理工科英语阅读小丛书

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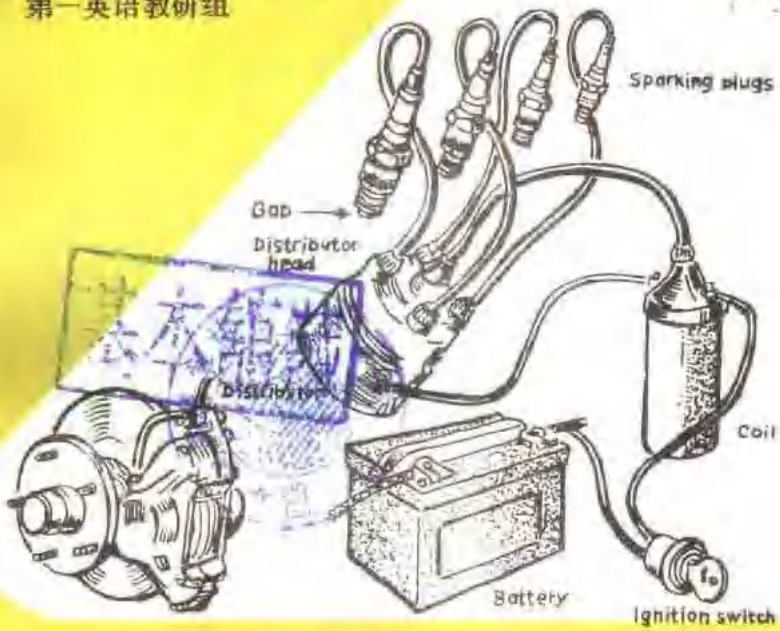

ENGLISH FOR ENGINEERS

工程英语读物

清华大学出版社

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内 容 提 要

本书文章选自《English for Engineers》一书，内容包括无线电通讯、金属材料、石油、通风、汽车、焊接和混凝土等知识。书中某些疑难之处均有注释。书后附有词汇表。

本书适合高等学校理工科学生及有关科技人员阅读。

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前　言

在理工科大学的英语教学中，我们常常感到如何提高学生的阅读能力是一个不太容易解决的难题。现有的精读教材，由于篇幅和内容的限制，词汇量往往偏窄，各种语言现象的出现和重复受到极大的影响，不利于培养学生的阅读能力。

学习外语必须通过实践，而阅读能力的培养和提高更有必要通过大量的阅读实践；有了这种实践，才能积累和扩大词汇量，巩固已掌握的语言知识，并在此基础上，进一步学习一些新的习惯表示法；从而提高阅读速度，增强理解力。为此，我们编选了一套理工科大学生英语阅读小丛书。在选材方面，我们尽量考虑到内容的知识性、科学性和趣味性。语言力求生动活泼、清新明快，简洁易懂。每册书后附有总词汇表，以利查阅和记忆。对某些难点作了适当的注释。本丛书总共有八册，包括传记、小品、科普文选以及有关工程技术方面的文章。

本丛书第七册由李相崇教授审阅，邹泳华同志注释。在此，我们表示深深的谢意。

由于我们水平有限，时间仓促，缺乏经验，缺点和错误在所难免，热切希望得到广大读者的批评和指正。

清华大学外语系
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Contents

I. Communications

1. Messages by Electricity

Electricity completely changed communications. Once it was **discovered** that an electric **current** would flow along a wire, it seemed possible that it could be used for messages. As long as[1] two places were connected by a wire, they could send electric currents to each other. They could send over hills and round corners, and they could send them with the speed of light. The question was how could electric current make words?

Real telegraphs were not possible until it was proved that electricity and magnetism were connected. A Dane discovered this. He was called Hans Oersted[2]. He found in 1819 that he could make a needle of a compass move by putting it near a wire with a current flowing through it.

Then a Frenchman named Ampère[3] thought about this discovery. He reasoned like this. A compass needle is a magnet. If a wire carrying a current could move it, then the wire must be

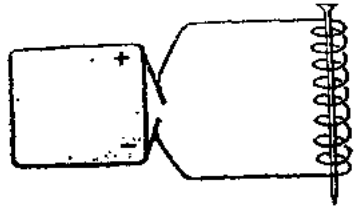
a magnet too. This he found to be true[4]. He also found that the magnetic force round the wire could be **concentrated** by **coiling** the wire. He had, in fact, made an **electromagnet**.

⑤ A lot of people began to see how electromagnets could be used to send messages. Two men, called Wheatstone[5] and Cooke[6], laid a **telegraph line** between Euston Station and Camden Town, in London. The way they used electricity to ⑩ send messages[7] was to have five compass needles swinging in the centre of wire coils at each end of the telegraph line. (See figure 1.) Their movements showed letters of the alphabet. When Cooke, in Camden Town, sent a current along one ⑮ of the wires it went through a coil in front of Wheatstone, in Euston. The magnetic force made the needles swing. Wheatstone read the letter the needles pointed to and **gradually got the message**. Then he switched the current through to ⑳ Cooke by pressing a 'key' and sent a reply.

But one of the most famous people of all in communications is Samuel Morse[8]. He **invented** the Morse code. This code is still used in **signalling** all over the world. His idea was simple. ㉕ He thought of using time, sending current along a wire for a long time or a short time. **Combining** different sets of these '**impulses**', just using

the long or short, he made a code for the whole alphabet, and the numbers from 0 to 9. For instance, E is the most commonly used letter in the alphabet, so Morse used the **simplest** signal for it—a short impulse, which is called a ⑤ 'dot'. T is the next most commonly used letter. Morse used the next simplest signal—a long impulse, which is called a 'dash'. He went through the alphabet in this way, making up signals for all the letters, in 'dots' and 'dashes'. ⑩ Here are some of the letters:

A.—B—...C—.—.D—..E.F..—.G——.



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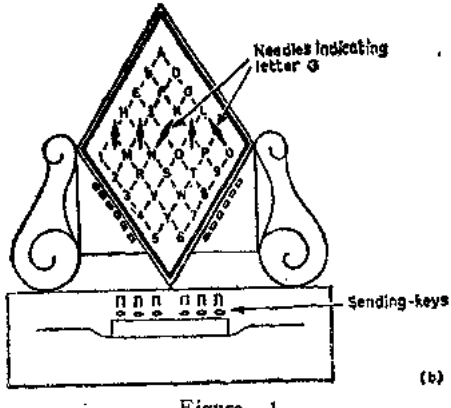

(b)

Figure 1

Everyone knows the Morse code for S O S[9], which is the distress signal for ships in serious trouble. It is ... — — — ... It is the simplest signal to make in times of danger or disaster.

The Morse code simplified sending messages. It was also very fast. With practice, Morse code can be read at 30 words a minute or more. It became by far[10] the most widely used code because it was the easiest to understand and the fastest to transmit. By 1871, for instance, there were 6,000 telegraph stations in the United States, all working on the Morse code system.

The telegraph meant that at last people could send messages a long way at great speed. Soon people wanted to send messages even farther.

If two places on land, say[11], London and Manchester[12], could be connected by wire, why could not the lands themselves—England and America, for instance—be connected by wires under the sea? This was a question quickly answered after the telegraph was proved to work. There were some problems about this, however. The main one was insulation, which means protecting the wire so that the electric current does not leak away. Dry air is a good insulator, but sea water is not. If a wire was laid under water, the

current would all leak away. In any case, all the insulating substances known up to then could be damaged by sea water. But in 1847 gutta-percha ⑤ was introduced as an insulating material. Gutta-percha is a gummy substance obtained from trees, like rubber, and it does not allow electricity to flow through it easily.

After several unsuccessful attempts, in 1866 ⑭ Britain and America were linked by underwater cable by the famous cable-laying ship the *Great Eastern*. After that cables were laid the world over, and nowadays it is possible to telegraph from almost everywhere. ⑮

Notes

1. as long as, (Conj.)只要。
2. Hans Oersted, 汉斯·奥斯特(丹麦人名)。
3. Ampere, 安培(法国人名)。
4. This he…true, 这是一个倒装句。this作found的宾语。当宾语表示的是前面一句刚提到的人或物，而我们希望使两句的联系更紧密时，往往可用这种倒装句。'他发现这是符合事实的。'
5. Wheatstone, 惠斯登(人名)。
6. Cooke, 库克(人名)。
7. they used…messages, 这是定语从句。说明名词the way。定语从句前面省去了in which。'他们用电来传送信息的方法是使五个罗盘针在电极线路两端的线圈中央摆动。

8. Samuel Morse，塞缪尔·莫尔斯(人名)。'

9. SOS，国际通用(船舶、飞机等)呼救信号。

10. by far，非常。常与形容词或副词的最高级连用。'它（指Morse code)成为使用非常广泛的一种电码，因为它最容易理解，并能以最快的速度传送。'

11. say，(插入语)比方说，譬如说。

12. Manchester，曼彻斯特(英国地名)。

2. The Electric Telegraph

Modern telegraph systems are based upon the fact that electric current will flow through a wire which forms a circuit. The circuit can be broken to interrupt the flow of electricity and ⑮ closed again for a short time by a key to send an electrical impulse through the circuit. Look at figure 2. Here the wire is not joined all the way round, but the circuit is complete because electricity will flow through the wire and back ⑩ through the earth. This is called an 'earth re-

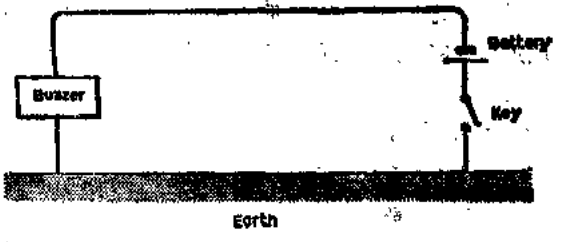

Figure 2

turn'[1]. When the key is pressed the circuit is closed. Electricity from the battery flows through the wire and earth circuit and causes the buzzer to make a noise. Using the Morse code, or some other code, messages can be sent in this way.

Men wanted to increase the speed of sending messages. They knew that current flows very quickly along a wire, much more quickly than even the fastest operator can use a machine to send messages by hand. One way of getting higher speeds was to use the fact that current could flow one way round the circuit, or the other. A flow in one direction could be the same as a dash in Morse, and a flow in the other could be the same as a dot. This system is called 'double current working'. It is faster than normal, or 'single', current working. A dash or dot is signalled for the same length of time, but in ordinary Morse code a dash is signalled by an impulse lasting three times as long as a dot.

A machine was invented to receive messages by making a mark on a paper tape with dots on one side of a line and dashes on the other[2]. (See figure 3.) Through the years other machines were invented, both to receive and to transmit messages. These machines are called teleprinters.

They use a code called the International 5-unit teleprinter code instead of the Morse code. It is called a '5-unit' code because every letter or figure is made up of five impulses of electrical current, either positive or negative—three positive, two negative; one positive four negative; and so on. All the letters are the same length in time. This is quite different from the Morse code, where E is the shortest and 'nought' the longest[3].

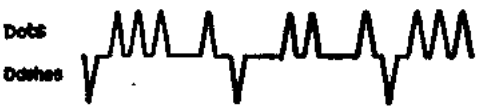

Figure 3

A teleprinter is really a machine which sends a typewriter message over a telegraph circuit. In fact, it looks like a typewriter and has the same keyboard. Every time one of the keys on the keyboard is pressed it sends the five impulses that make one letter or figure. It also sends a 'start' impulse. This sets the teleprinter (or any number of them that are connected) at a receiving station ready to print the letter that follows immediately. A 'stop' impulse brings all the teleprinters to rest after each letter or figure.

In the early days of telegraphy direct current was used. This is current which flows along a line in one direction at a time. Most modern telegraph systems use alternating current. This is current which flows backwards and forwards along the wire. To show that a current is alternating we draw it as in figure 4. Alternating current is usually supplied to people's houses at 50 cycles per second. This means that every second the current reverses its direction 100 times. Alternating current used to send telegraph messages reverses its direction much more frequently than this. We say that it works on much higher frequencies. These frequencies range from 420 cycles per second to 3,180 cycles per second.

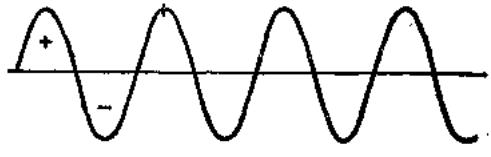

Figure 4

As the number of people who wanted to send telegraph messages increased, more and more messages had to travel along the same telegraph line. Using alternating current, one line can be used to send many messages at the same time if each message is sent out at a different frequency. A transmitting machine sends a message at

one of the high frequencies mentioned, say 420 cycles. A receiving machine also working on a current alternating at 420 cycles per second will get the message. But it will not get a message being transmitted at the next highest frequency (which is 540 cycles per second) by another machine, even though this message is travelling along the same line at the same time. To get this message another receiving machine, working on current alternating at 540 cycles, must be used.

Notes

1. earth return 大地回线；地(电)回路。
2. with dots on…the other，这是with＋名词＋介词短语的复合结构。这种结构一般作状语。说明附带情况或行为方法。with无词义。译成汉语时，可将整个复合结构译成一个独立完整的汉语句子。'发明了一种机器通过在纸带上作符号的方式来接受信息，沿一直线的一侧作点的符号，而另一侧则作短线的符号。'
3. where E…the longest，这是where所引出的一个定语从句。说明前面的名词Morse code。这个定语从句本身又是一个由连接词and所连接的并列复合句。而and 'nought' (is) the longest是省去系词is的不完全句。'这种电码与莫尔斯电码完全不同，在莫尔斯电码中，E是最短的脉冲，而O是最长的脉冲。'

3. The Telephone

We use the electric telegraph to send written messages to people far away from us. We use the telephone to talk to people far away. In many ways the telephone is better than the telegraph as[1] a means of communication. The cost of sending a telegraph depends on the number of words in it. We have to make our telegraph message as short as possible, but, even in a short telephone call[2], we can say a lot of words. A telegram can only be sent from one post office to another. There is a delay before it can reach the person it is addressed to[3]. The telephone connects you to a person directly. You may have to wait several hours for an answer to a telegram. You can ask a person questions and get the answers immediately on the telephone.

Sound travels through the air in waves. When you play a violin, for example, the violin string vibrates. The vibrations from the violin string pass through the air in little waves. When these waves reach the ear, the eardrum vibrates, and so you hear the violin. Different notes have different distances between the tops of the waves. We call these different 'wave