are wrapped about a central stalk. These fibres are woven into hats and cloths of various kinds. The chief use of manila hemp is for making ropes for ships, as rope made of this hemp stands an enormous strain and does not rot in salt water. The fibre is regarded in the trade as unrivalled for rope-making.

It is fortunate for us to-day that we have in our Empire a plant almost as good for making rope and string—**sisal hemp.** Sisal hemp is the fibre of the agave plant, a plant something like the pineapple. Its long, thick, sword-like, pointed leaves growing up from the ground contain the fibres. Sisal hemp is grown on a large scale in East Africa, especially Tanganyika, and South-east Africa. It grows also in Mexico, Central America, and the East and West Indies.

New Zealand flax or hemp is not really flax or hemp. It is obtained from the leaf of a lily-like plant, sometimes called the flax lily. Its fibres were used long ago by the Maoris, who wove it and used it for dress material. Its fibres are fine and strong, and it is now only produced to a limited extent in New Zealand chiefly for matting, rope, and binder twine for harvest sheaves.

Ramie, or China grass, is widely grown in China. It is also cultivated in Formosa, Malaya, and Mexico. Ramie is a nettle-like plant that sometimes reaches a height of eight feet. The fibres come from the plant stems, which are retted and then treated much the same as flax. They are stronger than hemp and almost equal to silk in their lustre. From them are woven grass linens and grass cloths, fabrics which resemble both silk and linen and make beautiful dresses. Ramie is also used for making gas mantles, but its chief value is as a substitute for linen, or wool, or cotton in manufacturing clothes and other fabrics. It is said that ramie would be more used were it not for a sticky substance in the fibres that is difficult to remove.

There is a tropical tree that grows in the East Indies and Africa called the **cotton-tree,** or the **silk cotton-tree.** It produces pods containing kapok, a silky-white floss very like cotton which is sometimes used for weaving, but mainly for stuffing mattresses and pillows.

CUTTING DOWN HEMP STALKS FOR STRIPPING
Photo by courtesy of Messrs Hindley and Company, Ltd

Unfortunately the fibres are much more brittle than cotton, and so can only be woven with difficulty. The cotton-tree therefore is little used for clothing.

Jute is another important fibre. It is grown for commerce only in one part of the world—the hot, wet delta lands of the river Ganges, in India. The jute plant grows to a height of eight to twelve feet with but few branches or leaves until near the top. Like flax, jute must be retted—that is, steeped in water for a time to loosen the fibres. It is spun and woven by much the same type of machinery as that used in the linen industry. In India the fibre has long been used for the manufacture of gunny bags and native clothing, but in Europe it was not much used until the great improvement in the spinning machinery made its working easy. Jute first came to the Dundee linen mills in 1822, when Dundee was the chief linen town in Scotland. To-day the jute industry has quite displaced the linen industry as the principal trade in Dundee. Jute is the cheapest of all fibres and used to a greater extent than almost any others except flax or cotton. The number of purposes for which jute is used is legion. With regard to clothing, aprons come first. Some of the finer qualities of jute are used for shirtings and coat linings, and they are mixed with wool, cotton, and flax in cheap clothing materials. Because of their satiny lustre, the fibres are sometimes mixed with silk in cheap satins. The main reasons that jute is not used greatly for clothing are because it cannot easily be bleached (though it takes brilliant dye colours readily) and it does not wash well. Among the many useful things made from jute are sacks and bags (any number of these), buckram, hessian,

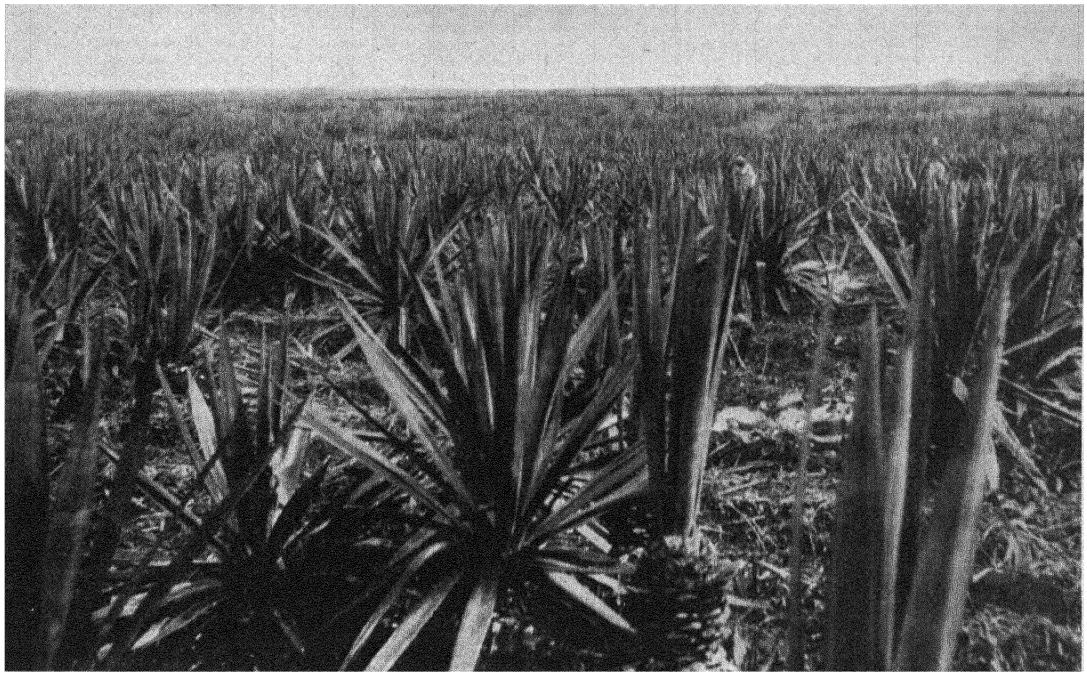
canvas, burlap, carpets, and rugs—especially prayer rugs for Mohammedans—cords, stage wigs, tresses, ladies' hair pads, and many other things.

There are roughly four to five million bales of jute per annum shipped from India to various parts of the world, and about the same number of bales used in the Indian jute mills, particularly in Calcutta. Outside India, Dundee has the greatest trade in products of the jute manufacture. The Dundee Chamber of Commerce issue a booklet containing a list of over ninety products.

Perhaps the most interesting 'vegetable' clothing in the world is that found already made or woven. To find this we must go to British East Africa, to Uganda, on the edge of Lake Victoria. Here the natives dress in the fibrous bark of a tree which makes excellent clothing without spinning or weaving. The tree is a kind of fig-tree that they grow in their gardens and has leaves something like the ash. From time to time the bark is taken from the tree by cutting two rings parallel to each other and some distance apart.

STRIPPING HEMP BY HAND (*above*), BY MACHINE (*below*)

Photos by courtesy of Messrs Hindley and Company, Ltd



A Typical Plantation of Sisal in Kenya
Photo E.N.A.

A third cut is made perpendicularly from one ring to the other. The bark can thus be taken away in great strips, each the full circumference of the tree. When the bark has been stripped off, its rough outer surface is scraped or broken away, and only the fine, soft inner fibrous part remains. This is soaked in water and pounded again and again with a hard wooden mallet crossed and recrossed with grooves. When the wet sheet has been well hammered it is folded and hammered again. It is folded a second time and beaten until it spreads out and is an even thickness throughout. It is now dried and is ready to be sewn together for clothing. The natives of Uganda sew the bark into sheets or blankets, and one such sheet forms a dress for a man or woman. The cloth looks as though it had been woven upon a loom. It ranges in thickness from that of fine canvas to a rather coarse blanket. It is soft, pliable, and warm. It is generally reddish-brown in colour, although sometimes bleached white or stamped with a black pattern. In wearing bark cloth a woman wraps a big sheet about her body under the arms and fastens it at the front with a knot or twist. She ties it in at the waist with a belt of the same material. Such dresses cling tightly to the body so that the natives can do all sorts of work in them. Once nearly all the negroes of Uganda wore bark cloth, but now they like cotton better. The poorer natives, however, still use it, and the boys are often dressed in gowns grown in their gardens and made by their mothers at home.

Besides the famous Uganda bark cloth, bark cloth is also worn by certain tribes of Indians who live in the wilds of South America near the head waters of the Amazon river. The South Sea Islanders make their famous Tapa cloth from the bark of the paper mulberry. They use the bark of the small branches, which they soften in water, and then,

SETTING OUT SISAL FIBRES TO DRY
Photo E.N.A.

A FULL-GROWN FIELD OF JUTE IN BENGAL
Photo E.N.A.

scraping off the rough outer surface, they beat and press the moist strips together. The paper which is used in Japan and many parts of the East is in great part made from the bark of the young shoots of this plant, which for this purpose is boiled to a pulp. Besides the above vegetable fibres there are, of course, many others that play a very small part in dressing the world—for example, the raffia, or bass, we know in the school handwork lessons, and which is obtained from the leaves of a palm from Madagascar. Raffia is used for making plaited slippers or hats.

The important fibre obtained from the coconut and known as coir is too coarse for clothing; indeed, it is perhaps the coarsest and roughest of fibres. It is used to make twine, cord, mats, and sacks.

Things to Do

1. What is true hemp? Write all you know about manila hemp. To what different fibres is the name hemp given?
2. Describe a 'hemp' grown in East Africa. Why is it specially important to-day?
3. What do you know of New Zealand flax and China grass?
4. Where is jute grown? What town in Great Britain makes a number of things from jute? Make as long a list as possible of things made from jute.

A Tailor of Kampala, Uganda, stripping a Tree of its Bark, which, after being properly treated and cured, is fashioned into Native Garments

Photo E.N.A.

5. What parts of the following plants yield the useful fibres: cotton, flax, true hemp, manila hemp, sisal hemp, jute?

6. In what parts of the world do people wear clothing made from the barks of trees? Write what you know of this clothing.

7. Make a frieze or booklet about useful plant fibres. Find pictures of the plants that yield these fibres.

8. Classify all the kinds of clothing material you have learnt about so far under these headings: (*a*) Plants. (*b*) Trees. (*c*) Animals. (*d*) Insects.

9. Classify useful fibres under these headings: (*a*) from hot lands; (*b*) from warm temperate lands; (*c*) from cool temperate lands; (*d*) from mountain lands.

10. Name a plant that yields a useful fibre in each of these places: Kentucky, Philippine Islands, Tanganyika, New Zealand, East Indies, Bengal, China. Describe the position of each of these places.

CHAPTER TWELVE

BUTTONS

BUTTONS are often thought to be of little value. Nevertheless they are very important in the world of clothing, as we can see when we button up our greatcoats. The use of buttons on articles of dress is comparatively recent. The people of long ago used strings or strips of leather as the less civilized tribes in all parts of the world do to-day. The Greeks and Romans used girdles or belts.

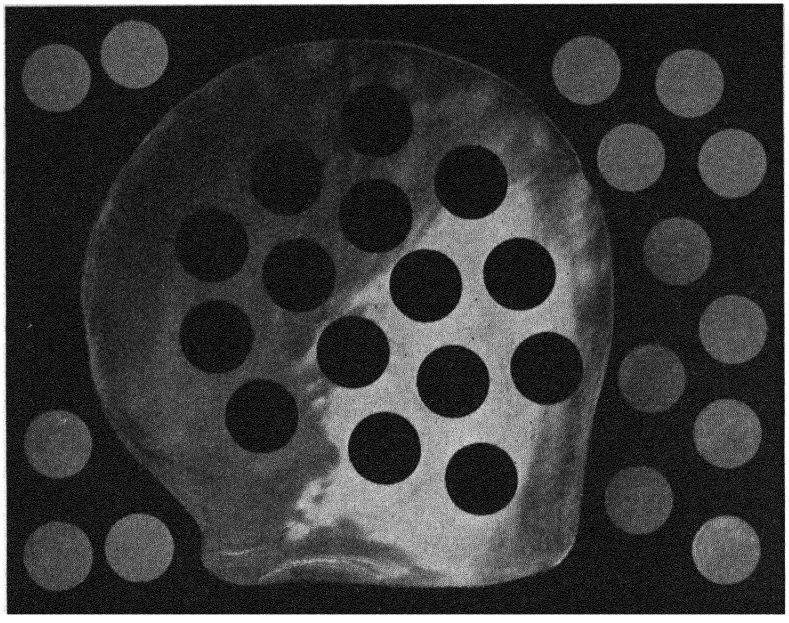
Probably buttons were first used for purposes of decoration only. They began to be employed as fastenings at least as early as the fourteenth century. At first a loop was used to slip over the button, the button-hole coming later. Some say the trade in buttons dates from the reign of Queen Elizabeth. The process of making buttons was very slow in those days, as they were all made by hand from wood or metal. Large quantities of buttons are now made both for fastenings and decorations and as distinctive badges, such as the buttons on policemen's and soldiers' uniforms.

The number of materials that have been used and are used for making buttons is very large.

(*a*) **Wood,** or wood covered with cloth. Old button-makers of long ago advertised that they made "buttons of apple, holly, and laurel wood, hard and clear." (*b*) **Metal**—brass, tin, pewter for the cheaper ones, and gold and silver for the expensive ones. (*c*) **Horn,** made from the horns or hoofs of cattle. (*d*) **Ivory** from the tusks of elephants. (*e*) **Vegetable ivory** from the nuts of a South American palm-tree. (*f*) **Pearl** from pearl oyster shells and mussels. (*g*) **Rubber.** (*h*) **Porcelain.** (*i*) **Glass.** (*j*) **Paper.** (*k*) **Rice.** (*l*) **Potatoes** (potatoes when mixed with certain acids become as hard as stone). (*m*) **Cloth.** (*n*) **Seaweed.** (*o*) **Casein,** made from milk or blood. (*p*) **Celluloid,** made of gun-cotton and oil.

Many other materials are also used, such as vegetable gums. Indeed, there seems to be no end to the list of button-making materials. Buttons are called 'composition' buttons when they are made from a compound substance or mixture that resembles a natural material, such as ivory.

Before we visit the places where buttons are made and learn a little about how they are made, it is interesting to examine a handful of buttons; notice their shapes, and try to guess from what they are made. See if you can divide the buttons into three classes according to the way they are sewn on your clothes. You may find big flat coat buttons or little horn buttons with four holes bored through the centre, or buttons that have only two holes. Many buttons are pierced in this way. They all belong to the same class, being sewn on through holes in the button itself. Put all these in one class. Now look for metal buttons with shanks on their under sides, the shanks being little round metal rings through which the thread goes to sew them on. Buttons of bone, glass, and vegetable ivory are made in this way—big buttons for overcoats down to the little round black buttons sewn on shoes. Put these in another class. You may find other buttons in your collection that have a tuft, or layer of felt or cloth, on their under side in place of the shank. The needle is run through the cloth tuft, or layer, and the button fastened by means of it to the garment. Many buttons of this kind are covered entirely with cloth; sometimes they are of pearl or other material with cloth fastened on to the back only. These all go in the last class. Almost all buttons are made in one of



AUSTRALIAN PEARL SHELL FROM WHICH PEARL BUTTONS ARE MADE
Photo E C M.

these ways, and machinery of many kinds has been invented to make them in vast quantities and at low prices.

Buttons are of so many materials that we cannot trace them all back to their source, but it is interesting to find out where and how some of them are made.

In England, Birmingham soon became the centre of the button industry. Brass buttons were first made there in 1689, and from that date the **metal** button industry developed. Matthew Boulton, the friend of James Watt, made great improvements in the manufacture of metal buttons. At their Soho works steel and gilt buttons were made in great quantities. The eighteenth century was the Golden Age of the Birmingham button industry, and large fortunes were made. In the United States, New York and Connecticut are famous for their brass buttons. The best metal buttons are formed by stamping circular discs out of sheets of brass or other metal. They are then pressed into shape and are ready for the shanks, which are made of wire. These are soldered on the back. Metal buttons are dressed on a lathe and gilded and burnished; sometimes they are lacquered or varnished.

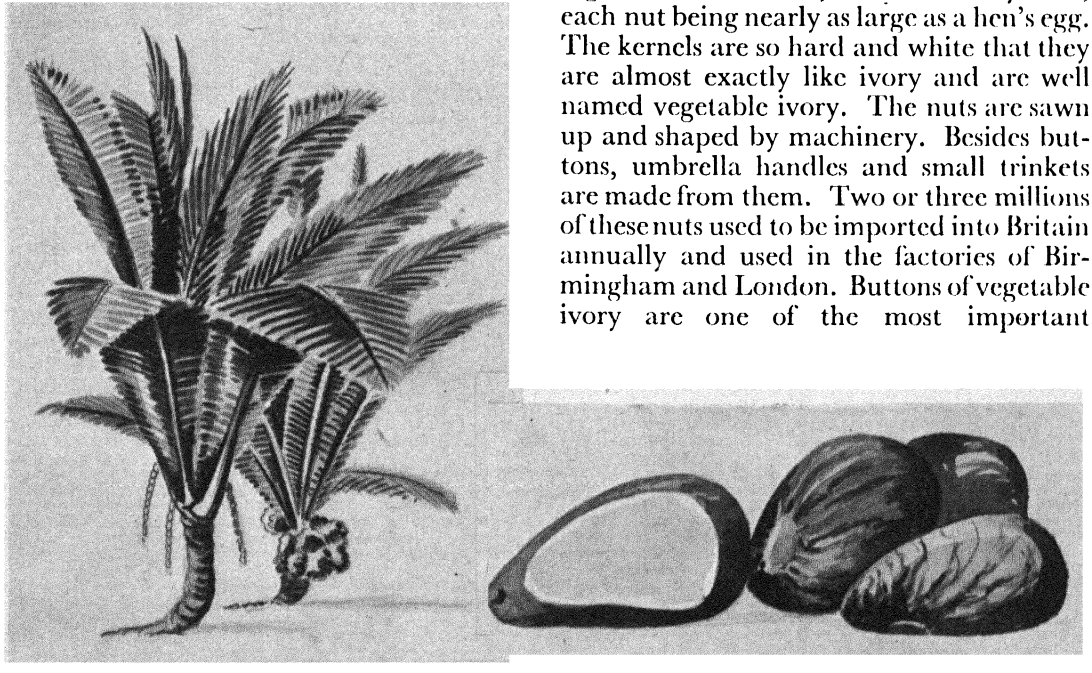
Horn buttons were made at Birmingham at least by 1777. Towards the middle of the nineteenth century a process was thought of whereby horn buttons were made from the hoofs of cattle. To-day most so-called horn buttons are made from hoofs bought from the meat packers for this purpose. The hoofs are boiled in water until they are soft and then cut into strips with a long-handled knife. The strips are cut up into squares, each large enough to make one button. They are then dyed, dried, and shaped. In the United States Connecticut is famous for its horn buttons.

Pearl buttons are made from pearl shells and mussel shells. The best pearl buttons are made from the shells of the pearl oysters, which are found especially in the Persian Gulf and off North Australia. They have been collected in these parts by the thousands of tons for making fine buttons. The United States is famous for its pearl buttons. They were first made there on a small scale in 1855, but their manufacture received an enormous impetus when it was found possible to use the shells of the niggerheads (freshwater mussels) found in large quantities along the Mississippi; in one year as many as three hundred million buttons have been made from them. These shells are small and dark in colour.

They are gathered in boats by men and boys, who cook the mussels to extract the meat and sell the shells by the pound.

Pearl oysters are found at the bottom of the sea and gathered by divers. Buttons made from pearl oysters are called mother-of-pearl buttons or ocean pearl buttons. In 1905 the U.S.A. made 1,700,000 gross of these. When the shells come to the factories they are sorted into sizes and soaked in water for several days, then sawn into 'blanks' by saws that are really hollow tubes of steel about as long as one's little finger and as big round as the buttons which are to be made. One end has many fine teeth. As this tubular saw fastened in a lathe revolves round and round the teeth cut out the blanks from the shells pressed against them. Other machines (*a*) rub them to take off the skin and give them an even surface; (*b*) turn or grind them into shape; (*c*) drill holes in them. Lastly comes the polishing, which gives back the lustre lost in the grinding and is the chief charm of these buttons. Almost all buttons with holes, made of shell, bone, wood, or ivory, are cut out and drilled in this way. Needless to say, so many buttons have been made from the shells of the Mississippi niggerheads that the supply is nothing like what it was. Iowa and Illinois used to make an enormous number of pearl-button blanks from niggerheads. Iowa, New York, and Pennsylvania are famous for freshwater pearl buttons.

Ivory buttons are among the oldest of all buttons and are made from the tusks of elephants. They are so costly that they do not enter much into the trade of the world. But a great number of buttons are made from **vegetable ivory,** which can be easily dyed bright colours. Vegetable ivory comes from the nuts of palm-like plants that grow in South America. The fruit, which is about as big as a man's head, contains many nuts, each nut being nearly as large as a hen's egg. The kernels are so hard and white that they are almost exactly like ivory and are well named vegetable ivory. The nuts are sawn up and shaped by machinery. Besides buttons, umbrella handles and small trinkets are made from them. Two or three millions of these nuts used to be imported into Britain annually and used in the factories of Birmingham and London. Buttons of vegetable ivory are one of the most important



IVORY NUT PALMS AND NUTS FROM WHICH BUTTONS ARE MADE
One of the nuts has been cut to show the ivory-coloured inside.

BUTTONS OF BONE, WOOD, GLASS, LINEN, JET, METAL, IVORY, AND PLASTIC, FOR EVERY PURPOSE AND USE

Photo E.C.M.

branches of the American button industry. They were first made at Leeds, Massachusetts, in 1855.

Celluloid is another substitute for ivory. It was first made at Birmingham about 1855. It consists chiefly of a dried solution of gun-cotton and oil or gun-cotton and camphor. It resembles ivory, horn, tortoiseshell, and hardened indiarubber.

Cloth buttons. The manufacture of these is very complicated, especially 'three-fold linen buttons.' Massachusetts is famous for its buttons covered with cloth.

The more we learn about buttons the more we realize they are far from being of no importance because so much thought and ingenuity have gone to the making of them; and the materials from which they are made come from so many interesting sources. The study of buttons will teach us the names of many States in the U.S.A. The chief manufacturing states of the United States are in the north-east.

Things to Do

1. Why do you think Birmingham became famous for buttons?
2. In 1905 the U.S.A. made eleven million gross of 'freshwater pearl' buttons. How many buttons were made each month?
3. What has the river Mississippi to do with button-making?
4. Find in your atlas all the places mentioned in this article.
5. Make a list of materials from which buttons are made. Write a few notes about

A Pearly King and Queen and shall we say—a 'Pearly Apprentice'

An unusual use for pearl buttons.

Fox Photos

each and, where possible, make drawings, *e.g.*, mussel shells and pearl oysters. You may find other materials from which buttons are made—for example, the hard shell of the coconut.

6. Begin to make a collection of buttons. Mount them on strips of cardboard and arrange them in a box or on a shelf. Write labels for each button. You will be surprised how interesting a button collection can be. You can classify your buttons in different ways—size, use, colour, and so on.

7. Write a short account of the uses of buttons, or choose a button—for example, a pearl-oyster button—and imagine it tells the story of its life.

8. Explain tubular, saw, blanks, niggerheads, shanks, 'composition' buttons.

9. Find out all you can about the men who dive for pearl oysters in the Indian Ocean.

10. Find out more about these two nuts from which buttons are made: (*a*) ivory nuts, (*b*) coconuts.

11. Is it true to say "that is not worth a button," meaning a button is worthless? Discuss this in class.

12. Why do you think button manufacturers look out for fresh materials for making buttons? Have you seen buttons made of the new plastic?

CHAPTER THIRTEEN

GLOVES

WHENEVER one goes out in the streets, summer or winter, people can be seen wearing gloves; gloves of leather, fur, silk, cotton, or wool. Not so very long ago mittens were in general use. Often they were of woollen yarn and knitted by some member of the family.

From many points of view the glove is the most interesting of all articles of dress. Its use stretches back to the days of very, very long ago. We are told in the old Greek story of Ulysses that Laertes, the farmer-king, wore gloves to protect his hands from the thorns. The uses of gloves are very varied:

(*a*) To protect one's hands from the cold, especially in the northern countries, (*b*) to keep one's hands clean, (*c*) to protect one's hands from injury: gardeners and other workers often wear gloves. Besides these three main uses gloves are worn for certain ceremonies, and given as gifts on special occasions. Long ago they were sometimes given to those who were in great sorrow as a sign of sympathy as well as to those who rejoiced. In the Middle Ages a knight often threw down his glove in front of another as a challenge to battle; his enemy accepted the challenge by picking up the glove.

The long **gauntlet** gloves we wear to-day have stories to tell. In olden times a sport called hawking was very popular. Hawks and falcons were trained to catch birds and rabbits. The hunters rode into the fields carrying the birds on their wrists. To protect their wrists and hands they wore long gloves, or gauntlets. Knights, too, wore armoured gloves. Stout long gloves are used to-day for driving, fencing, and wicket-keeping, as well as for warmth and beauty.

A pleasing custom still remains from the past of giving a pair of white gloves to the judge who comes to an assize town and finds there are no cases to be tried. Gloves made of thin indiarubber are worn by surgeons when they are performing operations because they are waterproof and do not muffle the touch. Apart from rubber gloves for special uses, however, modern gloves are generally of two distinct classes: (*a*) woven (cloth) or knitted gloves, and (*b*) leather gloves. The manufacture of knitted and woven gloves is allied to the hosiery trade, about which you will learn more when you come to stockings. Silk, wool, and cotton are used for this trade. Some gloves are entirely made and finished by knitting; others, particularly the best gloves, have the pieces fashioned separately and sewed together, as in the making of leather gloves. The headquarters of the thread-and-cloth glove trade used to be in Berlin and Saxony.

The materials used for making leather gloves are principally the **skins** of deer, sheep and lambs, goats and kids. Kid gloves are supposed to be made of kid leather, but far more kid gloves are made of sheepskin than of kid. The finest of kid gloves used to come from France, Paris and Grenoble being the chief seats of the French kid-glove trade. Very young calves furnish the rare gloves made at Limerick, in Ireland, which are so fine that one can be enclosed in a walnut shell. Gloves known as doeskin, buckskin, and dogskin are made from the skins of deer and dogs, and also of sheep and calves. In England Worcester is the principal seat of the glove industry, being especially famous for the so-called English dogskin gloves made from the tanned skins of Cape sheep. English manufacturers were without rivals in making these gloves. Heavy working gloves are sometimes made of horsehide.

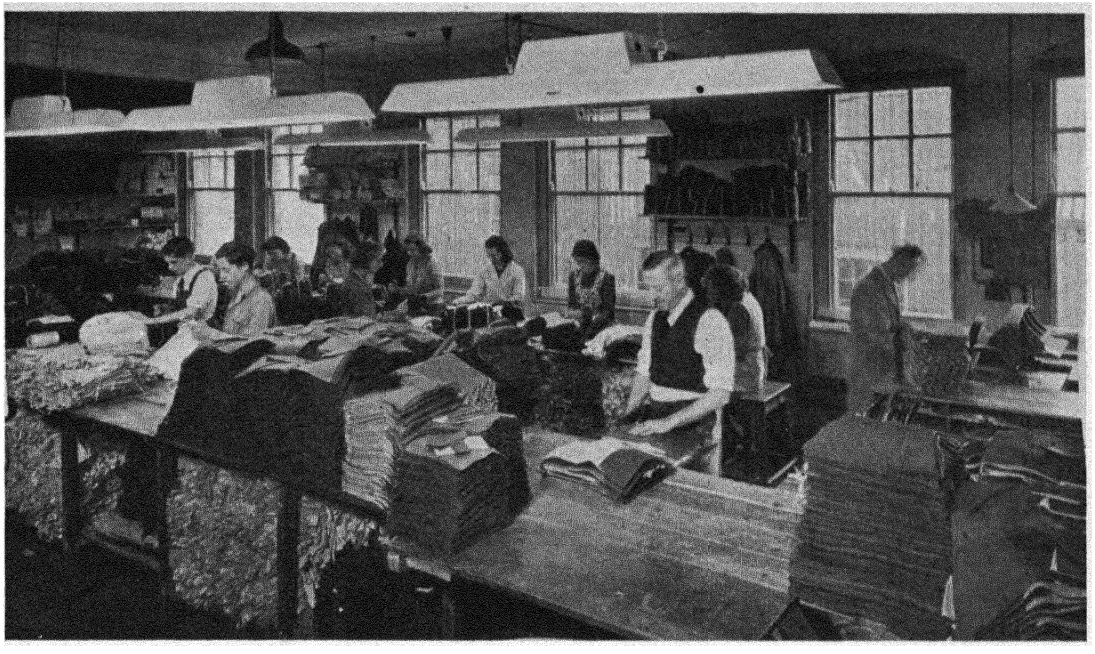
The best way to learn about the glove industry is to visit the places where gloves are

made. We shall not go to Worcester, but take a long journey across the Atlantic to the **United States.** We must look for the seat of the glove industry in the busiest and most densely populated part of the U.S.A.—the north-east. This part of the States which is south of Canada and stretches from the Atlantic to the Great Lakes contains some of the largest cities in the continent, including New York, Boston, Philadelphia, Baltimore, Washington, Pittsburgh, Buffalo, Cleveland, and Detroit. More than half of the gloves of the U.S.A. are made in this part and in or near two towns which are quite close together in New York State—Gloversville and Johnstown. These towns are famous because glove-making as a trade in America first started here. Before there was any Gloversville some glove-makers from Perth in Scotland (Perth had a Glovers Guild in the twelfth century) settled in this part about 1760. They brought with them from over the ocean the patterns, needles, and thread (linen) necessary for their work, and began to make gloves and mittens for the farmers around; there were no big towns then. This was the beginning of a great glove industry, and large factories have now taken the place of the little work-rooms of long ago.

Perhaps the most interesting sight in these factories is the **cutting out** of gloves. Once all the cutting out was done by hand, but now steel dies are used. You can get some idea of how gloves are cut out by hand in this way. Take a piece of paper long enough and large enough for a glove and fold it lengthwise. This gives you the front and back of a glove. Lay your hand on the paper with the thumb-side on the fold and the thumb beyond the fold. Draw round your hand and between the fingers. Do not outline your thumb which lies outside the fold. With your scissors cut round and between the fingers (do not cut the fold). You will then have a glove without a thumb. The thumbs are

THE CUTTING-ROOM AT THE YEOVIL GLOVE COMPANY FACTORY AT YEOVIL, IN SOMERSET

Photo H C. Tilzey, by courtesy of the Yeovil Glove Company



THE WEBBING- AND SORTING-ROOM
Photo H C Tilzey, by courtesy of the Yeovil Glove Company

always made separately. An oblong hole is cut at the bending of the fold for the insertion of the thumb. Your paper glove unfolded should look something like the pattern of a modern gauntlet glove. The cutting of the hole to the exact shape and size requires a good deal of skill. Indeed, the cutter has to be very skilful and careful, or a great deal of leather would be wasted. In some factories machines now do the work of cutting instead of men. First, machines chop out pieces of leather the right size for gloves, two or three skins being laid at once under the cutter. Next, machines shape these pieces into the form of a hand in this way. Six pieces of leather are put in a box (the die), at the bottom of which is a shiny steel hand. The pieces of leather just fit in this box, and they lie upon the hand. The cover of the die is fitted on, the machinery moves, and the leather is pressed down upon the hand so tightly that when it is taken out it is cut in the shape of a glove. Large gloves are made in this way. The only things that are wanting are the thumbs and the little strips that join the sides of the fingers. These also are often cut out by machinery. The pieces are now ready to be sent to the sewers, whose job it is to join them together with sewing-machines. In large factories these machines are fastened to long tables and worked by steam or electricity. Many people work on the same pair of gloves, each doing his or her part. The makers sew in the fingers and insert the thumbs. This requires much skill and care. The best gloves are often hand-sewn. Other workers, called silkers, put the embroidery on the back. The edge of the glove is sewn by welters. Still others make the button-holes and put on the buttons or fasteners. After the glove is sewed it is stretched over a metal hand and treated with steam to give it the right shape and finish. It is then ready for inspection and sorting, and finally packed for the market. The pictures show how well-fitting dainty gloves are made. These are cut out by hand, and little machinery is used.

THE FUR DEPARTMENT
Photo H. C. Tilzey, by courtesy of the Yeovil Glove Company

THE IRONING- AND DISPATCH-ROOM
Photo H. C. Tilzey, by courtesy of the Yeovil Glove Company

Over forty million pairs of gloves are made in the United States every year. The industry is carried on in hundreds of factories and gives employment to vast numbers of people. It is not only important in Johnstown, Gloversville, and New York State, but in many other parts of the United States. The chief states engaged in glove-making are New York, California, Illinois, and Wisconsin, with New York far in the lead.

Things to Do

1. Look at a map of the United States for these States—New York, California, Illinois, and Wisconsin.

2. Where are these places, and what have they to do with the glove trade: Gloversville, Worcester, Perth, Paris, Berlin, Grenoble?

3. Name some of the various animals whose skins are used for glove-making.

4. What stories and old customs are connected with gloves, especially long gloves called gauntlets? What do we mean to-day when we say "He threw down the gauntlet"? Name the uses of gloves in olden days and to-day.

5. Name some of the largest towns in the United States that are near Gloversville (Gloversville is a little to the north-west of Albany). Look for the position of these towns on your map and say which are ports.

6. Examine carefully one of your gloves and notice how it is made. Then describe it. Make drawings or write descriptions of different kinds of gloves you know, *e.g.*, babies' gloves, gauntlets. Make a glove frieze something like your boot-and-shoe frieze.

7. Describe clearly how coarse gloves are made by machinery. Why are so many gloves made in New York State?

8. Make a list of the different materials used for making gloves. Explain the particular use of each material—*e.g.*, rubber, wool.

9. Find some paper and draw a pattern of a glove for yourself. Take an old glove to pieces, and see from how many pieces it is made.

10. With the help of the pictures tell the story of how a good pair of leather gloves is made. These notes will help you to understand the pictures. First the skins are stretched and smoothed out, and patterns of the gloves stamped on them to the best possible advantage. The skins are then trimmed round by the cutters and sent to the **webbing- and sorting-room.** The knives used for cutting out gloves are called webs. There are many different webs used in the webbing-room. The parts of the gloves are cut out, the right knife being selected in each case. These parts are sorted or arranged and sent to the sewers (see picture in Chapter XVIII).

CHAPTER FOURTEEN

KNITTED GARMENTS: HOSIERY

You have heard about one way in which threads (or yarn) are made into cloth, namely weaving. We now come to a different way of putting the yarn together. In weaving the threads are first divided into two sets, the threads of the *warp* and those of the *weft* (or woof); and these are plaited in and out or over and under one another, as in the making of a mat.

In the new way we are going to learn how garments are made by means of *one* thread only, on the principle of *looping*, or *loop structure*, the work being known as knitting. Most of you know how to knit, and you have seen jerseys and cardigans being knitted. Knitting is a very modern art as compared with weaving. No certain mention of it is made until the fifteenth century. It is said to have been first practised in Scotland, perhaps because that country is cold and damp during the long winters and warm clothing is so important. Probably caps were first knitted before the difficult task of stocking-making was attempted. Before the knitting of stockings people wore *hose*, or leg coverings of leather or cloth. It was in the sixteenth century that knitted stockings took the place of woven cloth stockings. During the reign of Queen Elizabeth thousands of people were to be found knitting stockings both in England and Scotland, especially in the woollen districts. Knitted goods soon grew so popular that men began to invent machines to make them.

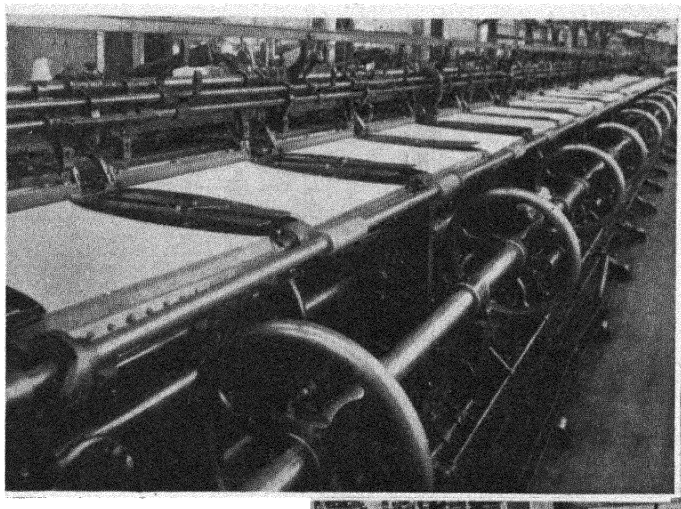
It was in 1589, during the reign of Queen Elizabeth, that William Lee invented the stocking-frame by which knitting was done by many needles all at once. This machine was the first used to produce a looped or **knitted** fabric, and was the origin of all the hosiery and lace machines at present in use. In hand-knitting many loops are put on one wire or needle, but in Lee's frame there was one hooked needle for each loop. The first fabric he made was very coarse, but later he made a better machine with twenty needles to the inch. It is said that Queen Elizabeth was so pleased with a pair of silk stockings knitted on his frame that she said she would wear no others.

The first pair of English **cotton** stockings was knitted in 1730. Soon there were inventions for the production of various kinds of knitted goods, and the machines for knitting stockings were improved. About 1816 the first **circular** knitting-machine was made in America. A circular knitting-machine of American origin is the type of machine on which is produced the **seamless** hosiery of to-day. Like the sewing-machine, it is largely used in the home as well as in the factory. Knitting remained more or less a home industry until steam was used to work the machines; now there are great factories in this country, in North America, Europe, and other manufacturing areas. These factories knit not only stockings, caps, and gloves of all kinds, but knitted underwear and underwear made up from knitted fabrics—bathing-costumes, scarves, sports clothes, outdoor wear of all kinds, and dainty garments for infants-in-arms. In modern machine knitting all sorts of materials, from the finest silk to the coarsest wool, are employed, and the product is enormous.

The British **hosiery** trade is now the third largest of the textile trades; spinning and weaving of cotton come first, then wool. It must be remembered that the word hosiery includes everything made by machine knitting, whether stockings or not. As stockings were one of the earliest and most popular garments knitted, the word hosiery (from hose—stocking), at first applied to them only, became applied to all goods turned out by factories

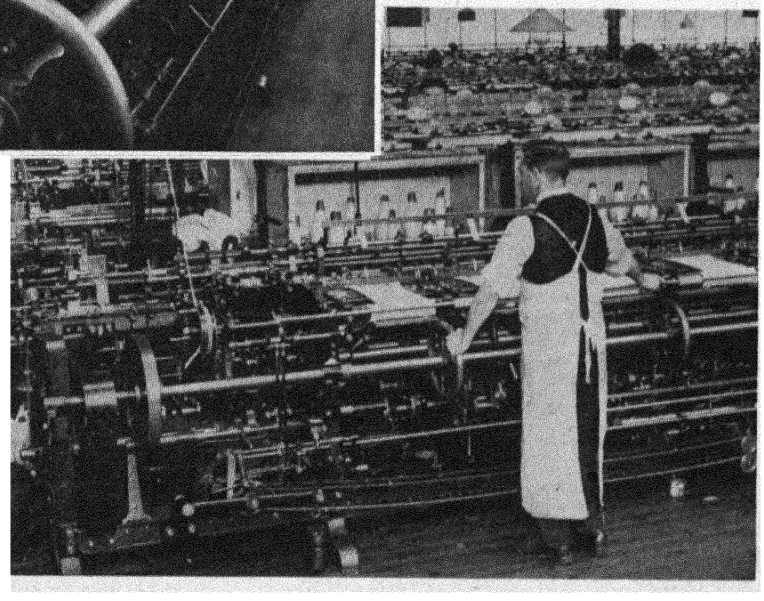
that knitted stockings. The principal centres of the hosiery trade are Leicester, Nottingham, Derby, Hinckley, Hawick, Ilkeston, Loughborough, Mansfield, Sutton-in-Ashfield, the West of Scotland, outer London, Leek, and Baldock. Just before the war of 1939 there was a development in Lancashire principally in the making of cotton underwear.

Now let us visit some of these places. First we will go to the city of Leicester, where more knitted garments are made than in any other part of the United Kingdom. There are nearly two hundred and fifty factories in Leicester, and if we visit one we shall find the machinery far different from that of the spinning and weaving mills; and it is so complicated that it is difficult to understand it. The stitches are made by the machine very much the same way as they are made by hand, only more perfectly and evenly, a large number of needles being used for each article. A small-sized stocking made of fine yarn is knitted in a cylinder containing about *sixty* needles; if the stocking is to be larger more needles are used. In starting the work, the knitting begins at the top of the stocking and the leg is shaped by a regulator by which it can be made larger or smaller without stopping the work. There is another arrangement, which enables the knitters to make the heel of a double thickness if desired, and also to knit the foot and finish the toe before the stocking is taken out. For knitting other goods there are machines of different shapes and sizes, and also special arrangements for making ribbed goods. Indeed, the variety of machines is too numerous to mention, from the complicated fully fashioned hose machine that knits a dozen pairs of silk stockings in under one hour, and an interlock machine that



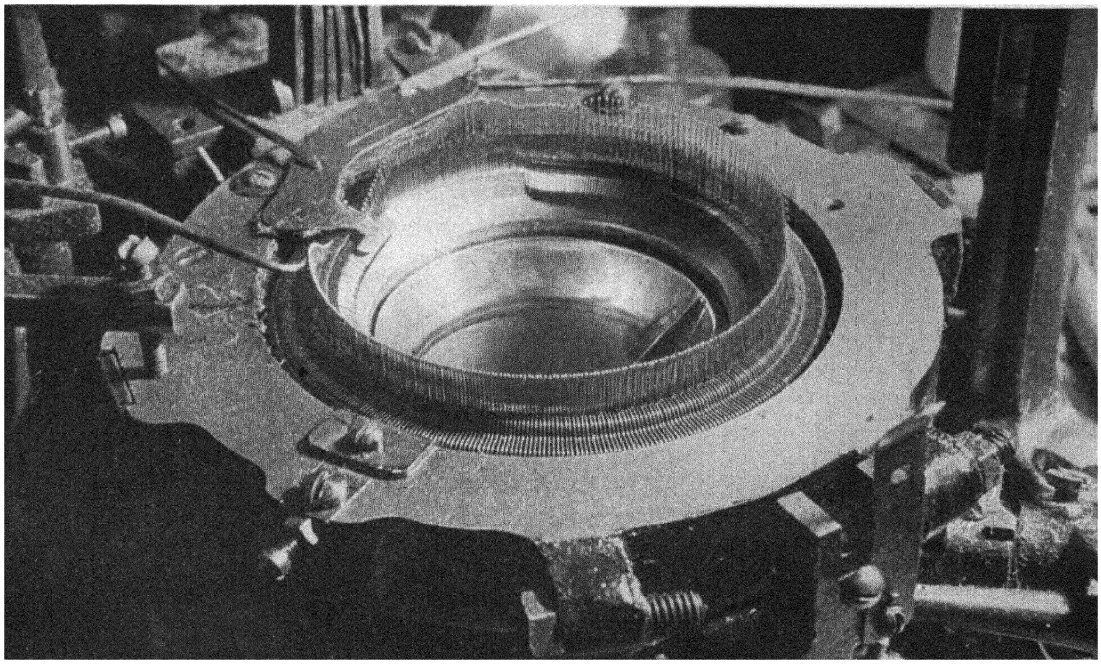
THE NEW-PATTERN SILK-STOCKING MACHINE WHICH MAKES TEN PAIRS OF STOCKINGS AT ONCE

Photo by courtesy of Messrs I and R Morley, Ltd

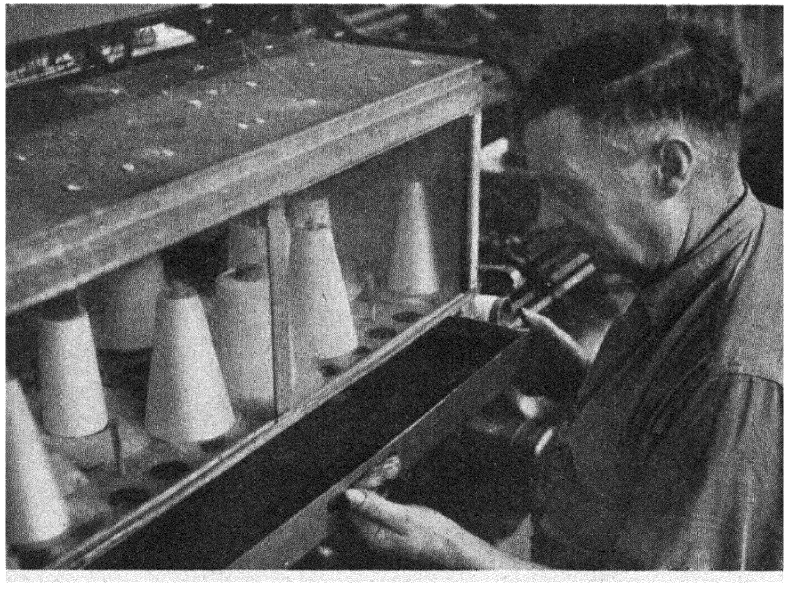


A CLOSE-UP OF THE MACHINE

Photo by courtesy of Messrs I and R Morley Ltd



THE MACHINE THAT SPINS GOSSAMER
A close-up view of the latest, finest machine head.
Photo Keystone

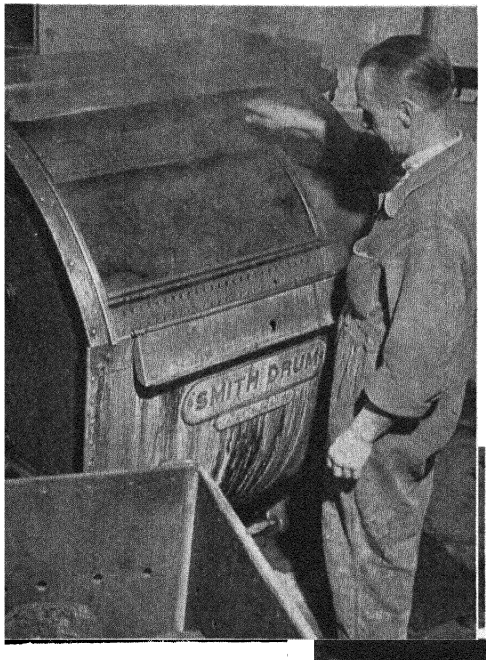


HUMIDITY MUST BE KEPT CONSTANT
Trays of water beneath the spool ensure that the correct temperature is preserved.
Photo Keystone

knits one yard and a quarter of fabric in six minutes, to a simple sewing-machine for joining. Inventions and improvements still go on, and there appears to be no end to the extent to which knitting machinery can be developed. Leicester and its neighbourhood specialize especially in woollen knitwear.

Now let us go to Nottingham, famous for its cotton and silk hosiery. The hosiery trade had its origin in Nottingham, for William Lee, who invented the stocking frame, lived in the little village of Calverton, a few miles from Nottingham. He was a curate whose wife spent all her spare time knitting because they were so poor. To help his wife he thought of the stocking frame with the idea of making a whole row of stitches at once instead of one at a time, as in hand knitting. An interesting branch of the wool trade in Nottinghamshire is the manufacture of shawls, an old but still-flourishing industry carried on chiefly at Hucknall. The shawls are made from the finest quality merino Australian wool. Many of these beautiful shawls take the form of opera warps, boudoir jackets, and other dainty articles.

From Nottingham we can travel to Loughborough, a flourishing Midland town between the two great hosiery-producing cities of Leicester and Nottingham. It was William Cotton who made Loughborough famous for knitting-machinery in the nineteenth century. His invention, Cotton's Patent Machine, ranks next to Lee's as one of the most important helps to the hosiery trade. As many as twenty-four stockings are now made on it simultaneously, and it can produce a wide variety of other fully fashioned garments. In the long years that have elapsed since Cotton's Patent



260 DEGREES TO MAKE THE DYE FAST

Photo Keystone

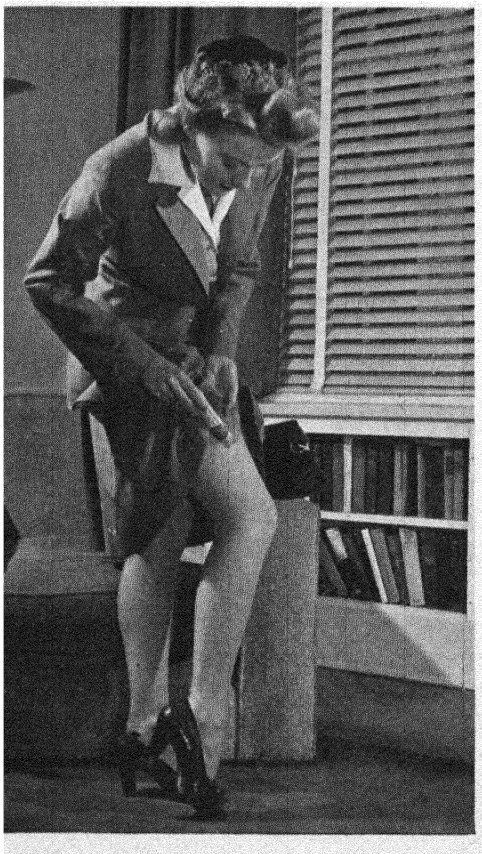
DYEING DAY

These stockings have come from the dyeing drums, have been dried in the spinning drums, and now await shaping on boards and drying in steam presses.

Photo Keystone

Machine made its appearance (1851–1864) other builders have used the same principles, and this type of machine is found in many countries; but the firm in Loughborough to which it owes its origin is still in the forefront. The Loughborough factories turn out practically all the types of knitted articles known under the general name of hosiery—underwear, footwear, men's and women's outer garments, children's wear, and a variety of other goods. There are also a number of enterprising and up-to-date factories in the surrounding district of Loughborough. Considerable quantities of hosiery are also dyed and finished by Loughborough firms.

Hand knitting is still immensely popular in spite of machinery, and numbers of women wear hand-knitted jumpers and suits. Craft journals and weekly and monthly papers generally have instructions for making smart new woollies. Perhaps one reason for this popularity is the lovely hand-knitting wools that can be obtained. The manufacture of these wools is centred chiefly in the West Riding of Yorkshire, where yarns of all classes are produced. Southern Scotland and the Leicester district have a considerable output, too. Most widely used of all knitting wools is the worsted yarn known as four-ply Fingering (or Scotch Fingering, which does not necessarily indicate Scottish manufacture, but rather a particular make-up of skein). This is suitable for jumpers, cardigans, suits, children's outfits, and men's pullovers. Vest wool is softer than fingering, and is blended from wools selected for freedom from shrinkage. Wheeling is characteristically Scottish.



STOCKINGS—THE FINISHED ARTICLE. (*Left*) STOPPING A LADDER FROM SPREADING BY APPLYING A SPECIAL SOLUTION

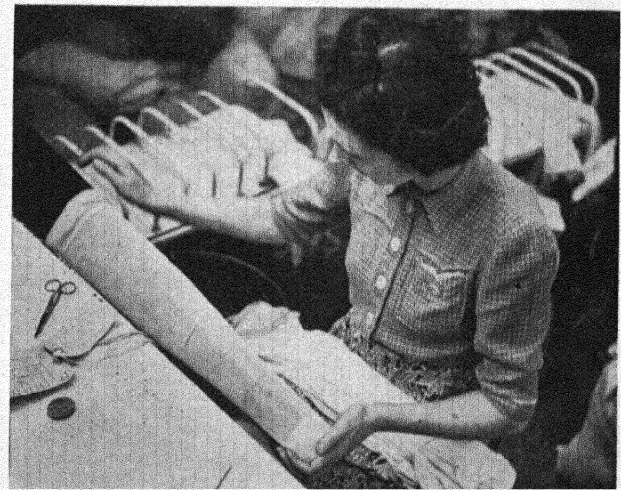
Photos Paul Popper

A Hand-knitted Jumper and Two Pretty Hats

Photos by courtesy of Messrs Paton and Baldwin, Ltd, Halifax

The Girl who joins Soles

This girl is called a 'looper.' Her work entails sewing up the sole of the stocking without leaving a seam and connecting the twin stitches with a strand.



The Blow-out Test

A compressed-air machine used for inspection of the finished knitted stocking. The stocking is draped over the model leg.

Photos Keystone

It is a woollen yarn which is not combed and therefore more heavy, bulky, and hard-wearing. It is used for socks, stockings, and garments requiring frequent washing. Knittings are a hard-wearing group that are more tightly twisted than fingering. These yarns form the backbone of the trade. More recently special new wools have been made—for example, crepes of varying character, boucles (wools with knotted surface), tweeds, and rayon mixtures. These wools produce fabrics with interesting surfaces, while the knitter need employ only the simplest stitches. Angora yarns from the angora rabbit are also used. These are beautifully soft. The angora rabbit must be added to our list of wool-bearing animals.

Things to Do

1. What is hosiery? Make a frieze about hosiery. Write the names of garments made by knitting and find pictures.
2. Look on the map of Great Britain for these places that make hosiery—Leicester, Nottingham, Derby, Hinckley, Hawick, Ilkeston, Loughborough, Mansfield, Sutton-in-Ashfield, Leek, Baldock. Copy the name of each town and its county. Draw a sketch-map to show the position of Nottingham and Leicester.
3. Tell what you know about machines for knitting stockings. What did people wear before the days of knitted stockings?
4. Explain the difference between knitting and weaving. Which art is the older?
5. Write what you know about William Lee and William Cotton.
6. Where do we think knitting was first practised, and why?
7. Name the three largest textile trades of Great Britain.
8. In what parts of Great Britain are knitting wools manufactured?

CHAPTER FIFTEEN

JEWELLERY

We are now going round the world to learn a little about the gold and silver and precious stones worn by man for decoration.

Besides gold, other cheaper metals are also used, such as copper and brass. For example, the natives of British East Africa delight in bands of wire wound about the arms from the wrists to the elbows, and about the legs from ankles to knees. They wind the upper arm with this wire, and in some tribes, such as the Masai, the women have great coils of it tied to strings passed through the lobes of their ears. Indeed, in many parts of Africa wire of copper, brass, and iron is greatly desired for personal adornment; so, too, are necklaces of all kinds. The Zulu children wear little else than beads. The natives of Uganda wear brass rings in their ears. In Borneo (the East Indies) the women wind thick brass wire about their bodies from the waist to the shoulders, so that at a distance when the sun shines they seem to be half clad in gold. There are tribes, too, who wear rings in their noses and ornaments of shell or bone thrust through their under lips.

The peoples of India especially love well-made jewellery, and in all the Indian cities there are clever men skilled in making rings, bracelets, and other ornaments of gold and silver. We know the kind of jewellery worn in our own land. It is like that worn by the white peoples of most lands—of Europe, North America, and Australia. For many years the finest jewellery was made in London and Paris, and diamonds were chiefly cut in Holland; but the United States in later years became a rival, and New York and other cities became famous for their fine workmanship. Tens of thousands of men and women are kept busy all the year round in the United States making jewellery; for example, several millions of finger rings are made every year. A large number of modern factories make cheap gold and silver ware—that is, ware made of brass or other metals and washed over with gold or silver. Enormous numbers of imitation gems are also made.

Gold is found in very many parts of the world—in the cold regions, such as Alaska; the Klondike (north-western Canada); the frozen river valleys of Siberia; in hot, waterless lands like those of Western Australia; and in other places. The world's biggest producer of gold is the Union of South Africa. The fine city of Johannesburg owes its origin to gold. The next biggest producers are the U.S.S.R., Canada, and the United States of America. Nearly all the silver of the world comes from the New World, from Mexico, U.S.A., Canada, and Peru.

Diamonds, the most brilliant of all gems, are little cousins of coal. Diamonds are pure carbon, and coal contains a great deal of carbon. Diamonds are not only valuable as ornaments but in cutting-machinery, where great hardness is needed. For a long time all the diamonds of the world came from India and Borneo. In India they were found in rivers not far from the town of Golconda. Then in 1727 diamonds were discovered in Brazil, and for one hundred and forty years Brazil had the principal diamond fields of the world. Finally the mines of South Africa were opened up, and since then the best diamonds have come from that region, although many diamonds are still found in Brazil.

In Brazil the diamond fields are the beds of the rivers. Men go out in boats and scrape the gravel into bags, which they bring ashore and spread out in the sunlight to look for diamonds. But in South Africa there are real diamond mines, especially near Kimberley, the diamond city. These mines are something like coal mines; there are shafts, lifts, and

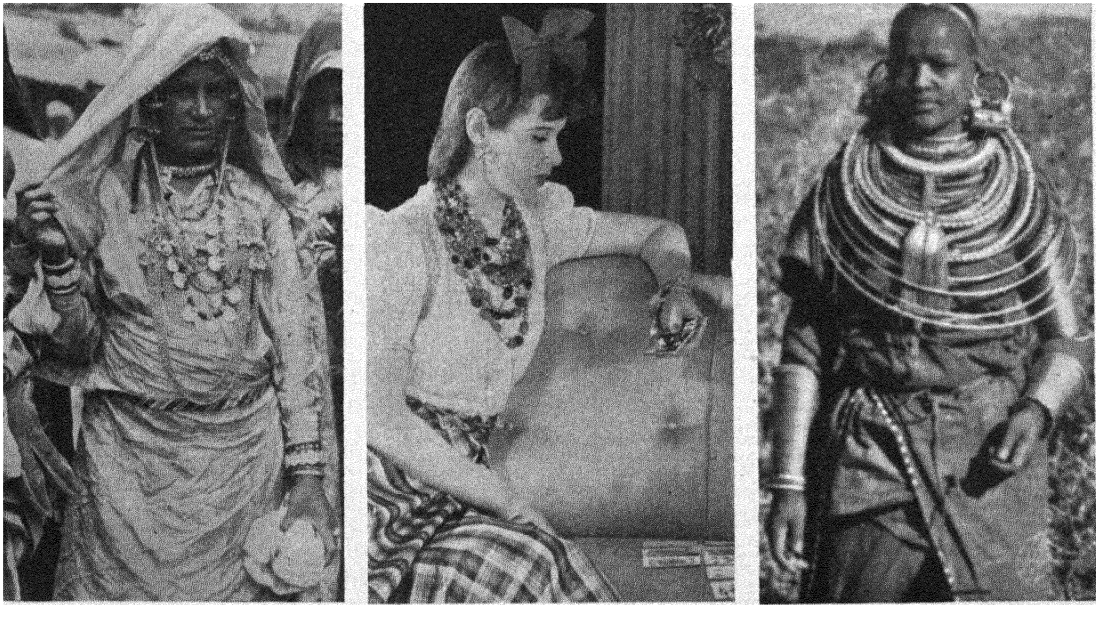
miles of tunnels. Miners blast and dig out the blue earth or rock, which is carried to the surface. It is in this rather soft blue rock that diamonds are found. It is said that elevators used to carry ten tons of rock to the surface four times every minute.

A few diamonds are found here and there in other parts of the world—in British Guiana and Australia, for example. Africa, however, is the diamond continent.

Other stones that are prized for their beauty are **rubies, sapphires, emeralds,** the rich **yellow topaz,** the **opal,** which shines like fire when the light strikes it, the blood-red **amethyst,** and the **turquoise,** which is as blue as the sky. The most precious rubies, sapphires, topazes, and emeralds are the Oriental ones, which are little cousins of alum and the metal aluminium. The word Oriental is important in speaking of gems. It means that they come from India or other parts of far-away Asia, and also that they are of a different nature from other stones of somewhat similar names and appearance found in the Americas, Europe, and elsewhere. The most beautiful sapphires and rubies are found in Siam, Burma, and India. Sapphires also come from Ceylon, Australia, and elsewhere.

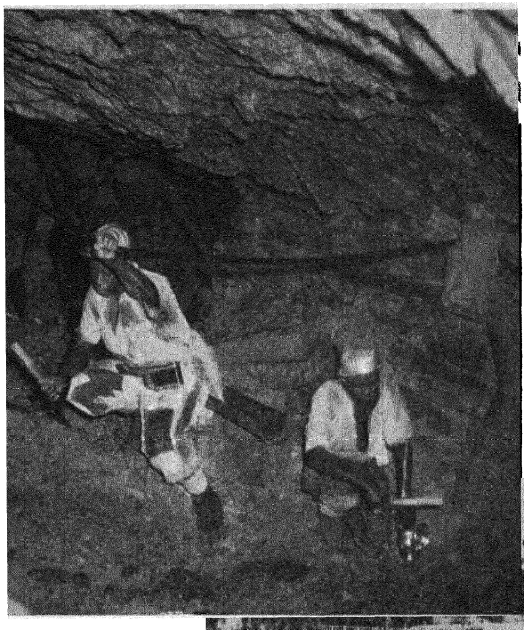
Beautiful emeralds come from the Republic of Colombia, in the northern part of South America. Emeralds have also been found in Austria, in Soviet Russia, in the mountainous parts of the desert of Sahara, and in Peru. The opal is found in Mexico and Honduras, and also in South America. It occurs in the Carpathian Mountains, in Europe, and there are opal mines in eastern Australia. The most beautiful opal ever found came from the Carpathians.

Many other stones less precious than those mentioned are also used in jewellery. The blue turquoise is prized among the Mohammedans, and characters from the Koran are sometimes carved upon it. It is found in parts of Asia and Europe and also in Arizona and other south-western states of the United States.



NECKLACES: A HINDU WOMAN, A MODERN MISS, AND A MASAI WOMAN

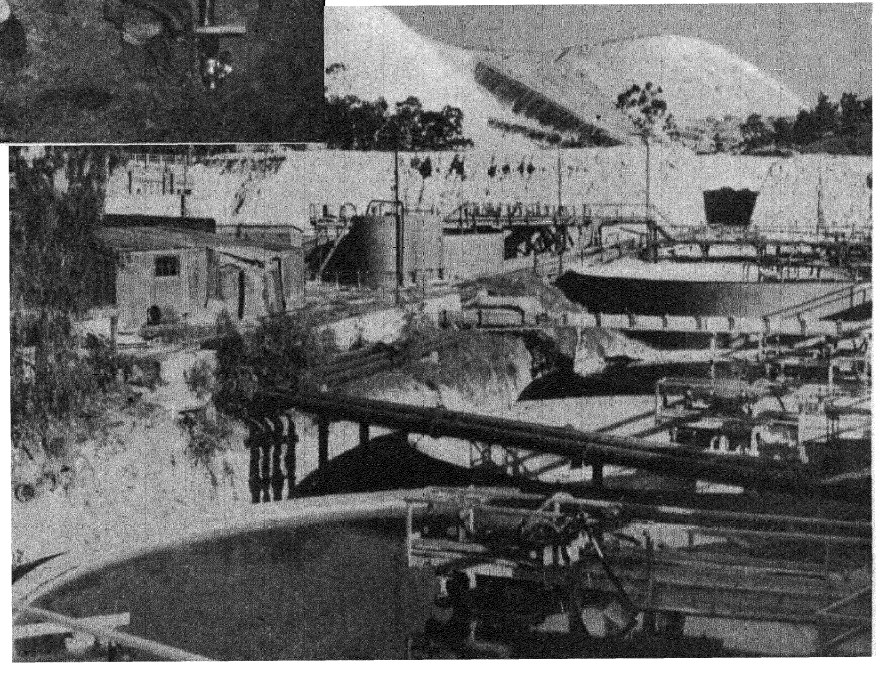
Photos E N.A. (left) and Paul Popper (centre and right)



NATIVE MINERS IN THE GOLD MINE
Fox Photos

The **jade** that the Chinese prize so highly is found in Burma and in some other parts of Asia. It lies in veins running through rocks, and varies in colour from white to dark green. Some streams have jade pebbles which are known as water jade. They are much prized by the Chinese.

The **garnet** is a very common stone, somewhat like the ruby in colour, but not so beautiful. Fine garnets are mined in Bohemia and at Kimberley, in South Africa, where they are mixed with diamonds. In the United States there are fine garnets in Arizona, Colorado, and New Mexico, and many common ones in New York, Pennsylvania, and Massachusetts. In the latter states garnets are mined to be used for polishing and cutting other stones, and many tons of them are ground up for making sandpaper. They are also employed for pivots in watch movements.



THE ROBINSON DEEP GOLD MINE IN SOUTH AFRICA
Fox Photos

The ordinary amethyst (not the Oriental variety), a purple variety of quartz, is common in many parts of the world. There are fine amethysts in the U.S.A., in Pennsylvania, Maine, North Carolina, and along Lake Superior: they are also found in Brazil, Ceylon, and the Ural Mountains.

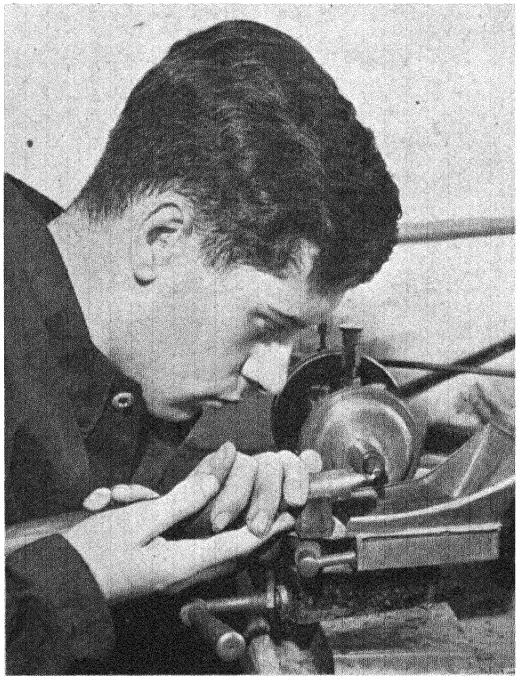
The sea gives many valuable products that man wears in one shape or another. First comes the most beautiful of jewels, the **pearl.** The pearl is found in the body of the

pearl oyster. It is not in every oyster, but only in an occasional one. It is believed to be caused by a grain of sand or some other irritating substance getting inside the shell. This annoys the oyster, and to protect itself it coats the offending particle with layer after layer of material similar to that of which it makes its shell, until it finally builds up the beautiful round or irregular object we know as the pearl. It is so smooth that it does not hurt the oyster, which lives on happily. The material the oyster uses is carbonate of lime, the same as is found in whitewash or mortar, so that the walls about us and often the ceiling overhead are composed of little cousins of the pearl.

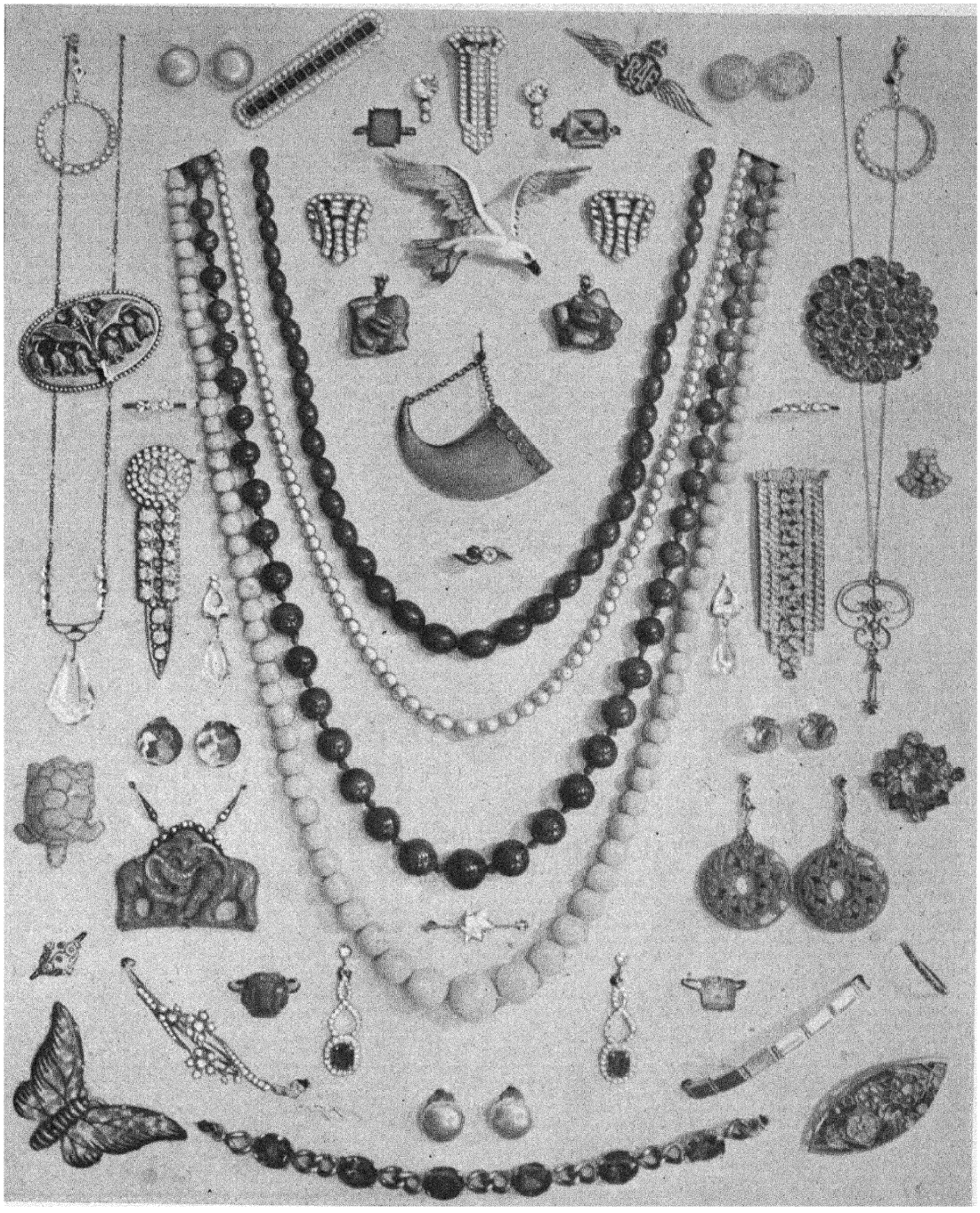
The finest white pearls come from about Ceylon and in the Persian Gulf; also from the west coast of Australia and near Thursday Island, Australia. They exist too in the Red Sea. Yellow pearls are found in the Bay of Panama, and the finest black and grey ones off the west coast of Mexico and in the Gulf of California. Pink pearls can be found in the conch shells of the West Indies and in the freshwater mussels of many rivers and creeks of the U.S.A. Purple, light blue, and black pearls are made by the common clam. The most famous pearling-grounds are: (*a*) off North-western Australia, the town of Brome being the centre of the industry; (*b*) the Gulf of Manar, off the north-west of Ceylon; (*c*) in the Persian Gulf, off the British-owned islands of Bahrein, which lie on the B.O.A.C. routes to India and Australia. The shells of the pearl oysters are worth almost as much as the pearls sometimes found inside them. They are used, as you have learnt, for buttons, brooches, buckles, etc.

The shell of a tortoise of the semi-tropical seas is used for combs, hairpins, brooches, etc., but a very great deal of imitation tortoise-shell is now made.

From the coral beds of the Mediterranean Sea we get beautiful red, pink, and white beads, and from the sands of the Baltic come the most transparent of the yellow amber,



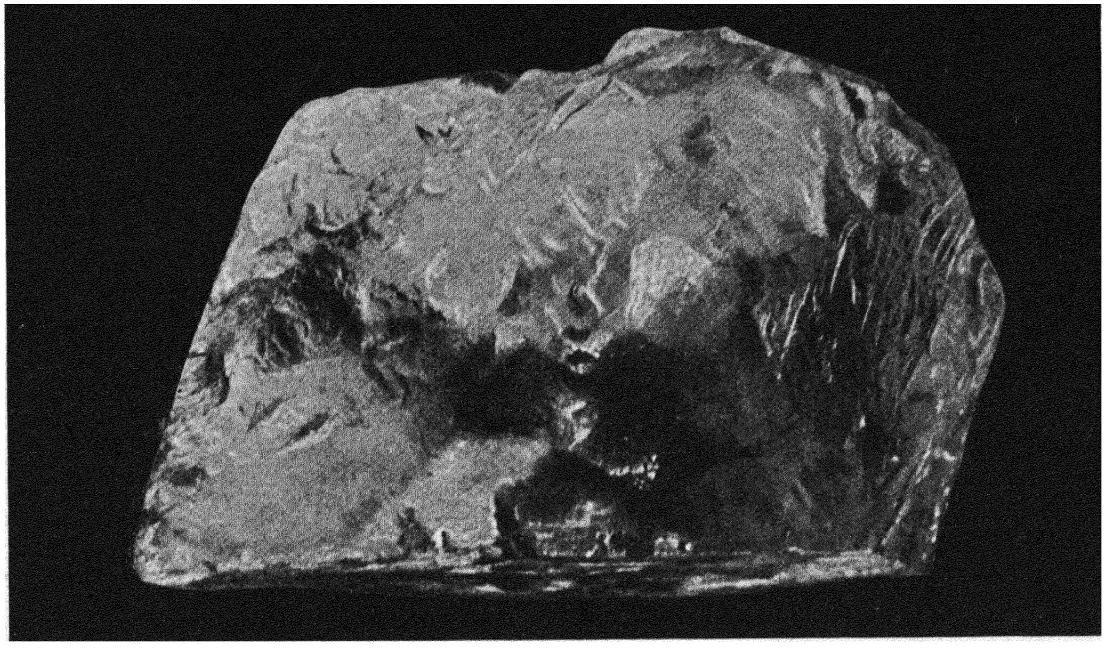
(*left*) Cutting and (*right*) Polishing Diamonds
Fox Photos



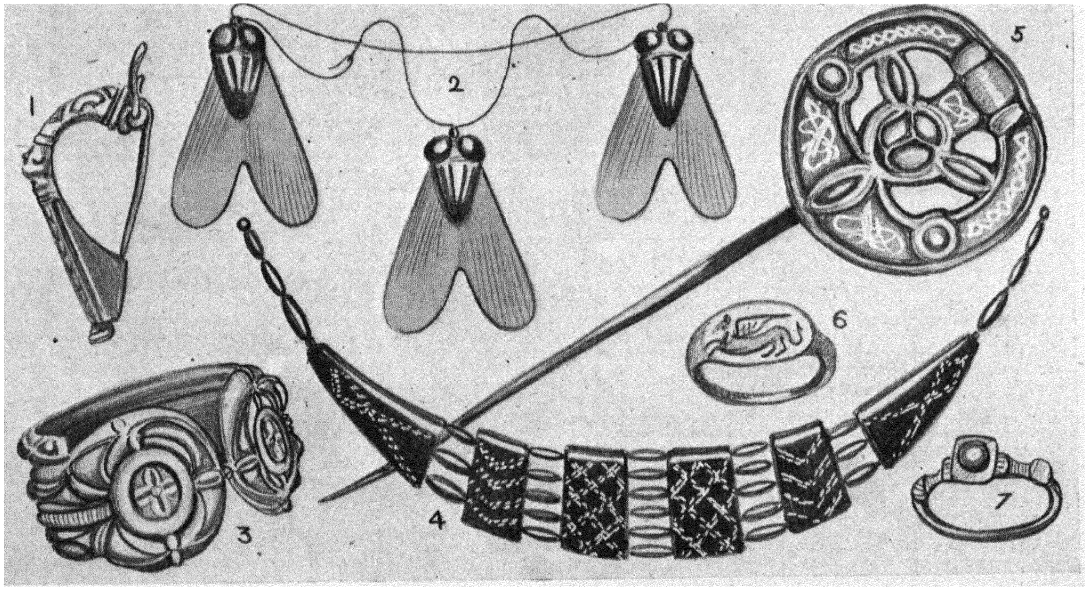
SOME EVERYDAY JEWELLERY

Necklaces of jade, pearls, lapis lazuli, and ivory, earrings of jade, pearl, topaz, emerald, and sapphire; brooches, rings, négligés, clasps, pendants, and bracelets of diamonds, opals, crystal, gold, platinum, and enamel.

Photo E.C.M.



THE CULLINAN DIAMOND (ACTUAL SIZE) WHEN FOUND



SOME ANCIENT JEWELLERY

(1) Bronze brooch (Roman); (2) Golden bees on a chain (Ancient Egyptian); (3) Bronze armlet (Celtic); (4) Jet necklace (Celtic); (5) Gold and silver pin set with amber (Celtic); (6) and (7) Rings of gold (Roman).

prized so highly for necklaces. Coral is made by the coral polyp, a little being that lives in many parts of the warm seas and oceans. There are lovely coral reefs off the north-east coast of Australia—the Great Barrier Reef—but commercial coral was obtained chiefly from the Mediterranean.

Amber is a fossilized resin. It is the gum of trees that has become almost as hard as stone by age and the action of the weather. It lies in a layer along the Baltic coast, and is sometimes washed up by the waves. The rich yellow lumps were in great demand for beads, especially among the dusky beauties of the tribes of North Africa.

Things to Do

1. With the help of your atlas and this article go round the world searching for precious stones and metals.
2. Make a frieze of precious stones and metals. Say where each is found. Draw pictures and make diagrams where possible.
3. Make a list of the different kinds of jewellery worn, such as rings. Where is jewellery worn as clothing?
4. Why do we say: (*a*) "I would not do it for all the wealth of Golconda"; (*b*) "Diamond cut diamond"?
5. Make diagrams to show the world's production of gold, silver, copper, and diamonds.
6. What are Oriental gems?
7. What jewellery do we get from the sea?
8. Name the continents where: (*a*) the most gold is found; (*b*) the most diamonds; (*c*) the most silver; (*d*) the most copper.
9. Why is Johannesburg called the gold city, and Kimberley the diamond city? What is the name of the large diamond mine near Pretoria that was discovered long after the Kimberley mines?
10. Find out something about diamond-cutting and polishing.

CHAPTER SIXTEEN

HATS

In most parts of the world some sort of covering is worn upon the head. In all civilized countries now—in Europe, North and South America, South Africa, and other parts of Africa, Australia, New Zealand, and many parts of Asia (for example, China and Japan) we see hats just like ours, but there are still many places where more uncommon head-dresses can be seen.

In the far north of Canada, in Alaska, and in Greenland the Eskimos wear hoods of fur instead of hats. They do not take off their hoods as we do our hats, but simply push them back. The trappers in the pine forests of Canada also wear hoods, as do the men and women along the Arctic regions of northern Siberia.

In cold lands, or lands with cold winters, caps of fur, felt, or wool are very common. The Laplanders of Northern Europe wear caps of *felt*. Fur caps are common in Eastern Europe, especially Russia. The Tartars along the Volga have fur caps. A common cap is one of sheepskin or lambskin with the wool on. This is often seen in Soviet Russia. Some of the best caps are made of Astrakhan (Persian lambskin).

In far Eastern lands, where people work in sunny rice-fields or drive bullocks along hot roads, hats like small sunshades or shallow basins tied on with string are worn. These hats are made of grasses such as bamboo splints, and many are two feet in diameter. Hats like these can be seen in Korea, southern China, Japan, the Philippines, and Hawaii. In India hats called turbans are worn. The turban is made of many yards of cloth (often white) wound round the head. Many different turbans are seen in India, some with jewels on them. A green turban is supposed to denote that the man who wears it has either made a pilgrimage to Mecca, where Mohammed was born, or that he is one of the descendants of the prophet's family. Another common head-gear of Mohammedan lands—Syria, Egypt, North Africa, etc.—is the felt cap known as the 'tarboosh.' It has no brim, but a coloured tassel on top, and varies in height. Both it and the turban are kept on indoors and out. The Arabs of the desert wear the koufiyeh—a silk or cotton cloth over their heads kept in place by a rope or cord. This protects them from the sun. Thus we see that hats are of many different kinds. Differences in climate, in taste, and in the habits of the people are some of the reasons that account for this.

The making of hats or the hat industry to-day is divided into three distinct classes. The first and the oldest is the manufacture of felt hats. The second is the manufacture of **straw** or **plaited** hats, and the third the more modern and extensive manufacture of **silk** (**velour**) or dress hats.

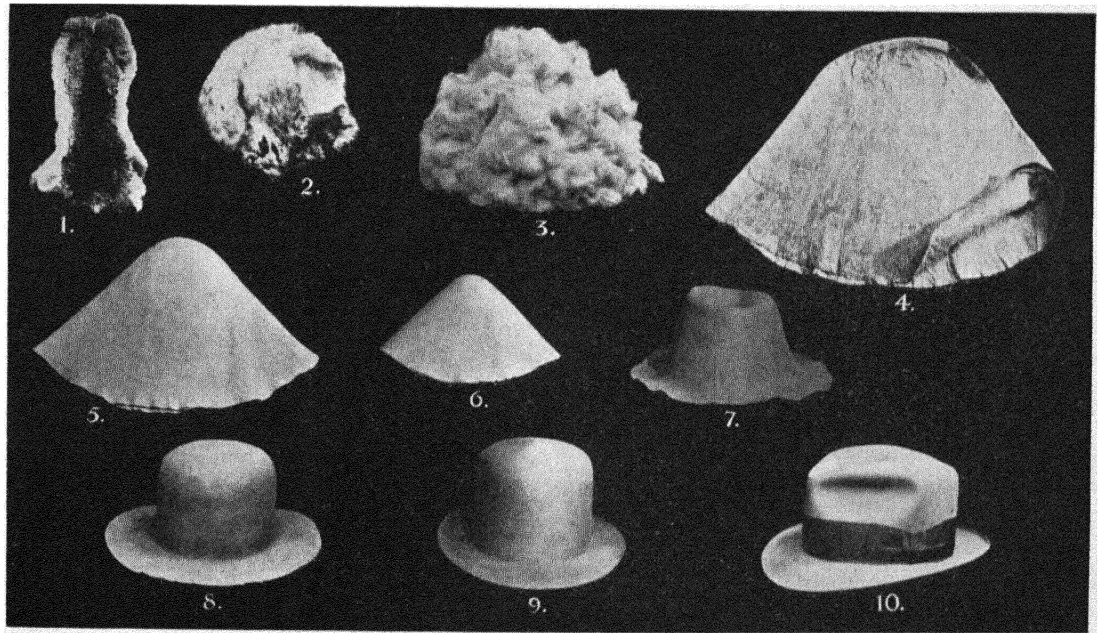
If we examine a piece of felt closely we see that it is made of fine short fibres of fur or wool or a mixture of both. We have learnt how fibres are twisted or spun into thread, and then either woven into cloth on looms or made into cloth by looping (knitting). We now come to a third way of making cloth, the simplest way of all, by *matting*, or *felting*.

Wool when seen under a microscope is covered with tiny scales like those of a fish. Similar scales or barbs are found on the hairs of certain animals, all sloping towards the tips, such as the beaver, rabbit, racoon, and cat. It is this roughness caused by scales or barbs that enables us to make felt. By mixing, pounding, and pressing the fibres together they interlock and form a compacted sheet of cloth. The first felt-makers laid the wet fibres on a sheet of raw hide and pounded them into one mass with a mallet. In

the middle and northern regions of Asia we can still see the Kirghiz of the steppes and other tribe making felt for clothing very much in the same way as it was made in the days before history. The wool is spread out in a thick layer and beaten with long rods. The rods whistle in the workers' hands as they beat the wool. The wool is then soaked with water and rolled up tightly. This long roll is pushed backward and forward for hours. When it is unrolled there lies on the ground a piece of felt ready to be dyed and stitched at the edges.

The making of modern felt hats is very interesting. Cheap felt hats are made from wool felt, more expensive ones from fur felt. The fur must first be cut from the skins and prepared for the hatters. In the factory where this is done we shall see perhaps rabbit and hare skins from Great Britain and Europe, rabbit skins from Australia, nutria (beaver rat) skins from far-off Argentina, and skins of musk rats, racoons, and rabbits from Canada and the United States. Once a great deal of felt was made from beaver fur, and the hats themselves were called beavers, but now there are fewer beavers, and their furs are more costly.

First the furs are cleaned, the long, coarse over-hairs pulled out, and the fur cut from the skins by machinery. The different kinds of furs are mixed together according to the quality of the hat to be made. The mixing is done by different machines. One machine is called a blower. Here the fur is tossed and blown about like a fleecy cloud. Finally it becomes as soft as thistledown and is ready for felting. To see this felting we must watch the hatters at work. Each hatter stands in front of a revolving table upon which is a



SOME OF THE TWENTY OR MORE PROCESSES IN THE MAKING OF A FUR FELT HAT

(1) and (2) Selected rabbit skins from which the fur is obtained; (3) Fur after removing coarse hair and impurities; (4) First step in forming the hat; (5) Shrinking process; (6) Felting complete; (7) The rough hat; (8) Crown blocked to shape, (9) Finished, ready for trimming, (10) The finished hat.

Photo by courtesy of Messrs G A Dunn and Company, Ltd

STRAW HATS
Gelatine is used to stiffen the hats. Here they are ready for dipping at a St Albans factory.
Fox Photos

SOME FINISHED STRAW HATS AT A LUTON FACTORY
Fox Photos

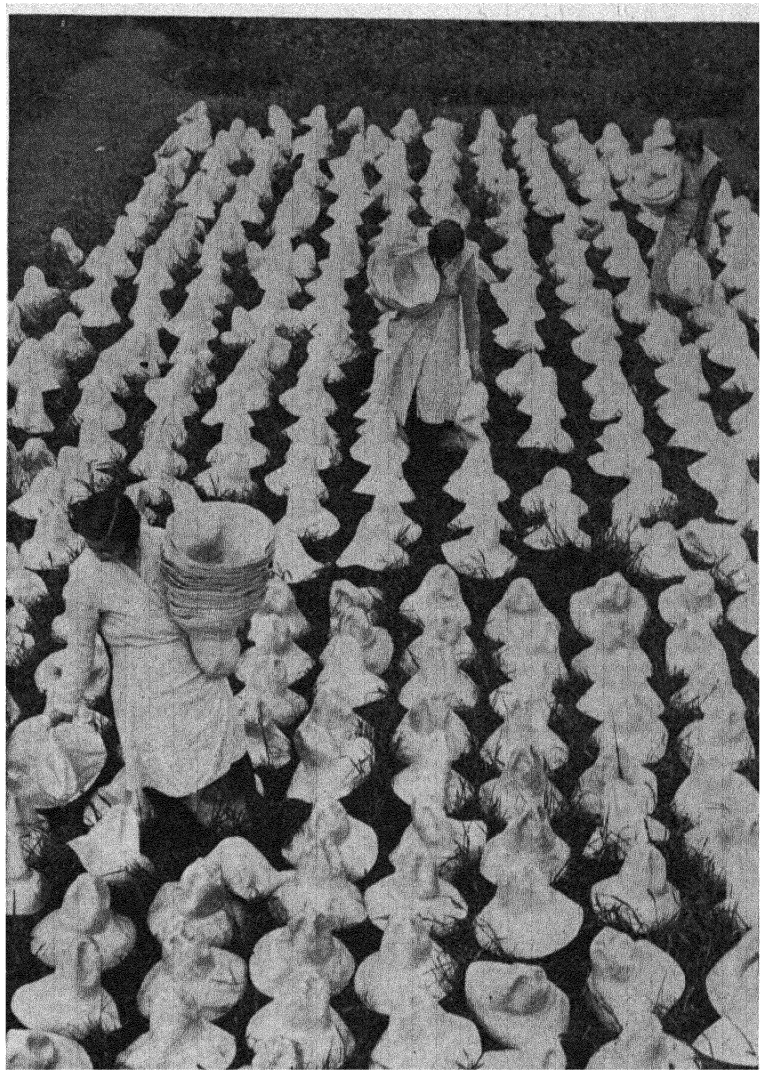
felting-machine with a hollow cone-shaped form of brass, something like the crown of a hat, only much larger. There are many tiny holes in this cone through which air is drawn by a fan so that a current is always flying through each hole. At the same time the cone is kept moist. The worker puts the fur in the box of the felting-machine, from which it is thrown out so that it is caught by the little currents of air and sucked on to the cone. The thousands of fine hairs soon coat the cone, and in a moment or so they become a connected mass of thin felt. This is damped and a cloth is wrapped round it. Then an outer cone is slipped over it and it is removed for further felting. It looks more like an open bag than a hat and stands as high as our waist. It is felted by being rolled and pressed, these operations being partly done by hand and partly by machine. In all forms of felting, whether of wool or fur, the chief agencies are heat, moisture, pressure, rubbing, and rolling.

When by thorough felting the big cone has been reduced to a dense, leathery cone one half its original size, it is dried. If a hard felt is required it is stiffened with a varnish of shellac. Next comes blocking, or shaping the felt cone into a real hat. For this the cone is softened in boiling water and forcibly drawn over and over a hat-shaped wooden block. Then follows dyeing. The finishing processes include shaping on a block again over which the crown and brim receive ultimately their accurate form, and pouncing, or pumicing, which consists of smoothing the surface with fine emery paper, the hat being mounted for the purpose on a rapidly revolving block. Lastly the trimmer binds the outer brim and inserts the lining.

Felt hats are most suitable for spring, autumn, and winter. In summer we need something that will ward off the sun, and also be light. For this reason summer hats are made of straw, palm leaves, and wood splints. In the tropics white people often wear helmets lined with pith or cork bark to protect their heads and necks from the hot rays of the sun.

Straw is the name given to the stalks of grain-plants, especially wheat, rye, oats, barley. Wheaten straws are the most important for hat-making. It is only in certain parts that straw suitable for plaiting, and therefore for hats, is grown. The most valuable straws are grown in Tuscany, in Italy, and from them the well-known Tuscan plaits and Leghorn hats are made. Many straw hats are the work of the peasant women of Italy. It is said that they weave braids and make hats while walking along the road or while visiting.

The districts around Luton, in Bedfordshire, and the neighbouring counties have, since the beginning of the seventeenth century, been the British home of the straw hat industry. In the olden days the plaiting of straw for hats gave employment to many thousands of women and young children in the counties of Buckingham, Berkshire, and Hertfordshire, but in more modern times vast quantities of plaits have been imported from Italy, China, and Japan at a very cheap rate. The result was that while the Luton trade in the manufacture of straw and fancy hats of every description grew, the number of British plaiters decreased, and



STRAW HATS BLEACHING IN THE SUN AT LUTON

Fox Photos

Turban (India)

Eskimo Fur Hat (Greenland)

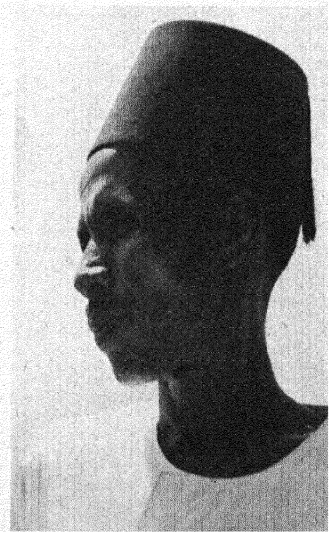
Photos Dorien Leigh, Ltd

Feli Hat (Lapland)

Kouffyeh (Desert Arab)

Sari (India)

Photo E N 4



Tarboosh (Arab World)

Photo Dorien Leigh, Ltd

thousands had no work to do. The finished plaits are sewn together by machinery or sometimes by hand and stiffened by gelatine size.

In the U.S.A. the straw-hat industry is principally centred in the State of Massachusets. Besides straws other materials are used for hats—thin strips of willow and cane and the fronds of numerous palms. 'Brazilian' hats made from the fronds of the palmetto palms are largely made at St Albans.

The famous Panama hats are made from the leaves of small palms that grow in Colombia and Ecuador, where they are cultivated in the principal hat districts. The leaves are plucked when they are young and tender and just beginning to open. The fibres are then taken out and boiled in a mixture of water, salt, and lemon juice to whiten them. The work of making Panama hats is chiefly done by native women. The best hats are made from exceedingly fine fibres that are difficult to plait. The hat is called the Panama because it comes to the U.S.A. and Europe by way of the isthmus of Panama. The chief seat of its manufacture is Ecuador, although some hats are now made in Panama and also in parts of Colombia and other places. There are, of course, imitation Panama hats. Fine palm-straw hats are made in Porto Rico and the Philippines. The Manila hat is a very light hat. Plaits for making hats are also made from ramie grass, from mixtures of straw, horsehair, and ramie grass, and from poorer varieties of silk, cotton, and flax.

ASTRAKHAN HATS AND THE SHEEP THAT PROVIDE THE WOOL TO MAKE THEM

Photo Keystone

A velour hat consists of a light, stiff body covered with a plush of silk; the manufacture of this plush in a brilliant glossy condition is the important part of the industry. Once the bodies were made of felt; now they are made of calico stiffened with a varnish of shellac. The plush covering which becomes one with the body may be of silk or cotton, but it always has a long and soft nap. The finished hat is veloured in a revolving machine by the application of hair-cloth and velvet velours.

Besides these three classes, hats are also made of silk, wool, cotton cloth, or leather, sewn together in various shapes. Then we have knitted caps and hats of different kinds.

Things to Do

1. Make a hat frieze showing hats of *different* lands.
2. Describe the materials used for making summer hats.
3. Give some of the reasons why different people wear different kinds of hats. Where do people wear veils instead of hats?
4. The fur of what animals is used in making felt hats? Tell how felt hats are made.
5. Find out all you can about hats suitable for wet weather.
6. Whereabouts in Great Britain are hats made?
7. Write a short account of the hats or head-coverings worn in Great Britain to-day.

CHAPTER SEVENTEEN

DYEING CLOTHES AND WEAVING PATTERNS

LINEN, cotton, wool, and silk clothes, as well as other materials, like leather, have been dyed for ages. Dyeing is the art of colouring these materials so that the colour will not be removed by washing, rubbing, or light. The purple of ancient Tyre was already famous one thousand years before Christ. It was so beautiful that the kings of that country made it the royal colour, and it has continued to be a royal colour until this day. The Bible tells us about the coloured robes of priests and kings and Joseph's gaily striped coat. This shows how old the art of dyeing is.

The older dye-stuffs were all natural dye-stuffs, chiefly the products of the vegetable and animal kingdoms. Modern dyes are artificial dyes, the products of chemistry, and their source is coal. It is strange to think that it is coal that gives us most of the bright colours we see to-day.

Some of the old dyes are very interesting and are still used to-day for art work. Vegetable dyes are obtained from all parts of plants, such as the roots, the wood, the bark, the leaves, the flowers, and the seed or fruit. The number of plants that yield colouring materials is very great, and if we include those used by savage races the number is still larger. Those, however, that are well known are not very great.

Indigo, the oldest of all dyes, is obtained from a plant that is found wild over most parts of India, but generally near places where it has been cultivated—for example, Bengal. The plant is something like ragwort, and grows to a height of from three to five feet. The indigo is contained in the leaf of the plant in the form of a colourless substance that is soluble in water. The plant when ready to flower is cut early in the morning and transported to the factory in bullock carts. Here it is steeped in water for nine or fourteen hours according to circumstances, when the liquid—the colour of which varies from a bright orange to an olive green—is run into the beating vats which lie at a lower level. The beating, the object of which is to bring the liquid as freely as possible into contact with the air, was formerly done by striking the surface with bamboo sticks, but is now done by paddle wheels or by forcing a current of air through the water. Through beating, the liquid changes in colour from yellow to blue, owing to the gradual precipitation of the dye-stuff as a fine powder. This is allowed to settle and the water drawn off. The indigo mud thus obtained is strained, boiled for a short period, formed into bars, and cut into three-inch cubic blocks and dried.

Indigo is also grown in Java, Guatemala, and Natal, and indigo plants of different kinds grow in Africa and elsewhere. The cotton clothing of the natives of many parts of Africa, and the poor of India, Egypt, China, and Japan, is often dyed with indigo. Not nearly so much indigo is now exported from Bengal, or, indeed, used, because of the new chemical dyes.

Woad is believed to be the blue dye with which the ancient Britons stained their skins. It is obtained from a plant belonging to the mustard family. Up to the middle of the seventeenth century it was the only blue dye-stuff used by dyers in England and on the adjoining continent. The dye is obtained from the root leaves of the plant.

Madder, from which the famous dye called Turkey red was obtained, is a plant which was cultivated in India and Egypt in very early times. The dye is obtained from

the root. It is still used for dyeing calico in Persia and some parts of India, but very little comes to Europe.

Logwood is the heart-wood of a tree growing in Central America. It is one of the most important natural dyewoods and is used for dyeing dark blues, purple, and black on silk, wool, and cotton. When wood is used as dye-stuff it is cut into chips or ground to a powder, and the colouring matter is then extracted by boiling or by allowing the chips or powder to stay in the water until the dye is soaked out. There are many dyewoods. Fustic is a yellow dye-stuff obtained from the ground-up bark of the dyer's mulberry-tree, which grows in Central America, Cuba, Jamaica, etc.

Once all our most brilliant scarlets and crimsons came from the cochineal insect, which lives on certain of the cactus plants of Mexico and elsewhere. The rearing of cochineal was not so very long ago an important industry in the Canary Islands and other places. For many years it was the source of the scarlet dye used for dyeing the 'red coats' of our soldiers. The colour is obtained by drying and crushing the insects. The ancient dyers of Tyre obtained their famous purple in a similar way from shell fish.

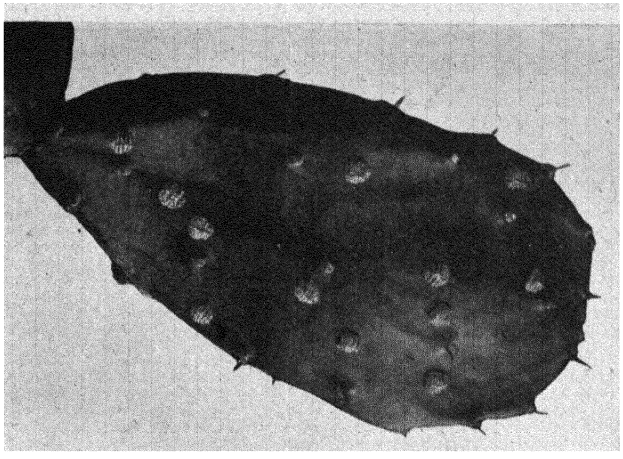
Lichens produce good dyes for wool, especially various shades of yellow, brown, fawn, and chocolate. It is these dyes that helped to make Harris tweed so famous. Harris tweeds are still hand-woven from wool spun, dyed, and finished in the Outer Hebrides. The lichens used in Scotland are known as crottle, or crotal, and give a range of browns that even to-day are the backbone of any Harris tweed range.

But all these natural dyes have been largely replaced by chemical or manufactured dyes. The use of natural dye-stuffs lasted until the middle of the nineteenth century. In

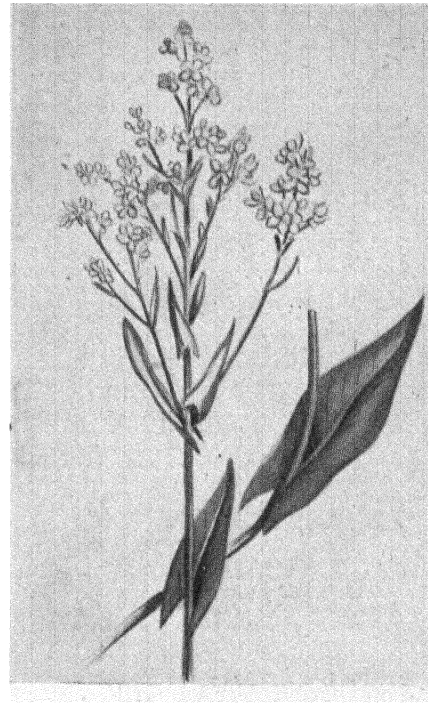
WORKERS HARVESTING A CROP OF INDIGO

The dye is obtained by steeping and macerating the freshly cut plants in water, and precipitating and drying the extract.

Photo E.N.A.



Cochineal Insects on a Cactus
Photo H. Bastin



Woad Plant

1856 an English chemist, Sir W. H. Perkin, made the first artificial dye. He was trying to make quinine from aniline, a product of coal-tar. Coal-tar itself is a sticky fluid got from coal in the process of gas-making. This first aniline dye was the purple colouring matter mauve. It was not a great success, but it showed what might be done. This mauve was last used to dye stamps in the reign of Queen Victoria, so the colour can still be seen in stamp collections. The discovery of other aniline dyes followed: indigo as good as the natural indigo from Bengal, madder like that from the root of the madder plants, and many other colours. Big factories were built and chemists worked hard experimenting with coal-tar in combination with other chemicals, so that a bewildering number of colours were produced. Engineers helped the chemists by inventing new machines for mixing dyes. Germany led the way at first, and had the largest factories in the world for dye-stuffs at Frankfort-on-Main and Ludwigshafen. Up to 1914 Germany almost controlled the world's dye market. Then both the United States and Britain began to make great advances. Some measure of protection was given to British manufacturers to prevent the market from being flooded with cheap German dyes. Chemical dyes are much cheaper to produce than natural dyes, and so many interesting and natural dyes are no longer used. The most important centres for dye-stuffs in Britain are at Manchester, Huddersfield, Leeds, and Carlisle.

To return to weaving and spinning mills, we find that many of them have dyeing departments connected with them so that the cloths are treated in many different ways in order that they may become the beautiful goods sold in the shops. In some cloths the fibres themselves are dyed before spinning, in others the thread is dyed, and in still others the cloth is dyed after it has been woven. The dyeing itself requires great care in order

A Printer at Work with his 'Tier,' or Tray, Boy

Photo by courtesy of Messrs Liberty and Company, Ltd

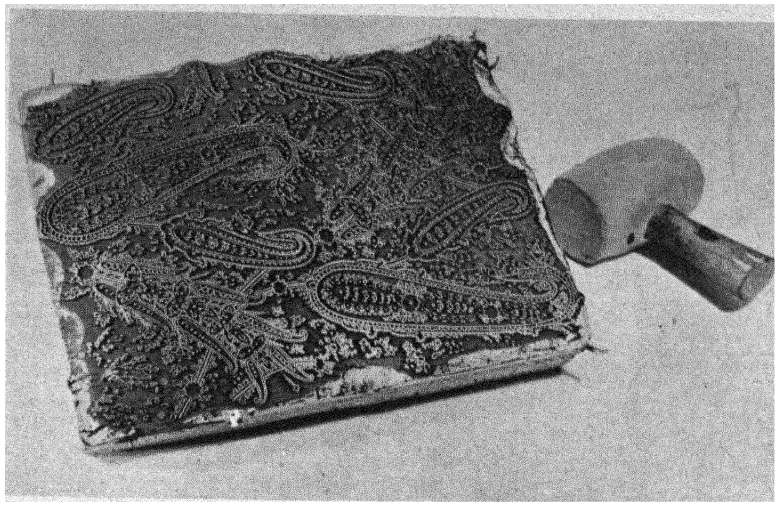
that each thread may be of just the right colour before it goes into the cloth, or, where the whole cloth is dyed, that it may be of the same colour throughout.

Beautiful patterns can be woven by the use of different-coloured threads. The rooms in the factories where this is done are bright with the gay hues of the thread; and the looms are different from the ordinary power looms. It was a Frenchman of Lyons, Joseph Jacquard, who invented a loom for weaving patterns. Now Jacquard looms are used everywhere.

In our travels through the weaving mills we shall find some weavers making cloth in raised patterns, others making goods of mercerized cotton which have the finish and gloss of silk. It was J. Mercer who discovered the chemicals for giving a silky gloss to cotton, hence the word **mercerized.** We can see how velvets are made by weaving the silk upon wires and then cutting the threads so that a soft and smooth nap, or pile, is left. We see silks and ribbons with gay and beautiful patterns, some raised in satin on a soft silken ground.

The designs and patterns for silk and other clothes must all be drawn before the looms can be arranged for them. This is true of all cloths other than those absolutely plain, so that designing and pattern-making is quite a business of itself. In most countries there are schools where boys and girls learn to make designs for the weaving mills, and where they are taught the arts of fine weaving and pattern-making.

A much cheaper and easier way of making patterns on cloth is to stamp or print



A Fine Old Paisley Block built up of Copper Insertions

Photo by courtesy of Messrs Liberty and Company, Ltd

Printed Materials—Cotton, Silk, and Linen

Photo E.C.M.

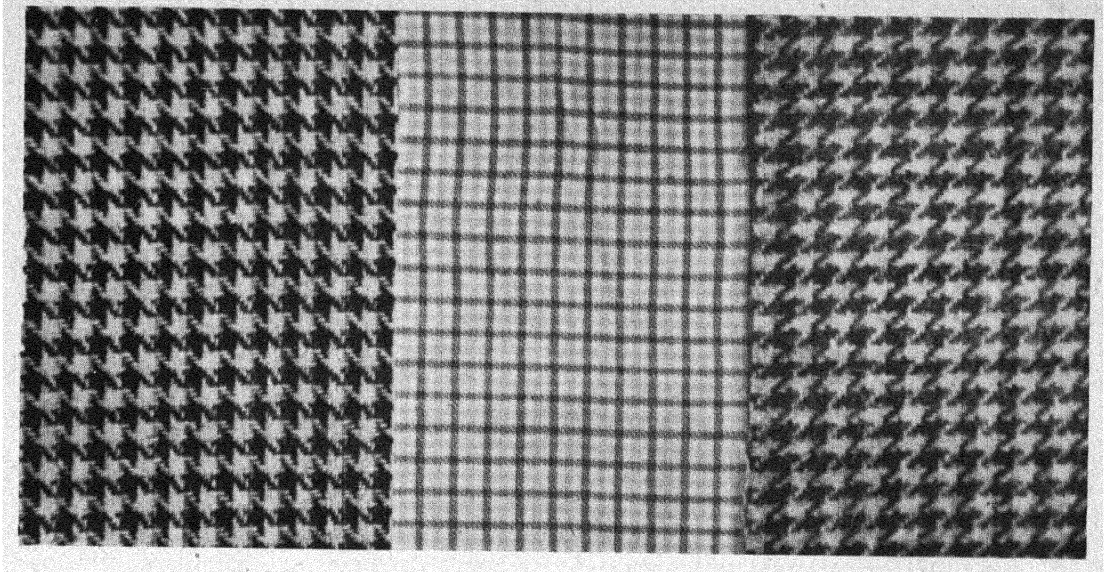
them on in different colours. This is done by running the finished goods through copper rollers engraved with the patterns, and fed with the various dyes required. A separate roller is needed for each colour. Almost all coloured cottons are made in this way, hence the process is generally known as calico-printing; some of the cheaper coloured linens, woollens, and silks are also printed. The original printed cloths were hand or block prints, stamped by hand with small wooden blocks moistened with colour paste. The old method

A SMALL HAND-LOOM, SHOWING HOW IT IS WORKED
Fox Photos

is still practised for a small quantity of expensive goods and by art students. Calico-printing is a very ancient art in India, Persia, and China. Although calico printing has made great strides in Great Britain, the patterns printed are not of a high standard, because the art of designing patterns has made little progress.

Things to Do

1. Find out more about plants that give natural dyes—for example, wild mignonette, onion skins, elderberries, heather, and twigs. Perhaps you can make some experiments with flowers and other plants.
2. Make a very simple loom from an old box and see what different patterns you can



WOVEN MATERIALS—HARRIS TWEED, VIYELLA, TWEED
Photo E.C.M.

make by altering the colours of the warp and weft (or woof) strands. Strips and plaids are easy.

3. From what places did these famous natural dyes come: (*a*) indigo; (*b*) cochineal; (*c*) logwood; (*d*) fustic (yellow) from the dyer's mulberry-tree; (*e*) madder; (*f*) crotal; (*g*) woad.

4. Describe how the dye-stuff indigo is made from the indigo plant.

5. How are modern dyes made? Write what you know about them.

6. Make a frieze about the natural dyes. You will be able to find pictures of many plants that give good dyes, and some you can draw.

7. Make some good designs for: (*a*) weaving; (*b*) calico printing. Try printing designs with tops of pencils or sticks cut in different shapes, etc.

CHAPTER EIGHTEEN

LACE, NEEDLES AND PINS, AND OTHER FINE THINGS

LACE, like jewellery, is used chiefly for ornament. It is often very lovely. It is interesting to collect different specimens of lace so that we can describe it. We notice it has pretty patterns of different shapes and sometimes of birds or flowers. The work is very open, and the open work and closed work help to make the patterns. We might say lace is the name given to an ornamental fabric of linen, cotton, silk, or gold and silver threads, made by looping, knotting, plaiting, or twisting the thread into definite patterns of contrasted open and close structure. It is the patterns and the open work that distinguish lace from other fabrics.

There are three very distinct varieties of lace made; the first two are hand-made:

(*a*) **Needle- or point- lace,** or **needle-point-lace,** made by a single thread, the only tool being a needle. This consists of different combinations of button-hole stitches and is closely allied to embroidery.

(*b*) **Pillow-lace** is an elaboration of plaited fringe work. It needs a pillow or cushion, many pins, and many threads on bobbins.

(*c*) **Modern machine-made lace,** which is a development of fancy weaving.

Let us first think about hand-made lace, or 'real' lace as it is called, to distinguish it from machine-made lace. Lace-making dates from about the sixteenth century. Before that period 'lace' described such articles as cords and narrow braids of plaited and twisted threads, used not only to fasten shoes, sleeves, and corsets together, but also in a decorative manner to braid the hair, to wind round hats, and to be sewn as trimmings upon costumes. The activity in cord- and braid-making, and in ornamental needlework, such as cut-and-drawn thread linen work, and the darning of stiff geometric patterns into a hand-made network of small square meshes soon changed to lace-making.

From the sixteenth century onward there was a regular trade demand for lace, and lace-makers became busy. These lace-makers were the womenfolk of peasants and fishermen. It was in north Italy, about the lagoons of Venice, and in Flanders that lace-making first became important in art and trade. Some say it was the Flemings who invented pillow-lace. In normal times in Belgium it would be no uncommon sight in summer to see a number of women sitting outside their doors busy making pillow lace. They deftly move their pins and bobbins as their patterns grow. The flax-fields of Belgium provided the fine linen thread they used. The lace of Bruges and Brussels was especially famous.

France and England were not far behind Venice and Flanders in making needle and pillow-lace. Pillow-lace making was carried on in England, in the seventeenth century, in Buckinghamshire, Hertfordshire, and Bedfordshire, and in the eighteenth century good lace was made in Devonshire. Pillow-lace makers can still be seen at little seaside villages tucked away in Devonshire dells. Honiton was famous for its pillow-lace.

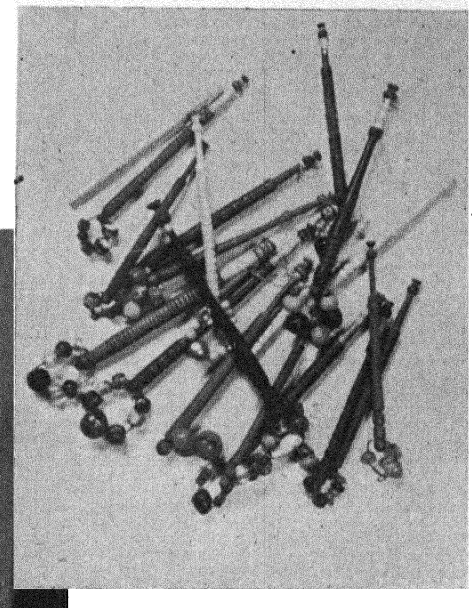
In the south of Ireland there are needle-lace workers making lace in whitewashed cottages and cabins, at Youghal and Kenmare. Ireland, too, is the best producer of that substantial looped thread work known as *crochet*, which is a hand-made lace fabric, though it cannot be classified with needle-point or pillow-lace. The laces from Limerick, Carrickmacross, Kinsale, Newry, Crossmaglen, and elsewhere, are embroideries on net, and cut and embroidered cambrics and fine linens.

The making of pillow-lace has spread to distant parts of the world—for example,

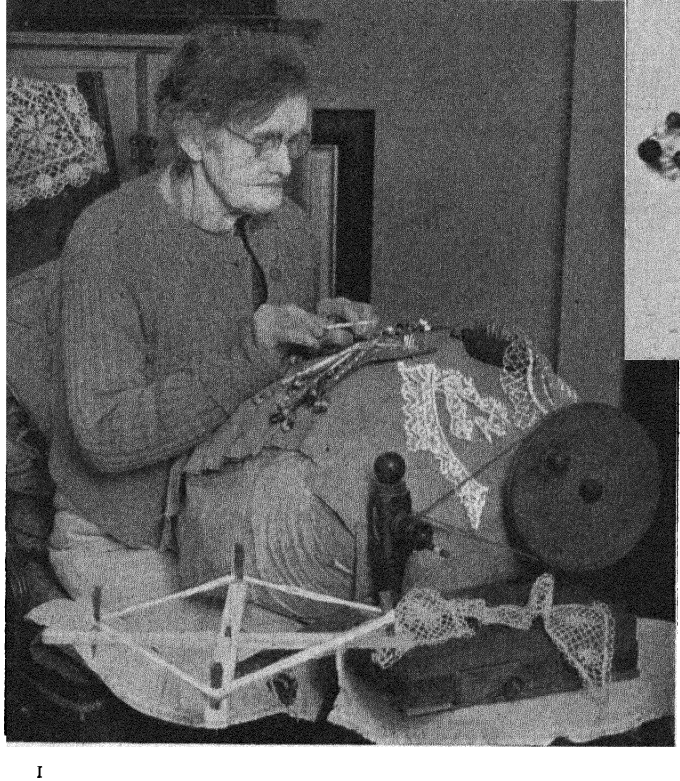
India, Ceylon, and Japan. Malta is noted for producing a silk pillow-lace of black or white or red threads, the patterns being based on wheels or circles. Lace is also a peasant occupation in Germany, Sweden, Russia, and Spain. The countries that were the chief sources of hand-made lace before the war of 1939 were France, Belgium, Ireland, and England.

Most of the modern lace of to-day comes from machines, especially the machines of England, France, and Germany. These machines date from the close of the eighteenth century. Lace is very quickly and very cheaply made by machinery. This cheap lace did a great deal of harm to the beautiful art of lace-making. In Britain, Nottingham became famous for its machine-made lace. Other towns famous for their lace factories were Calais and Lyons, in France, Plauen, in Germany, and St Gall, in Switzerland.

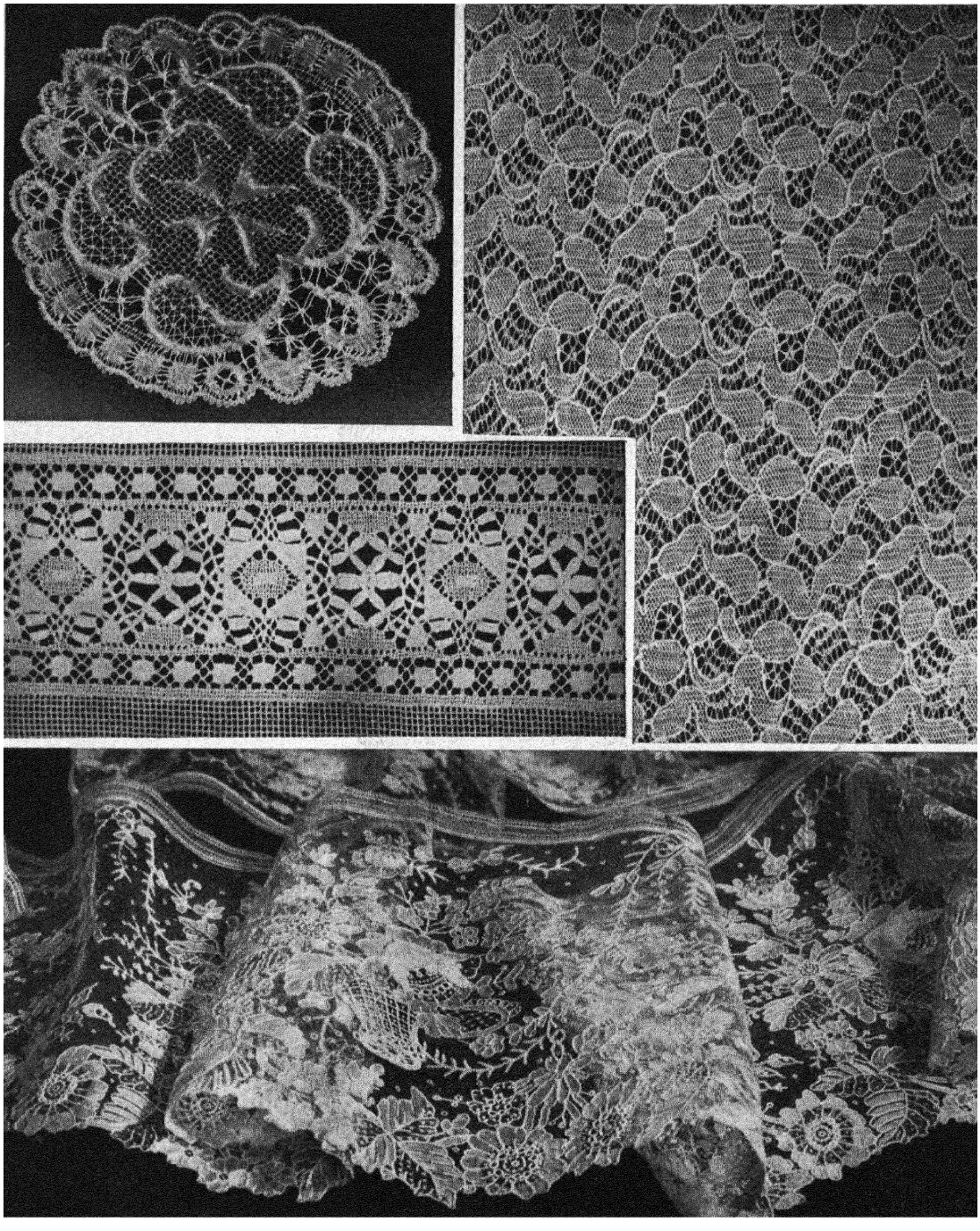
Needles and pins, which play so large a part in helping to make clothes, date back to the earliest days. In that long-ago time the sharp thorns of certain bushes were used for needles, and sometimes people sharpened the slender bones of birds and fishes. At first, too, needles were only used for making holes in the clothing through which thongs or strings were put. Steel needles were introduced into Europe by the Moors and Arabs, and were made in Europe in the fourteenth century. In England their manufacture was established about 1650. At first the making of pins and needles was a home industry; now they are made by wonderful



Pillow-lace Bobbins
Photo I. C. M.



An Old Lady who still practises the Art of Pillow-lace making
Fox Photos



SPECIMENS OF LACE

The illustration at the top (left) is of Maltese lace, and that at the bottom of Brussels lace; the other two specimens are of machine-made lace.

Photos Fox (top left), Paul Popper (top right and bottom), and E C M. (middle left)

AN EXHIBITION OF BEAUTIFUL OLD LACE

Fox Photos

A DRESS MADE ENTIRELY OF LACE

Photo Paul Popper

machines in huge factories. The centre of the trade in needles in England is Redditch, in Worcester, with several small towns in Warwickshire. Before the war England made perhaps more needles than any other country, and she and Germany produced the greater number of the hand needles used by the world. Aix-la-Chapelle was an important centre of their production. The United States of America made the most needles used in sewing-machines. They are famous for these needles.

Birmingham became the principal centre of the pin industry in the seventeenth century. The beautiful automatic machinery by which pins are now made of single pieces of wire is an invention of the nineteenth century. It used to be very slow work putting the pins in paper by hand, but now machines even do this. The papers are folded and the holes made in them by machinery. The pins and papers are then put into another machine. By a wonderful process the machine puts the pins into the proper places in the papers.

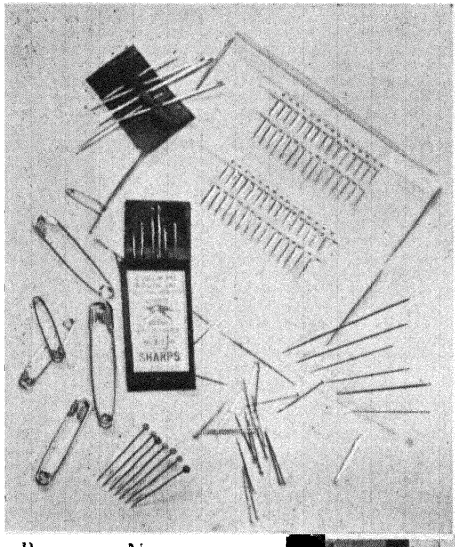
It is to the United States of America that the world owes the sewing-machine. Various sewing-machines were invented in the eighteenth century, but they were chiefly useful for making lace, and did not sew cloth together. They were not of great value. It

was Elias Howe, an American, who invented the first practical sewing-machine. Howe's invention contained the eye-pointed needle, a needle without which no sewing-machine is possible. As soon as it was seen to be a success other inventors added improvements, especially the Americans Wilson and Singer. Singer's machine was patented about 1852. To-day Singer's machines are very famous, and very different from those first invented. The Singer Manufacturing Company had a very large establishment near Glasgow and others at Vienna and in Canada. Sewing-machines will do almost every kind of work in making clothes. They are used in shoe factories, in shirt factories, by tailors, dress-makers, and milliners.

Before we leave the interesting subject of clothes a word must be said about feathers, which are most interesting to study.

Feathers in hats, and for dress trimmings and boas, were once very fashionable, and there was a great demand in centres like London and New York for beautiful feathers from different lands, especially ostrich feathers, so that many ostrich farms flourished in South Africa. The feathers were cut from the birds every seven or eight months. The ostrich often reached the age of three score and ten, and it sometimes produced one hundred dollars' worth of feathers in one year.

Off the coast of Norway were flocks of eider ducks whose soft velvety down was frequently used for collars, muffs, and clothes linings. The feathers of the egret, a small white heron, are still used in oriental countries where men sometimes wear them on the fronts of their turbans, fastened with a diamond or precious stone. A few primitive races used feathers for example, the feathered head-dress of the Red Indians and the feathered capes of the Hawaiian Islands. It is interesting to find pictures or make lists of birds with beautiful feathers. Most birds with



PINS AND NEEDLES
Photo I. C. M.

SINGER SEWING-MACHINES IN USE IN THE YEOVIL GLOVE COMPANY
Photo by courtesy of the Singer Sewing-machine Company, Ltd

brilliantly coloured plumage live in the warm lands of the globe, such as the Amazon Valley, in South America, and the forests of the Congo, in Africa.

Things to Do

1. Look at the map for the different places where lace-makers still make lace by hand. Look for the towns where there are great factories for machine-made lace.

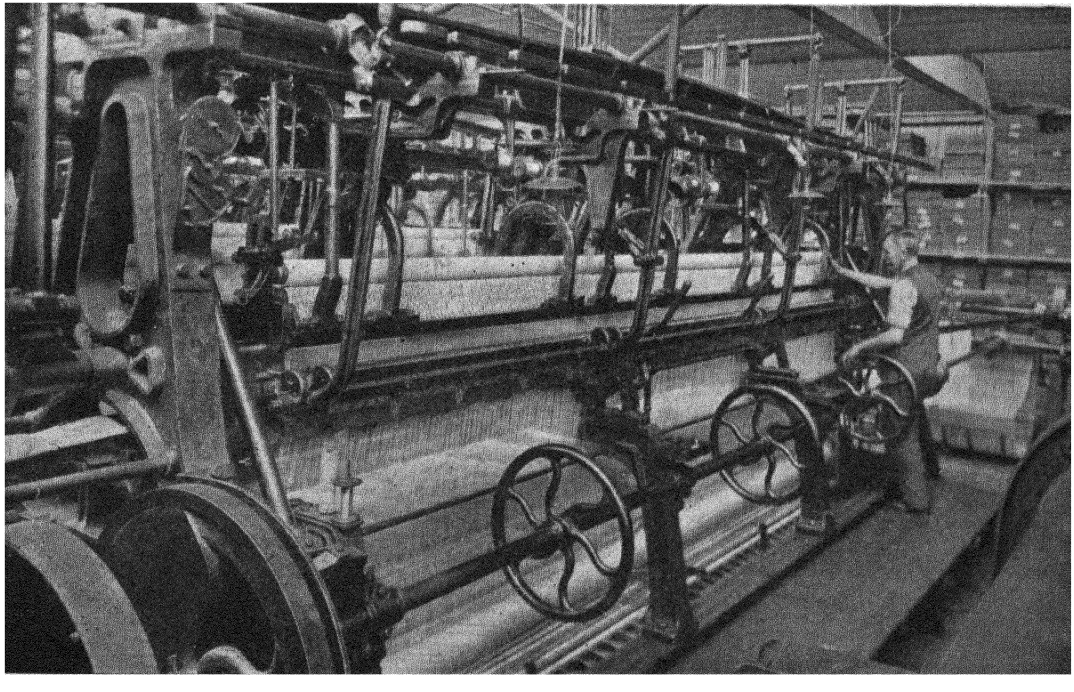
2. Make a frieze or booklet about pins, needles, and sewing-machines. Find pictures or make drawings of the first pins and needles—for example, sharp thorns, the slender bones of birds and fishes, the first metal needle with the thread tied at one end; find pictures of safety-pins and sewing-machines.

3. Collect pictures or examples of different kinds of lace. You will be able to find pictures of machine-made lace curtains. Perhaps you can make a frieze and add pictures of 'real' lace-makers at work.

4. Who invented the sewing-machine? What country makes the most sewing-machines?

5. How did the people who lived long ago make their pins and needles?

6. Reels (or spools) of cotton or linen thread are very important in clothing the world. Examine a reel of thread and write down all you notice about it. How many yards of cotton do you think there are on a reel? Some say 150 yards. On some there are 400 yards. Think of a thread of this length being twisted from cotton fibres less than two



One of the huge Lace-machines in the Factory of Herbert Woolley's, the Nottingham Lace Manufacturers

Photo by courtesy of Messrs A. Herbert Woolley and Company, Ltd

inches long! Find how the thread is fastened when enough has been wound on a reel. Why is there a hole through the reel? When reels were *first* made in Europe the people returned the empty ones and were paid for them. Why were they not returned when the industry was established?

7. Make a list of birds that have lovely plumage. Say in what countries they live. Collect pretty feathers you find.

8. What is needle-point lace, pillow-lace? Collect examples of different kinds of lace. Choose a piece to describe.