Reading

First Headlamps

A

Before electricity, light was tricky business. Flames cast limited light, are vulnerable to winds and weather, and can lead to disaster. Making fire portable and dependable was so difficult that lights on moving vehicles were hardly ever considered.

B

The early trains traveled[1] only during the day. The tracks were too dangerous during the dark of night, and passengers wanted to see where they were traveling anyway. In the late 1830s, railroad traffic became heavy enough for freight trains to delay passenger trains. To avoid these delays, railroads started running freight trains at night. Horatio Allen's 1831 innovation, the "Track Illuminator," was suddenly in demand. It was a pile of pine knots burning in an iron grate that sat in a box of sand on a platform car. The car was pushed ahead of the locomotive. The illuminator did not cast much light, but it warned of the approaching train and was the best technology available.

C

In 1841, some trains used an oil[2] lamp backed by a curved reflector, an improvement, but oil lamps blew out easily in the wind, including the wind generated by the movement of the train. At about the same time, Schenectady and Troy Railroad trains displayed a whale oil lamp positioned between a reflector and a lens about twelve inches high; it threw light up to 100 feet ahead of the train. Although this was an improvement, the braking distance the trains required was more than the 100 feet of track that were illuminated. In 1849, a calcium lamp was developed that threw light 1,000 feet and lasted four hours; however, the only railroad company to use it was Camden and Amboy. Limelights, which were used to light theater[3] stages on both sides of the Atlantic, were considered too intense for trains. Eventually, acetylene, which did not extinguish in the wind, replaced oil in headlamps.

D

In 1851, the first electric headlamp was developed. This headlamp had two major drawbacks: It required its own generator, which did not become portable until the 1890s when steam generators became common, and the delicate parts broke easily as a result of the rough rails over which the trains traveled. Russia ran the first train equipped with

[1]BrE: travelled
[2]BrE: kerosene
[3]BrE: theatre

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a battery-powered electric headlamp. The French first used steam generators to power electric headlamps on trains. In the United States in 1897, George C. Pyle developed an efficient electric headlamp. By 1916, federal law required trains to have electric headlamps.

E

Automobiles, the exciting new mode of transportation[4] at that time, needed headlamps, too. The requirements for car headlamps were more stringent than those for trains: Because roads were even rougher than rails, cars required more rugged parts, and the steam generators had to be smaller than those in trains. Despite these tougher requirements, the Columbia Electric Car was equipped with electric headlamps in 1898.

F

Electric headlamps made travel at all hours and in almost all weather possible, something we take for granted today.

Answer the questions about **First Headlamps**.

Questions 1–8

The reading passage contains six paragraphs, ***A–F***.
Which paragraphs discuss the following information?
Write the correct letter, ***A–F***.

_____ 1. a lamp that used burning wood

_____ 2. lamps rugged enough to use with cars

_____ 3. a lamp that generated its own electricity

_____ 4. the drawbacks of using flames for light

_____ 5. lamps that used reflectors to cast more intense light

_____ 6. the year the first train was equipped with electric headlamps

_____ 7. a reason why acetylene lamps are more efficient than oil lamps

_____ 8. a reason why freight trains traveled at night

[4]BrE: transport

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My Words

Write the words that are new to you. Look them up in the dictionary and write their definitions.

Words	Definitions

Word Families

noun	efficiency	Efficiency is an important quality for any new product.
adjective	efficient	Efficient headlamps made safe travel at night possible.
adverb	efficiently	Candles do not light a room very efficiently.

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noun	generator	If the power lines are down, you can use a gasoline generator to have electricity in your house.
noun	generation	The generation of electricity can cause air pollution.
verb	generate	There are a variety of ways to generate electricity.

noun	illuminator	An illuminator can provide an area with light.
noun	illumination	The illumination of an electric lamp is stronger than that of a candle.
verb	illuminate	In the past, people used candles to illuminate their houses.

noun	innovation	The innovation of electric headlamps made travel much easier.
noun	innovator	Several innovators worked on the development of electric headlamps.
adjective	innovative	The development of electric headlamps was the work of a number of innovative people.

noun	intensity	A locomotive needs a headlamp with high intensity.
verb	intensify	Using a stronger battery will intensify light.
adjective	intense	The light from candles is not very intense.
adverb	intensely	Some materials burn more intensely than others.

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noun	reflector	A reflector on a lamp makes the light more intense.
noun	reflection	You can see your reflection in a mirror.
verb	reflect	A piece of metal can be used to reflect light.
adjective	reflective	If a lamp is coated with reflective material, it will cast a stronger light.

Word Family Practice

Choose the correct word family member from the list below to complete each blank.

Traveling at night was tricky before people had developed headlamps that worked **1**..... . Early **2**..... for use on locomotives included lamps that **3**..... by burning pine knots or whale oil. Some of these lamps used metal as a **4**..... material to **5**..... the light. Later, electric headlamps were developed. The problem with these lamps involved finding a portable way to **6**..... the electricity that they used.

1.	efficiency	efficient	efficiently
2.	innovators	innovations	innovative
3.	illumination	illuminator	illuminated
4.	reflector	reflect	reflective
5.	intensity	intensify	intensely
6.	generation	generators	generate

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Dictionary Skill

Different Meanings
Many words have more than one meaning.

Read the definitions below. Then read the sentences and write the letter of the correct definition for each sentence.

QUESTIONS 1–2

dis-play [dis-PLAY]
A *noun.* a showing, an exhibit
B *verb.* to show or exhibit

_____ 1. The new, more efficient headlamps for use on trains were on *display.*

_____ 2. Everyone was excited to see cars that *displayed* the new electric headlamps.

QUESTIONS 3–4

knot [NOT]
A *noun.* a hard bump in wood
B *verb.* tie something in a certain way

_____ 3. Burning pine *knots* is a way to create light.

_____ 4. If you *knot* your shoelaces well, they won't untie.

Listening

CD 1 Track 8

Listen to the lecture. Choose **FOUR** *letters,* ***A–G.***

Which **FOUR** drawbacks of early train travel does the lecturer mention?

A difficulty traveling at night
B frequent delays
C safety problems
D dirt
E cost of tickets
F uncomfortable rides
G crowded passenger cars

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