

高等教育“十二五”规划教材

采矿工程专业英语

Mining Engineering English

主 编 刘永立 尹小军
副主编 赵利安 付志亮 孙臣良

中国矿业大学出版社



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内 容 提 要

本教材课文均直接或间接选自国外专业书刊。内容主要包括煤炭开采史、煤矿地质和测量、矿井设计和开拓、井巷工程、岩体力学、矿山压力和巷道支护、长壁采煤方法、房柱式采煤方法、矿井运输和提升、矿井通风、矿井排水和供电、矿山事故防治、特殊条件下采煤、露天开采、深海开采、绿色开采等方面的知识。每课均包括课文、生词和词组、长句难句注释、阅读练习及课文的参考译文等内容。

本书既可作为高等院校采矿工程专业的英语教材,也可供有一定英语基础的矿山工程师自学参考。

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前 言

随着煤炭科技的迅速发展和全球一体化趋势的日益明显,煤炭行业对专业外语的要求也越来越高,根据高等教育“十二五”规划教材编写的要求,我们组织编写了这本《采矿工程专业英语》教材。根据采矿工程专业需要和知识更新的要求,教材内容主要包括煤炭开采史、煤矿地质和测量、矿井设计和开拓、井巷工程、岩体力学、矿山压力和巷道支护、长壁采煤方法、房柱式采煤方法、矿井运输和提升、矿井通风、矿井排水和供电、特殊条件下采煤、露天开采、深海采矿、绿色开采、矿山事故防治等专业知识。本书比较全面地涵盖了采矿专业的基本知识,相当于一本英语采煤概论。

在编写本教材的过程中,特别注意所选文章的新颖性、知识性、可读性。每课的后面都有生词、词组。每篇文章都针对长句和难句给出了详细的注释,并在课后给出了相应的参考译文。每课后面都附有一篇阅读材料,可供学生自学,拓宽知识面。

在安排教学进度时,原则上每课(节)课文用时两个学时,考虑有的课文较长,可适当增加课时,结合一定数量的练习以及其他相关内容。

本书具体编写分工为:黑龙江科技学院刘永立编写煤炭开采史、煤的成因和赋存、矿山事故部分;黑龙江科技学院尹小军编写采煤方法、长壁采煤工艺、矿井通风、通风测量、岩体力学、矿山压力、特殊条件下采煤部分;辽宁工程技术大学赵利安编写煤矿地质、井筒设计、矿井测量、矿井开拓部分;安徽理工大学付志亮编写露天开采、房柱式采煤、矿井绿色开采及深海采矿部分;辽宁工程技术大学孙臣良编写凿井、矿井提升、矿井照明及矿井排水部分。

由于编者水平所限,加之时间仓促,书中不足之处在所难免,恳请广大读者批评指正。

编 者

2012年4月

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Lesson 1 History of Coal Mining

The exact date of man's first use of coal is lost in antiquity. The discovery that certain black rock would burn was undoubtedly accidental and probably occurred independently and many times in the world over thousands of years. It's quite likely that these independent discoveries were made when primitive man chanced to build camp fires on exposed ledges of a black rock, then was amazed when it caught fire.

The Chinese recorded the use of coal 1100 years before the Christian Era and from the Bible we learn that King Solomon was familiar with coal in what is now Syria. In Wales, there is evidence that the Bronze Age people used coal for funeral pyres, and it is known that the Romans used this fuel. There are other ancient references.

So the knowledge that coal would burn, and even some uses of that knowledge, go back thousands of years. However, practical and consistent use of coal seems to date England in the Middle Ages.

In the Americas, there is evidence here and there of occasional use by the Indians. However, the first recorded discovery of coal, in what is now US, was by French explorers, who reported an outcrop exposure on the Illinois River in 1679. Following this, other discoveries were made by French and British explorers, but the first recorded actual usage was in Virginia in 1702, where a French settler was granted permission to use coal for his forge.

Earliest recorded commercial mining was in 1750, from the James River coalfield near Richmond, VA, a deposit now abandoned. Besides local consumption from this field, shipments were made to Philadelphia, New York, and Boston.

At first, all coal was hewed by hand from the solid bed by use of pick and bar. It was then shoveled into baskets, boxes, or wheelbarrows and dragged by men, or women, to the outside or to the foot of a shaft. Later, cars were developed but still drawn over wood plank by humans. As time went on, iron straps, then rails, were used for the cars while mules, ponies, or horses did the pulling.

Gradually, black powder was introduced to blast down the coal, but undercutting, sidecutting, and drilling were still done by hand. During the late 1700s and 1800s, a number of basic developments greatly aided the mining of coal. The first steam engine was invented by James Watt in 1775 in Britain to pump water from coal mines, a very important application that made it possible for mines to go deeper. The first rail transportation was for mining, the first steam locomotive was developed in 1814 by George Stephenson in England for a colliery, and the first electric locomotive was developed in

1883 in Germany for underground use.

Mechanization of operations at the face started before 1900 with development of punching machines and chain-type cutters for undermining the coal seam before blasting, of coal and rock drills, electric and compressed air locomotives, and even some early experiments with continuous mining machines.

Longwall mining was used here and there in the US until about 1910, particularly in Illinois, but then became noncompetitive with room-and-pillar methods in thicker seams that better lent themselves to mechanization. In the meantime, longwall continued to be dominant in Europe and Asia because of thin coal and depth of cover.

During World War II, the Germans developed the longwall scraper for continuous loading onto a chain conveyor at the face. This was followed by various types of shearing machines developed in several countries. However, the most important development was in hydraulic, self-propelled roof jacks and chocks that greatly reduced the manpower formerly required to set and reset individual jacks and to build cribs by hand.

With these developments, US coal companies again became interested in the longwall system. Numerous modifications and a general "beefing-up" were found necessary for US conditions but, after some failures and misapplication, longwall mining has become practical in this country, providing mining conditions are right, as attested by the gradually increasing number of units.

Surface mining was the earliest method of extracting coal. It consisted of recovering coal exposed in stream beds and visible outcrops with zero to a few feet of loose dirt cover. Under deeper cover and under rock the cheapest method—in fact the only means of recovery at first—was by underground mining, so surface developments were insignificant until about 1910, although, here and there, slip and cart scrapers drawn by mules were used to a very small extent.

New Words and Expressions

outcrop ['aʊtkrɒp] *n.* (岩层等的)露头,露出地面的岩层

hidden outcrop 掩蔽露头

coalfield *n.* 煤田,产煤区

deposit [dɪ'pɒzɪt] *vt. & vi.* 存放,沉积;*n.* 矿床,沉积,储藏量,存积

pick and bar 镐和钎杆

shovel ['ʃʌvəl] *n.* 铲,铁;*vt.* 铲,用铲子掘起,推,涌流

undercutting *n.* 底部掏槽,拉底

sidecutting *n.* 侧面掏槽,侧面采掘

punching machine 冲床,冲压机,冲击式机械

chain-type cutter 链式截割机

longwall mining 长壁开采

room-and-pillar(柱子,柱状物)method 房柱法

scraper ['skreipe] *n.* 铲运机,耙斗,扒矿机

shearing(剪切,切割) machine 剪机,滚筒式采煤机

self-propelled(推动)自推进

roof jacks and chocks 自移式液压顶柱和垛式液压支架

individual jacks 单体支柱

surface mining 露天开采

slip scraper 刮土铲运机

cart scraper 铲运机

Notes

1. The discovery that certain black rock would burn was undoubtedly accidental and probably occurred independently and many times in the world over thousands of years.

over thousands of years 意为“在几千年中”;over 意为“在……期间”;thousands of 意为“许许多多,无数,几千”。

译文:发现某种黑色岩石能够燃烧毫无疑问是偶然的,这种发现可能是各自发生的,并且在过去几千年中出现多次。

2. The Chinese recorded the use of coal 1100 years before the Christian Era and from the Bible we learn that King Solomon was familiar with coal in what is now Syria.

in what is now Syria 意为“在现在叫叙利亚的地方”。what is now Syria 是介词 in 宾语,这里是宾语从句。如:in what follows(如下,在下文中)。

译文:中国人在公元前 1100 年已有使用煤的记载,从《圣经》中,我们获悉所罗门国王熟悉现在叫叙利亚的地方的煤。

3. As time went on, iron straps, then rails, were used for the cars while mules, ponies, or horses did the pulling.

as time went on 意为“随着时间的推移”;as 为连词,意为“当……的时候”。

译文:随着时间的推移,铁板,然后铁轨,被用于马车的运输,而由骡、矮种马或者马来拉。

4. The first steam engine was invented by James Watt in 1775 in Britain to pump water from coal mines, a very important application that made it possible for mines to go deeper.

a very important application that made it possible for mines to go deeper 意为“一种非常重要的作用,使得矿井有可能开采更深的部分”。it 是形式宾语。如:The invention of radio has made it possible for mankind to communicate with each other over a long distance (无线电的发明人使人类有可能进行远距离通讯联络)。

译文:1775 年,詹姆士·瓦特在英国发明了第一台蒸汽机用来抽煤矿中的水,这是一个非常重要的应用,使得矿井有可能开采更深的部分。

Exercise History of Coal Mining

Coal has been used worldwide as a kind of fuel for centuries.

Around 1842 coal became the main energy source for the Industrial Revolution, the expanding railway system of countries being a prime user to power steam trains. Britain developed the main techniques of underground coal mining from the late 18th century onward with further progress being driven by 19th century and early 20th century progress.

Because coal is found mainly underground, it must be mined or extracted prior to use. Large-scale coal mining developed during the Industrial Revolution, and coal provided the main source of primary energy for industry and transportation in the West from the 18th century to the 1950s. Coal remains an important energy source, due to its low cost and abundance when compared to other fuels, particularly for electricity generation. However, coal is also mined today on a large scale by open pit methods wherever the coal strata strike the surface and is relatively shallow.

However oil and its associated fuels began to be used as alternative from this time onward. By the late 20th century coal was for the most part replaced in domestic as well as industrial and transportation usage by oil, natural gas or electricity produced from oil, gas, nuclear or renewable energy sources.

Since 1890, coal mining has also been a political and social issue. Coal miners' labour and trade unions became powerful in many countries in the 20th century, and often the miners were leaders of the Left or Socialist movements (as in Britain, Germany, Poland, Japan, Canada and the U. S.) Since 1970, environmental issues have been increasingly important, including the health of miners, destruction of the landscape from strip mines and mountaintop removal, air pollution, and coal combustion's contribution to global warming.

Prehistory: An 120,000-year-old Stone Age coalstone hunting camp was discovered in 2005 by archaeologists in an opencast coalstone mine in Germany, its first known use being campfire cooking fuel for German hunters. China Coal Information Institute reports the Chinese mined coalstone for fuel since 10,000 years ago at the time of the New Stone Age, or Neolithic Era. 'People in Shanxi, now the largest coal production base, have been burning coal as fuel since then.' Coal usage was widespread in various parts of the world by the Bronze Age, 2000~1000 BC. Chinese usage of coal for smelting began in the Warring States Period (475~221 BC). They are credited with organizing production and consumption to the extent that by the year 1000 AD this activity could be called an industry. In the 11th century, the demands for charcoal of the Song Dynasty (960~1279) Chinese iron industry led to widespread deforestation. With the advent of coal replacing charcoal in the iron smelting process, thousands of acres of prime timberland were spared

in China. China remained the world's largest producer and consumer of coal until the 18th century. Roman historians describe coal as a heating source in Britannia.

The earliest use of coal in the Americas was by the Aztecs. They used coal not only for heat but as ornaments as well. Coal deposits were discovered by colonists in Eastern North America in the 18th century.

Early coal extraction was small-scale, the coal lying either on the surface, or very close to it. Typical methods for extraction included drift mining and bell pits. In Britain, some of the earliest drift mines (in the Forest of Dean) date from the medieval period. However, the Romans exploited coal on a large scale as shown by the stores of coal at many forts along Hadrian's Wall, and the remains of smelting industry at forts such as Longovicium nearby.

As well as drift mines, small scale shaft mining was used. This took the form of a bell pit, the extraction working outward from a central shaft, or a technique called room and pillar in which 'rooms' of coal were extracted with pillars left to support the roofs. Both of these techniques however left considerable amount of usable coal behind.

参考译文:煤炭开采史

人类首次使用煤的准确日期在古代没有记载。发现某种黑色岩石能够燃烧毫无疑问是偶然的,这种发现可能是各自发生的,并且在过去几千年中出现多次。很可能,当远古人们碰巧在岩石的暴露部分堆积露营地时,惊奇地发现该岩石着火了,于是就造成了这些独立的发现。

中国人在公元前 1100 年已有使用煤的记载,从《圣经》中,我们获悉所罗门国王熟悉现在叫徐利亚的地方的煤。在威尔士,有迹象表明:青铜器时代的人们已使用煤作为火葬用的柴堆。大家知道罗马人也使用这种燃料。还有一些其他古老的参考文献。

因此,认识到煤能够燃烧,甚至利用这种认识,可以追溯到几千年前。然而,实际上一贯使用煤的历史似乎回溯到中世纪的英格兰。

在美洲,各处有迹象表明印第安人偶然使用煤。然而,在现在叫美国的地方,第一次记载了法国勘探者发现了煤,他们在 1679 年公布了位于伊利诺斯河的一煤露头的方位。紧接着,其他法国和英国勘探者也发现了煤,然而,首次实际使用煤的记载是 1702 年在弗吉尼亚,在那里一位法国定居者得到了为其锻炉使用煤的准许。

最早商业化开采的记载是在 1750 年来自詹姆斯煤田,该煤田在弗吉尼亚州里士满附近,现在是一个废弃的矿床。该煤田的煤除了当地使用外,还(船)运输到费城、纽约和波士顿。

最初,所有的煤是靠人工用镐和钎杆砍、劈坚固的矿床挖掘出来的。然后,煤被铲到篮子、盒子和手推车里,并由人拉到外面或者竖井的底部。随后,发展到用四轮马车,但是,仍然靠人在木板上面拖拉。随着时间的推移,铁板,然后铁轨,被用于马车的运输,而由骡、矮种马或者马来拉。

逐渐地,黑火药被引入用来炸落煤,但是,底部掏槽、侧面掏槽和钻孔仍然靠手工来完成

成。在 18 世纪晚期和 19 世纪,许多基本的进展极大地帮助了煤的开采。1775 年,詹姆斯·瓦特在英国发明了第一台蒸汽机用来抽煤矿中的水,这是一个非常重要的应用,使得矿井有可能开采更深的部分。第一次铁轨运输是应用在煤炭开采上;第一台蒸汽机车是由乔治·史蒂芬森于 1814 年在英国发明的,用于煤矿上;第一台电力机车是于 1883 年在德国出现的,用于地下使用。

随着在炸落前对煤层进行底部掏槽的冲击机和链式切割机、煤和岩石钻孔机、电力和压气机车,甚至早期一些连续开采机械实验的进展,工作面的操作机械化开始于 1900 年前。

长壁开采法直到大约 1910 年才在美国各地使用,尤其是在伊利诺伊州。但是,随后该方法竞争不过应用在较厚煤层中的房柱法,因为房柱法更有利于机械化。同时,由于薄煤层和覆盖层的厚度,长壁法继续在欧洲和亚洲占统治地位。

在第二次世界大战期间,德国人发明了长壁铲运机用于在工作面连续装载到一链式输送机上。紧接着,在一些国家,出现了不同类型的滚筒式切割机。然而,最重要的进展是自移式液压顶柱和垛式液压支架,它们在很大程度上减轻了人力,因为以前需要靠人工安置和重新安置单体支柱以及修建木垛。

由于这些进展,美国煤炭公司重新对长壁系统感兴趣了。尽管美国的开采条件需要进行大量的改变和总体上的“加强”,但是经过一些失败和误用,长壁开采法在美国已变得实用起来,这是以开采条件适宜为条件的。这一点已经被逐渐增长的开采单元的数量所证实。

露天开采是最早的采煤方法。它包括暴露在河床中的重新覆盖煤层和可见化露头,露头上面覆盖有从零到几英尺厚不等的泥土层。在较深层和岩石下,最廉价的方法是地下开采,起先,这实际上是唯一的回收方法。因此,露天开采的进展直到 1910 年左右才变得有意义起来,尽管当时各地很少使用骡子拉的刮土铲运机。

Lesson 2 Coal of Origin

1. Discovery of Coal

Coal was known to man thousands of years ago, Ancient writings tell us that three thousand years ago the Chinese knew that certain kind of black rock could burn, and in one part of the country where there was little wood they used to dig into the earth to find this black rock for their fires. This is the first evidence of coal being deliberately dug from the ground, but it is quite possible that even before this, coal was used for fuel in some parts of the world. Early man probably discovered it by accident, when he noticed that in some places the stones on which he built his fires would burn.

When the shortage of wood in some places forced men to look for other material to burn, they searched for coal in the banks of streams, or on the sides of the valleys and hills. Having found coal, they worked it by burrowing into the hillside, as they soon discovered that the coal occurred as a thick layer or 'seam' running into the hill. The burrows generally collapsed before they had reached far into the coal, and other burrows were then dug alongside. The place where a layer of coal or any other rock comes to the surface of the ground is known as its 'outcrop'. When as much coal as possible had been dug from one outcrop a search was made for another outcrop and it was often found that there were several seams one above the other, separated by layers of other kinds of rock.

It was noticed by these early coal diggers that the coal seams continued beyond the ends of their burrows, so when no more coal could safely be worked from the outcrops or edges of the seams, pits were dug to reach down to the coal further from the outcrop. These pits were like village wells near the top, but in order to uncover as much coal as possible they were made wider as they got deeper, and because of their shape they have been called 'bell pits'. It was not until hundreds of years later that the miners learned how to support the overlying rocks so that they could extend their workings a mile or more from the bottom of the pit, as they do today.

Coal was therefore known to exist as a series of layers called 'seams', separated by layers of other rocks. In Britain these rocks—sandstones, shales, fireclays and coal seams are called the Coal Measures, and they form the upper part of a large series of rocks to which the name Carboniferous, meaning 'coal bearing', has been given. Scientists say that the Carboniferous period began about 285 million years ago, and lasted for about 75 million years.

The greatest thickness of the Coal Measures in this country is about 10,000 ft, but they generally reach 2,000~3,000 ft, and are sometimes even thinner. Coal seams do not

occur throughout the full thickness but are usually concentrated in or about 500~1,000 ft, of rocks, near the bottom of the Coal Measures in some coalfields and about the middle in others. Within this thickness there may be over one hundred layers or seams of coal, but many of them (from an inch or two up to 2 ft in thickness) are too thin to be worked. Most British coal seams of workable thickness measure between 2 ft and 10 ft, but in Staffordshire and Warwickshire there is a seam 25~30 ft, thick, and in Scotland there is another 100 ft, thick, but it is found only in a very small area. In Australia there is a seam 800 ft, thick, and others about 200 ft, thick.

2. Formation of Coal

Imprints of leaves and stems of plants are often found in the roof of a coal seam—that is, in the rocks lying immediately above the seam, and occasionally a tree stump is found in this position. In the floor, or rocks just below the seam, dark worm—like markings are seen which prove to be the remains of tree roots. When a very thin slice of coal is examined under the microscope it is seen to contain fragments of plants. When a chemist analyses a piece of coal he finds that it is a sort of altered wood.

These facts leave no doubt that coal is made up of plant material, but to understand how Britain's coal seams were formed over 200 million years ago, we must first study something that is happening at the present day.

In some parts of the world there are densely forested swamps, one of the best known of which is the Dismal Swamp in America. This is a low-lying area, only a few feet above sea level, covering an area of about 1,500 sq miles in the States of Virginia and North Carolina. Trees are still growing in the swamp, but those that have died have formed a layer of decaying vegetable material leaves, branches and trunks—about seven feet thick.

The same thing is happening in swamps on the delta of the Ganges in India, and here borings have shown that there are several buried layers of plant material, changed to a kind of peat, separated by layers of sand and mud. Obviously each layer of peat was formed at the surface. The land then sank below the water and sand and mud carried down by the river were laid on top until the water became shallow enough for trees to grow again and form another layer of peat. Similar forest swamps are also found in the delta of other tropical rivers.

With these happenings of the present day in our minds we can go back and picture how Britain's coal seams were formed 250 million years ago. At this time Britain had not its present shape. Instead, the area where Great Britain and Ireland now stands was largely a vast shallow estuary or lagoon. Hilly land lay northwards from the middle of Scotland, westwards from Ireland, and southwards from England's present south coast, and from these hills great rivers flowed into the estuary. The whole area was sinking slowly, at such a rate that for most of the time the sand, mud and clay deposited by the rivers on the bottom of the estuary kept the depth of the water fairly constant.

From time to time, however, there was a pause in the sinking, so that the sand and mud nearly filled up the shallow estuary and turned it into a great swamp. In this swamp trees and giant ferns began to grow, and encouraged by the warm damp climate of those days they soon formed dense forests. The forest swamp condition lasted for many centuries, during which the trees as they died formed a thick sludge of partly-decayed vegetable matter, giving a kind of peat.

Eventually, sinking began again, the forests were overwhelmed by water, and the rivers again poured layer upon layer of sand and mud over the area. But from time to time the sinking was checked, the water became shallow, new forests grew up, and new layers of peat were formed.

After millions of years these conditions came to an end. The areas of land and sea changed, and although thousands of feet of rocks were formed on top of the layers of peat, sand and clay, they never again(at least in Britain)contained any peat layers from buried forest swamps. Owing to the enormous pressures of the overlying rocks, as well as to a slight rise in temperature due to being buried so deep, the peat layers gradually changed into coal. The other layers also became hardened, the sand being changed to hard sandstone, and the clay to shale.

When colliery shafts are sunk to reach the coal seams they pass through the different layers of rock(called 'strata', which simply means 'layers').

3. Types of Coal

Peat is included under this heading because, as we have seen, it is the first stage in the formation of coal(though if it is not deeply buried, it will never become coal). The type of peat usually dug for fuel consists of the partly decayed reeds and mosses growing in bogs. Peat bogs, often called 'mosses', are found in Ireland, Scotland and Somerset, as well as in many other parts of the world.

Brown coal results from the first stage of alteration of the buried peat. It is brown and crumbly, and can often be seen to be composed of decayed woody material. Another name given to this fuel is lignite—but some lignites are black. There is very little brown coal in England—none at all in coalfields—but very large quantities occur in several other countries. The thick seams in Australia, consist of brown coal.

The commonest type of coal in Britain, used in houses and factories, is known as bituminous coal. It is always black, and is made up of bands or layers which vary from bright and glassy to dull and sooty. This type of coal generally breaks easily into rectangular blocks along planes of easy splitting(cleavage)which the miner calls the 'cleat' of the coal. Noticing the direction of the cleat helps the miner in his difficult task of 'getting' or 'winning' the coal.

Anthracite is a form of coal showing the greatest amount of change or alteration from the peaty layer of which it was originally formed. It is hard and shows little sign of banding, but has a luster(or shines)rather like dull steel, and it breaks into skew-shaped blocks.

'Cannel' coal is a dull, hard coal without bands or cracks. It is found in most coalfields especially in Scotland and Lancashire. The name cannel is said to have been given to this type of coal because it burns with a long smoky flame as does a candle.

New Words and Expressions

accept [ək'sept] *vt.* 接受, 认可

accident [æksɪdənt] *n.* 事故

anthracite [ˌænθrəsait] *n.* 背斜

alteration [ˌɔ:l'təreɪʃən] *n.* 变更

bend [bend] *v.* 弄弯; *n.* 弯曲

bog [bɒg] *n.* 泥炭地, 沼泽

bore [bɔ:] *v.* 穿孔, 钻孔, 打眼

bottom ['bɒtəm] *n.* 底, 井底

break [breɪk] *v.* 破, 碎, 裂

burrow ['bʌrəu] *n.* 穴; *v.* 掘穴

bituminous coal 烟煤

brown coal 褐煤

cannel coal 烛煤(含高挥发物, 容易燃烧)

cleavage 解理, 劈理

cleat [kli:t] 楔子, 解理

cliff [klɪf] *n.* 峭壁

coal measures 煤系

collect [kəlekt] *v.* 收集, 集中

complicate ['kɒmplikeɪt] *vt.* 弄复杂

compose [kəm'pəuz] *vt.* 构成

concentrate ['kɒnsəntreɪt] *v.* 集中

crack [kræk] *v.* 弄裂, 敲碎; *n.* 裂缝, 破裂声

damp [dæmp] *n.* 湿气, 雾, 瓦斯; *a.* 潮湿的

deliberately [dɪ'lɪbəreɪtli] *ad.* 有意地, 慎重地

delta ['deltə] 三角洲

dense [dens] *a.* 稠密的, 浓厚的

deposit [dɪ'pɒzɪt] *vt.* 使沉淀, 存入

dig [dɪg] *n.* 斜坡, 倾斜, 下山

disturbance [dɪ'stɜ:bəns] *n.* 骚动, 干扰, 扰动

fern [fɜ:n] 羊齿植物

fireclay *n.* 耐火黏土

fold [fəʊld] *n.* 褶皱, 褶曲

fragment ['frægmənt] *n.* 碎片, 断片

getting 采煤, 采掘工作
 giant ['dʒaɪənt] *a.* 巨大的
 gravel ['grævəl] *n.* 砂砾
 harden ['hɑ:dn] *v.* 使坚固, 变硬
 hilly ['hili] *a.* 丘陵多的, 多山的
 hollow ['hələu] *v.* 弄凹; *n.* 洼地, 小谷
 lignite [lignite] *n.* 褐煤
 luster ['lʌstə] *n.* 光泽
 molten ['məultən] *a.* 熔化的
 mosts *n.* 苔, 藓, 沼泽
 occupy ['ɒkjupai] *vt.* 占有, 占领
 partly decay 部分腐烂
 peat [pi:t] *n.* 泥炭
 polish ['pəuliʃ] *vt.* 磨光; *n.* 摩擦
 push *v.* 推, 推进
 reed [ri:d] *v. & n.* 到达, 达到
 ridge [ridʒ] *n.* 背, 岭, 山脊
 roll [rəul] *n.* 背斜, 隆起, 顶板或底板凸起
 sandstone ['sændstəun] *n.* 砂岩
 shale [ʃeɪl] *n.* 页岩
 sheet [ʃi:t] *n.* 片, 板, 张, 轰
 sill [sil] *n.* 岩床
 slickenside *n.* 断层的擦痕光滑面
 throw [θrəu] *n.* 落差, 断错, 断层垂直位移
 trough [trɒf] *n.* 坑道, 石门, 平峒; *v.* 掘坑道
 valley ['væli] *n.* 溪谷, 流域, 盆地
 washout ['wɒʃaut] 冲击, 冲刷

Notes

1. Coal was known to man thousands of years ago, Ancient writings tell us that three thousand years ago the Chinese knew that certain kind of black rock would burn, and in one part of the country where there was little wood they used to dig into the earth to find this black rock for their fires.

句中, where 是关系代词, 它引导一个限制性定语从句, 修饰 the country. 在这个从句中, little 作“很少”、“几乎没有”解, 它与不可数名词连用。须注意: 它和 a little (作“一些”解) 不同。试比较: There is little water there (那儿没有多少水), There is a little water there (那儿有一点水)。

译文: 几千年以前人类就知道了煤。古书告诉我们, 在 3 000 年以前中国人就知道某几