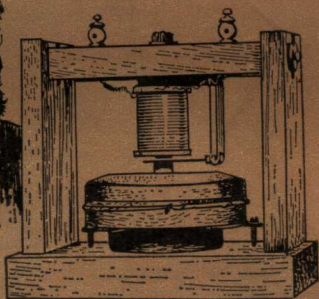


The

# Telephone

英语科普注释读物



# 电话

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英语科普注释读物

The Telephone

电 话

英语科普注释读物

# The Telephone

电 话

刘元吉 钱石麒 注释  
沈 利 杨明俊

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## 注释者的话

本书选注的原文是英国人 Divid Carey 撰写的 科普丛书, How It Works 中的一个分册。主要介绍电话发明史、原理及现代电话发展情况。

原文文字较浅近, 可供广大科技工作者、英语教师和具有英语基础知识的有关专业的读者阅读。我们对文中较难的专业用词, 习惯用语和句子结构都作了注释, 以便读者借助注释逐步提高阅读英语科技读物的能力。

注者限于水平, 难免有缺点或错误, 希读者批评指正。

一九七九年三月

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## How telephones began

In every aspect of our daily lives we need to communicate with one another. *We do this mostly by speaking to other people and listening to what they have to say to us<sup>1</sup>, and when we are close to<sup>2</sup> them we can do this very easily. However, our voices will not travel very far even when we shout, and it is thanks to the invention of the telephone that we are still able to communicate with our fellow men and hold conversations when we are far apart<sup>3</sup>.*

The telephone is a method of transmitting speech by electricity. It was invented by *Alexander Graham Bell<sup>4</sup>*, a Scotsman who was born in Edinburgh in 1847. *Bell, a teacher of elocution who later emigrated to Canada, spent all his spare time experimenting<sup>5</sup>. So enthusiastic was he in his search for a means of transmitting human speech by electricity, that he left little time for his day-to-day work and at one time*

1. 我们主要通过与其他人讲话和听他们给我们讲话来做到这一点。speaking to other people 和 listening to what they have to say to us 是两个动名词短语，都作介词 by 的宾语。2. 靠近，接近。这里的 to 是介词。3. 由于电话的发明，才使我们在（互相）相隔很远时仍能和伙伴们取得联系，进行谈话。这是一个强调句型，其结构为 “It is (was) + 被强调的成分 + that + 其他成分”，这里强调的是原因状语 thanks to ... telephone。4. Alexander Graham Bell [ˌæliɡˈzɑːndəˈgreɪəm bel] 亚历山大·格雷厄姆·贝尔（1847—1922），美国电话发明家。5. 贝尔是个演说术教师，后来移居加拿大，他把所有的空闲时间都化在实验上。a teacher of elocution 是主语 Bell 的同位语；who later emigrated to Canada 是定语从句，修饰 Bell；to spend... (in) doing something: 花费（时间）做某事。

was almost penniless<sup>6</sup>.

On June 2nd, 1875, he heard the first sounds ever to be carried over wire<sup>7</sup>. Some months later in 1876—using an instrument made from pieces of clock springs and electro-magnets—he spoke the first words ever to be sent over a distance by electricity<sup>8</sup>.

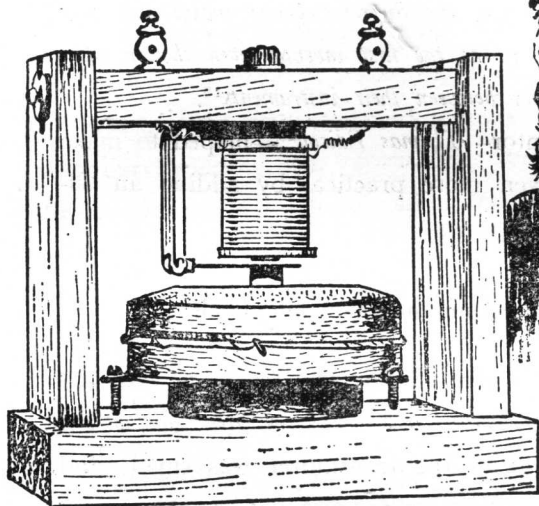
Although Bell had made the first telephone, at first none seemed interested. He exhibited an instrument at an exhibition in Philadelphia but it was regarded as no more than a toy by the visitors<sup>9</sup>, and almost overlooked by the judges.

Fortunately for Bell, the Emperor of Brazil happened to pass by and enquired about<sup>10</sup> his invention. Bell gave him the receiver and went to speak into the transmitter<sup>11</sup> at the other end of the wire. When the Emperor heard Bell's voice on the receiver, he dropped the instrument in surprise<sup>12</sup> and said—"It talks". Next day Bell's invention was famous.

By coincidence<sup>13</sup>, another inventor—Elisha Gray<sup>14</sup>—tried

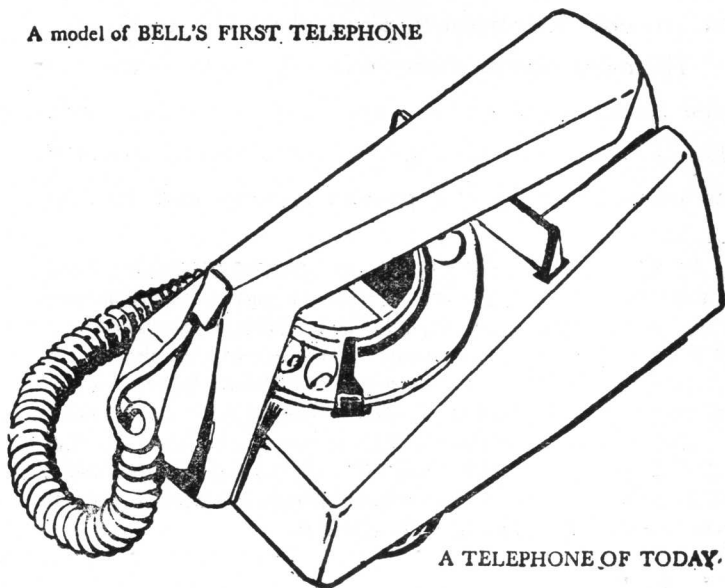
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6. 他如此热衷于寻找用电作为通话的媒介的办法,以至于只剩下很少时间去顾他的日常工作,有个时期差不多落到身无分文的地步。本句是倒装句,表语 so enthusiastic 挪到句首,起强调作用。so...that: 如此…… 以至于…… in search for: 寻找。at one time: 有个时期。7. 他听到了有世以来第一次从电线上传来的声音。to be carried 是不定式的被动式,作定语,修饰 sounds。8. 他使用一个由几片钟表簧片和一些电磁铁制成的器械,讲了有世以来第一句由电流传输一段距离的话。using an instrument 是现在分词短语,作方式状语, made from pieces of clock springs and electro-magnets 是过去分词短语,作定语,修饰 instrument。9. 参观者只不过把它当作一件玩具。to be regarded as: 被当作; no more than 作“只不过,仅仅”解。10. 问起。11. 对送话器讲话。12. 惊异地。13. 碰巧。14. Elisha Gray [i'laifə grei] 伊莱沙·格雷。



Alexander Graham Bell

A model of BELL'S FIRST TELEPHONE



A TELEPHONE OF TODAY.



to patent a telephone only a few hours after Bell had patented his. *However, the Supreme Court maintained that Bell should be regarded as the first inventor even though there were many similarities between their instruments*<sup>15</sup>.

Another inventor—*Thomas Edison*<sup>16</sup>—helped to make Bell's telephone even more practical by adding an 'induction coil'<sup>17</sup>.

### How Edison improved on the early telephone

One of the problems of the early telephone was *that transmission could not take place over very great distances*<sup>18</sup>. The electric current in the transmitter was small, and *the resistance of the wires over which the current passed*<sup>19</sup> soon reduced this current to zero and made it ineffectual.

*The electric current coming from Edison's transmitter was passed through a coil of wire wound round a soft iron core*<sup>20</sup>. This was the *primary winding*<sup>21</sup>. Then a *secondary winding*<sup>22</sup> was wound round. *This consisted of many more turns of*

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15. 尽管他们两人的器械有许多相同之处，最高法院仍认为贝尔是第一个发明者。本句中的 *should be* 是虚拟语气。在 *maintain, suggest, insist* 和 *demand* 等动词后的宾语从句中，谓语动词都用虚拟语气，即动词原形或“*should + 动词原形*”。如：I suggest that we (should) all be present at the meeting. (我建议我们大家都参加会议)。16. Thomas Edison ['tɒməs 'edɪsn] 托马斯·爱迪生 (1847—1931)，美国电灯，唱机和麦克风的发明人。17. 感应线圈。18. 相隔很远的距离，(声音)就无法传送。to take place: 发生。19. 电流通过的导线的电阻。20. 爱迪生的送话器输出的电流通过一个绕在软铁芯上的线圈。coming from Edison's transmitter 是现在分词短语作定语，修饰 the electric current。21. 初级绕组。22. 次级绕组。

*much finer wire*<sup>23</sup>.

*When current passes through the primary winding of such an induction coil, it causes a magnetic field to be produced in the soft iron*<sup>24</sup>. The magnetic field induces a current in the secondary winding, *this current being capable of overcoming the resistance of the wires and making transmission possible over greater distances*<sup>25</sup>.

*At the receiving end Edison reversed the process, stepping down the current so that it operated the earpiece.*<sup>26</sup>

*From the early experiments of these inventors has grown the service which the majority of us use every day*<sup>27</sup>. It is estimated that there are over 270,000,000 telephones installed throughout the world, *nearly all of which can be connected with the instrument you have in your home, or in your locality, enabling you to have conversation with your next-door-neighbour or with someone on the far side of the earth*<sup>28</sup>.

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23. 这个线圈的线(比初级线圈)细得多, 圈数也多得多. to consist of: 由……构成. 24. 电流通过这样一个感应线圈的初级绕组时, 就在软铁芯内产生一个磁场. to be produced 是不定式的被动式, 在这里和 a magnetic field 一起构成动词 cause 的复合宾语. 25. 这个电流能克服导线的电阻, 使之有可能在较长距离间输送. 这是“名词+现在分词短语”的复合结构, 在这里作状语, 表示结果. 26. 在接收端, 爱迪生把工作过程反一反, 降低电流以使耳机工作. stepping down the current so that it operated the earpiece 是现在分词短语, 作伴随状语; 其中 so that it operated the earpiece 是结果状语从句. 27. 每天为我们大多数服务的电话就是在这些发明家的早期实验的基础上发展而来的. 28. 其中所有的电话几乎都能和你家里的或你所住地区的电话接通, 使你能够和隔壁邻居或和在地球另一面的人谈话. nearly all of which 引导的非限制性定语从句修饰上文中的 270,000,000 telephones; 从句中的 you have in your home, or in your locality 是限制性定语从句, 修饰 the instrument; 现在分词 enabling 引导的短语作结果状语.

## How the sound of your voice travels

When you speak, you cause *the vocal chords*<sup>29</sup> in your throat to vibrate. These vibrations *set up*<sup>30</sup> tiny changes of air pressure in your mouth, and *these pressure changes radiate from your mouth into the surrounding air in the form of waves*<sup>31</sup>. *Throw a pebble into a smooth pond and see how little waves of water radiate from the point where the pebble entered*<sup>32</sup>. Sound waves act in a similar manner, and *just as the waves in the pond diminish as they get further away from their starting point, so sound waves fade away in the air*<sup>33</sup>. A big pebble makes big waves in the water; a loud noise makes big sound waves in the air.

When someone speaks to you, the sound waves radiating from the speaker's mouth *make an impact on your ear*<sup>34</sup>, a message is sent to *the nerve centres*<sup>35</sup> of your brain and the voice is heard. If you stand too far away from *the person speaking*<sup>36</sup>, the sound waves lose all their force, or amplitude before they reach your ear and you hear nothing.

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29. 声带. 30. 引起. 31. 这些压力的变化以波的形式从你的嘴巴传到周围的空气中. in the form of: 以……的形式. 32. 在平静的池塘内扔进一粒小石子, 看看小水波是怎样从石子投入的地点传播开来的. where the pebble entered 是定语从句, 修饰 the point. 33. 正如同池塘中的水波随着离起点越远而逐渐消失一样, 声波也逐渐消失在空气中. 本句中两个 as 都是连词, 前一个 as 作“如同”解, 后一个 as 作“当……的时候”解. to fade away: 逐渐消失. 34. 使你耳朵受到一次(声波)冲击. 35. 神经中枢. 36. 正在说话的人. 现在分词 speaking 作定语, 修饰 the person.

Air is not a good medium for transmitting sound waves, that is why another way of speaking to people over long distances had to be found.

### Sound waves into electric currents

*In addition to<sup>37</sup> loud sounds which cause big waves, and soft sounds which cause small waves, we also have high-pitched, or high-frequency, sounds and low-pitched, or low-frequency, sounds. A high-pitched sound, a squeak for instance<sup>38</sup>, will cause the waves to radiate out very quickly one after the other<sup>39</sup>. A low-pitched sound, such as a growl, will cause the waves to radiate more slowly. So, depending on how we speak and the words we use, our voices send out big or small sound waves of high or low frequency.<sup>40</sup>*

*An electric current can be transmitted without much loss of power over far greater distances than our voices can carry in the air<sup>41</sup>. What we have to do, therefore, is to convert all the changes of speech sound waves into corresponding changes of electric current which can be transmitted along wires over the required distance<sup>42</sup>. On reaching the other end<sup>43</sup>, the changes*

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37. 除……以外。 38. 例如一声尖叫。 for instance: 例如。 39. 一个接一个地。 40. 因此, 我们声音输出的声波大小和频率高低是根据我们讲的话和用的词而定的。 depending on how we speak and the words we use 是现在分词短语, 作原因状语, 其中 how we speak 是介词 on 的宾语; we use 是定语从句, 修饰 words。 send out: 输出。 41. 电流毋须损失很多功率便被输送到比我们的声音在空气中传送距离远得多的地方。 than our voice can carry 是比较状语从句。 42. 把讲话声波的各种变化转换成相应的电流变化, 才能沿着导线传送所需的距离。 43. 一传到另一端。 这里介词 on 后面跟动名词作“在……后立即……”解。

of electric current must then be *converted back into*<sup>44</sup> sound waves so that the speech can be heard.

In a telephone, the mouthpiece, or transmitter, converts the sound waves of speech into *variations of electric current*<sup>45</sup>, while the earpiece, or receiver, converts the electric current back into sound. On the next two pages we will see just how this is done.

## The Transmitter

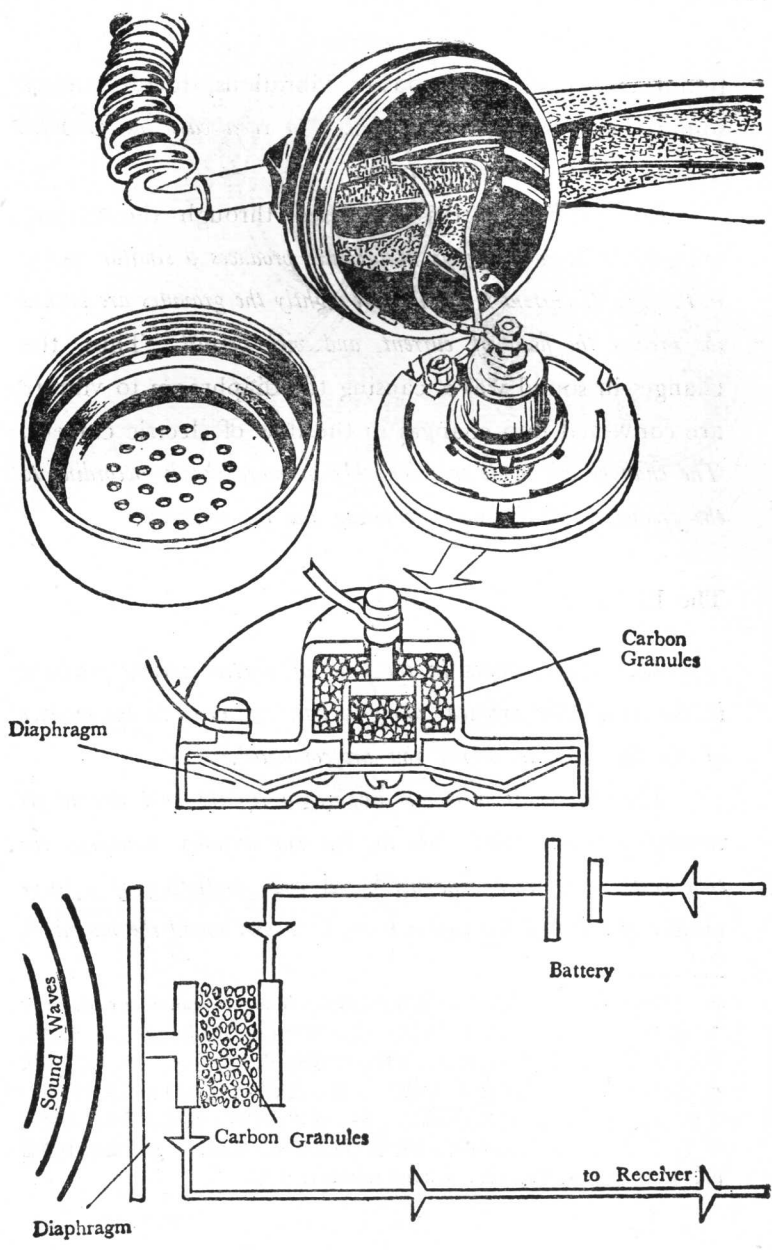
The simplest and most common form of telephone transmitter consists of a thin metal disc, called a diaphragm, and *a box containing tiny particles, or granules, of carbon which are in light contact with the centre of the diaphragm*<sup>46</sup>.

When you speak into the mouthpiece of the transmitter, the sound waves from your mouth cause the diaphragm to vibrate. *These vibrations produce changes in pressure on the carbon granules*<sup>47</sup>. Big sound waves cause greater vibration and therefore greater pressure on the granules, *packing them more closely together*<sup>48</sup>. Small sounds produce less vibration, less pressure is applied to the granules—packing them together more loosely. High-

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44. 转回成. 45. 各种电流变量. 46. 一只装有微小碳粒的盒子, 碳粒与振膜中心有轻微接触. in contact with 作“与……接触”解. 47. 这些振动引起碳粒的压力变化. 48. 把它们压得更紧. 这是现在分词短语, 作伴随状语.

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frequency sounds cause faster vibrations, low-frequency sounds cause slower vibrations. *In each case the granules react in a corresponding manner*<sup>49</sup>.

An electric current is passed through the carbon granules and each change in pressure produces a similar change in the flow of current<sup>50</sup>. *The more tightly the granules are packed the greater the flow of current, and vice versa*<sup>51</sup>. Thus, the changes in sound waves causing the diaphragm to vibrate are converted into changes in the flow of electric current. *The changes are made more quickly or more slowly according to the frequency of the sound entering the transmitter*<sup>52</sup>.

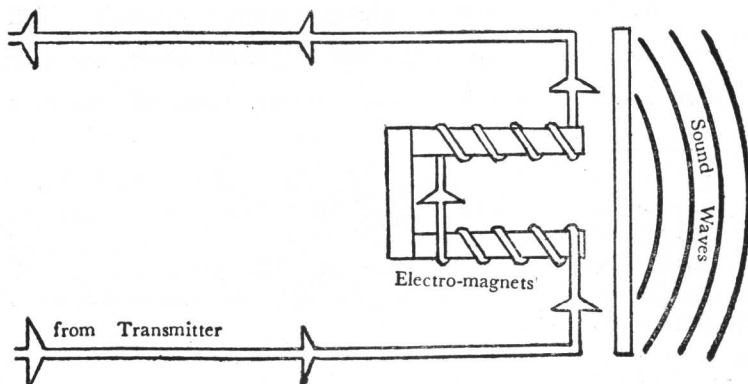
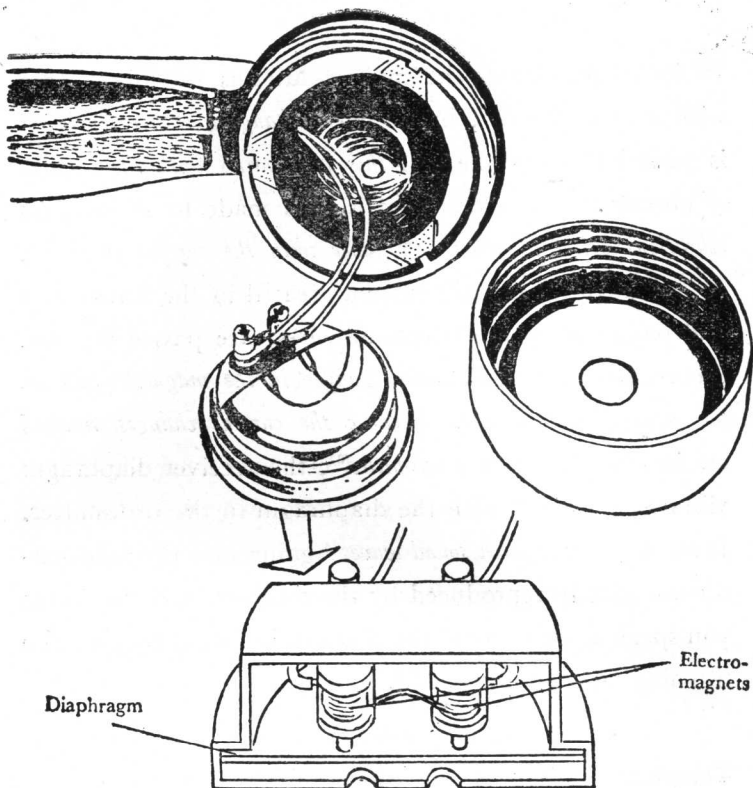
## The Receiver

*The rapid changes in the flow of electric current produced in the transmitter are sent along a pair of wires to the receiver of the telephone to which you are connected.*<sup>53</sup>

*The receiver is a metal diaphragm tightly held around its circumference and fitted close to, but not actually touching, the two poles of a strong magnet*<sup>54</sup>. *A coil, consisting of a large number of turns of fine copper wire, is wound round the magnet*<sup>55</sup>.

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49. 在每种情况下, 碳粒以相应的方式起反应. in a corresponding manner 作“以相应的方式”解. 50. 压力的每一变化都产生相似的电流变化. 51. 碳粒压得越紧, 电流就越大; 反之, 碳粒压得越松, 电流就越小. 52. 变化的快慢是根据进入送话器的声音频率而定. 53. 送话器里电流的迅速变化沿着一对电线送往你接通的电话的受话器. 54. 受话器中有一块被紧紧夹住的金属薄膜, 装在靠近一块强磁铁两极的地方, 但又不与之接触. 55. 磁铁上绕着由许多匝细铜丝组成的线圈. a large number: 大量.





In its normal state, the magnet attracts the diaphragm with a *constant pull*<sup>56</sup>, but when a *changing electric current*<sup>57</sup> is passed through the coil *this pull varies with the changes of current*<sup>58</sup>. The diaphragm is thus made to vibrate, *the vibrations being in strict accordance with the current changes*<sup>59</sup>.

Changes of electric current created in the transmitter and passed along the telephone wires, are passed through the receiver coil and *cause changes in the magnetic pull on the receiver diaphragm*<sup>60</sup>. *Because the current changes received are identical with those transmitted*<sup>61</sup>, the receiver diaphragm vibrates *in unison*<sup>62</sup> with the diaphragm in the transmitter. *In this way*<sup>63</sup> *the speech sound waves*<sup>64</sup> going into the transmitter are exactly reproduced by the receiver, and the words you speak at one end of the line can be heard by someone listening at the other end.

## Telephone exchanges

*So far*<sup>65</sup>, we have considered a simple system in which two telephones are connected by *direct lines*<sup>66</sup> enabling two people to speak to one another. But, of course, a

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56. 持续的吸力. 57. 变化的电流. 58. 该吸力随着电流的变化而变化. to vary with...: 随……而变化. 59. 振动精确地按电流的变化进行. 这是带主语的分词独立结构. 作伴随状语. in accordance with...: 按照……. 60. 使磁铁对受话器振动膜的吸力发生变化. 61. 因为收到的电流变化与传来的电流变化是一致的. 62. 与……一致. 63. 这样. 64. 说话的声波. 65. 迄今为止. 66. 直通线路.