

GOING UNDERGROUND 地下世界

【城市基础设施】



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Contents 目录

Going underground! 4
到地下世界去!

Under the street 6
地下世界

Where is the water? 12
水在哪儿呢?

Getting rid of waste 18
排污

Below a building 22
建筑物的下面

Travelling underground 24
地铁旅行

What is underground? 28
地下世界是什么样的?

Glossary 30
词汇表

Want to know more? 31
想知道得更多吗?

Index 32
索引

有些单词被印刷成粗体，**就像这样**。你可以在第30页中找到它们的意思，还可以在单词第一次出现时，在相关书页下方的方框内发现它们的含义。

Going underground!

到地下世界去！

Look up in a city. Very tall buildings called skyscrapers surround you. How do heat and water get into these buildings? How do they get electricity (power)? The skyscrapers are heavy. How do they stay standing?

You will not find the answers to these questions by looking above you. The answers are hidden underground. A city that rises up high into the sky begins deep underground.

在城市里，抬头望去，四周都是高楼大厦。那么热和水是怎样进入这些大厦里的呢？它们又是怎样获得电能的？摩天大楼这么沉重，又怎么挺立不倒的呢？

只是往上看，你可找不到问题的答案。答案都藏在地底下。拔地而起、直指天空的城市其实都是深深扎根于地下的。

In a city, some buildings soar ►
to the sky. But what happens
under the ground?

城市里，一些大厦高耸入云。但
地下会是什么样子呢？

Let's take a look at the hidden world
under our feet. Let's look beneath a city.

让我们来看看脚下的秘密世界吧。看看城市下面的样子。



Under the street

地下世界

Let's start our underground tour. We travel down from the surface of the street. About half a metre (almost two feet) below, we reach the first pipes. They are buried beneath the side of the street. These pipes hold **electric cables**. A cable is made of a wire or a group of wires that are wrapped together. The wires are made of a reddish-brown metal. The metal is copper. Electricity (power) flows through the wires.

Where has the electricity come from? Electricity is made at a **power plant**. The electricity travels from the power plant through cables. Cables bring electricity to every building in a city.

开始我们的地下之旅吧。从街面往下走，大约半米深的地方（接近两英尺），我们来到第一排管道。管道埋在街道的一侧，里面包的是**电缆**。电缆是由一根或者捆成一束的很多根电线组成的。这些电线是用一种红褐色的金属——铜做的，而电（电能）就通过电线输送。

那么电是从哪儿来的呢？电是在发电厂产生的。发电厂发出的电，通过电缆，输送到城里的每座建筑物里。

Where are the wires?

电线在哪儿呢？

Sometimes cables are strung above ground on telephone poles. But on crowded city streets, there is no room for telephone poles. That is why the cables are buried in pipes under the street.

有时候电缆架在地面上的电线杆上。但在拥挤的城市街道，根本没有立电线杆的地方，所以电缆就埋在街道下面的管道里。

▼ Electric cables run through pipes. These pipes are buried beneath the street. Workers go under the street to fix the electric cables.

电缆铺设在管道里，管道埋在街道下，所以工人要爬到街道下面来安装修理电缆。



Let's talk!

让我们聊聊天吧!

Next to the electric cables, we find other pipes. Telephone wires are inside of them.

If you want to call a friend, you pick up the telephone and dial. The phone rings in your friend's house. Your friend picks up the phone. You start to talk. How do your voices travel to each other?

Your telephone cord is plugged into a **phone jack**. The phone jack is in the wall. A pair of wires runs from the phone jack through the walls of your house. One wire sends your message to your friend. The other wire brings your friend's voice back to you.

紧挨着电缆管的还有一些管道，里面包的是电话线。

要想给朋友打电话，你会拿起话筒拨号。朋友家的电话铃响了，朋友拿起电话，于是你们开始交谈。那么你们的声音是怎么传送给对方的呢？

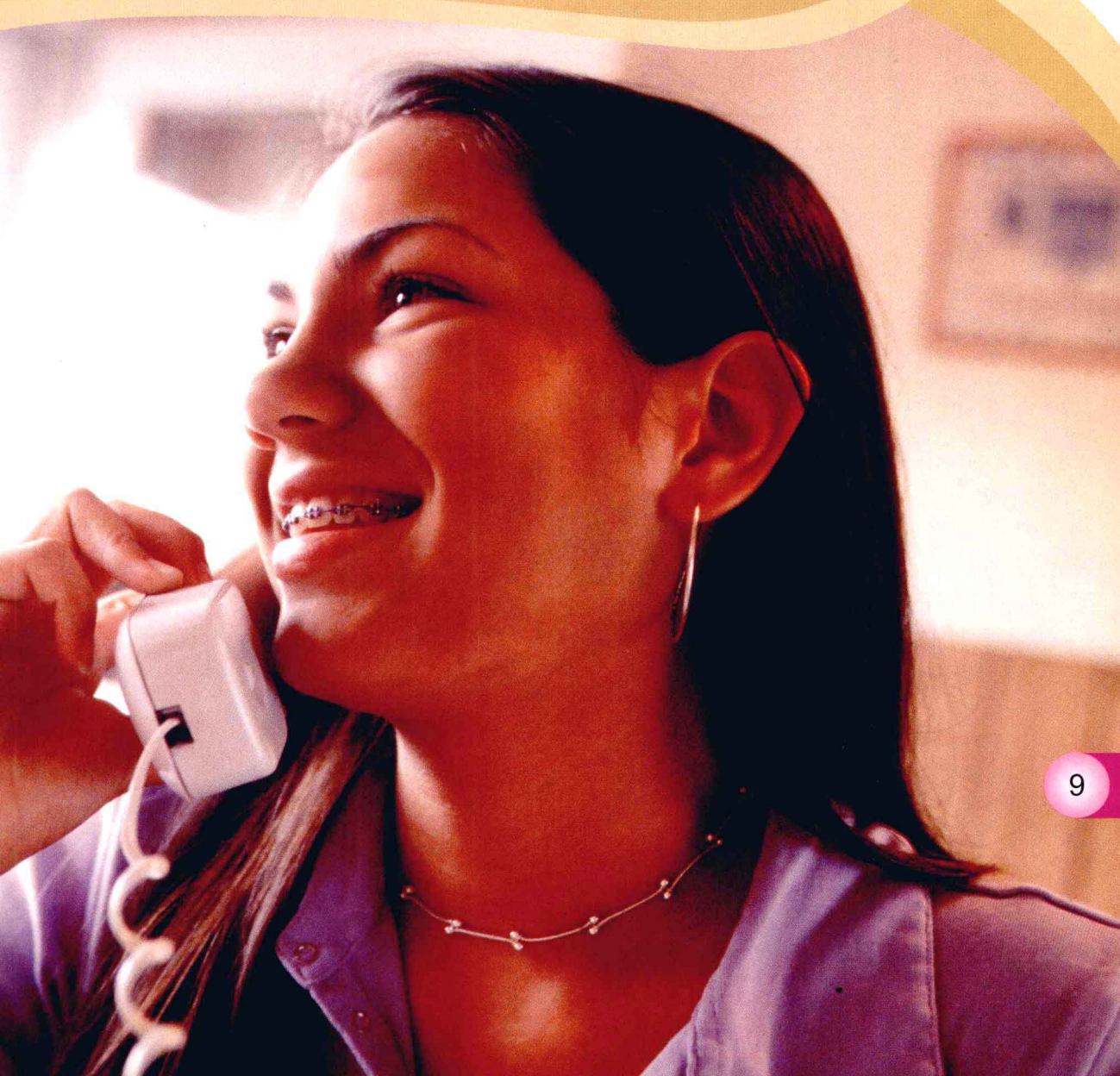
你的电话线插在墙上的**听筒插口**里。从听筒插口引出两根电线，穿过房间的墙壁，一根把你的声音传给你朋友，另一根将你朋友的声音传回给你。

When you speak on the telephone, ►
a signal is sent through telephone
wires. Telephone wires are often
buried beneath the street.

当你打电话时，信号是通过电话线传
送的。电话线通常埋在街道下面。

The wires connect to a box outside your home. From the box, your phone wires go under the street. The wires go to a phone company. When you dial a friend's number, your phone lines are connected at the phone company. Signals travel back and forth along the wires.

电线连接到屋外的一个盒子中。从这个盒子开始，电话线被埋在街道下面，最后连接到一个电话公司。当你拨朋友的电话号码时，电话线路会在电话公司连通。信号就沿着电线来回传递。



Staying warm

取暖

Now we travel 1 metre (3 feet) below the street. Beneath the electrical and telephone pipes is another pipe. **Natural gas** flows through it.

What is natural gas? It is a **fuel**. People burn fuel to get energy (power). The energy from natural gas heats and cools buildings. Natural gas is also used for cooking. **Power plants** use natural gas to make electricity.

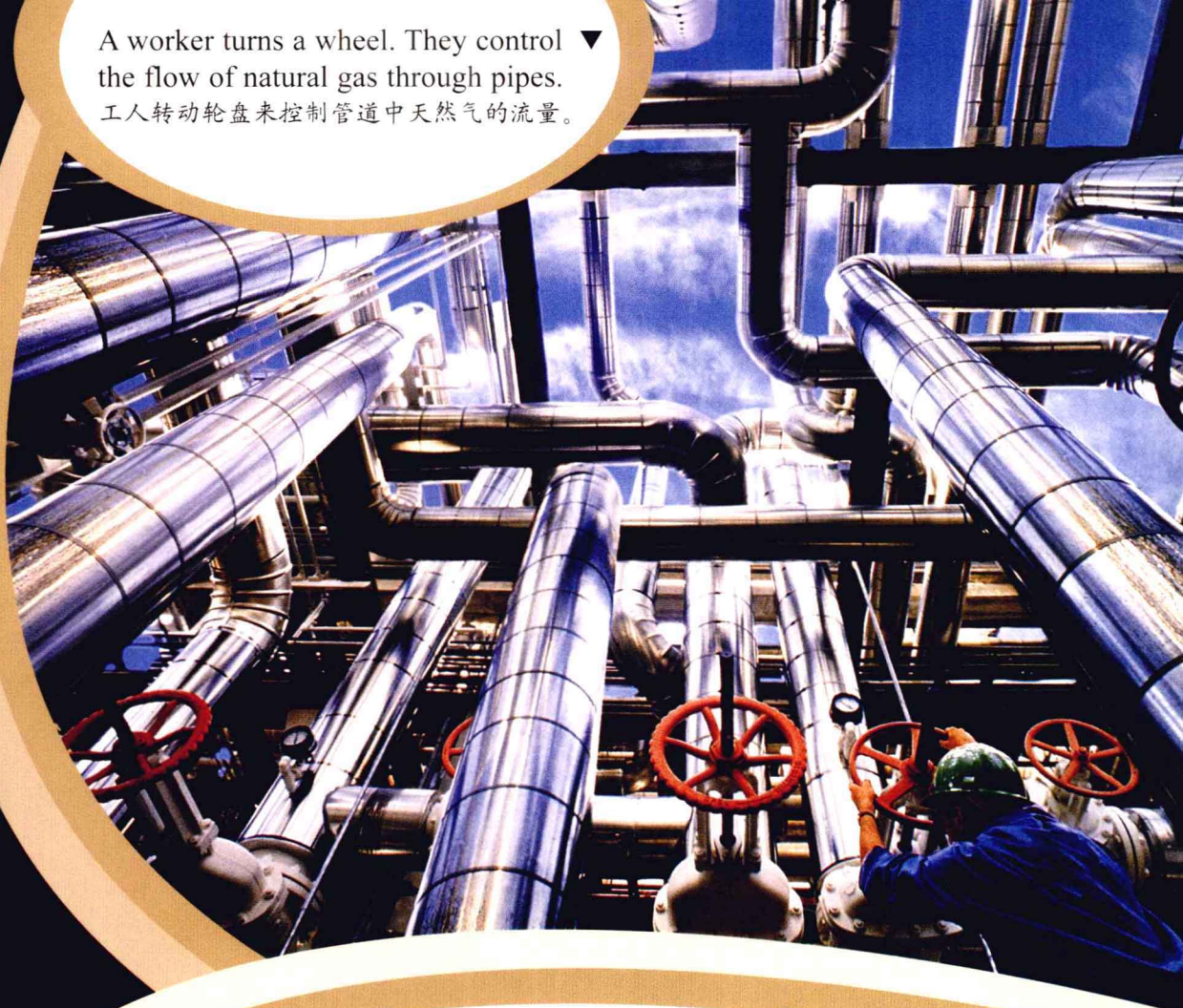
现在我们下到距离地面1米（3英尺）的地方。在电缆管道和电话线管道下面，就是天然气管道。

什么是天然气？天然气是一种燃料。人们燃烧燃料来获得能量。从天然气获得的能量可以使房屋温暖或凉爽。天然气也可以用来煮饭。发电厂用天然气来发电。

When you turn on the ►
cooker, flames heat a pan.
The cooker burns natural
gas to make heat.

当你打开燃气灶，火焰就会
加热炒锅。燃气灶是烧天然
气来加热的。

A worker turns a wheel. They control ▼
the flow of natural gas through pipes.
工人转动轮盘来控制管道中天然气的流量。



Natural gas travels far before it reaches a city building. People drill deep in the ground to find natural gas. If there is gas underground, it rises to the surface. It flows into large **pipelines**. Pipelines are systems of many pipes.

Pipelines can carry natural gas hundreds of kilometres. The pipelines carry gas to where people use it. In a city, natural gas moves through pipelines beneath the streets.

天然气要走很远才能送达城里的高楼大厦。人们往地下钻很深的孔来寻找天然气。如果地下有天然气，它就会冒出地面。天然气流进巨大的管线中，这些管线是由许多管道组成的。

管线可以将天然气输送数百公里，送到千家万户。在城市里，天然气则通过街道下面的管道输送。

Where is the water?

水在哪儿呢？

As we move farther below the street, we find a larger pipe. Water flows through it.

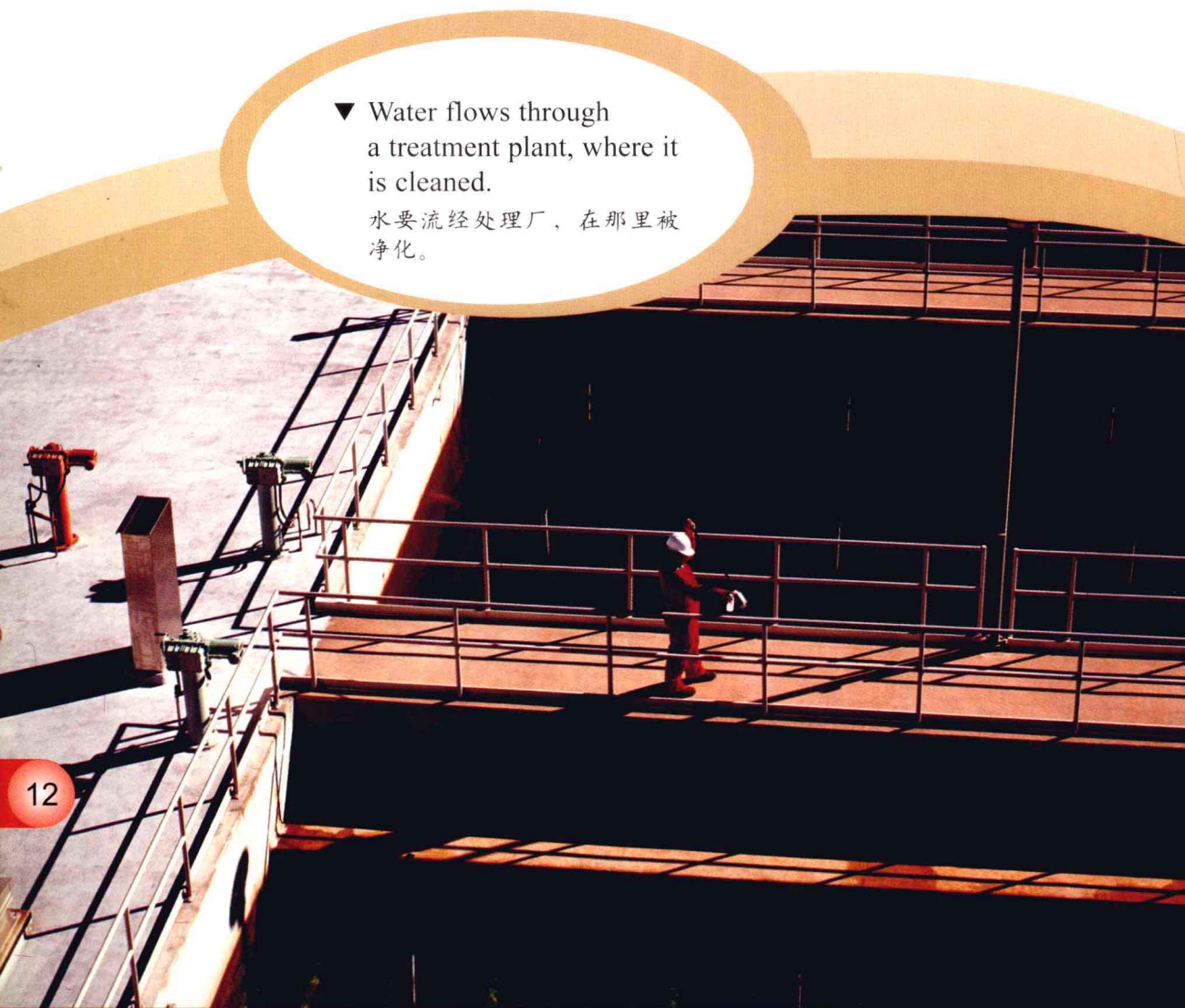
We use water every day. We need clean water for drinking. We need clean water for cooking and washing. Water also flushes a toilet.

我们继续往下走，会发现一个更大的管道，里面流的就是水。

我们每天都在用水。我们需要干净的水来饮用、做饭和洗涮。水也用来冲厕所。

▼ Water flows through a treatment plant, where it is cleaned.

水要流经处理厂，在那里被净化。



A city may get water from a lake or river. It may get water from the ground, or from a large, human-made lake called a **reservoir**. Pumps push this water to a **treatment plant**. Water is cleaned at the treatment plant.

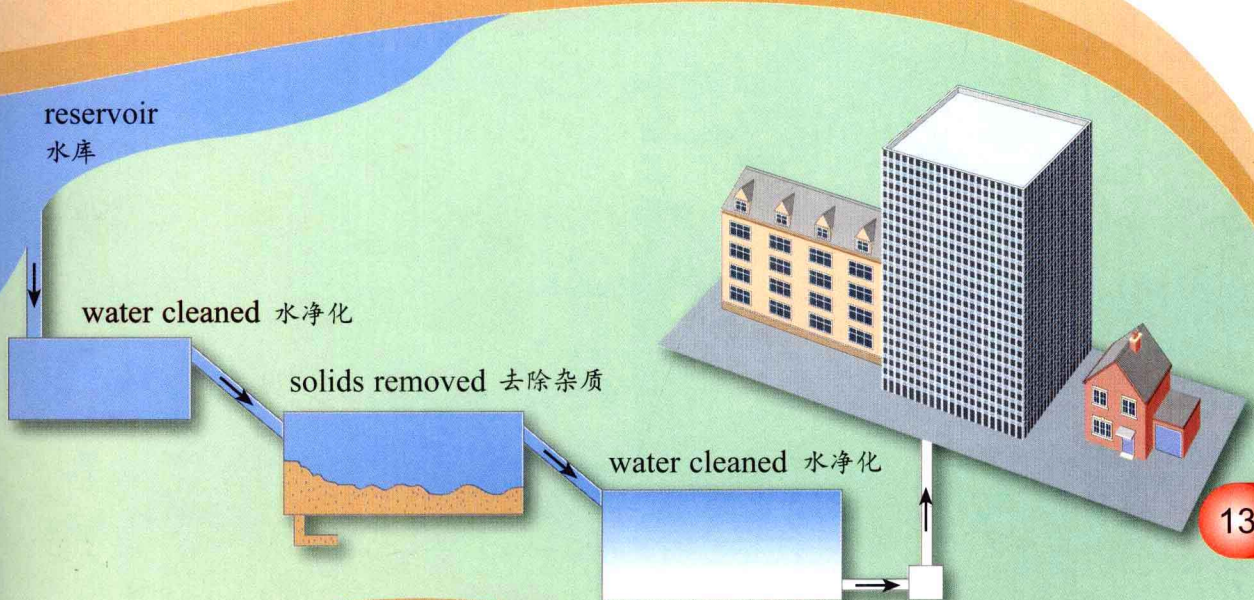
Then, the clean water flows through pipes. These pipes are called **mains**. Water mains are buried underground.

Smaller pipes branch off a water main. They bring water into buildings. Water flows through pipes in the walls of buildings. The pipes connect to taps, such as those found in sinks. You turn a tap. Water flows out.

城市用水可能来自湖泊、河流，也可能来自地下或水库，所谓**水库**就是大型的人造湖。抽水机将水送到**处理厂**，在那里把水净化。

接着，干净的水流入管道，这些管道叫做**总管道**。给水总管被埋在地下。

较细的管道从给水总管分叉出来，它们将水输送到各个建筑物中。水在建筑物墙内的管道流过。管道连接着水槽中的水龙头。你拧开水龙头，水就会流出来。



▲ This diagram shows how water gets to a city building.

这幅图说明了水是如何送达城市里的建筑物的。



In a manhole 在检修孔里

Sometimes water pipes leak or break. How do workers fix broken pipes? They must go under the street. They climb down to special underground rooms. The holes in the ground leading to these rooms are called **manholes**.

On the street level, a heavy lid covers the entrance. To enter the manhole, a worker removes the cover. Then, the worker climbs down the manhole.

A large underground water **main** runs through the underground room. Attached to the water main is a **valve**. A valve controls the flow of water. A worker turns the valve. The valve lowers a gate inside the water main. The gate blocks the water. The water stops flowing through the main. Once the water is shut off, the pipe can be fixed.

输水管道有时会渗漏或破裂。工人们怎么来修理破裂的管道呢？他们必须下到街道下面去。他们要爬到地面下特设的空间里。通往这些空间的洞孔就叫**检修孔**。

在地面的入口处盖着重重的盖子。要从检修孔进去的话，工人要移走盖子。然后，工人从检修孔爬下去。

巨大的地下给水总管穿过地下空间。**阀门**安装在给水总管上，控制水流量。工人转动阀门，放下给水总管中的闸门，挡住水流，水就留在给水总管里了。一旦水流关闭，就可以修理管道了。

- ▲ Have you ever seen someone climb down a manhole? The person disappears under the street.

你曾经看到过有人爬下检修孔吗？这个人在街道下面不见了。

Steam power

蒸汽动力

Let's go farther down. We are about 2 metres (6 feet) below ground. We are in the middle of the street. We see another pipe. Hot steam travels through it. Steam is the gas that forms when water is boiled.

This pipe looks different. It is shaped like a square, not a circle. That is because concrete covers the round metal pipe. Concrete is a material made from sand and gravel. Steam makes the pipe very hot. The concrete keeps the heat inside the pipe.

Where does the steam go? In big cities, many buildings use steam for heat. Pipes carry steam under busy streets. Smaller pipes branch off the **main** pipe. The smaller pipes bring steam into buildings.

让我们继续往下走，来到距地面大约2米（6英尺）的地方。在街道正中间的部位，我们会看到另一种管道，里面是炽热的蒸汽。蒸汽是水沸腾时形成的气体。

这个管道看上去有些不同，它是方形而不是圆形的。这是因为圆形金属管被混凝土裹住了。混凝土由沙子和碎石混合制成。蒸汽使管道变得很烫，而混凝土将热量保留在管道中。

蒸汽会到哪里去呢？在大城市，许多建筑物使用蒸汽来取暖。繁忙的街道下面，蒸汽源源不断地在管道中输送。从总管上分支出较小的管道，将蒸汽输送到各个建筑物中去。

Steam story

蒸汽小知识

You cannot see steam. Steam is invisible. Tiny drops of water in the steam make it look white and cloudy.

你看不到蒸汽，因为它是看不见的，但蒸汽中的小水珠使蒸汽呈现出雾蒙蒙的白色。