



BEULAH HENRY TRADING CARD LESSON AND ACTIVITIES

SUMMARY

Explore the remarkable legacy of Beulah Louise Henry, a trailblazing woman inventor with over 100 inventions and 49 patents. This lesson plan, tailored for grades 3-8, provides engaging activities that cover states of matter, engineering and design, and literacy, and provides a historical lens on women inventors and significant events. Unleash creativity and learning across various subjects with this multifaceted educational resource.

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BEULAH LOUISE HENRY

Trading card lesson



Background

Beulah Henry was a prolific inventor with 49 U.S. patents and over 100 inventions credited to her name. She received her first patent at 25 years old for a vacuum-sealed ice cream freezer. Her numerous inventions included improvements to sewing machines, typewriters, cash registers, umbrellas, dolls, and toys. Henry founded two companies of her own and served as a consultant to many more. The image to the right shows Beulah Henry next to her fan cover invention, which was designed to prevent injury from spinning fan blades.



A New York Times article said, "She can make anything with scissors and a hairpin."

Student activities

- [A USPTO inventor card activity challenge: Animal motion with Beulah Henry](#)
- [Beulah Henry: A pioneer for women inventors](#)
- [Beulah Henry's first patent: Keep it cold](#)
- [Young inventors make it happen!](#)

Grades 3-8: Content and topics

Engineering, science, math, ELA and history

- Design
- Physiology
- Physics
- Chemistry
- Biomechanics
- 19th-20th century history & technology

Engage: A USPTO inventor trading card activity challenge: Animal motion with Beulah Henry

Time: 30 minutes

Background

The engage section of this lesson plan will introduce students to the work of Beulah Louise Henry and her passion for inventing toys. Students select an animal to animate according to the directions in the Beulah Henry U.S. Patent and Trademark Office (USPTO) inventor trading card activity challenge: Animal motion.

Materials

- [A USPTO inventor trading card activity challenge: Animal motion with Beulah Henry](#)
- Paper fasteners

Ancillary materials (included in appendix)

- Animal images on card stock (cut out and punch holes ahead of time for younger students)

Instructions

1. Hand out the student activity sheet.
2. Ask students to draw a line between the animal pictured and the skeleton that matches.
3. Explain that joints are where two bones meet.
4. Project a diagram of one of the skeletons on the whiteboard and circle the joints.
5. Ask students to circle the joints on each skeleton on their student activity sheet.
6. Students will select one of the animals and receive an envelope with appendages and a card stock image of an animal's body.
7. Ask students to use paper fasteners to connect the appendages to the body so that the appendages are moveable.

Student activity handout

- [A USPTO inventor trading card activity challenge: Animal motion with Beulah Henry](#)

Explore: Beulah Henry: A pioneer for women inventors

Time: 40 minutes

Background

The explore section of this lesson plan engages students in learning about significant historical events in the United States during the 19th and 20th centuries, especially those related to women's history.

Students will learn about historical events in the United States during the 19th and 20th centuries by placing descriptions that match images on a timeline provided. Students will then

place the women's historical event cards on the timeline to understand the impact these events have had on women's rights and women's contributions to technology and history. After matching the first two sets of cards with times on the timeline, students will place the Beulah Henry patent cards on the timeline to demonstrate her impact as a pioneer for women in the field of invention.

Materials

- [Journeys of Innovation: "There's a better way of doing that"](#)
- [Beulah Louise Henry trading card](#)

Ancillary materials (included in appendix)

- Large wall-sized timeline (could also be used on an interactive whiteboard)
- Cards with descriptions of significant women's historical events
- Cards with critical historical events
- Cards with patent information for Beulah Henry's inventions

Instructions

1. The teacher presents a women's history timeline.
2. Students receive cards with descriptions of women's historical events.
3. Students place the women's history event cards on the timeline.
4. Students receive cards describing events from Beulah Henry's life and her patents.
5. Students place the Beulah Henry and patent event cards on the timeline.
6. Discuss what students learned with the entire class.

Student activity handout

- [Beulah Henry: A pioneer for women inventors](#)

Explain: Beulah Henry's first patent: Keep it cold

Time: 80 minutes

Background

The explain section of this lesson plan engages students in learning about Beulah Henry's first patent: The "artificial freezer," created to make ice cream. Students explore how Beulah Henry improved on earlier patented technology for freezing ice cream.

Beulah Henry received her first patent at age 25 for an "artificial freezer" that used mechanical means to improve on the previous crank versions of ice cream freezers. Nancy M. Johnson invented the first hand-crank ice cream freezer in 1843, and Beulah Henry's invention improved upon it. In this activity, students will follow directions to make ice cream using a recipe, baggies, ice, salt, and motion. Students will learn about the different states of matter and how particle motion determines the shape and form of three phases. While making their ice cream, they will demonstrate their understanding of freezing and melting.

After following directions for making ice cream, the student will look at various materials the teacher has on display. They will create a new ice cream maker using the available items. Patent diagrams from Nancy M. Johnson and Beulah Henry's ice cream freezer patents will inspire students.

Materials

- Ingredients to make ice cream: Heavy cream, whole milk, sugar, vanilla
- Measuring cups
- Bowl
- Mixing spoon
- Ice
- Rock salt
- Large 1-gallon thick plastic freezer bags
- Medium 1-quart thick plastic freezer bags

Materials for creating a new and improved method for freezing ice cream:

- Empty 1-pint-sized containers
- Large plastic containers with tops that screw on (empty animal cracker plastic jars, for example)
- Other types of containers that close securely
- Duct tape to seal the containers when freezing

Instructions

1. Mix the ingredients in a bowl, following the ice cream recipe.
2. Pour the ice cream mixture into a medium, quart-sized plastic bag and seal.
3. Put the bag of mixture into a second medium, quart-sized bag with the closed end toward the bottom of the second bag. Seal the top. This double bag method is to prevent leakage.
4. Fill a large, gallon-sized plastic bag halfway with ice.
5. Place the doubled quart-sized bags that contain the ice cream mixture into the large gallon-sized bag.
6. Continue to fill the large bag with ice and place $\frac{1}{2}$ -cup of rock salt into the large bag on top of the ice. Close the large gallon-sized plastic bag.
7. Put the large gallon-sized bag into a second large gallon-sized bag with the closed end toward the bottom of the second bag. Seal the top. This is to prevent leakage.
8. Shake, mix, and keep moving the large bag with ice until the ice cream mixture becomes solid.

Instructions for the invention challenge

1. Students have learned about states of matter and how a liquid can be cooled to form a solid.
2. Students will observe the two patent diagrams on the handout and identify features they would like to use in their invention of an ice cream freezer.
3. Using the available materials, students will create a prototype of their invention.
4. Students will create a logo for their ice cream or frozen dessert brand.

5. Students will pitch their invention and brand to an audience.
6. Students will identify the types of intellectual property protection needed for their invention and brand.
7. Students will use the plan of their invention design matrix to create a new ice cream maker.

Student activity handout

- [Beulah Henry's first patent: Keep it cold](#)

Elaborate: Young inventors make it happen!

Time: 80 minutes

Background

The elaborate section of this lesson plan enables students to learn about Beulah Henry's inventive nature as a child, create a face automata, and invent an automata of their own. Beulah Henry created her first invention when she was nine years old. She observed a man trying to tip his hat to a passing woman on the sidewalk while holding his newspaper. Students will create a simple automata of a face with moving eyes and mouth. Students may refer to Beulah Henry's "Eye Structure for Dolls" patent. In addition, they will invent a new automata at the end of the activity. You may want to provide students with drawings from other Beulah Henry patents. You can give older students the abstract, background, and patent drawings, while it may be best to give younger students a few different patent drawings.

Materials

- Internet access
- Pencil and paper
- Safety apparel, equipment, and procedures
- Gears
- Cardboard boxes (small)
- Dowels
- Cardstock
- Tape
- Scissors
- Glue
- Craft materials
- LEGOs or building toys (optional)
- Manufacturing tools (optional)
- Hand tools (optional)
- 3D printers (optional)
- Laser cutters (optional)

Instructions

1. Read the newspaper story at the beginning of the activity.
2. Describe how an automata functions, then have students study Beulah Henry's "[Eye Structure for Dolls](#)" patent.
3. Cut out the templates for the face automata activity for younger students. Place them in envelopes for distribution.
4. Gather patent drawings from Beulah Henry's toy patents or use the ones in the timeline.
5. Links to Beulah Henry's patents:
 - a. [Movable Lip for Toy Figures and Means for Actuating the Same](#)
 - b. [Simulated Dispensing Device](#)
 - c. [Eating Toy Animal](#)
 - d. [Water Sport Apparatus](#)
6. After students have created the face automata, they can work on inventing an automaton from materials available in the classroom. The Exploratorium has a project about creating cardboard automata that may be helpful.

Student activity handout

- o [Young Inventors make it happen!](#)

Evaluate: Discussion

Time: 20 minutes

Lead a discussion or create a journal reflection with students.

Use the following questions to guide student discovery and connections to the inventions of Beulah Henry:

- o What opportunities do women today have that differ from Beulah Henry's era? Describe some of the challenges and successes she had as an inventor.
- o Why do you think newspapers referred to Beulah Henry as "Lady Edison?"
- o What unique ability (considered a disability for some people) did Beulah Henry have that enabled her to become a pioneer woman inventor?

Vocabulary

Skeleton

A supportive structure that may also protect an animal's organs and allow it to move. Skeletons may be on the body's inside (endoskeleton) or outside (exoskeleton).

Appendage

A part of the body of a person or animal that extends out from the middle of the body. For example, an arm, a wing, a leg, or a tail.

States of matter

There are four natural states of matter. Solids hold their shape and form. Liquids take the shape of their container but maintain their volume. Gases fill the container they are in, expanding to take up the space of the container. Plasma is a superheated high-energy gas.

Intellectual property

Creations of the mind that may include but are not limited to inventions and written, artistic, and design works. These may be protected by patents, trademarks, and copyright, or as a trade secret.

Patent

A grant of a property right issued to the inventor by the United States Patent and Trademark Office that confers, for the duration of the patent, the right to exclude others from making, using, offering for sale, or selling the invention in the United States or importing the invention into the United States.

Trademark

A word, name, symbol, or device that is used in trade with goods to indicate the source of the goods and services and to distinguish them from the goods and services of others.

Copyright

A form of protection provided to the authors of "original works of authorship," including literary, dramatic, musical, artistic, and certain other intellectual works, both published and unpublished.

Trade Secret

Information that has either actual or potential independent economic value by not being known to others who cannot legitimately obtain the information. It is subject to reasonable efforts to maintain its secrecy. The formula for the beverage Coke[®] is one example of a trade secret.

Standards alignment

Math, Grades 3-12

Mathematical Practices

- MP.2** Reason abstractly and quantitatively.
- MP.4** Model with mathematics.
- MP.5** Use appropriate tools strategically.

Next Generation Science Standards

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Crosscutting Concepts

Influence of Science, Engineering, and Technology on Society and the Natural World

Disciplinary Core Ideas

Developing Possible Solutions

- 2-PS1-4.** Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
- 3-PS2-1.** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- 3-PS2-2.** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- 4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 5-PS2-1.** Support an argument that the gravitational force exerted by Earth on objects is directed down.
- 5-PS1-3.** Make observations and measurements to identify materials based on their properties.
- MS-PS1-4.** Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- MS-PS2-2.** Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- MS-PS2-4.** Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- 3-5-ETS1-1.** Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.
- 3-5-ETS1-2.** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5-ETS1-3.** Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

English Language Arts Standards

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

W.3.7 Conduct short research projects that build knowledge about a topic.

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

National Curriculum Standards For Social Studies

Theme: Time, Continuity, and Change

Studying the past makes it possible for us to understand the human story across time.

Knowledge and understanding of the past enable us to analyze the causes and consequences of events and developments and to place these in the context of the institutions, values, and beliefs of the periods in which they took place.

A USPTO inventor trading card activity challenge: Animal motion with Beulah Henry

Beulah Louise Henry

Self-taught inventor and entrepreneur

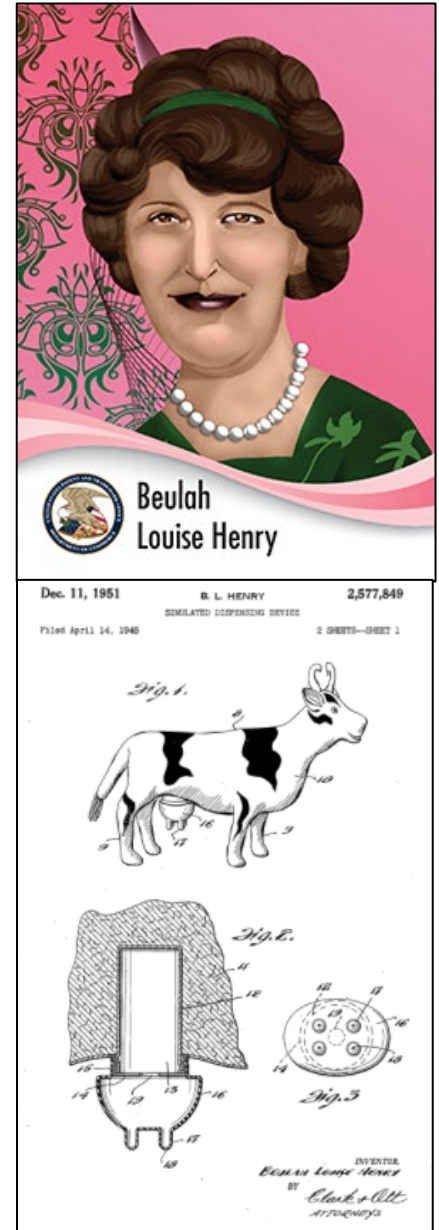
Born: September 28, 1887, in Raleigh, North Carolina

Background

Beulah Henry was a prolific inventor with 49 U.S. patents and over 100 inventions credited to her name. At the age of 25, she received her first patent for a vacuum-sealed ice cream freezer. Her numerous inventions included improvements to sewing machines, typewriters, cash registers, umbrellas, dolls, and toys. Beulah founded two companies and was a consultant to many more.

Beulah's family was known for their involvement in the arts. At age 9, Beulah invented a way to keep a person's hands free while reading a newspaper. In 1920, she traveled to New York City to demonstrate her replaceable parasol cover invention, which she created to match the user's outfit. Lord and Taylor paid Beulah \$50,000 for her invention, and displayed her parasols in their front display window. Of all her inventions, Beulah's favorite was the "Milka-Moo," a plush toy cow that children could milk by pulling on the rubber udders.

Beulah had no formal engineering training but stated that she could "visualize" her inventions. She attributed her ability to create mechanical inventions to this "inner vision" that caused her to see color and shape for musical scale notes. It has since been surmised that she had synesthesia, a condition in which sound is perceived as color or taste as touch.

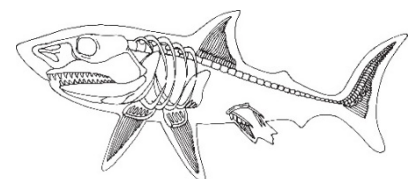
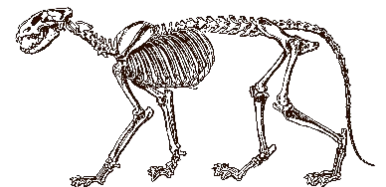
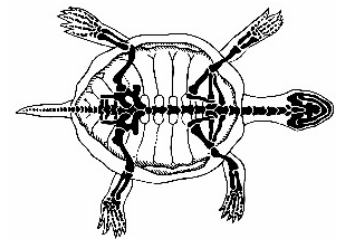
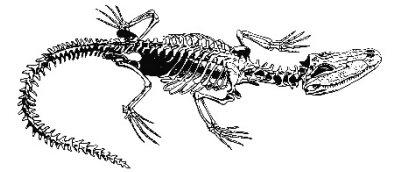
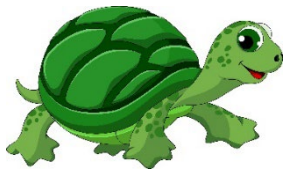


Activity

Can you invent a paper animal that moves?

Directions

Draw a line to match the animal with the correct skeletal system.



Directions for creating a movable paper animal

1. Select a paper animal cut-out.
2. What type of skeleton does your animal have?
 - Internal skeleton
 - External skeleton
 - Skeleton made of cartilage
3. Circle the joints on the skeletal system picture that allow movement.
4. Cut out the animal and its appendages.
5. Punch a hole in the dots on the animal and the origin appendages.
6. Use paper fasteners to connect the places where the animal can move.
7. Use materials available to control the movement of the animal (string, dowels, cardboard).
8. An example of an animal cutout is shown below.



What is intellectual property (IP)?

Intellectual property (IP) refers to creations of the mind, such as inventions, artistic works, designs, symbols, names, and images used in commerce.

What ideas for an invention, product, or service do you have?

How could you express your intellectual property so that it is protected?

Beulah Henry was an inventor and innovator. You are one, too!

Inventors are problem solvers. If you have ever solved a problem or thought of a

new way to accomplish a task, you are an inventor!

When you made this activity your own, you were an inventor! One day, you could invent something new that could benefit society.

What will you invent?

What is a patent?

A patent is a property right granted by the government that allows an inventor to stop others from making, using, or selling their invention for a certain amount of time. This right allows the inventor to develop their inventions further to benefit society. Patents also allow the public to learn how an invention works so that others can learn from it and develop ways to improve it.

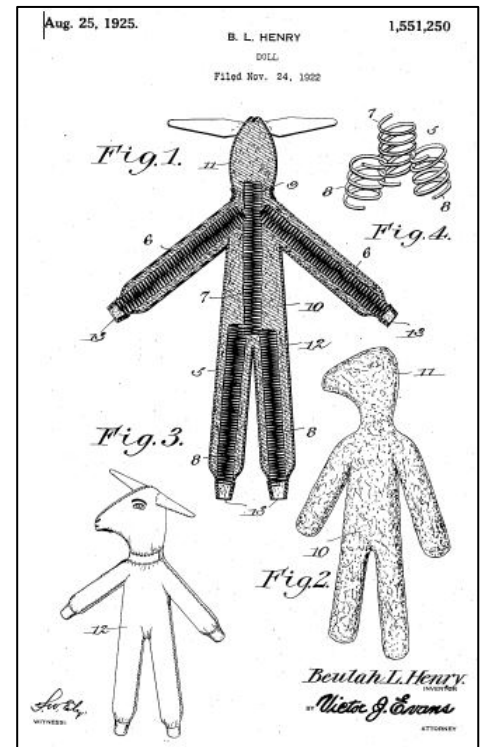
Do you have an idea for an invention that could be patented?

Design your trademark

Trademarks help us distinguish between the source of products or services.

Trademarks are source identifiers! They can be words, designs, or a combination of such, but trademarks may also take other forms, such as sounds, scents, shapes, and colors if they distinguish a product or service source. Think of a design, name, or symbol you would use to help the world identify and distinguish the brand of your invention. Make sure that it is unique and not confusingly similar to other trademarks.

How will you create a trademark that will distinguish your invention or product?



Patent for a doll that is designed of materials that will give it lifelike animation and springiness.

Beulah Henry: A pioneer for women inventors

Background

Women have been inventing for many years, but before 1970, many female inventors were not recognized. By 1850, only 32 patents were issued to women. From 1855 to 1865, women received ten patents yearly, while men received 3,767. This may have been because women at this time didn't have the right to own property. Beulah Henry was born in 1887 and earned 49 patents in her lifetime. She was a role model for other women inventors and paved the way for women inventors to patent and receive credit for their work. In this activity, you will match events in Beulah Henry's life with a timeline in women's history.

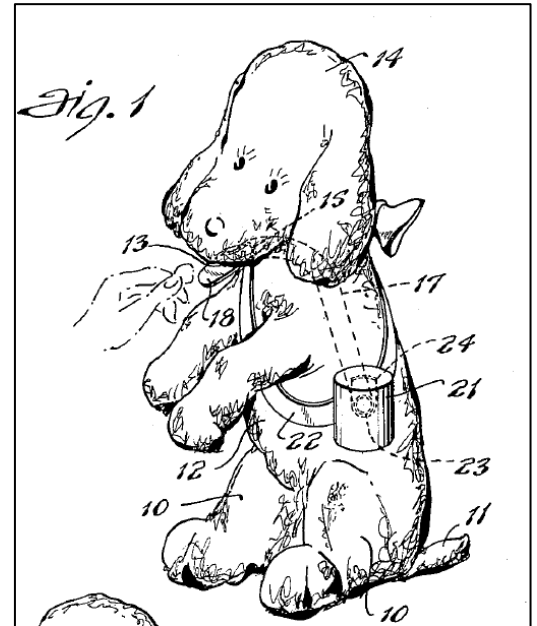
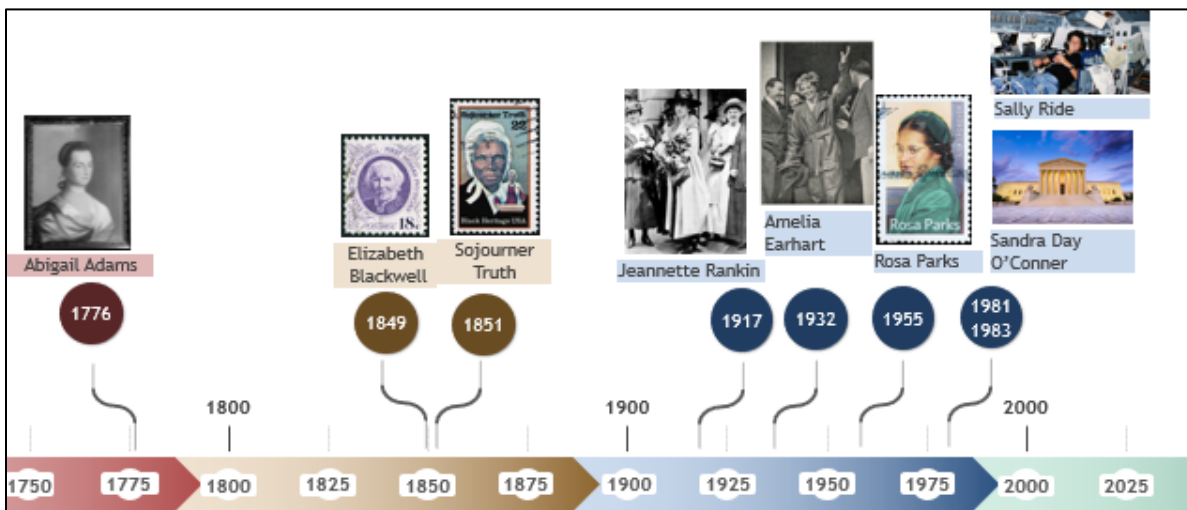


Figure 1 is a patent drawing for Beulah Henry's invention for an Eating toy animal, constructed to receive food through the mouth.

Directions

1. Your teacher will present a women's history timeline.
2. You will receive cards with descriptions of women's historical events.
3. Place the women's history event cards on the timeline.
4. You will receive cards describing events from Beulah Henry's life and her patents.
5. Place the Beulah Henry and patent event cards on the timeline.
6. Discuss what you learned with your class.



Questions

1. Beulah Henry was 9 years old when she created her first invention. What historical events took place during the century of her birth?

2. How do you think these events may have impacted Beulah as a young girl?

3. What types of things did Beulah Henry invent? What observations can you make about the women's history timeline and Beulah Henry's inventions and patents?

Beulah Henry's first patent: Keep it cold!

Background

In 1843, Nancy M. Johnson patented an "artificial freezer." It quickly became popular, and delicious ice cream became available to many. Beulah Henry's first patented invention improved on this hand-cranked "artificial freezer." Her patent for an ice cream freezer didn't require people to crank it by hand like earlier models. Making ice cream became much easier and faster with Beulah Henry's invention.



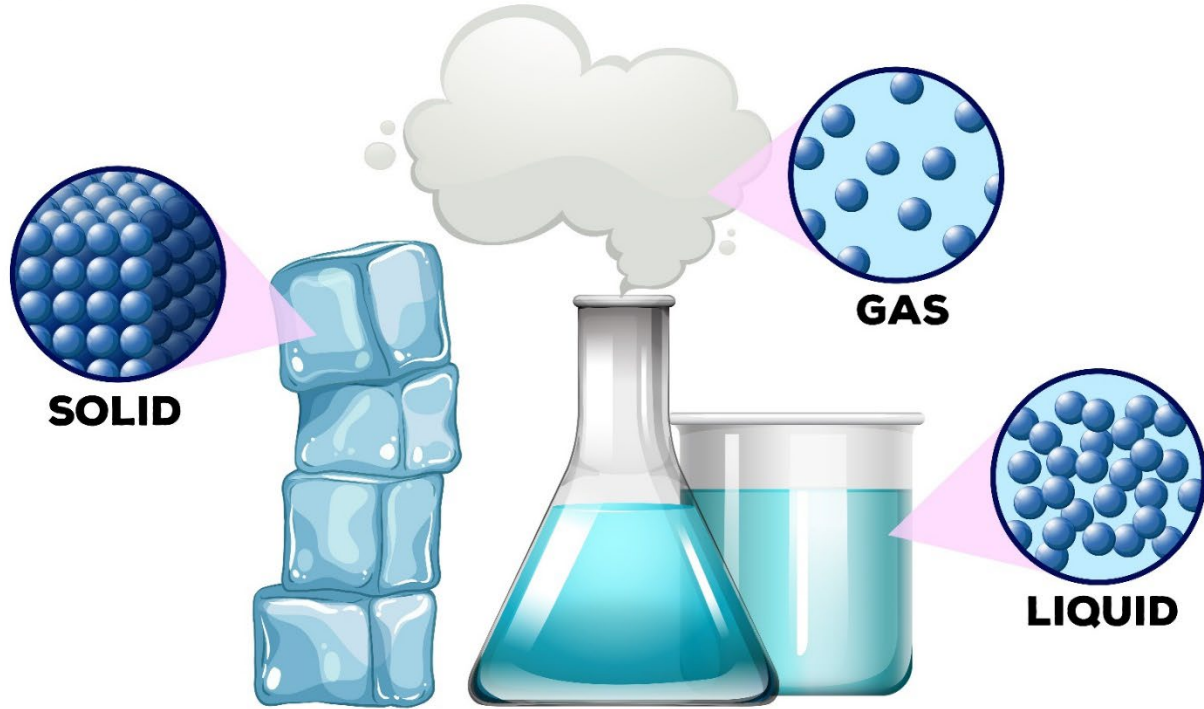
The science behind making ice cream

Making ice cream involves taking a liquid solution of cream, milk, vanilla, and dissolved sugar, and then freezing it to form a solid.



Some things are solid at room temperature, and some are liquid. Three states of matter include liquid, solid, and gas.

STATES OF MATTER



Liquids take the shape of their container.

Solids hold their shape and form.

Gases fill any container they are in and expand to the space.

States of matter change when energy, in the form of heat, is added or taken away.

Freezing happens when a liquid cools, changing it to a solid.

Melting happens when a solid heats, changing it to a liquid.

Directions

Demonstrate a change in the state of matter by making ice cream.

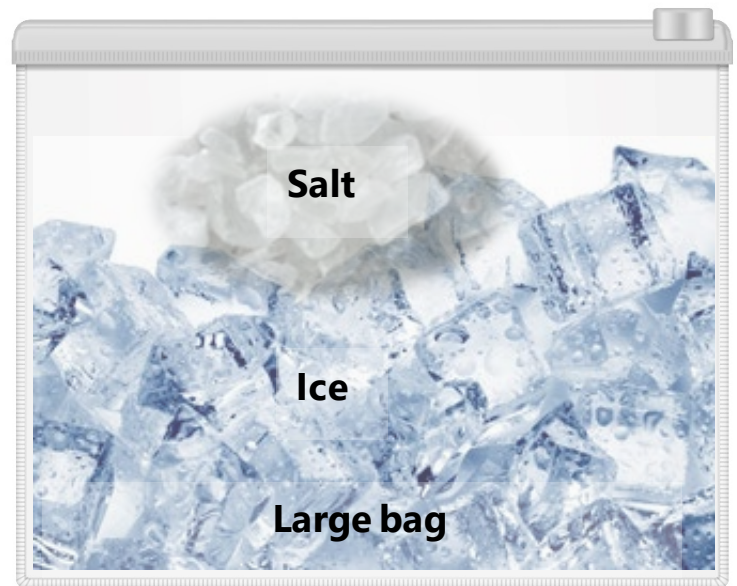
1. Mix the ingredients to make ice cream in a bowl.

1 pint of heavy cream
½ cup whole milk
½ cup of sugar



**Ice cream
mixture**

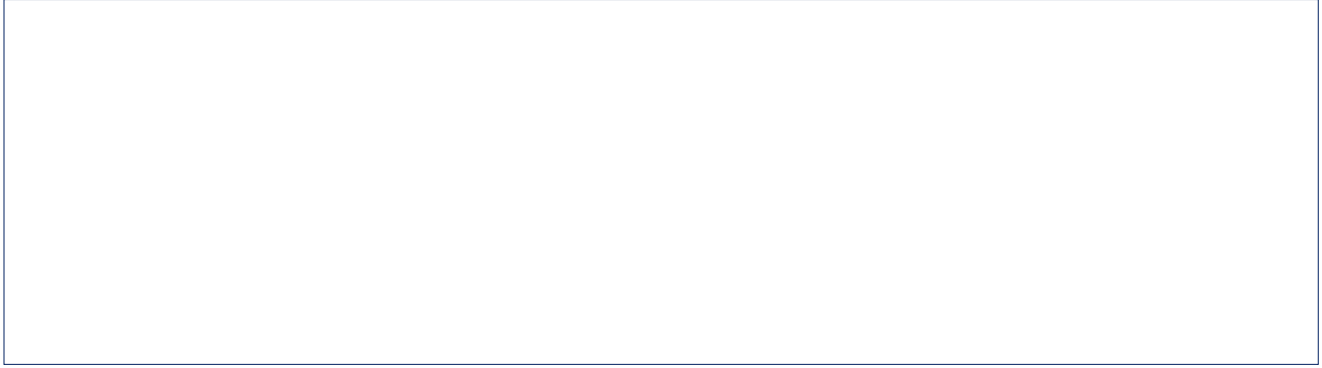
2. Pour the mixture into a medium quart-sized thick plastic bag and seal it.
3. Put the bag into a second medium quart-sized thick plastic bag with the sealed opening end toward the bottom of the bag, and seal it.
4. Fill a large gallon-sized thick plastic bag halfway up with ice.
5. Place the double-bagged ice cream mixture into the large gallon-sized plastic bag with ice.
6. Fill the rest of the large gallon-sized bag with ice and place $\frac{1}{2}$ cup of rock salt onto the ice.
7. Close the large gallon-sized plastic bag and place it into a second large gallon-sized bag. Put the sealed opening toward the bottom of the second large gallon-sized bag.
8. Shake, mix, and keep moving the large bag with ice until the ice cream mixture forms a solid.



Questions

1. What state of matter changed when you made ice cream? (**Hint:** Think about the ice cream mixture and the ice in the large bag.)

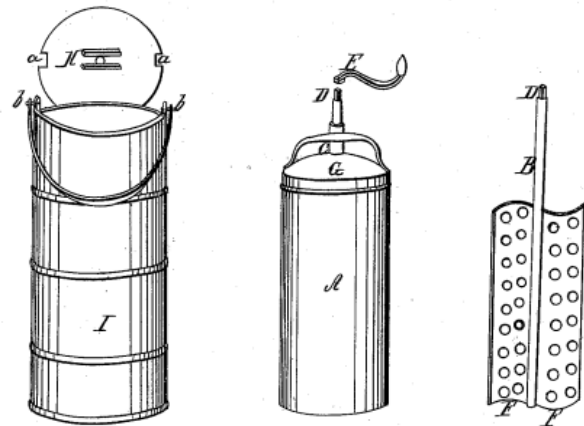
2. Why do you add salt to the ice in the large bag that surrounds the baggie with the ice cream mixture?



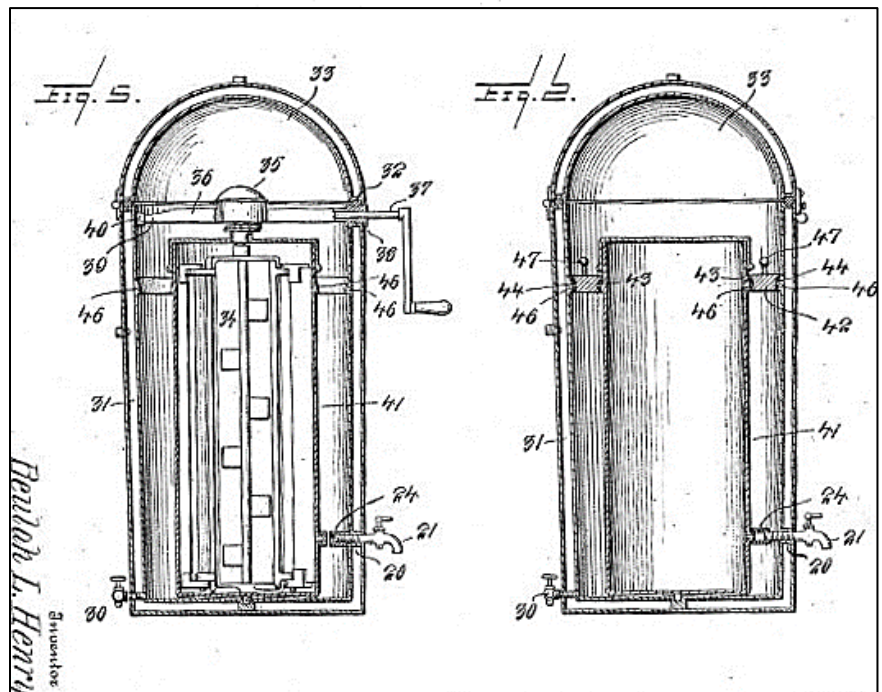
Invention challenge

The picture below shows Nancy M. Johnson’s invention of the first artificial freezer in 1843. (U.S. Patent No. US3254)

To all whom it may concern:
 Be it known that I, NANCY M. JOHNSON, of the city of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in the Art of Producing Artificial Ices, and that the following is a full and exact description of the machinery for carrying into effect the said improvement.

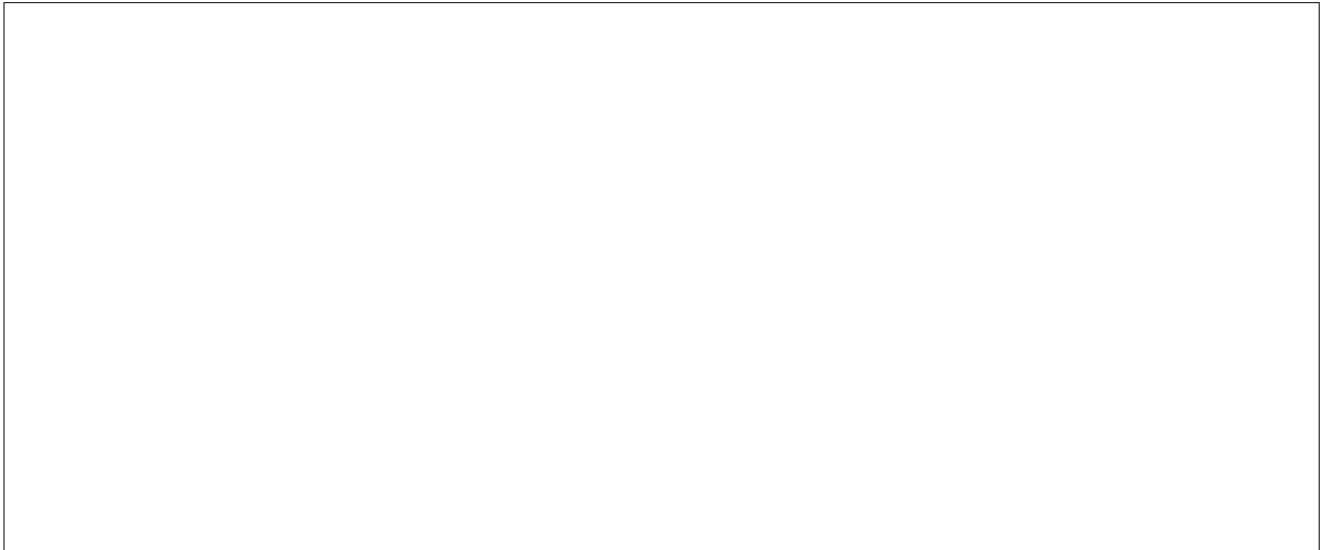


In 1912, Beulah Henry improved on Nancy M. Johnson’s artificial freezer and other inventors’ ice cream freezers. She patented an ice cream freezer that could be operated by a crank or by motor power. (U.S. Patent No. 1,037,762)



Instructions

1. You have learned how a liquid can be cooled to form a solid.
2. Observe the two patent diagrams above and identify features you would like to use to invent an ice cream freezer.



3. Using the available materials, create a prototype of your invention.
4. Create a logo for your ice cream or frozen dessert brand.
5. Pitch your invention and brand to an audience.
6. Identify the types of intellectual property protection you would seek for your invention and brand.

Plan your invention

Design Matrix

Title of invention: What are you trying to claim as yours?

What problem or passion does the invention take care of?

What other inventions exist that are like your invention? Complete an internet image and Google patent search.

Draw a picture of your prototype and label the features.

Create your brand: Name it, draw a logo, and sing a jingle or a tagline.

What intellectual property protection could you seek for your invention? Explain.

Pitch your invention to an audience: Use the design matrix to create your pitch. Include all parts of this matrix in your pitch.

Young inventors make it happen!

"I invent because I cannot help it."

~Beulah Louise Henry~

Background

"I was nine years old when I had the urge to invent something," Miss Henry recalled. "I was sitting on the front porch when a man and woman met in front of our house. The man was reading a newspaper, which he had to fold and place under his arm to tip his hat to the lady."

Beulah was a creative child, and she invented a mechanical gadget that attached around the waist so that a person could tip their hat while holding a newspaper.

"I could see the whole thing quite distinctly—even the color of the blue steel of which it was made."

The News and Observer, Raleigh, N.C., Sunday Morning, June 24, 1955

What will you invent?

Beulah Henry's hat-tipping invention took several parts to work. An automata is a mechanical sculpture that uses simple parts to make things move. Beulah Henry also created dolls with moving eyes and limbs.



At age 9, Beulah Henry invented a hat-tipping device so hands could be free to hold a newspaper.

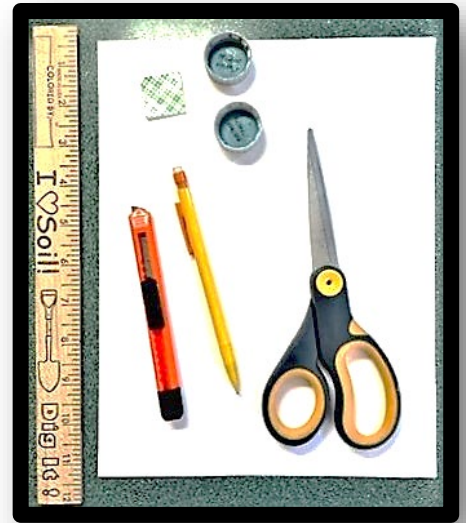


Cardboard Automata from #ESHLearns by Jim Tiffin Jr.

Make a simple face automata

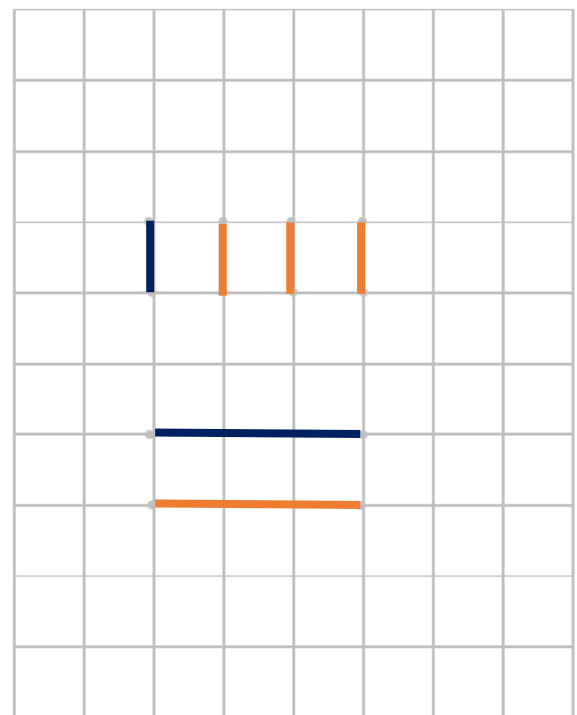
Materials

- The face board
- Two pieces of cardstock cut into two 4-inch by 5-inch squares
- Scissors
- Ruler
- Two bottle caps
- One adhesive square, cut into two smaller squares



Directions

1. Cut out the items on the template on the next page.
2. At the top of the "face automata card," cut four vertical lines $\frac{1}{2}$ inch high. Cut vertical lines between the grey dots on the grid as shown.
3. On the bottom of the "face automata card," cut two horizontal lines $1 \frac{1}{2}$ inch long. As shown below, cut the horizontal lines between the grey dots on the grid.
4. Cut out the eye strip and mouth strip from the template.



Face automata front

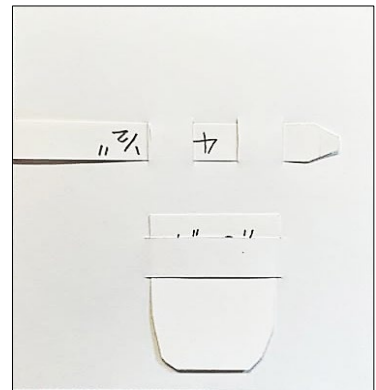


Eye strip

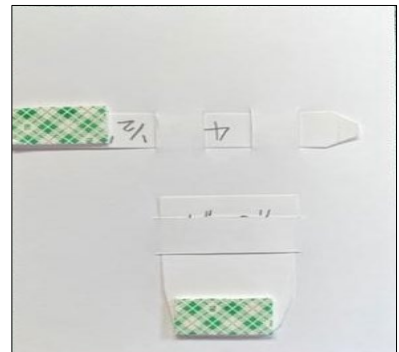


Mouth or tongue

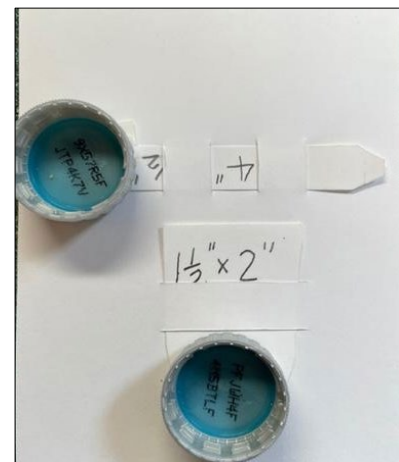
5. Weave the eye strip through the top vertical slits. Weave the mouth between the bottom horizontal strips.



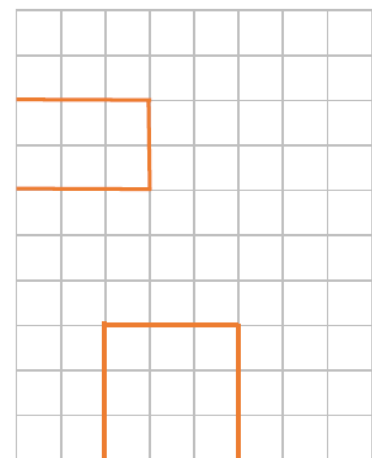
6. Cut a 1-inch by 1-inch square adhesive in half and place each piece on the end of the eye and mouth with tongue strips, as shown to the right.



7. Peel off the back of the adhesive and place the flat side of the bottle caps on top of them so that the bottle caps stick.



8. Cut out the face automata back and cut the sections of the back marked in red. One is for the eye strip, and the other is for the mouth and tongue strip.

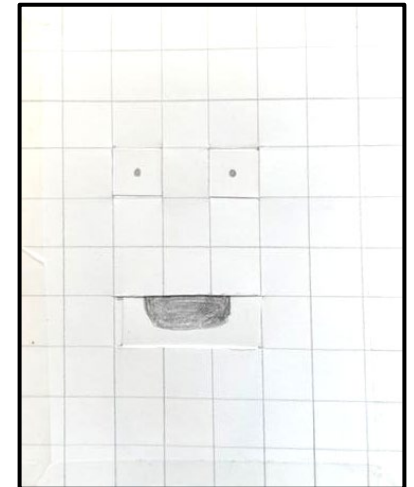


Face automata back

9. Place the back of the face automata onto the front of the face automata side with bottle caps.
10. Adjust the template so the bottle caps slide back and forth.
11. Tape around the edges of the automata.



12. Turn the automata over and draw in the eyes so they disappear when moving the bottle cap back and forth.
13. Draw the mouth so it or a tongue appears when you slide the bottom bottle cap.



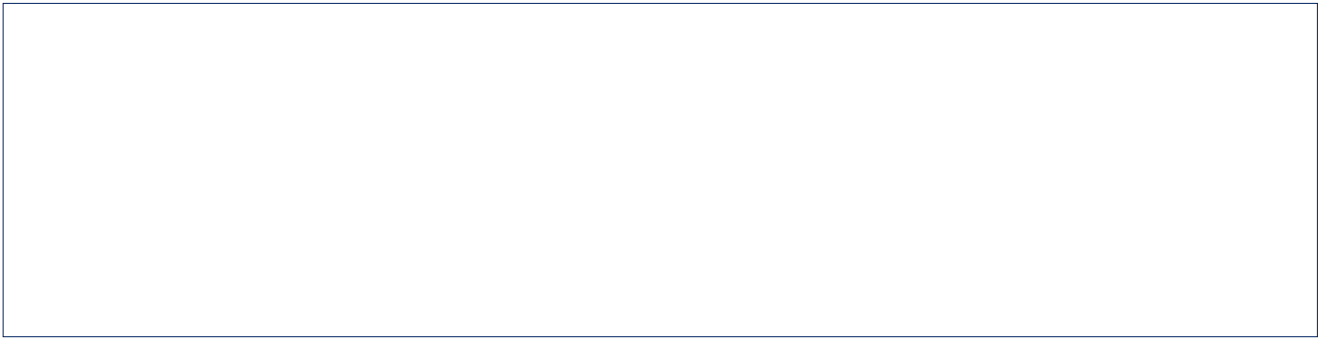
Instructions to create your automata

Use materials provided by your teacher to create your automata. Search the internet for ideas or create one like the face automata you made using specific directions. Use drawings from Beulah Henry's patents for inspiration.

1. What motion would you like to demonstrate with the automata?

2. What materials will be needed to create your automata?

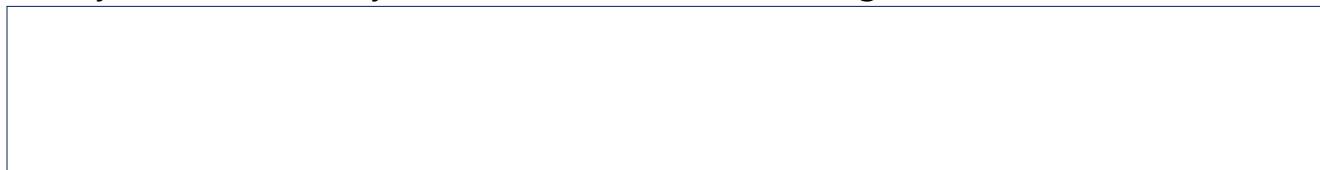
3. Draw a picture of the plan and label the moving parts.



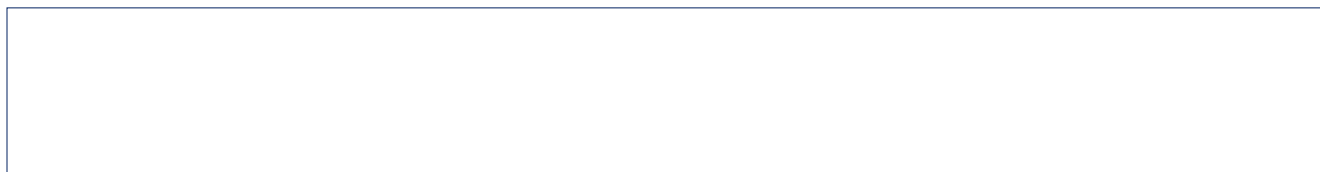
4. Build and revise the automata to make it move.

Questions

1. Beulah Henry was 9 years old when she created her first invention. What skills did you use to build your automata when following directions?



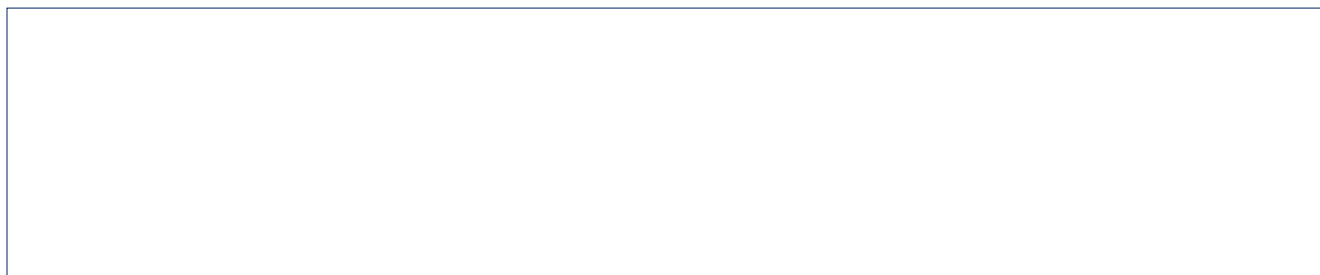
2. What skills did you use to build your automata when creating your own?

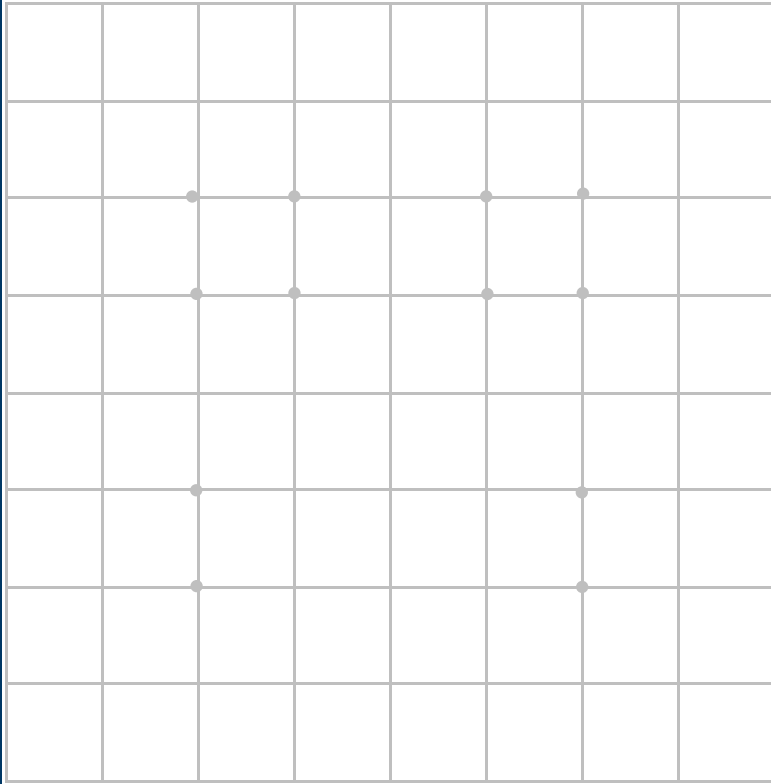


3. Draw or describe changes you made to get your automata to move.

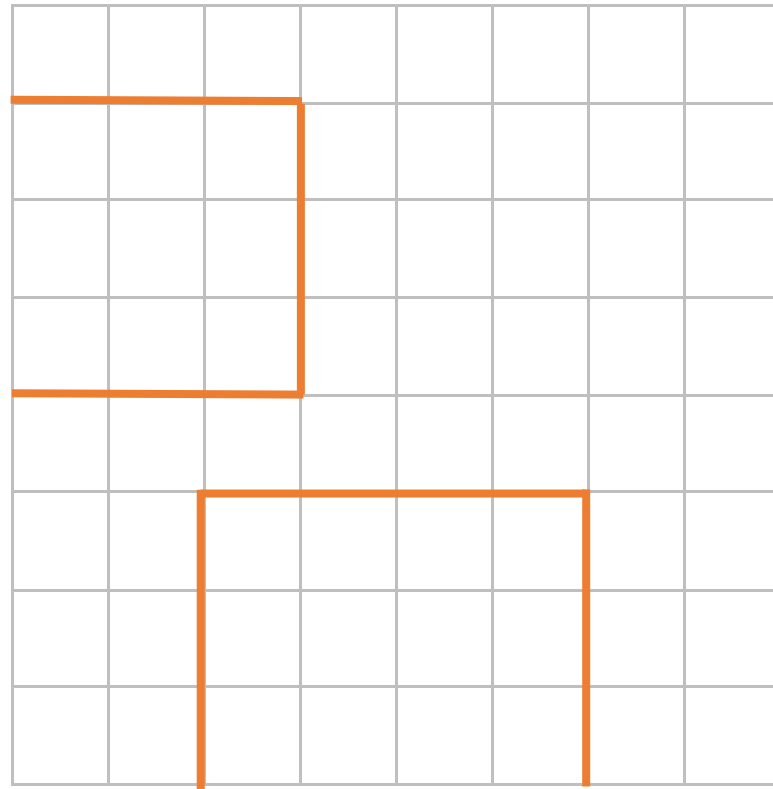


4. Which features did you keep from your original design that worked well?





Face automata back



Face automata front



Eye strip

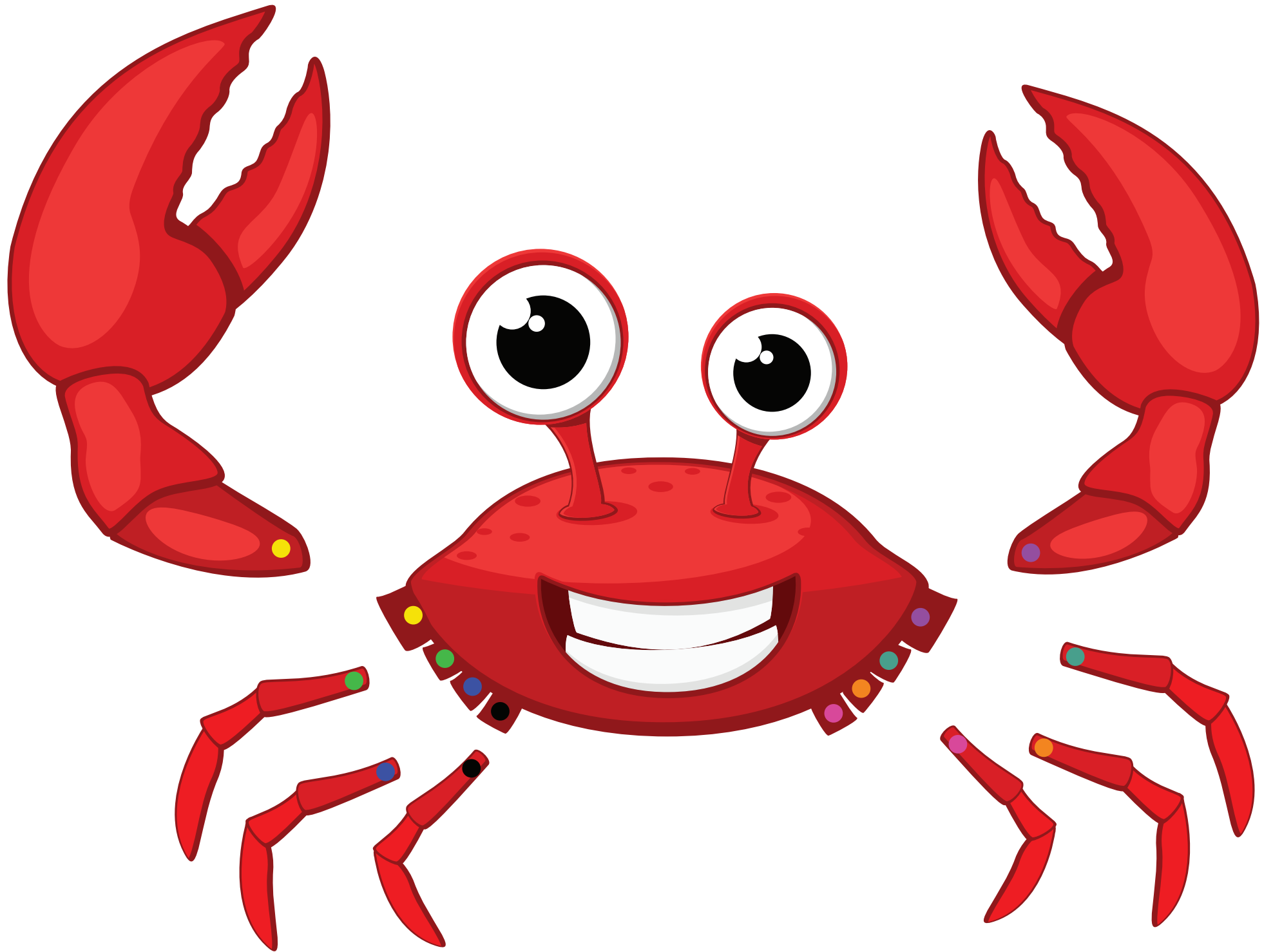


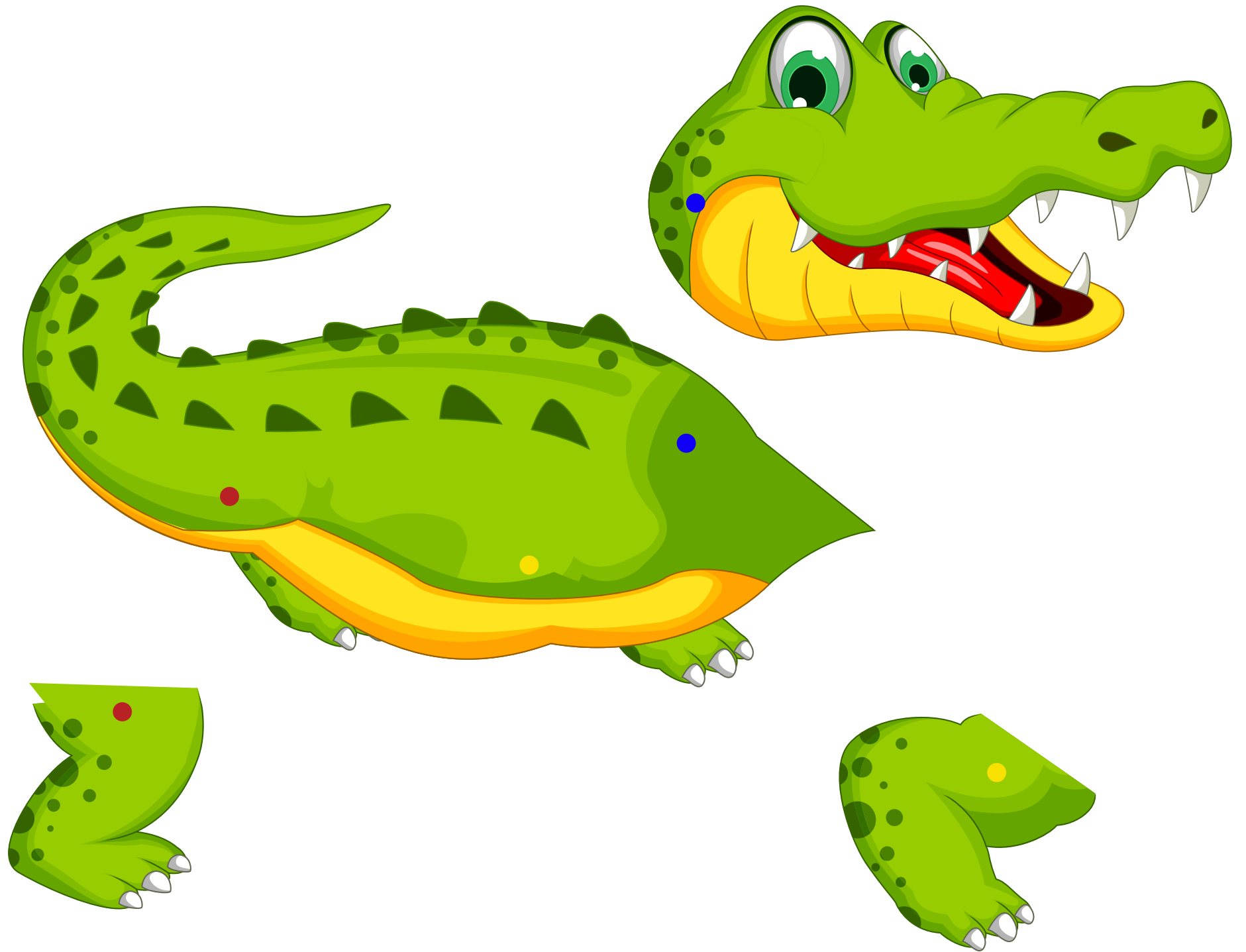
Mouth or tongue

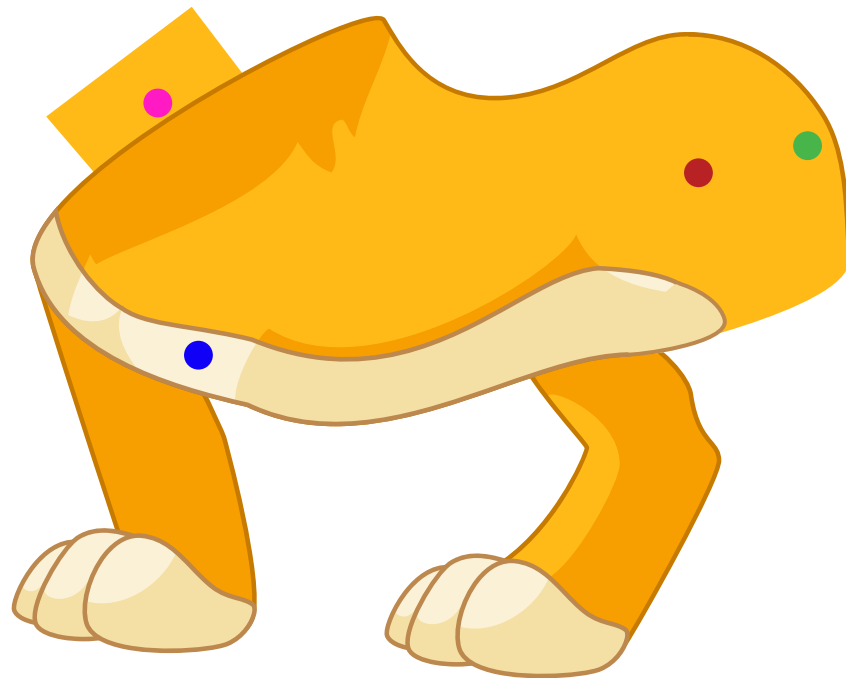
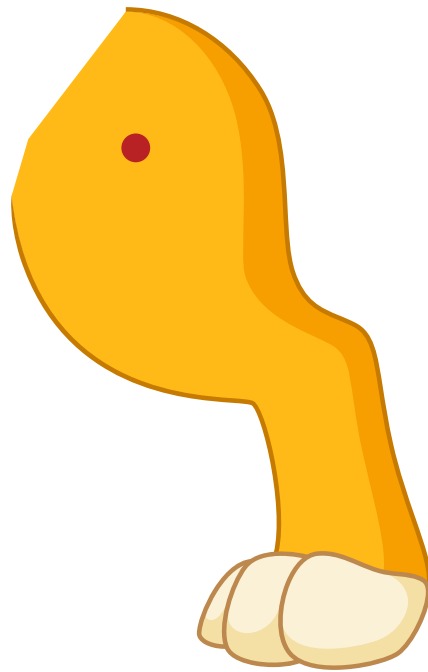
Appendix I

**Ancillary materials for “A USPTO inventor trading card activity challenge:
Animal motion with Beulah Henry”**



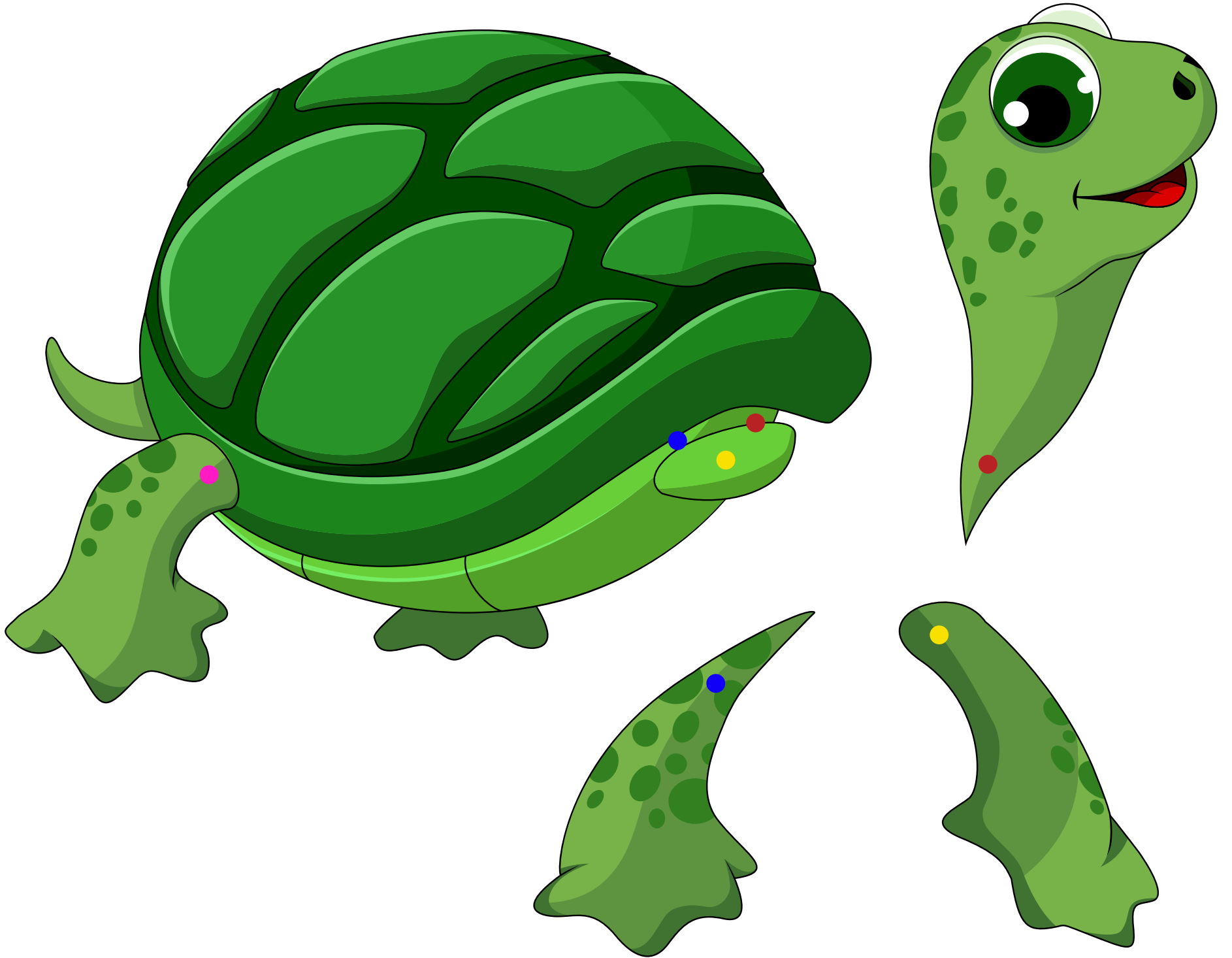












Appendix II

Ancillary materials for “Beulah Henry: A pioneer for women inventors”

18th Century

January 1, 1701 - December 31, 1800

19th Century

January 1, 1801 - December 31, 1900

20th Century

January 1, 1901 - December 31, 2000

21st Century

January 1, 2001 - December 31, 2100



1700



1725



1750



1775





1800

1825



1850

1875



1900

1925



1950

1975

2000

2025



2050



2075

1776

Wife of President Adams. She told her husband to “Remember the ladies” when he was thinking about a government for the American colonies.

1848

300 attendees met in Seneca Falls, NY, to sign the Declaration of Sentiments. Frederick Douglass (former slave and someone who believed in women’s rights) also attended.

1849

The first woman to graduate from medical school.

1851

A former slave who worked to end slavery. She delivered a famous speech, “Ain’t I a Woman” at the Women’s Rights Convention in Akron, Ohio.

1870

“The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.”

1917

She belonged to the National Woman Suffrage Association, a group that worked to allow women to vote. She was the first woman elected to the House of Representatives.

1932

First woman pilot to fly a plane across the Atlantic Ocean.

1920

“The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of sex.”

1955

This woman wouldn't give up her seat to a white man in the front of a Montgomery, Alabama, bus. She helped start the Civil Rights Movement.

1981

First woman to serve on the U.S. Supreme Court.

1983

First woman in space, flying on the Shuttle Challenger.

1941-1945

Women worked in factories during WWII to make ammunition, build ships, and perform other jobs as part of the war effort.

1963

The Equal Pay Act, which prohibited pay discrimination based on sex, was signed in 1963, one year before the Civil Rights Act, which outlawed unfair hiring based on race, religion, national origin, or sex.

1972

“No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance.”

1993

First woman attorney general of the United States.

1997

First woman Secretary of State of the United States.

2007

First woman Speaker of the House of the United States.

2013

This policy change was helped by women's bravery in the war in Iraq and Afghanistan.

2015

First woman to serve as the director of the U.S. Patent and Trademark Office.

2021

First woman and woman of color Vice President of the United States.

2022

Black women were inducted into the National Inventors Hall of Fame for the first time.

1776

Abigail Adams



1848

First Women's Rights Convention



1849

Elizabeth Blackwell



1851

Sojourner Truth



1870

15th Constitutional Amendment



1917

Jeannette Rankin



1920

19th Constitutional
Amendment



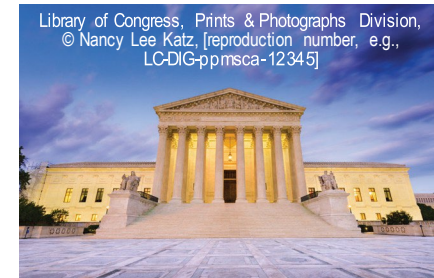
1932

Amelia Earhart



1981

Sandra Day O'Connor



1983

Sally Ride



1941-1945

Rosie the Riveter



1963

Equal Pay Act



1972

Title IX of the Education
Amendments



1993

Janet Reno



1997

Madeleine Korbelt Albright



2007

Nancy Pelosi



2013

U.S. military
allows women to
serve in combat
positions



2015

Michelle K. Lee



2021

Kamala Harris



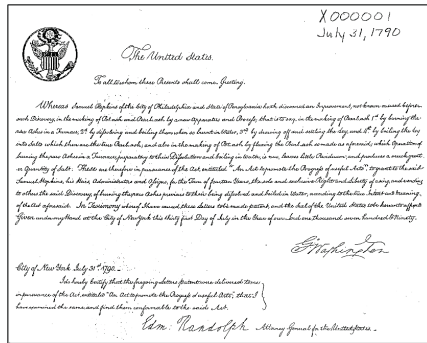
2022

Engineer Marian Croak
and ophthalmologist
Patricia Bath



1790

One year after the Constitution of the United States was signed, the "Patent Act of 1790" was passed into law. The Patent Act gave the owner the right to own, use or sell the new and useful invention.



The first patent was granted to Samuel Hopkins for "Making Pot and Pearl Ashes."

1809

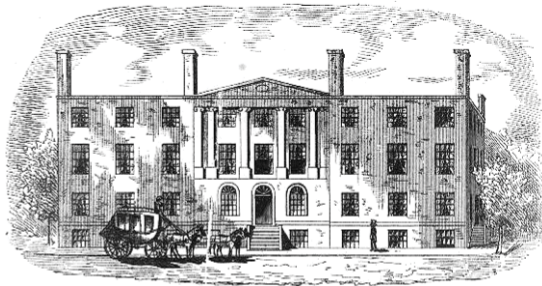
In 1809, Mary Kies became the first woman to receive a patent for her method of weaving straw and silk, which was used to make straw hats. Between 1790 and 1860 only 75 women owned patents.



CREDIT: Calvert Litho. Co., lithographer. Head-and-Shoulders Image of Brunette Woman, Facing Right, Wearing Large Blue Hat, 1892. Prints and Photographs Division, Library of Congress. Call Number POS - TH - STO, no. 11 (C size).

1836

After the first U.S. Patent Office burned down, the Patent Act of 1836 resulted in important changes. Applications for patents had to be approved by a patent examiner before they were granted. Professional patent examiners were hired, and a library of patents, called prior art, was created. Patent examiners could check the library to make sure that no one else had been granted a patent for the applications they were examining.



1876

By 1876, 1,000 women owned patents. What helped this happen? More women were allowed to go to school and more women were working. Many men were fighting in the Civil War (1861-1865). During the war, there was a greater need for invention.



1876

In 1876, at the Centennial International Exposition in Philadelphia, a woman's pavilion was devoted to the industrial and artistic pursuits of women. Over 80 patented inventions created by women were exhibited.



1883

Matilda Joslyn Gage declared the dilemma that women inventors faced. Women had no right to the work they created and couldn't sue anyone who stole their inventions. If a woman married, her husband could patent her invention in his name and benefit from her invention. Gage wrote "Woman as Inventor."



February 11, 1887

Beulah Henry was born in Raleigh, North Carolina. Her mother was Beulah Williamson Holden and her father was Walter Richard Henry. Beulah had a younger brother who was born three years later.

1896

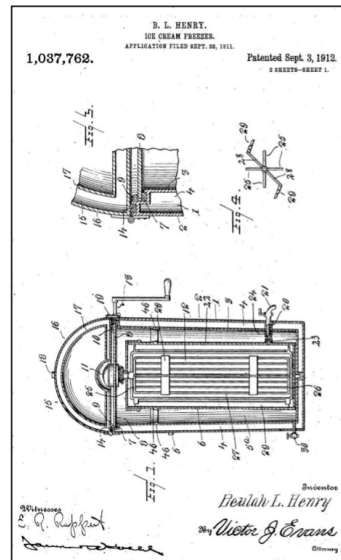
"I was 9 years old when I had the urge to invention something," Miss Henry recalled. "I was sitting on the front porch when a man and woman met in front of our house. The man was reading a newspaper, which he had to fold and place under his arm to tip his hat to the lady." Her childish imagination immediately conceived the idea of a mechanical gadget which, attached to his waist, would enable him to tip his hat while continuing to hold his paper in reading position. "I could see the whole thing quite distinctly—even the color of the blue steel of which it was made," she declared.



The News and Observer, Raleigh, N.C., Sunday Morning, June 24, 1955

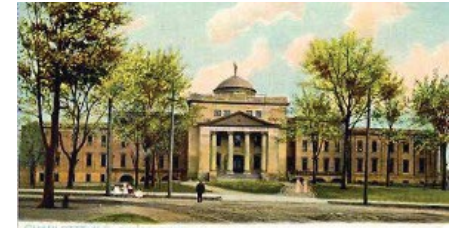
1912

Beulah Henry's first patent for an ice cream freezer. The freezer included a chamber surrounded by an insulating wall which kept the temperature cold enough for rapid freezing. The freezer could also be used as a water cooler.



1909-1912

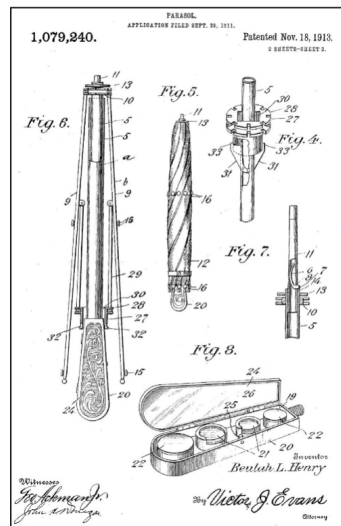
Beulah went to the North Carolina Presbyterian College, or Queens College-Elizabethan College.



Presbyterian College for Women,
now Queens University of Charlotte.
Image courtesy of
The Charlotte - Mecklenburg Story.

1913

Beulah Henry is awarded a patent for a parasol with a top that could be changed to match clothing. A parasol was a type of umbrella used to keep the sun off of people's faces. A parasol was usually fancy and could match an outfit.

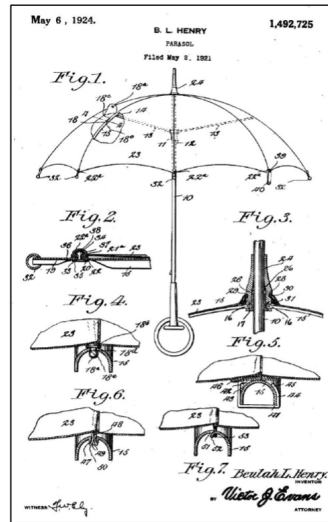


1914

Beulah published her first book, titled "Silent Chords." Now people knew her as an author and inventor.

1920

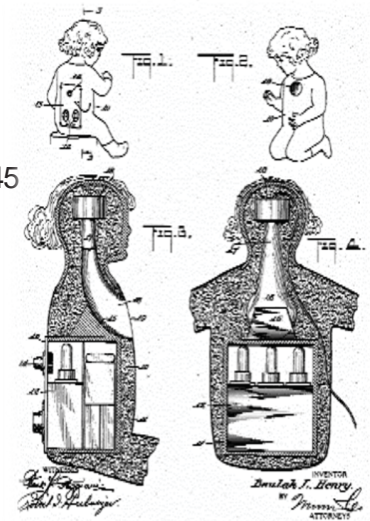
Beulah Henry and her mother moved to NYC and took her invention of an umbrella with snap-on covers that could be changed to match clothes. Many companies turned away her invention as something people wouldn't buy because they didn't think that she would be able to make snaps that would be strong enough. But Beulah invented strong snaps and the invention was a success. She received \$50,000 for her invention and it was sold in many stores.



1925

Radio doll, U.S. Patent No. 1,565,145

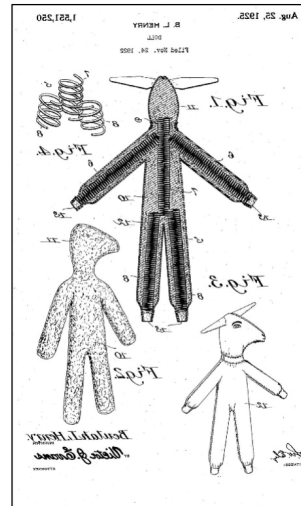
Beulah Henry invented a doll that holds part or all of a radio hidden inside of it and would function as a high-class radio set that could be stored in a room.



1925

Doll, U.S. Patent No. 1,551,250

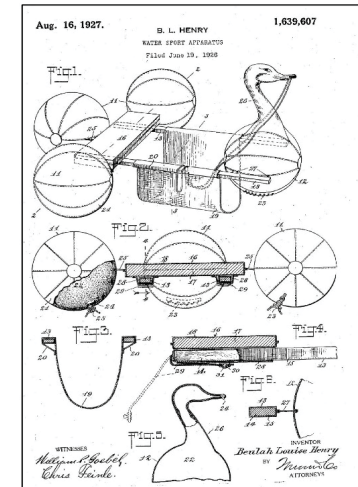
Beulah Henry invented a doll using materials that would give lifelike movements and springiness to its arms, legs, and body.



1927

Water-Sport Apparatus, U.S. Patent No. 1,639,607

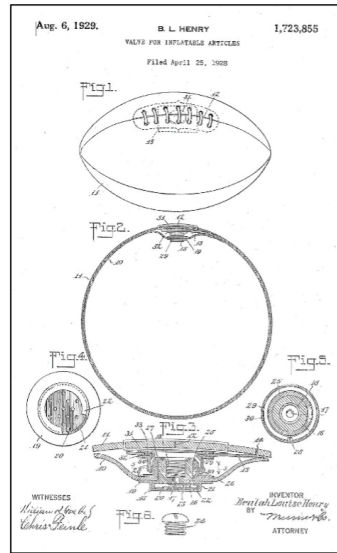
Beulah Henry invented an apparatus for keeping a person afloat while allowing them to sit so that they could use their legs to move the float. The front and rear balls in the patent drawing could be filled with and emptied of air.



1929

Valve for Inflatable Articles
Patent #1723855

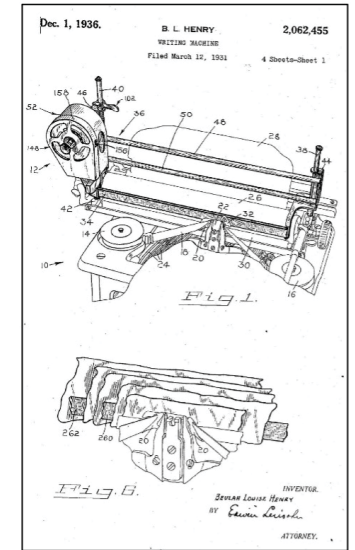
Beulah Henry invented a way to inflate objects through a metal valve that is attached to prevent leaking.



1936

Writing Machine Patent #2062455

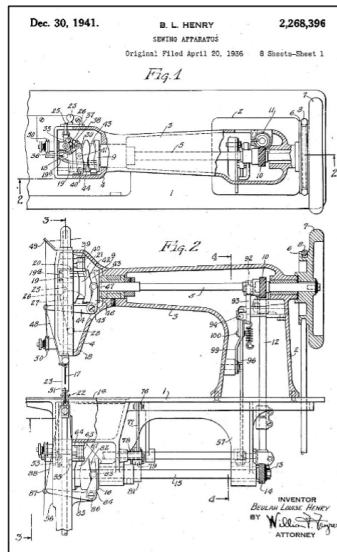
Beulah Henry invented a way to make copies of typewritten items without using carbon paper. When people used to type instead of using a computer, sometimes they needed copies and this method resulted in them being able to make copies with the same ink that was used in the typewriter.



1941

Sewing Apparatus Patent
#2268396

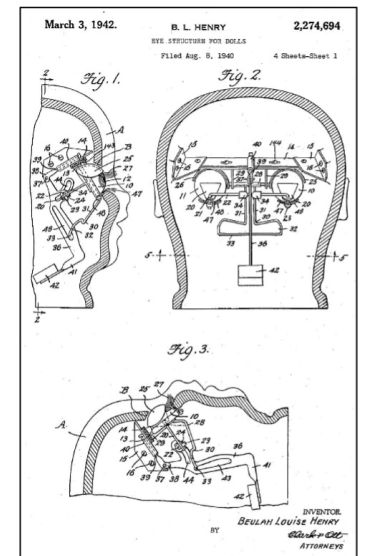
Beulah Henry invented a sewing machine that created a seam that was very strong even though it was made of thin thread. This was an advancement at the time of her invention.



1942

Eye Structure for Dolls Patent
#2274694

Beulah Henry invented the eye structure for dolls to make them appear more life-like in their look and movement. She also improved the doll's eye by using a picture of the iris of a human eye and magnifying it with a lens.



1942-1945

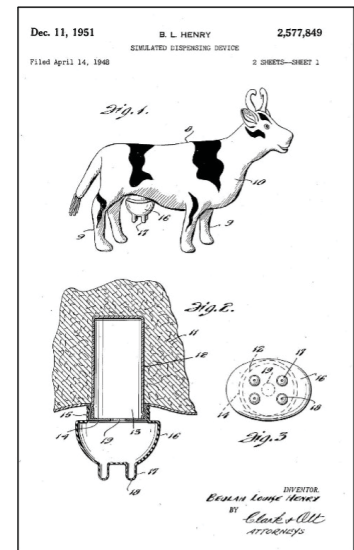
Beulah Henry took time away from inventing to help with the WWII war effort by working in a machine shop.



1951

Simulated Dispensing Device, U.S. Patent No. 2577849

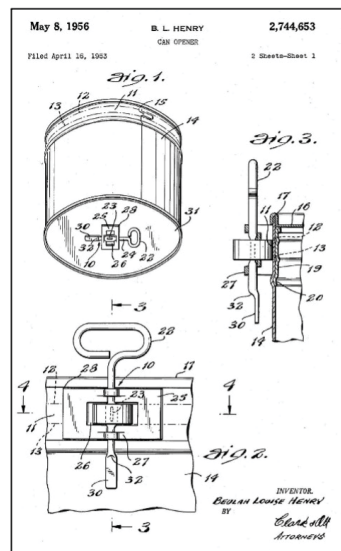
This was Beulah Henry's favorite invention. This invention was intended to provide entertainment for children by simulating the milking of an animal. A container in the animal holds the liquid and releases it when it is "milked."



1956

Can Opener, U.S. Patent No. 2,744,653

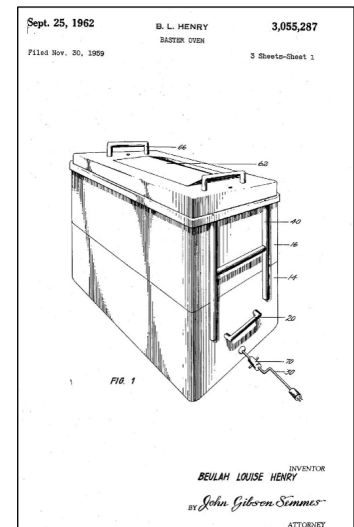
Beulah Henry invented this can opener, which includes a key to rotate a strip around the top of a can and open it. This type of can opener used to be attached to cans for easy opening.



1962

Baster Oven, U.S. Patent No. 3,055,287

Basting meat requires that a cook open the oven door and use a tool to cover meat with liquid juices that gathered in the pan. Beulah's baster oven invention allowed cooks to baste meat without having to open the oven door.



1970

Envelope Construction, U.S.
Patent No. 3,497,132

Beulah Henry invented a chain of envelopes that could be addressed using the typewriter or the addressing machine. The envelopes could then be separated by tearing them apart. This saved time for anyone sending a lot of letters by mail.

