

# INWED 2020

#SHAPE THE WORLD

Spirax-Sarco Engineering plc



**At Spirax-Sarco Engineering plc the future is really important to us. That's why we operate in a sustainable way and populate our Company with a diverse mix of talented individuals with a passion for what they do.**

**We're thrilled to be celebrating International Women in Engineering Day again this year and would like to thank you for celebrating with us by sharing these fun activities with you. Maybe one day you could work with us too – helping to shape the world!**

# What is an engineer?

An engineer is a person who designs and builds products, machines, systems or structures. Engineers want to know how and why things work. There are lots of different types of engineering, such as:

- Electrical engineering 
- Civil engineering 
- Mechanical engineering 
- Environmental engineering 
- Biomedical engineering 
- Chemical engineering 
- Materials engineering 
- Automotive engineering 
- Aeronautical engineering 
- Software engineering 
- And so many more...

There are lots of different skills that help make up a good engineer other than formal qualifications. On the next page you can cut out the pieces to help us build one.

Cut out the pieces below to find what qualities it takes to become an engineer!

Wants to help people

Good at explaining

Open minded

Curious

Creative

Adaptable

Good listener

Friendly

Thoughtful

Asks lots of questions

Likes puzzles

Enjoys finding out new things

Enthusiastic

Organised

Team player

Good at communicating

# What does Spirax-Sarco Engineering plc do?

## Spirax-Sarco Engineering plc

Spirax-Sarco Engineering plc is a global engineering company that serves customers in over 130 countries worldwide. It has three businesses: Steam Specialties (Spirax Sarco and Gestra); Electric Thermal Solutions (Chromalox and Thermocoax) and Watson-Marlow Fluid Technology Group.

## Steam Specialties (Spirax Sarco and Gestra)

For over 100 years Spirax Sarco and Gestra have been producing the world's leading steam systems. These companies design, manufacture and sell products that are used worldwide, from hospitals to hotels to factories. Steam is used for a wide range of purposes such as heating, cooking, cleaning, sterilising, humidifying and producing hot water. Spirax Sarco and Gestra also help customers to make their steam systems as efficient as possible, reducing energy use and lowering their environmental impacts.

## Electric Thermal Solutions (Chromalox and Thermocoax)

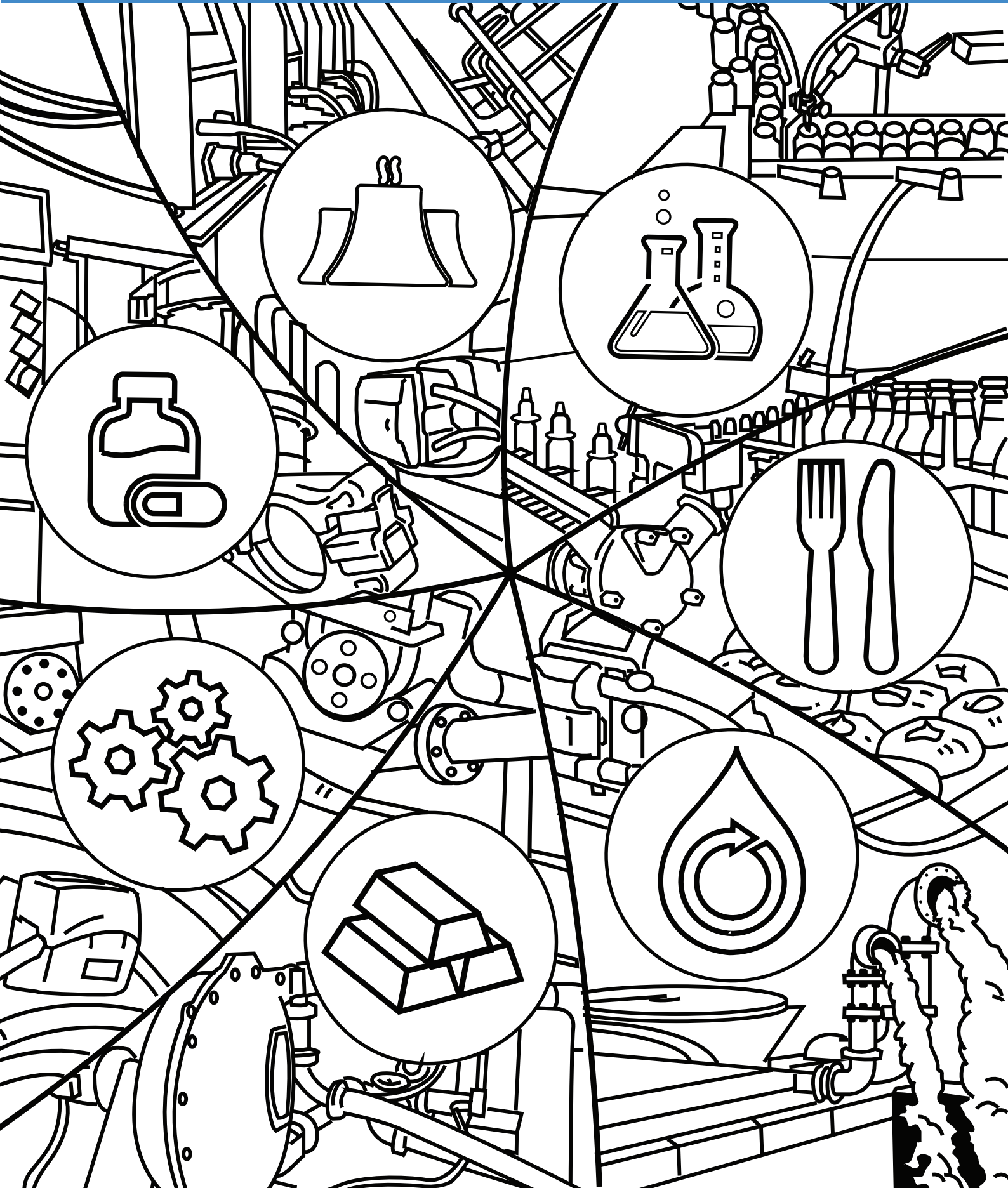
Chromalox and Thermocoax are the two companies that make up the Electric Thermal Solutions business. These companies design, manufacture and sell electrical heating products that are used in many different industries around the world. Chromalox invented electrical heating technology 100 years ago when the company's founder designed the heating element used in the first electric iron. Since then, Chromalox and Thermocoax have led the way in developing new and innovative technologies and even have products that have been to space!

## Watson-Marlow Fluid Technology Group

Watson-Marlow Fluid Technology Group is made up of 10 businesses. Together, they design, manufacture and sell pumps and other products that help to move and control liquids in industries all over the world. Watson-Marlow's products are widely used in the manufacture of medicines, during food production and the treatment of water. From pumping chocolate sauce into ice cream, to dosing soap into car washes, Watson-Marlow's products are used wherever liquids need moving safely and accurately.

# Colour in -

Watson-Marlow makes products that can be used in lots of different industries, from pumping orange juice to dispensing medicines.

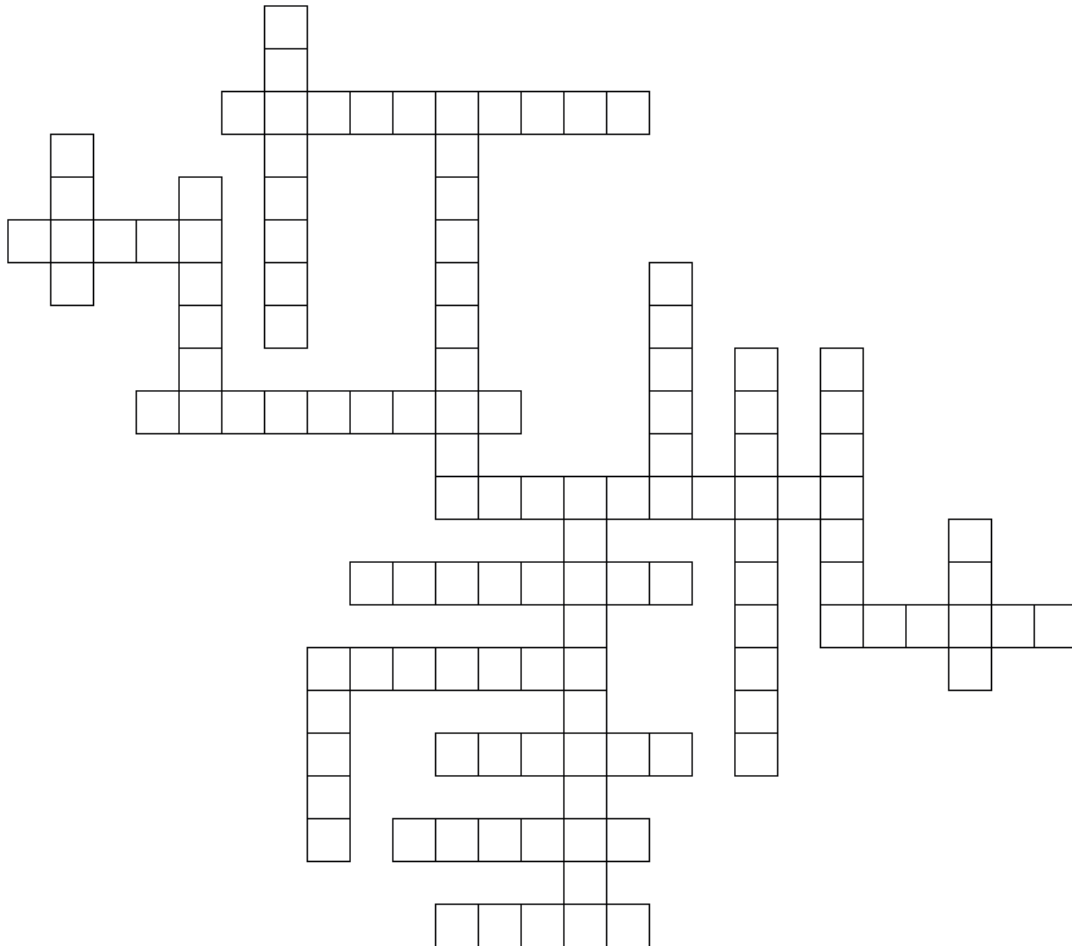


# Electric Thermal solutions wordsearch

V E L E M E N T S E H E A T E R S R S C Q Z P M E  
 A G Z C L N R E V S H S P T C E K N K O Z F S S M  
 O C D V U J Y P W Y X L C R E S I S T A N C E I J  
 H C S V J Q P O A E A D E S I G N W N O I J A U B  
 S T C R Z I T V S C I F P Q Q T I L V S P D V T L  
 V H L Q Y Z Y E Q H J C R N N B Z J J U C J I R O  
 U E N F X N Z H M W B O I G O R H T D M I N M H W  
 C R S L Y X J F T P E F H R O R H V N P T S M C E  
 J M G O D R A K E B E L O M C V Y I V P W F E P R  
 C O K J W L O C J O T R D E Y U C M K X P S R Q S  
 V C Y G U L E P H I O O A X L Z L Q F V I S S S E  
 G O O I C D W O R L V R E T E E A A R P G W I B W  
 E U Y S T A I N L E S S P H U Q C J T B T Z O P P  
 I P C T I M S B Y R E K F N I R R T Q I S Q N Q R  
 A L H R I U I P P G J Y J S I C E F R J O J W H B  
 M E R J N R D I J L I F I D D O O P V I E N P B N  
 L D O N C I F O L J I H B R B N U S E F C Z J M T  
 C K M I O J T C U B R Z Z E H T T U J Y Y I A M C  
 W T A V L L O K S T R I P W N R L V V F J U T Y B  
 Q N L C O Q E N G I N E E R Z O T L X M D D S Y Z  
 I P O M Y L A U G J W P M T E L X K E E R I I R M  
 H T X H P J T D R G Z P Y G B L Z V Y B B B G V W  
 P F K F I W V A M A X I Z O N E B J V C B B B O N  
 T O V Z S Z H A G I I L A A Q R U P F V R W J U F  
 P J M L D Z Y Z C E H E A T T R A C E C W D R V P

Thermocouple	Temperature	Electricity	Circulation
Controller	Stainless	Resistance	Chromalox
Heat Trace	Engineer	Immersion	Maxizone
Heaters	Elements	Incoloy	Voltage
Blowers	Design	Strip	Boiler

# Steam Specialties word fit



## Words to Fit

**4 letters:** trap, heat

**5 letters:** gauge, steam, flash

**6 letters:** expand, gestra, valves,  
boiler, sensor

**7 letters:** spector

**8 letters:** pressure, blowdown, strainer

**9 letters:** ballfloat

**10 letters:** condensate, conduction,  
production

**11 letters:** controllers

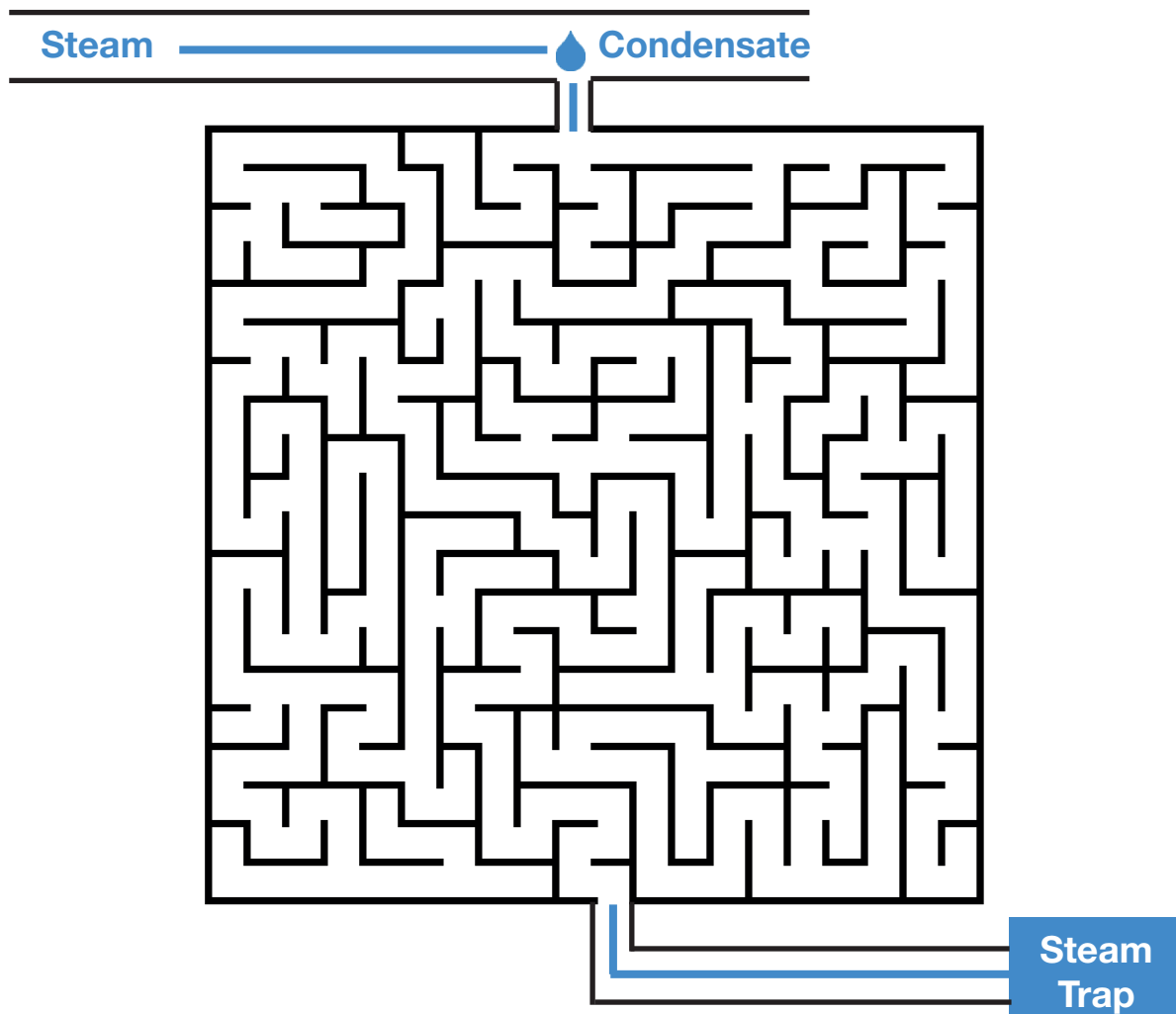


## Can you help the condensate to escape through the steam trap?

In a factory's boiler heat is added to water to make steam, just like in our kettles at home. The heat from steam is then used to make all sorts of products - like food, clothes, car tyres and so much more.

Once the heat has been used, the steam turns back into water. We call this water condensate. We need to get the condensate out of the steam pipes because condensate doesn't have much energy left and so it makes our system less efficient. It can also cause corrosion and noisy pipes. When we remove the condensate, we want to keep the useful steam in the pipes.

So how do we get rid of condensate but keep steam?  
Well, we use a piece of equipment called a Steam Trap!

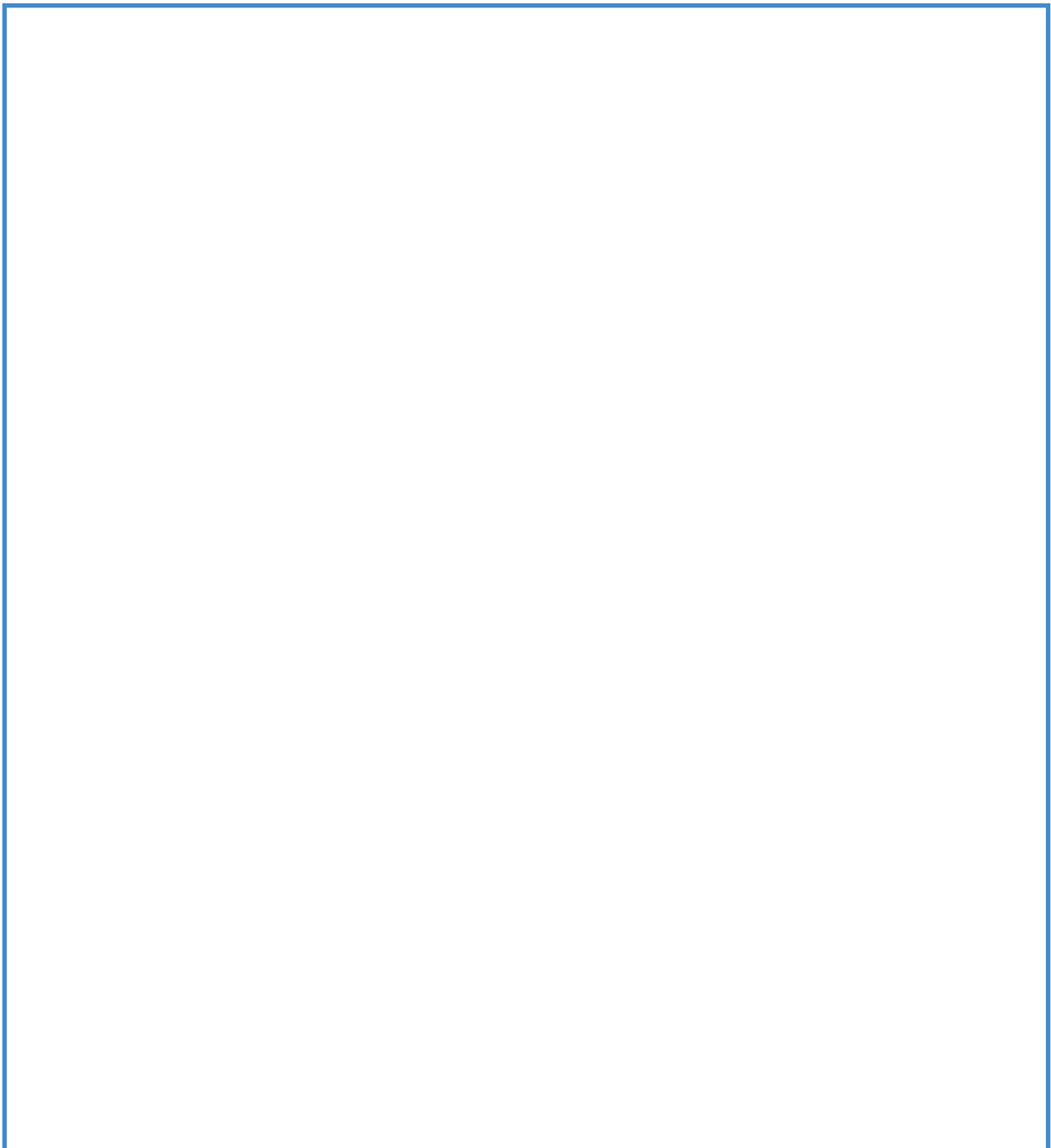


## Design a product to

# SHAPE THE WORLD

### Label your design:

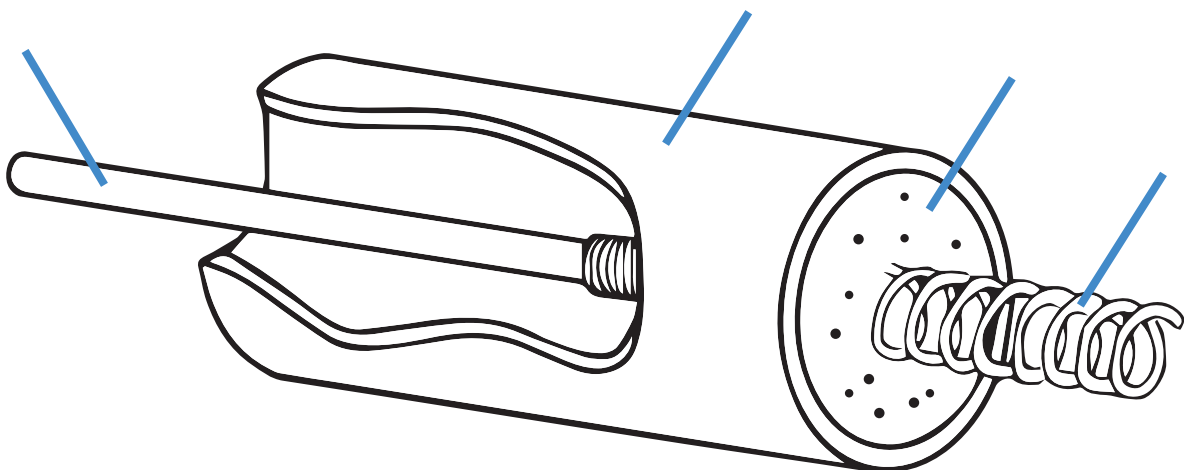
What will it do? How will it be powered? What will it be made of?



## How does a Heating Element work?

Elements are the backbone of electric heating and work by running electricity through a coiled wire inside a metal casing. Heating elements are used to heat air in buildings and can be bent to fit in ovens or dishwashers. You can also find Chromalox elements heating the gaskets of space shuttles or at your favorite glazed donut shop.

Can you label the Heating Element using the words below:



1. Terminal pin
2. Metal covering
3. Insulation powder
4. Resistor wire

**Current (Amps) = Voltage (V) ÷ Resistance (Ohms)**

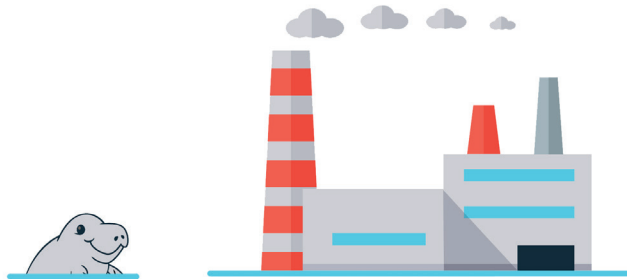
If a heater is rated at 240V and has a resistance of 8 Ohms, can you work out how many amps the heater will draw?

## DID YOU KNOW...?

### Chromalox products help to protect endangered manatees

Manatees are also known as sea cows. They need warm water to survive and so they often spend their winters in the water near power stations as the waste energy keeps the water warm.

In one case, the power station was not running often enough to keep the water warm, so the manatees were getting cold. Luckily Chromalox could put in a heating system to keep the water at the perfect temperature for the manatees to stay happy and healthy.



### Watson-Marlow helps to produce your favourite snacks

Have you ever thought about how to get the jam into jam tarts or the apple into apple pies? Watson-Marlow are experts at transferring lots of different types of food fillings. Their pumps can transfer the flavourings for your favourite flavour of crisps, fill up big tubs of chocolate spread and coat ice creams in an even layer of chocolate.



## Crack the code!

As well as maths and science, computer science is also very important in creating new technology, designing new software and solving complicated problems and equations.

**Ada Lovelace** is known as one of the earliest computer programmers, being the first to publish an algorithm for a computer. What year do you think she did this?

- a. 1781
- b. 1843
- c. 1904
- d. 1937









**Bletchley Park** was a really important place during World War 2. What was the main role of Bletchley Park during this time?

- a. Strategy
- b. Hospital
- c. Code breaking
- d. Training new soldiers









In the next activity you will have to solve the algorithm to crack the code. This is called cryptography and can be used to send secret messages.

Computers use algorithms for lots of different things to give a sequence of instructions. Below you will find a mixed up algorithm for making a cup of tea.

**Can you sort the steps into the correct order and crack the code to discover the message!**

- Pour water into the mug 
- Add milk to the mug 
- Fill the kettle with water 
- Drink the tea 
- Boil the water in the kettle 
- Remove the teabag 
- Put the teabag in a mug 
- Stir the tea 

Here is the top secret key to help you work out the message.

Shape name								
Corresponding Letter	T	A	S	R	F	E	W	O

## Women in Engineering who have changed the way we live

Can you work out when each of these inventions were first made?

Draw a line from the engineer who created it to the correct date.

1843



**Maria Telkes - 100% Solar Powered House** - Invented the thermoelectric power generator to provide heat for Dover House, a structure she designed with architect Eleanor Raymond.

1914



**Hedy Lamarr - Wireless Technology** - As well as being a famous actress, Hedy was the inventor of Spread Spectrum Technology. This made wireless technology, possible.

1941



**Stephanie Kwolek - Kevlar** - Created the first in a family of exceptionally strong synthetic fibres. The best-known is Kevlar, with around 200 applications it is used in bulletproof vests, boats, aeroplanes and more.

1948



**Nancy Johnson - Ice Cream Maker** - Nancy patented the design for the first hand cranked ice cream maker. It changed society because it was a quick, easy, simple machine and is still used worldwide today.

1965



**Florence Parpart - Electric Refrigerator** - Obtained her second patent for the modern electric fridge. As an experienced entrepreneur, Parpart was highly successful in marketing and selling her refrigerators.

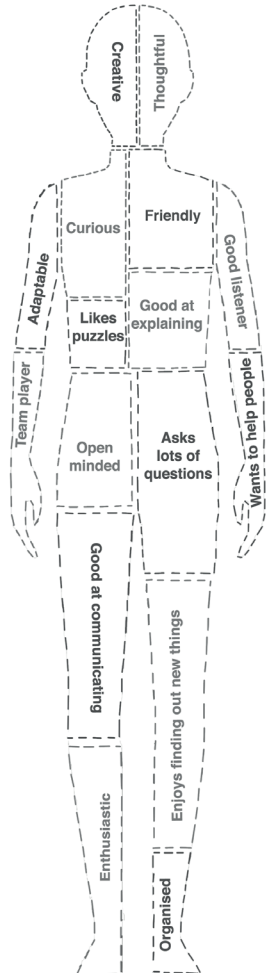
1980s



**Esther Takeuchi - Compact Batteries** - Materials scientist and chemical engineer, invented compact batteries that power implantable cardiac defibrillators (ICDs). Used by millions, they greatly reduce heart attack deaths, delivering life-saving shocks.

# Solutions

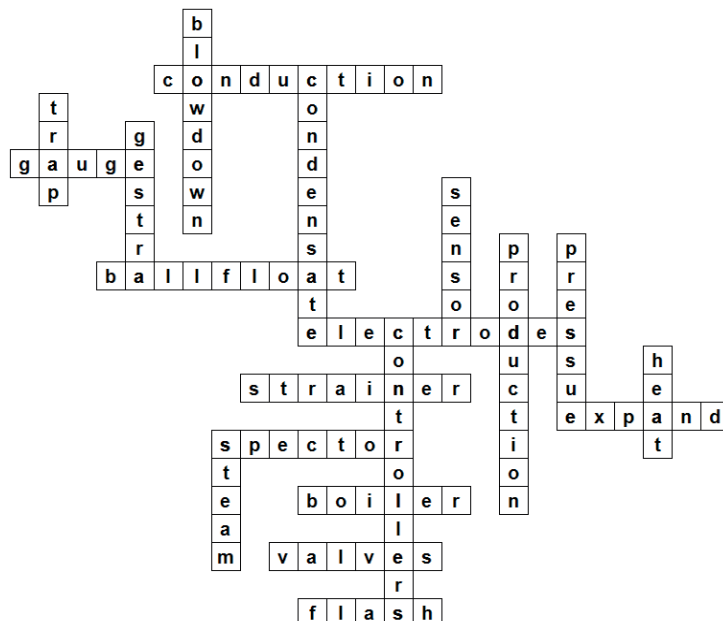
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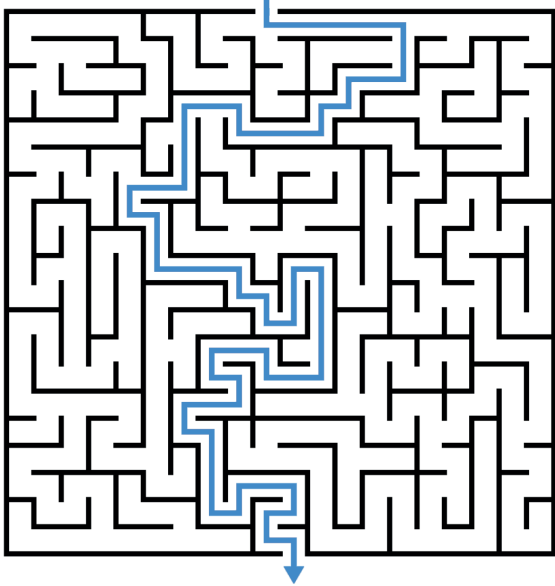


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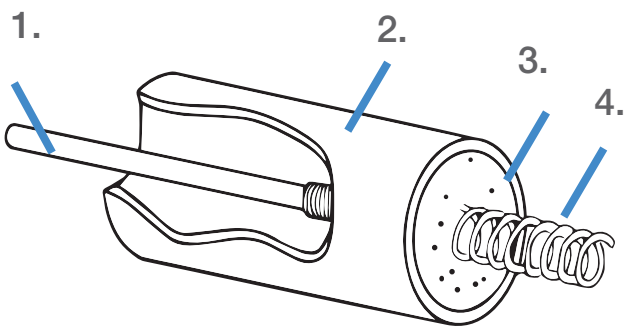




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AMPS = 30

Page 13:

b. 1843 c. Code Breaking

Page 14:

# SOFTWARE

Page 15:

1843



1914



1941



1948



1965



1980s



