



Changing States

When a material is in a liquid state, it will expand or contract depending on how much energy it has. Often, this energy comes from heat. When it expands, it takes up more space, and when it contracts, it takes up less.

Nowadays, you might be used to using thermometers that use digital sensors to detect the temperature of something. However, the very first accurate thermometers relied on liquids and the fact that they could contract or expand.

The first person to make use of this was a man named Daniel Gabriel Fahrenheit. People had realised that liquids expanded and contracted before, but they could never make an instrument accurate enough to make use of this. Fahrenheit was the first scientist to be able to make a glass cylinder with a narrow enough hole.

When this cylinder is filled with a material called mercury, it makes an accurate thermometer. As the mercury heats up, it expands and takes up more space in the tube. When it cools, the opposite happens. Nearly all of the thermometers you might have seen in cartoons, in the garden or perhaps even in a science lesson use the same technology as they did in 1717 CE when Fahrenheit developed the first one.

For some unknown reason, Fahrenheit decided to set his first thermometer up in a strange way. He set it so that water froze when the thermometer was saying it was 32° and boiled when it read 212° . Most scientists thought this was very odd, and a Swedish astronomer called Andreas Celsius came up with a different scale. That is why we now have the Fahrenheit and Celsius scales for temperature. Even Andreas Celsius had to be corrected. He set the boiling point at 0°C and freezing at 100°C , to begin with! Nowadays, only the United States of America and a handful of other countries measure temperatures using Fahrenheit's scale. Everywhere else uses Celsius.



It isn't just the properties of liquids that have helped humans. When water changes from a liquid to a gas, it expands and produces a lot of pressure. Engineers soon realised that this could be used to power things. In a steam engine, water is heated by coal. The water evaporates and produces steam and a lot of pressure. This steam is then directed through pipes towards a piston. The pressure of the steam moves the piston, which moves the engine.

Steam engines were vital for the Industrial Revolution. They helped people in mines and power the steam trains that raced across the country. Without the knowledge that water can be changed from a liquid to a gas, none of that would have been possible.

SUMMARY FOCUS

1. How do mercury thermometers work? Use a diagram to help your explanation if needed.
2. Why was Daniel Fahrenheit important, according to the text? Give two reasons.
3. How did Andreas Celsius's scale change?

VIPERS QUESTIONS

R

Which countries still use the Fahrenheit scale?

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Which liquid is useful for thermometers?

R

What is the Fahrenheit boiling point for water?

V

Which word means something takes up more space?

V

Which word means that something take up less space?