

The

Locomotive



英语科普注释读物

火车头

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The Locomotive

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注释者的话

本书选注的原文是英国作家 David Carey 撰写的，简单介绍近代机车的类型和结构。选自 How It Works 丛书之机车分册（1968 年版）。

本书具有较多的专业词汇，大都是常用的，对于非机电专业的一般读者学习英语也较适合，可供中、小学英语教师或具有英语基础知识的英语专业学生和有关专业的读者阅读。

在注释过程中，我们侧重于定语从句和用作定语的分词短语，以期读者能在这方面有所收获。

一九七八年十月

Contents

The Great Change.....	1
The Diesel Locomotive Power Plant.....	3
How the Diesel Engine Works.....	6
The Miracle of Combustion.....	8
The Ways in Which Diesel Engines Vary.....	11
The Four-Stroke Cycle of Operation.....	13
The Two-Stroke Cycle of Operation.....	16
Fuelling the Locomotive Power Plant.....	19
Combustion Needs Air—How It Is Supplied	22
Keeping the Engine Cool.....	24
Transmitting the Power to the Locomotive Wheels.....	26
The Mystery of Torque.....	28
Hydraulic Transmission.....	30
Mechanical Transmission	33
How the Diesel Locomotive Makes Use of Electricity.....	35
How the Locomotive Runs on the Track.....	37
Controlling the Locomotive	40
How the Driver Brakes the Train.....	42
Electric Locomotives	45
Power Supply	46
Power Protection and Collection.....	48
Traction Motors.....	50
Power Equipment	52

Cab and Controls of an Electric Locomotive54

*

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*

Vocabulary56

The Great Change

The big steam locomotives which have drawn our famous trains for about one hundred and fifty years, *have now given way to¹ locomotives propelled by diesel and electric power²*. Many railway enthusiasts will *regret the passing of the steam engine³ with⁴* its very individual character, its impressive appearance, its powerful beat and its distinctive whistle.

Modern diesel or electric locomotives do not seem to have the same special attraction, yet they are more efficient in operation, quieter, cleaner, more economical to run and faster between stations than their more glamorous predecessors. And, of course, *it is for the travellers rather than the enthusiasts that the railways must be run⁵*. *Train spotters⁶* of the future will know nothing of the steam age *which is rapidly receding into history⁷*.

1 现在让位于。 2 由柴油机和电力牵引的。这个过去分词短语作定语，修饰前面的 locomotives。 3 对不再使用蒸汽机而感到遗憾。 4 介词 with 在这里作“具有……(特点)”解。 5 经营铁路是为旅客而不是为(铁路)爱好者。这是一种强调句型。非强调形式可以复原为：The railways must be run for the travellers rather than the enthusiasts. 状语 for the travellers rather than the enthusiasts 是强调的对象。rather than: 而不是；to run railways: 经营铁路；to run a locomotive: 使机车运行；to run a machine: 开动机器。 6 指铁路事业发达国家中的某些喜欢观察和辨识火车类型变化的人(尤其是学童)。 7 它(指蒸汽时代)正在迅速成为历史陈迹。

How do these latest monarchs of the railways pull their heavy loads of carriages, passengers and goods along the iron highways of the world? How do the men in the driving cabs control them? This book will give you many of the answers and make your future spotting or travelling *all the more*⁸ interesting.

The diesel locomotive *is dealt with in*⁹ the first part of the book, *followed by the electric locomotive toward the end*¹⁰. They have *features of great difference as well as certain similarities*¹¹.

8 会更加, 更会. 9 在……中论述, 在……中说明. 10 接着在近尾声处介绍电气机车. followed 这个分词短语修饰 the diesel locomotive. toward = towards 是介词. 11 既有很大差异的也有某些相似的特征. as well as: 也, 又.

The Diesel Locomotive Power Plant

All diesel locomotives have a diesel engine which provides the power to drive the locomotive which pulls the train.

Every diesel engine has cylinders, *which are really tubes bored out of a cylinder block and closed off at the top by the cylinder head*¹. In each cylinder a piston *slides up and down*². Instead of the piston *working directly against the metal of the cylinder block*³, liners are fitted, *made of special material better able to withstand wear and tear and corrosion*⁴. These can be more easily and cheaply replaced than the whole cylinder block.

The movement of a piston *up and down a cylinder*⁵ is called a stroke. Pistons are joined to a connecting rod, *the lower end of which is connected to a crankshaft*⁶. *The crankshaft is shaped so that as the pistons move up and down they cause it to revolve*⁷. The action is the same as someone riding

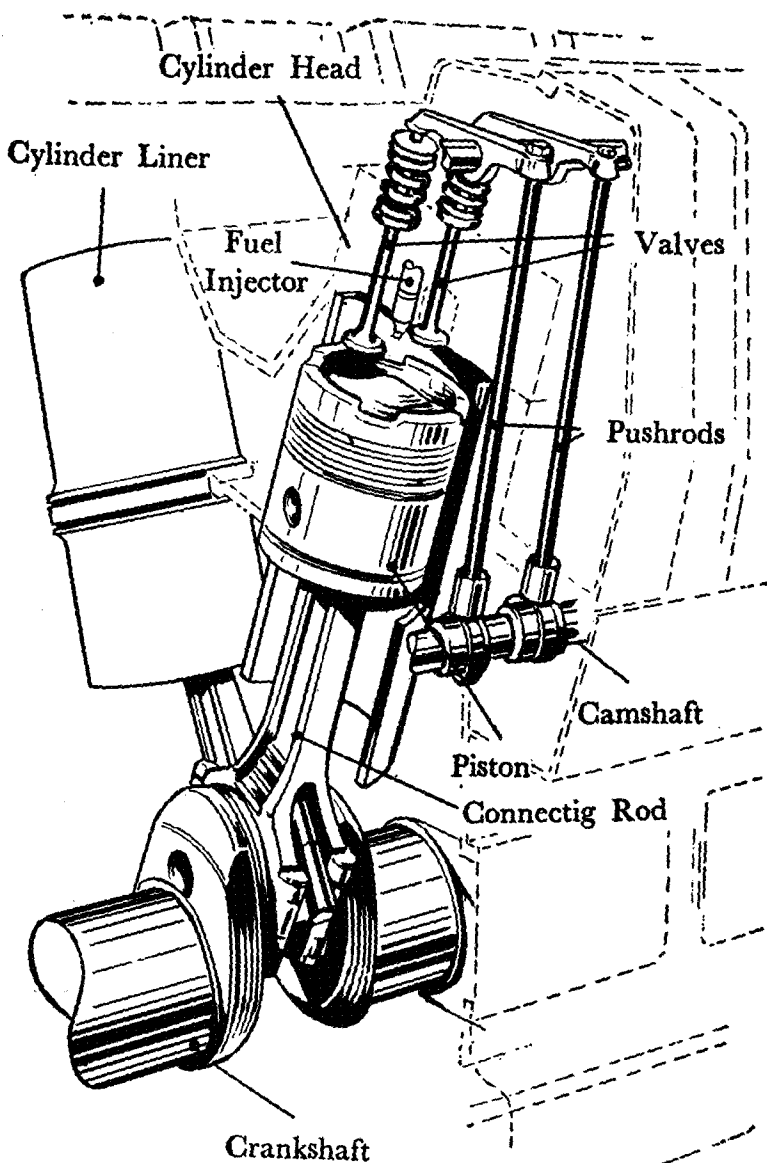
1 它们实际上是汽缸体上镗出的一些管状物，顶端为汽缸头所封闭。 2 上下滑动。这里 up 和 down 是副词。 3 直接贴着汽缸体的金属(内壁)活动的。这个现在分词短语作定语，修饰 piston。介词 against 作“贴着”“靠着”解。 4 用更加耐磨损和耐腐蚀的特殊材料制成的，这个分词短语修饰 liners。better able: 更能够。wear and tear: 磨损。 5 沿汽缸一上一下的。这里的 up 和 down 都是介词，这个介词短语修饰前面的 piston。 6 其下端与一根曲轴相连。这是一个定语从句，which 指 connecting rod (连杆)。 7 曲轴具有这样的形状，当活塞上下运动时，可使曲轴旋转。that 引出的句子是一个结果状语从句，从句中又包含一个 as 引出的时间状语从句。

a bicycle:⁸ his knees are the pistons, *his legs the connecting rods and his feet on the pedals, the crankshaft*⁹. The turning movement of the crankshaft provides the power to drive the locomotive along.

Around each piston there are a number of cast iron piston rings. *All the piston rings are split and act as springs*¹⁰, *pushing against the walls of the cylinder liner*¹¹, *sealing the space in the cylinder above the piston from the area below*¹².

Some diesel engines are fitted with valves, *two or more for each cylinder, inlet valves and outlet valves in equal numbers*¹³. These are opened and closed by push rods and the action of cams, *or projections*¹⁴, on the camshaft.

8 冒号后面部分是对冒号前面部分的说明。 9 他的双腿就是连杆，他踏在脚踏上的两脚就是曲轴。这里在 *his legs* 后面省去了 *are*，在 *pedals* 后面也省去了 *are*，因为这两个并列分句的结构和 *his knees are the pistons* 都一样，故可把相同的 *be* 省去。*pedals* 后面的逗号表示语流的一个小停顿，提醒读者这里又省去了 *are*。10 所有的活塞环都是开口的，起着弹簧作用。*to act as*：起……作用。11 紧贴汽缸衬套内壁。这个分词短语作状语，修饰动词 *act*。12 把汽缸中活塞上下两部分空间分隔开来。这个分词短语也作状语。13 每个汽缸有两个或两个以上的阀门，进气阀与排气阀数目相等。这个短语可以看作是 *valves* 的同位语。14 或称凸出物。这里 *or* 引出一个同义的词语，作进一步的说明，*cam*（凸轮）是技术用语。



How the Diesel Engine Works

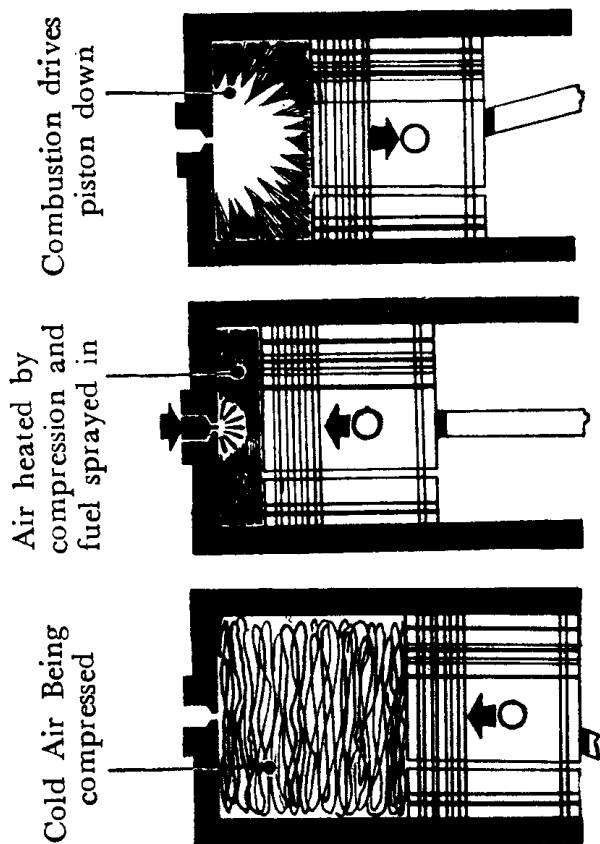
In common with steam engines¹, diesel engines need heat to make them work. The steam locomotive uses coal which is burnt to heat water in a boiler. The steam thus created² is then fed into the cylinders and causes pistons to move backward and forward. With diesel operation³, the necessary heat is created within the cylinders and the resulting burning, or combustion, works directly on the pistons⁴ in these cylinders. Because the heat is generated internally the diesel is known as an internal combustion (or i.c.) engine.

Let us make another comparison, this time with the petrol engine of a car.⁵ In a car engine, a petrol and air mixture is fed into the cylinders and is compressed by pistons which move up and down. The heat generated by this compression of the mixture⁶ is not sufficient to cause combustion, so sparking plugs⁷ are used to produce a spark which ignites the mixture and enables combustion to take place.

In the diesel engine, air is compressed by pistons into the top of the cylinders. Fuel oil is then sprayed into the

1 与蒸汽机相同。这个介词短语作状语。 2 这样产生的。这个分词短语是 the steam 的定语。 3 就柴油机的操作而言。 4 这样形成的燃烧便直接作用于活塞。burning 和 combustion 都是“燃烧”的意思，后者是技术用语。参见 4 页注 14。 5 这次让我们用汽车的汽油引擎再来打个比方。 6 这样压缩（汽油和空气）混合物而产生的。 7 火花塞。

compressed air. The heat generated through compression is *itself*⁸ sufficient to ignite the fuel and cause combustion *without the aid of*⁹ sparking plugs. Diesels are thus also known as *compression ignition*¹⁰ (or c.i.) engines.



8 (热量)本身. 这里用于强调. 9 无需借助. 10 压燃(式).

The Miracle of Combustion

We have seen *how fuel is sprayed into the compressed air*¹ at the top of the cylinder to enable combustion to take place. The space *in which this occurs*² is known as the combustion chamber, and, in a diesel engine, its design is very important. The power *that is developed by the engine*³ depends *on*⁴ efficient combustion occurring to drive the piston forcibly down the cylinder and give the crankshaft a powerful turning movement, or torque⁵. Efficient combustion depends *to a great extent*⁶ on the complete inter-mixing of the fuel spray with the air under compression in the cylinder. *It*⁷ is therefore necessary to design the combustion chamber and the top of the piston (the piston crown) *in such a way that the air is given a strong swirling motion as it is being compressed*⁸. This swirling motion helps the mixing process, which, of course, must take place *in a tiny fraction of a second*⁹.

1 燃料是怎样喷入压缩空气内的.副词 how 引出的从句是 have seen 的宾语.

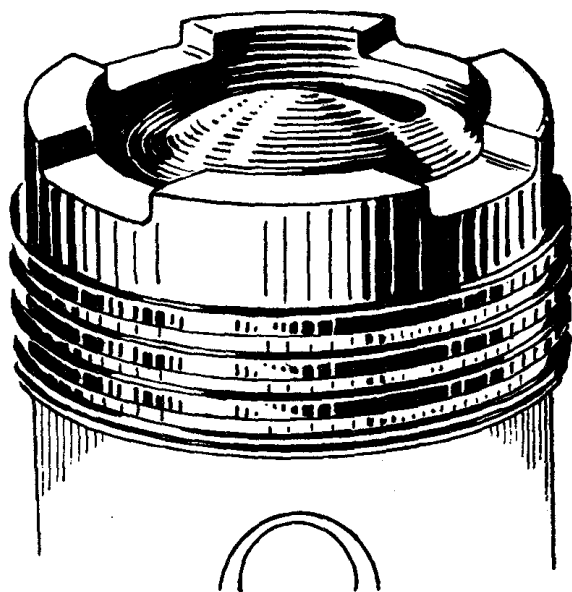
2 这情况(指上文油气混合燃烧)发生于其中的.这是一个定语从句, which 指 the space. in which 在从句中作地点状语. 3 引擎产生的. 4 取决于.

5 用来把活塞强行推下汽缸,并使曲轴有力地转动一次,即产生一个力矩.这个分词短语作 combustion 的定语. 6 在很大程度上.这是插在 depends 和 on 之间的状语. 7 这里 it 是形式主语,真实主语是后面的动词不定式短语 to design

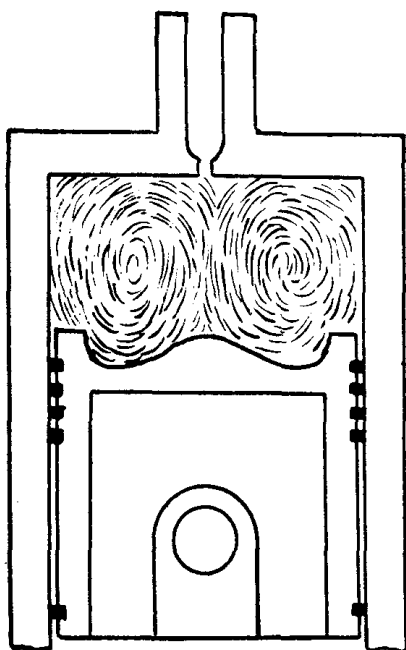
8 以这种方式,即在空气被压缩时,使空气作剧烈的涡旋运动. that 引出的从句是 way 的同位语. 9 在一瞬间.(直译:在一秒钟的一小部分时间内.)

The type of diesel engine *we have described*¹⁰ is known as a direct injection engine because the fuel is sprayed directly into the top of the cylinder *where combustion takes place*¹¹. In another type of engine, a separate swirl chamber is used to mix the fuel with the air. Combustion takes place in this chamber and the expanding gases then *force themselves into the cylinder*¹² to drive the piston down. This system is called indirect injection.

Piston Crown

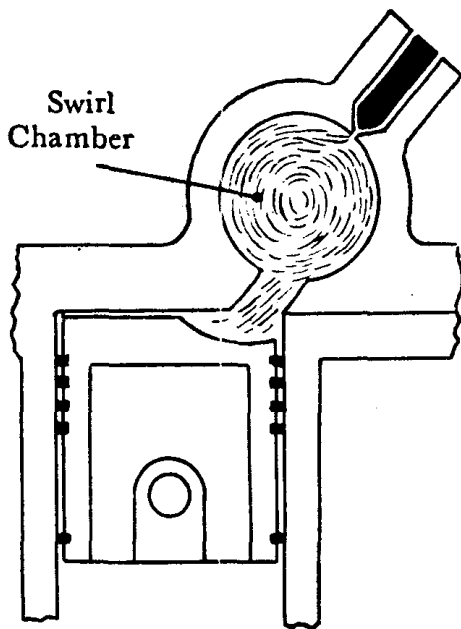


10 我们已描述过的，这个定语从句修饰前文的 type. 从句前省去了连词 that.
11 产生燃烧的，这是用副词 where 引出的定语从句，修饰前面的 top. 12 使
自己冲进汽缸。



Direct Injection

Air given swirling motion
before fuel injection



Indirect Injection

Air and fuel, mixed in
separate swirl chamber

The Ways in Which Diesel Engines Vary

Locomotive diesel engines *vary in shape, size and power*¹. The number and the arrangement of the cylinders also *varies*². Thus there are many different designs of diesel engines.

One rather special design is the 'deltic' engine. In this engine the cylinders are placed in triangular formation, *each cylinder having two pistons working in opposite directions*³.

Then there are *in-line engines*⁴ of six or eight cylinders, placed *one behind the other*⁵. *For more power*⁶ twelve cylinders can be used. These are often arranged in two rows of six cylinders placed side by side. V engines are also employed, in which the cylinders are set in two rows *at an angle to each other in 'V' formation*⁷.

All the different designs and shapes of diesel engine *can, however, be divided into one of two basic types*⁸: Four-stroke or Two-stroke.

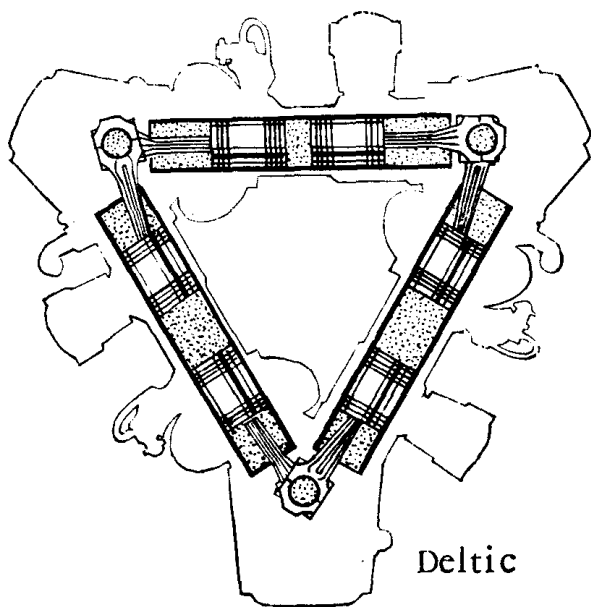
Four-stroke engines *work on what is called the four-stroke*

1 在形状、大小和功率方面各不相同。 2 汽缸的 number 和 arrangement 这两个概念是共存相关的，这里把二者看作一个整体，故谓语动词按单数变化。 3 每个汽缸有二个反方向运动的活塞。这是一个名词 + 现在分词短语构成的独立结构，起状语作用。 4 “直列式”引擎。 5 一个个前后相接的。 6 要得到更大的功率。 7 互成一定的角度，呈 V 字型。 8 然而……都可以分别列入两大类型之一。

cycle of operation⁹, and two-stroke engines work on the two-stroke cycle of operation.

Of the two¹⁰, the four-stroke cycle is the more generally used, but some locomotives are powered by two-stroke engines, a good example being the 3,300 h.p. English Electric 'Deltic' main-line diesel locomotive¹¹, powered by¹² two 1,650 h.p. two-stroke engines of the deltic design.

On the next five pages we shall explain the four-stroke and two-stroke cycles of operation.



9 按所谓四冲程循环工作。 10 这两种当中的。这个介词短语是后面 the four-stroke cycle 的定语。放在句首，是为了承接上文。 11 典型的例子是英国电力公司3300马力“三角”主干线柴油机车。这也是名词+分词短语构成的独立结构，参见本章注3。 12 由……提供动力。