THE STORY BOOK OF COAL

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THE STORY BOOK OF COAL

BY MAUD AND MISKA PETERSHAM

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COAL

HOW IT CAME TO BE

There was an age, long, long ago, when fish and reptiles lived in the sea, but no animals and no people lived upon the earth.

At that time dense, green jungles covered the land. The great trees of these forests had strange-looking bark and fernlike leaves. A tangle of grasses and ferns grew as high as the trees.

The ground was a swamp. The air was always hot and damp. Everything grew very fast in the steaming air and mushy ground.

Storms and hurricanes raged through the forests, and huge tree trunks crashed to the ground and lay half buried in the mud and water. The beautiful green trees and ferns died and decayed in the mud. Then they slowly turned into a black-looking mass.

Layers of sand and silt were washed into the swamps by the rivers and were left on top of this black, decaying mass. In the hot, steaming air more of these forests grew up. Through the years this happened again and again and again.

A time came when earthquakes and volcanoes shook the earth's surface. Then the earth's crust was pushed up and down and crumpled together. These masses of decaying forest matter were buried under great weights of earth and clay.

The different layers of vegetable matter, which had once been the growing forest, were slowly pressed into thin, dark seams of coal. The beds of mud and clay between these layers of forest matter were changed into rock and slate.

FOSSIL FERNS

The great forests, which had been as large as any jungle we know about today, had become a seam of coal. It took many, many forests one on top of another to make the layers of coal found today. Coal is sometimes called *buried sunshine* because of the years of hot sunshine which helped to form it.

In the coal mines, fossils have been found which have helped men to learn how coal came to be. Whole petrified trees, roots, trunks, and leaves have been found in some of the coal mines in England.

In the layers of shale and sandstone inclosing the seams of coal, petrified skeletons of fish and snails and plants are found. In the coal itself there is often the exact pattern of a leaf or a fern from those early forests.

DIFFERENT KINDS OF COAL

First there were beautiful green forests. As the trees and plants died and rotted away and were buried in the mud, they became peat. Bogs of this peat are found today and even it can be burned as a fuel. In many places in Ireland the people use nothing but blocks of peat for their fires.

EARLY FOREST

PEAT

There is great heat within the earth, and where the layers of mud buried the peat deeper under the surface, the pressure and heat have dried it out. The peat has been changed into soft, brownish coal called *lignite*. This often shows a woody structure, and sometimes branches and twigs are found in the form in which they grew. Germany is the greatest producer of this kind of coal.

As this lignite ages, it grows harder and becomes black in color. It is then called *bituminous coal*. This is found in many countries all over the world.

In certain places, under still greater pressure, this soft coal became very hard, shiny coal. Here the green forests have turned into hard coal or *anthracite*.

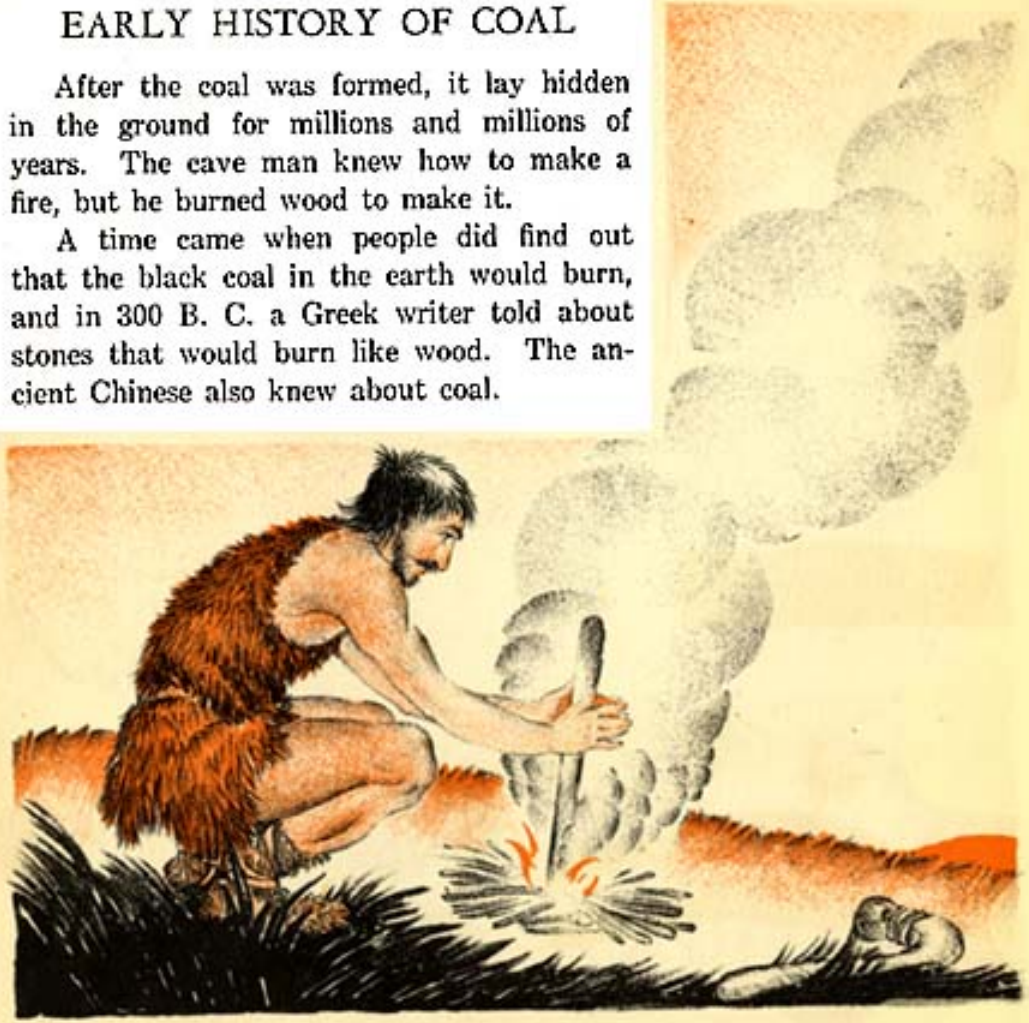
SOFT COAL

HARD COAL

EARLY HISTORY OF COAL

After the coal was formed, it lay hidden in the ground for millions and millions of years. The cave man knew how to make a fire, but he burned wood to make it.

A time came when people did find out that the black coal in the earth would burn, and in 300 B. C. a Greek writer told about stones that would burn like wood. The ancient Chinese also knew about coal.



In England cinders of burned coal were found in the ruins of old Roman forts and houses. So we know that the early Britons and Romans used coal. But the forests supplied plenty of wood, and so wood was the fuel that the world used for thousands of years.

There were coal mines in England long before there were any in America. Great Britain is the chief coal-exporting country in the world. The coal fields lie near the sea. The English people began mining very early and have continued for six hundred years.

There was a time in England, however, when people thought that the smoke from coal poisoned the air.

The English king, Edward the First, declared that if coal smoke were seen coming from a building, the building was to be destroyed. He also made the burning of coal an offense to be punished by death.

Many English ladies were afraid to eat food which had been cooked over a coal fire. Even later, coal could not be burned in London while the Parliament was sitting, because some of the members from the country thought that the smoke would make them sick.

In America, the Indians knew certain places where the black coal could be seen cropping out on the hillsides, but they had no use for it. Their fires were made with wood.

A soft-coal mine was opened in Virginia in 1787. A little later hard coal or anthracite was found in Pennsylvania.

In the early days blacksmiths were almost the only people in America who used coal. They needed a very hot fire to heat iron, and they found that coal made a hotter fire than wood.

Anthracite was called *stone coal* at first, and people did not think it would burn. As late as the year 1812, a man who tried to sell a few wagonloads of coal in Philadelphia was threatened with arrest. People thought he was selling just black stones.

PHILADELPHIA
1812

Then something happened that made coal very important and necessary. The steam engine was developed, and the steam engine needs much fuel to make the steam. Coal was the very best fuel which could be found for this purpose.

Railroads were built across the country. They needed fuel that did not take up too much space and that would make a very hot fire. Steamships, too, needed the same kind of fuel. Great factories were also built where large amounts of coal were used. As time went on, almost all the people began to burn coal in the furnaces and stoves in their homes.

COAL MINES

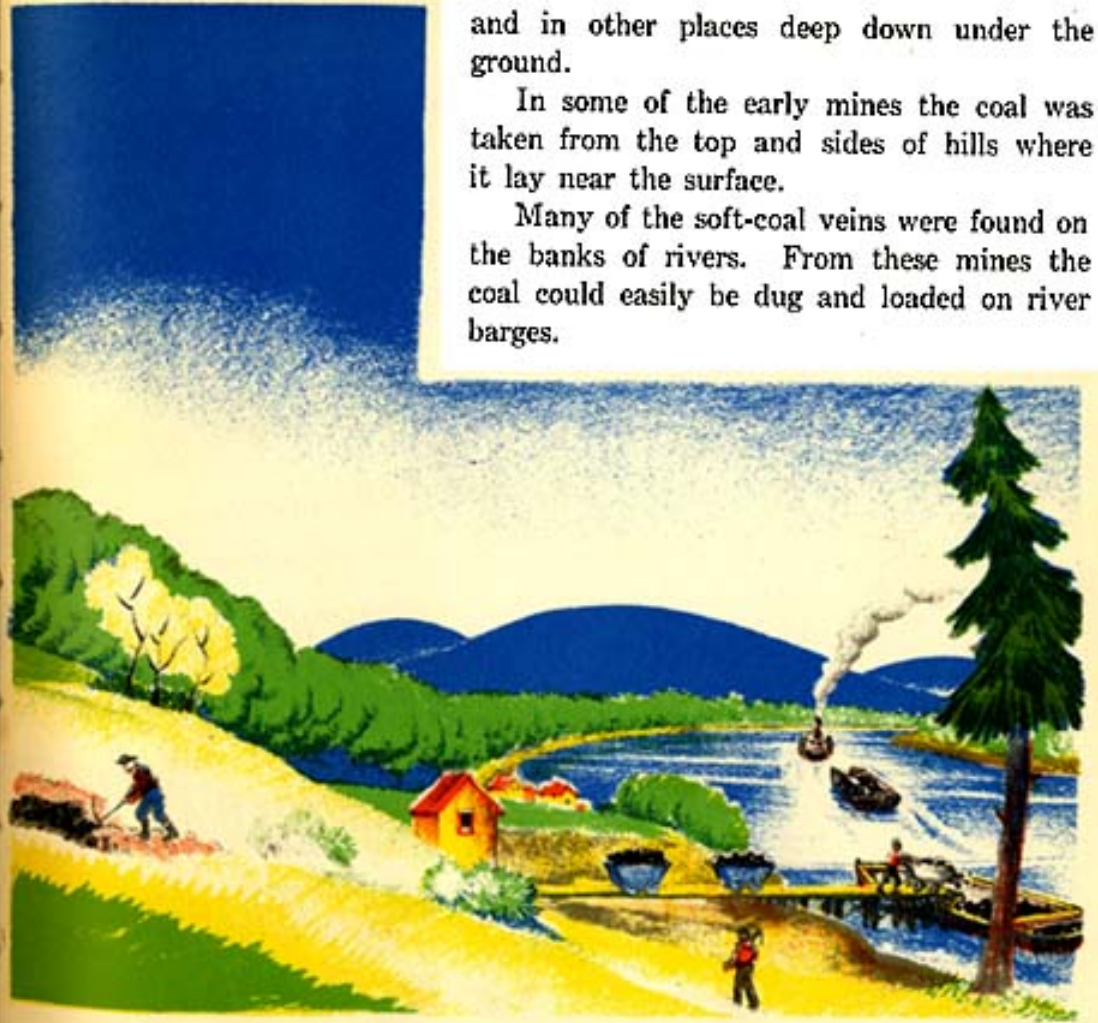
For all these uses more and more coal was needed. Men began to hunt for the places where it lay buried in the ground. New veins and layers were found, and many mines were opened.

The earthquakes of those early days when the coal was formed had tilted and twisted the layers up and down. So coal is found in some places near the surface of the earth and in other places deep down under the ground.

In some of the early mines the coal was taken from the top and sides of hills where it lay near the surface.

Many of the soft-coal veins were found on the banks of rivers. From these mines the coal could easily be dug and loaded on river barges.

COAL MINE
ON OHIO RIVER
1847



But most coal mines are deep down under the ground, and the miners work in dark pits with black coal and rock all around them.

Tunnels follow the coal vein into the earth, or deep shafts are sunk straight down. From the shaft, passageways are dug from which the coal is taken and brought up out of the ground.

The miners could never work down under the ground if it were not for the fresh air which is forced down into all parts of the mine. This is done by the use of huge fans.

Breaking the coal off down under the ground and getting it out are very dangerous. Often there are accidents in the mine, and many miners lose their lives while working.

One of the dangers is from underground rivers that sometimes flood the mines. Pumps are used to carry off the water. Sometimes the pumps break down, and sometimes more water comes in than they can carry off. Then there is great danger.

Another danger comes from the serious fires that break out and burn for a long time.

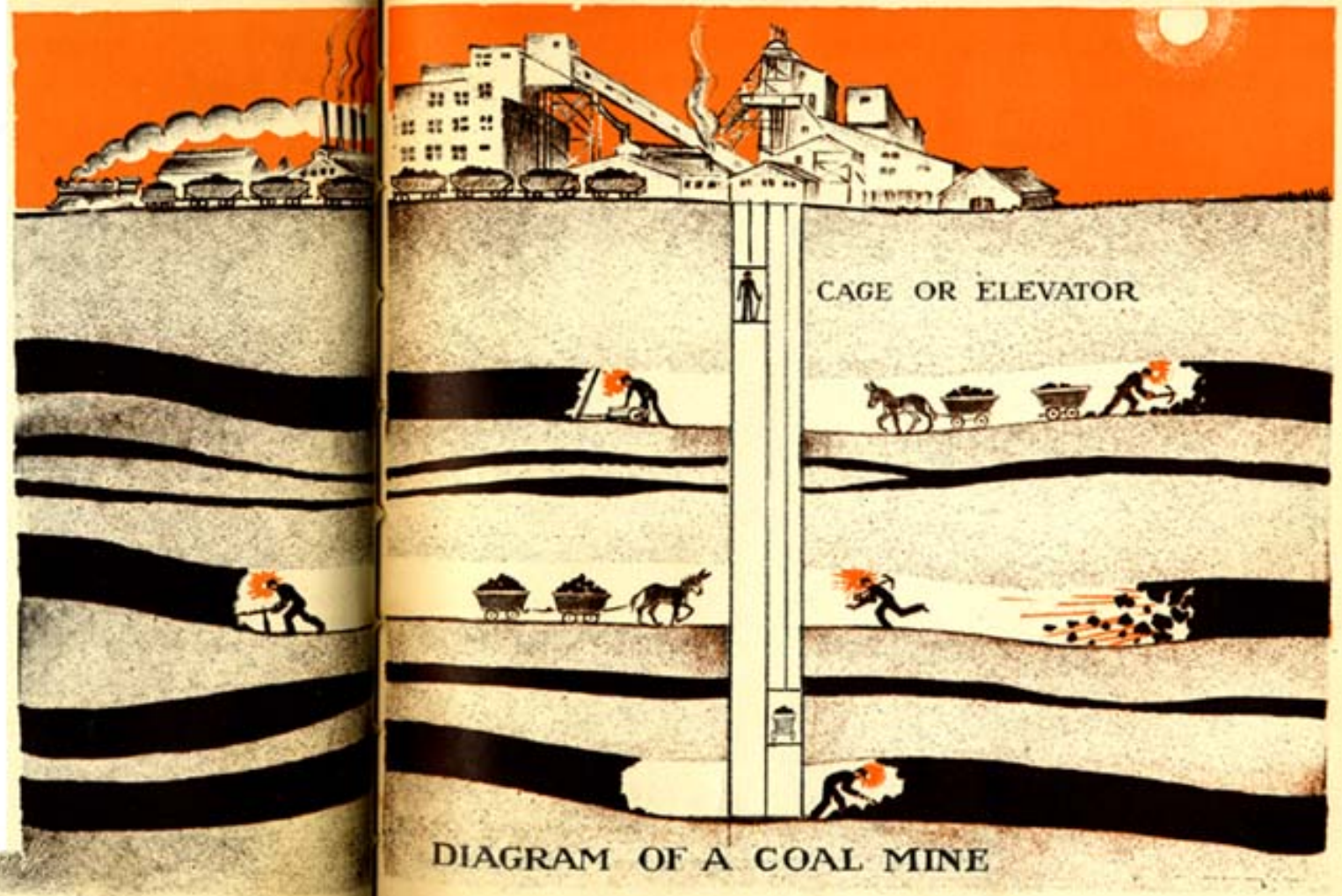


DIAGRAM OF A COAL MINE

But the greatest danger of all comes from cave-ins, when the rock and dirt come crushing down into the rooms from which the coal has been taken. Props of wood or steel are put in to keep this from happening. The miner must be skilful and careful or the whole mass over his head may crash down while he is working, and men will be buried.

A miner himself must never take a chance. Carelessness on the part of a miner may cost his own life as well as that of others.

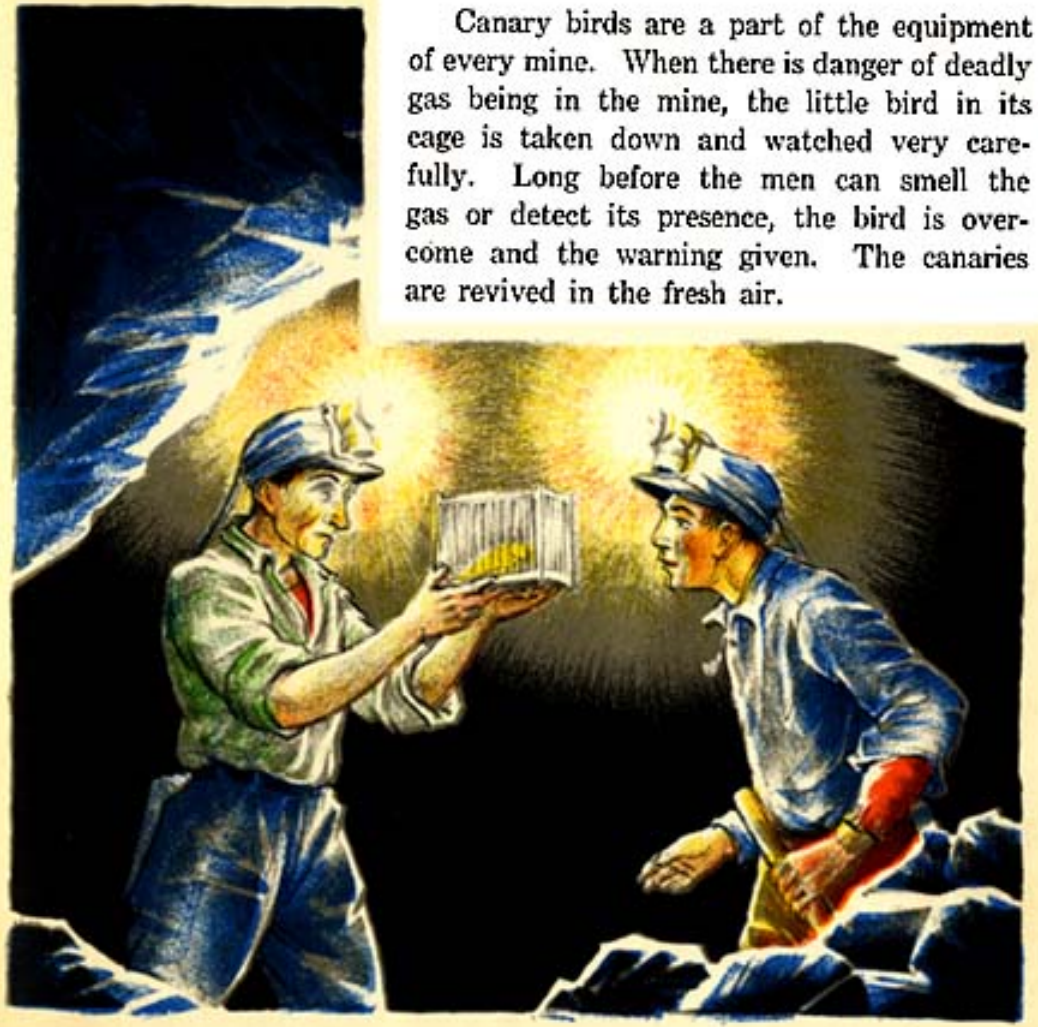
One of the things that has to be guarded against most carefully is gas in the mine. In the long, low, underground passageways, these deadly gases can explode or suffocate the men at work. Even coal dust mixed with air will sometimes explode.

Each day the different parts of the mine are tested to see if the poisonous gases are there.

A fire boss uses a lamp called a *Davy lamp* to make the test. The flame of the lamp is inclosed in a wire screen. If there is gas in the mine, the flame burns more brightly, and, because of the wire screen, it does not explode, but warns the fire boss of the danger.

ORIGINAL DAVY'S SAFETY LAMP

Canary birds are a part of the equipment of every mine. When there is danger of deadly gas being in the mine, the little bird in its cage is taken down and watched very carefully. Long before the men can smell the gas or detect its presence, the bird is overcome and the warning given. The canaries are revived in the fresh air.



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GETTING COAL OUT OF MINES

The oldest form of mining was to remove the dirt covering the coal which lay near the surface of the earth. It could then be dug, loaded, and hauled to the place where it could be used.

A picture in a very early book on mining shows different ways in which the miners of early times went down into the underground mines. Such pictures look strange to us now.

In the earliest days of mining, women and children with baskets on their shoulders carried the coal up ladders and out of the mines. In the old Roman mines they crawled on their hands and knees through small passageways, pushing carts of coal.

Today an elevator or cage takes the miners down a shaft into mines—down, down into blackness. The men have tiny lights fastened to their caps.

UNDERCUTTING MACHINE

From the shaft, passageways extend in different directions. The coal is dug from little rooms off these passageways. The rooms grow larger and larger as the miners take out the coal. The coal is blasted out of the vein, and the great, black chunks are loaded into cars and taken to the hoisting shaft of the mine.

Before the miner blasts the coal loose from the wall of the room, an undercutting machine cuts out a long groove at the bottom of the wall of coal. Sometimes the miner has to make this groove with his pickax.

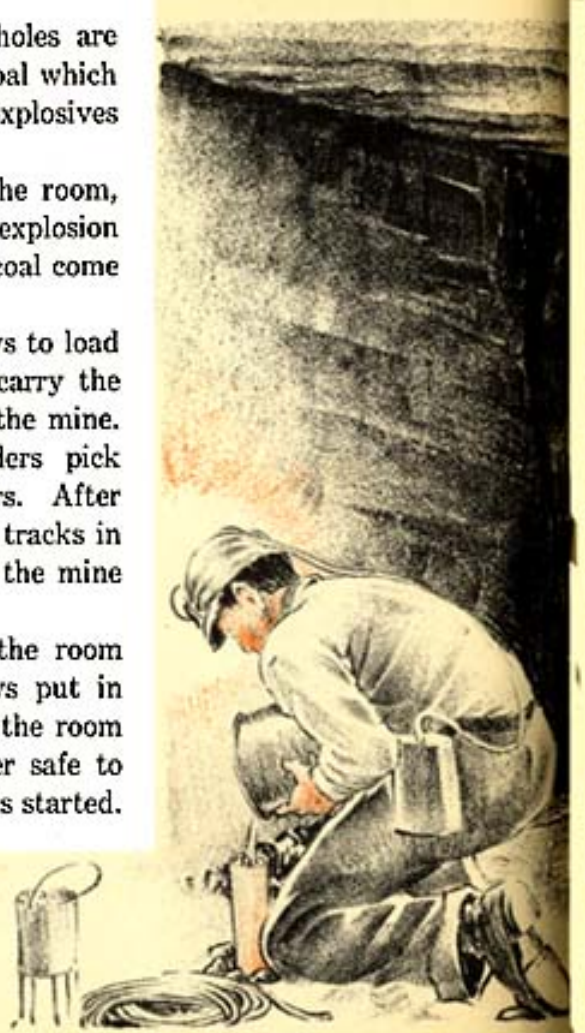
After the groove has been cut, holes are drilled into the shiny, black wall of coal which the miner wants to break down. Explosives are put into these holes.

If there is no dangerous gas in the room, the shot is fired. There is a loud explosion in the darkness, and great chunks of coal come tumbling down.

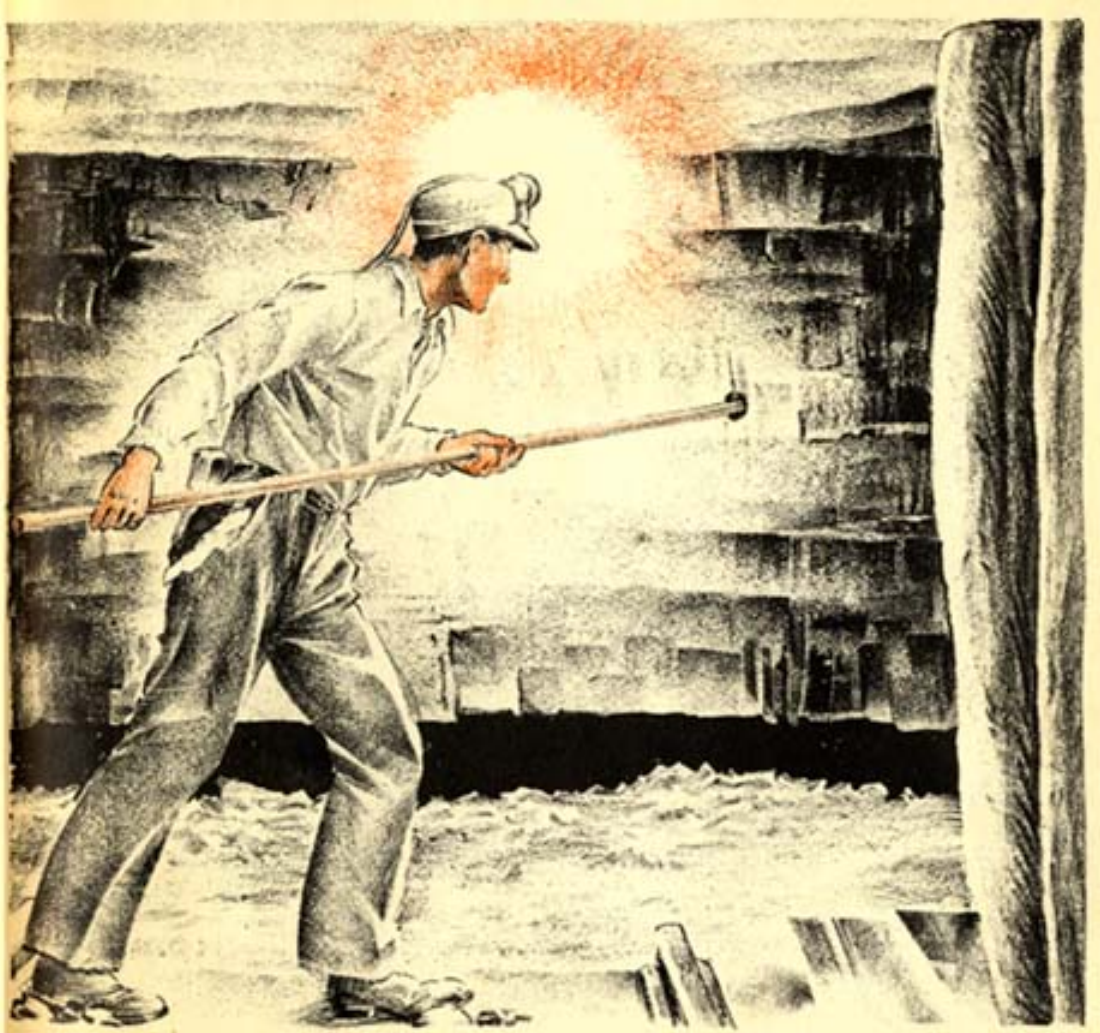
It may take the miner several days to load all this coal into little cars. These carry the coal to the shaft or the entrance to the mine.

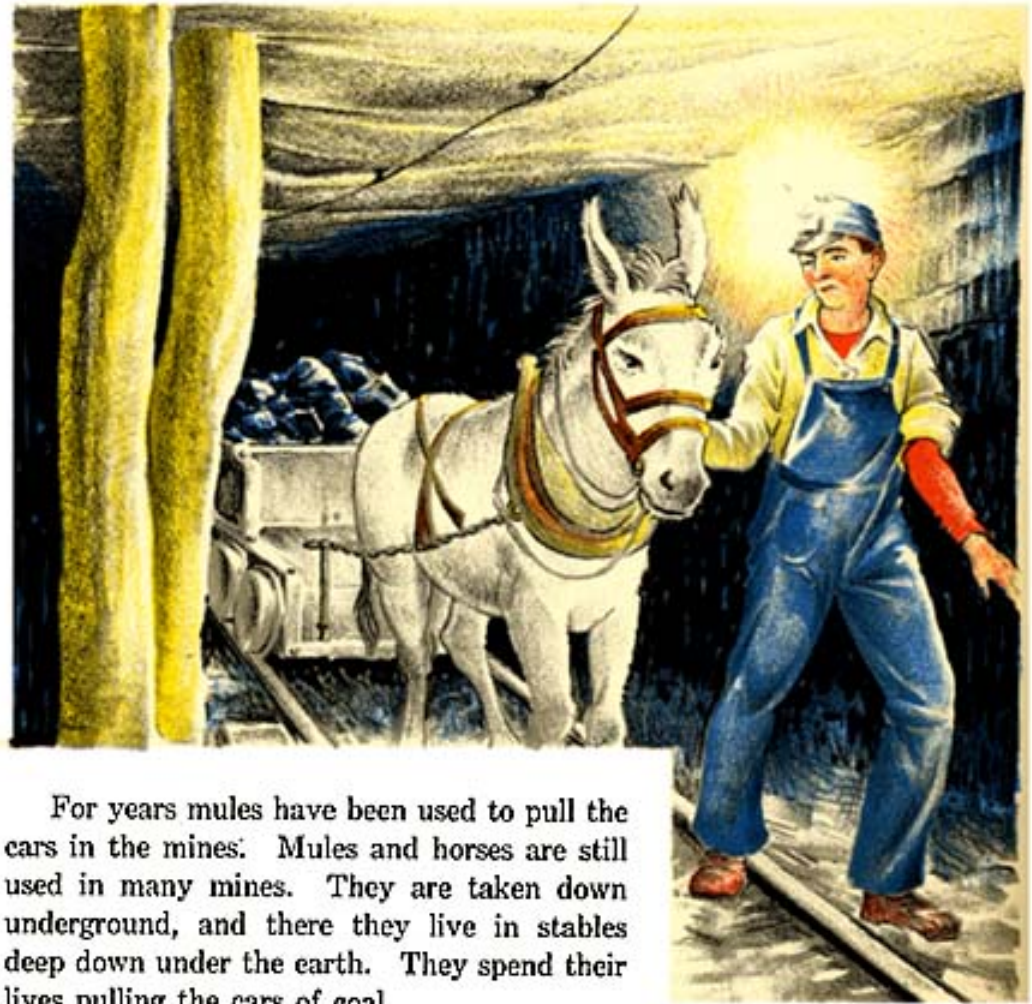
In some mines mechanical loaders pick up the chunks of coal and fill the cars. After the car is full, it is hauled down the tracks in the dark passageways to the foot of the mine shaft and hoisted up.

As the coal is taken out, and the room grows larger, the miner must always put in props to hold up the ceiling. After the room gets to a certain size, it is no longer safe to take out more coal; so another room is started.



PREPARING TO FIRE THE SHOT

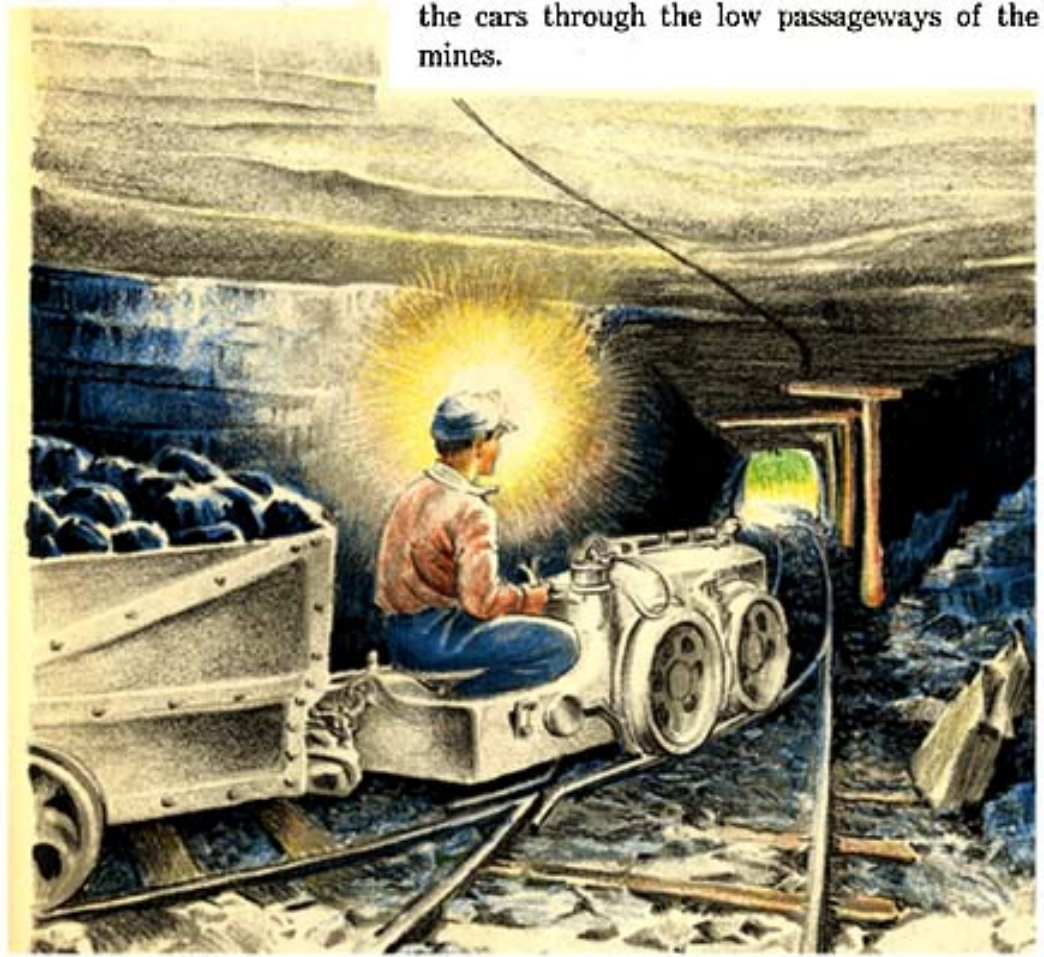




For years mules have been used to pull the cars in the mines. Mules and horses are still used in many mines. They are taken down underground, and there they live in stables deep down under the earth. They spend their lives pulling the cars of coal.

ELECTRIC MOTOR

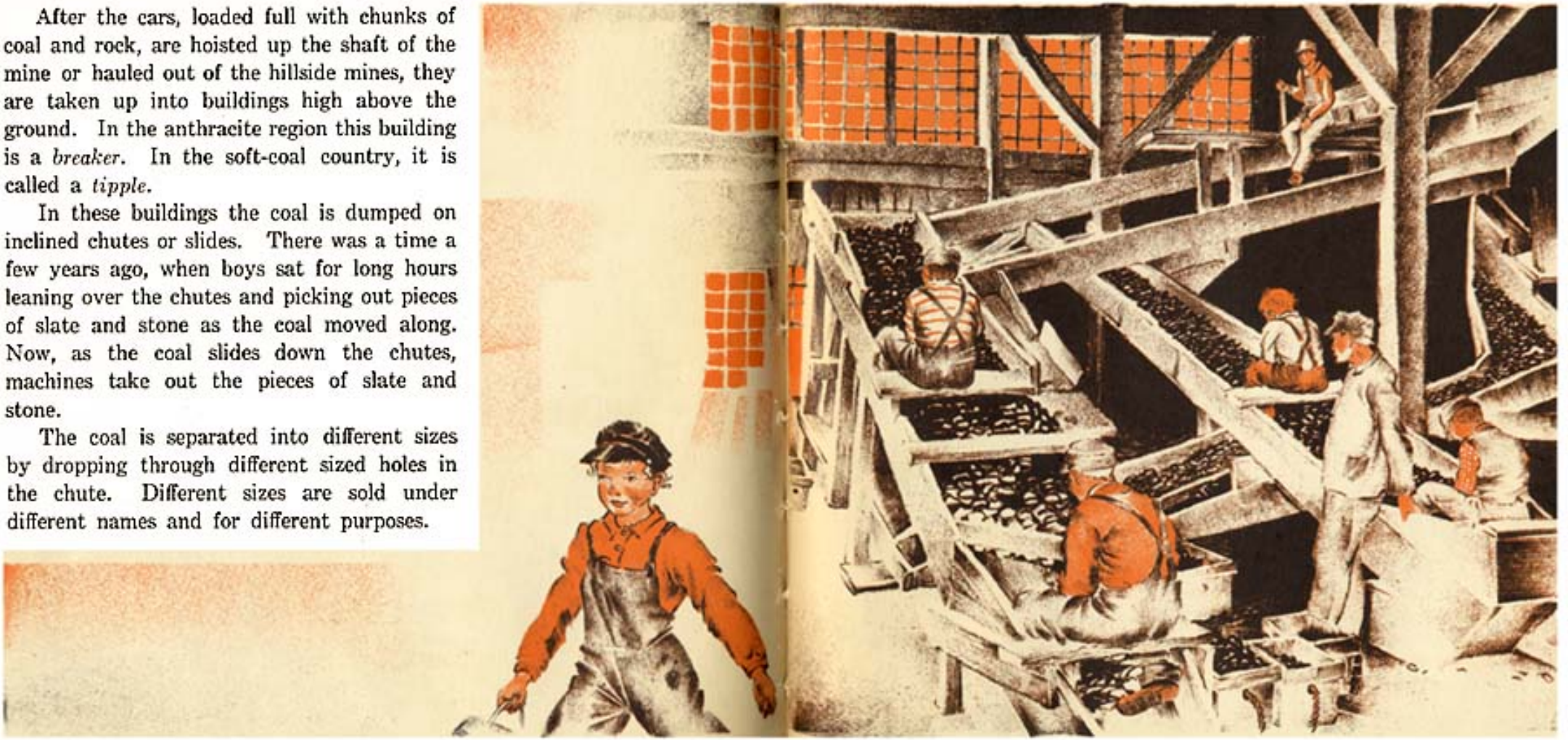
In many mines today, electric motors pull the cars through the low passageways of the mines.



After the cars, loaded full with chunks of coal and rock, are hoisted up the shaft of the mine or hauled out of the hillside mines, they are taken up into buildings high above the ground. In the anthracite region this building is a *breaker*. In the soft-coal country, it is called a *tipple*.

In these buildings the coal is dumped on inclined chutes or slides. There was a time a few years ago, when boys sat for long hours leaning over the chutes and picking out pieces of slate and stone as the coal moved along. Now, as the coal slides down the chutes, machines take out the pieces of slate and stone.

The coal is separated into different sizes by dropping through different sized holes in the chute. Different sizes are sold under different names and for different purposes.



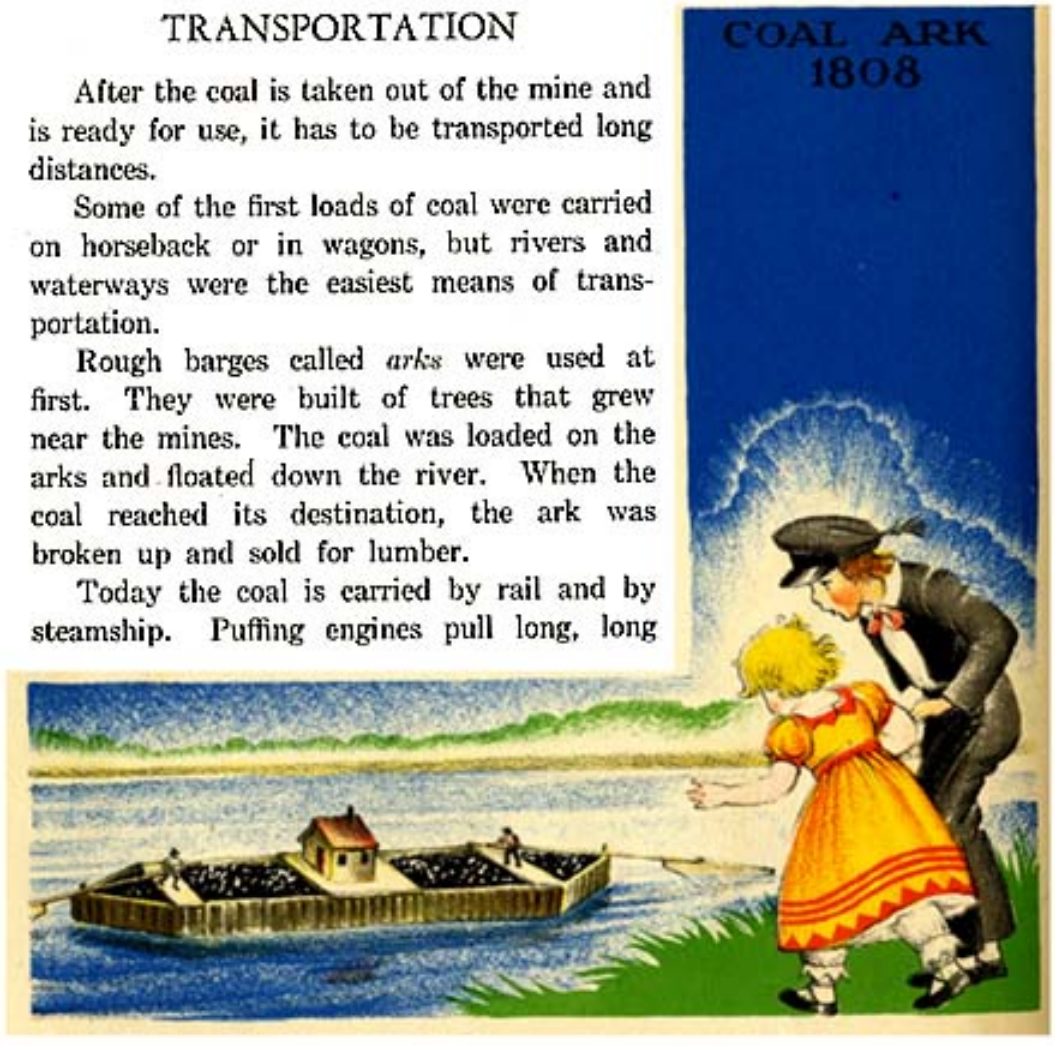
TRANSPORTATION

After the coal is taken out of the mine and is ready for use, it has to be transported long distances.

Some of the first loads of coal were carried on horseback or in wagons, but rivers and waterways were the easiest means of transportation.

Rough barges called *arks* were used at first. They were built of trees that grew near the mines. The coal was loaded on the arks and floated down the river. When the coal reached its destination, the ark was broken up and sold for lumber.

Today the coal is carried by rail and by steamship. Puffing engines pull long, long



lines of heavy coal cars for thousands of miles from one part of the country to another.

Coal is loaded and unloaded by powerful machines. These machines can easily pick up the coal car loaded with a hundred tons of coal, overturn it and dump the coal into the hold of a vessel, and then put the empty car back in its place on the railroad track.

USES OF COAL

Coal is used in other ways than for fuel.

Anthracite is used principally for fuel and the manufacture of illuminating gas.

Bituminous coal is used to produce the steam which gives power to run engines.

Sometimes it is heated and cooked in ovens and turned into coke, which burns even better than coal. While the coal is being turned into coke, gases are given off which are used for light and heat. Coke is also used in battery carbons and in dry-cell batteries.

In purifying the coal gas, coal tar is removed. From this coal tar a great many valuable products are obtained. Dyes of many beautiful colors, explosives, and many perfumes and medicines are coal-tar products.

It is also used in photography, in many kinds of paint, in pitch which is used in roofing, and in street paving.

In the making of gas from coal, some liquids are obtained. These are valuable in many ways. They help in making creosote which is used to preserve wood such as railroad ties and posts. The liquids also form benzol which is used in motor fuel and liquid ammonia for refrigeration. They are extensively used in fertilizers.

From lignite we obtain wax which is used in shoe polish, in certain lubricating greases, and in the making of candles. Lignite is also compressed into bricks and used as fuel.

A variety of bituminous coal which is very compact and burns like a candle is called *cannel coal*. It is sometimes used for ornaments because it takes a high polish. It is also very good to burn in open grates, but it is scarce and hard to get.

The black chunks of coal were once green trees and ferns, growing under the blue sky and the golden sun. Now they give back heat, light, and power, dyes of beautiful colors, and many other useful products.

The End.