



JOHNS HOPKINS

WHITING SCHOOL
of ENGINEERING

Electromechanical Pinball Machines

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Dogbone of the Week

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What is Pinball?

- Arcade game where players try to score points to win free games
- Steel ball rolls on slanted wooden surface and interacts with elements on the playfield
- Player receives feedback from lights and displays



Basic Layout



Types of Pinball Machine



Pinball "Ancestor"



Electromechanical



Modern/Computerized



Digital

History

- Pre-1940s Pin Tables with Shooting Ball
- 1940s-1970s Electromechanical (EM)
 - First official machine (with flippers) called “Humpty Dumpty” was made in 1947
- 1980s Early Solid State
- 1990s+ Modern Computerized Systems



EM Machines had lots of mechanical components!



EM versus Modern

Electromechanical

- Switch logic to keep track of gameplay and score
- Mechanical rotating score reels
- Bells that chime when scoring points
- Switches to trigger actions
- Solenoids and relays
 - Energized wire coils
- Original theming

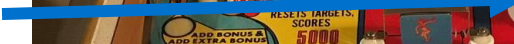
Modern

- Modern machines are computerized which allow for more complicated gameplay
 - More elements
 - Screens and animations
- Microprocessors and circuit boards
- Licensed theming (movies, tv, bands)
- More sloped playfield to speed up gameplay

Targets



Pop Bumpers



Slingshots



Flippers

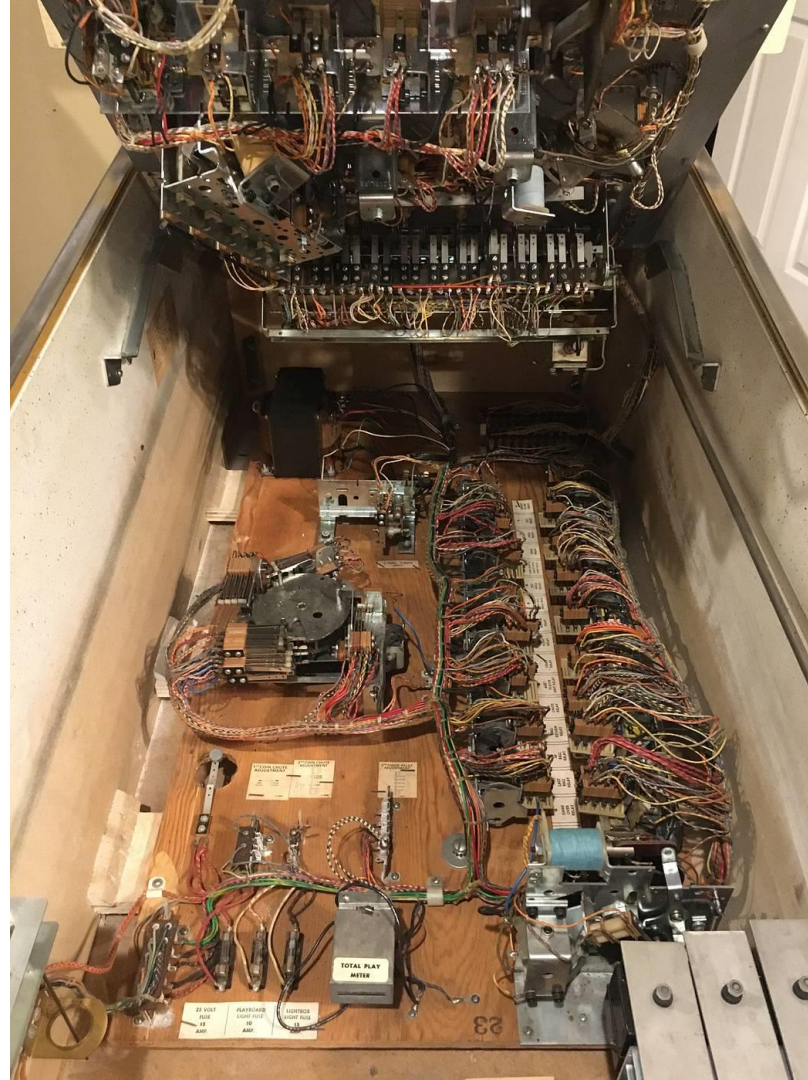


Score Reel



Plunger

The Guts



They used *a lot* of wires back in the day

Plunger (Ball Launcher)

Player pulls knob on plunger



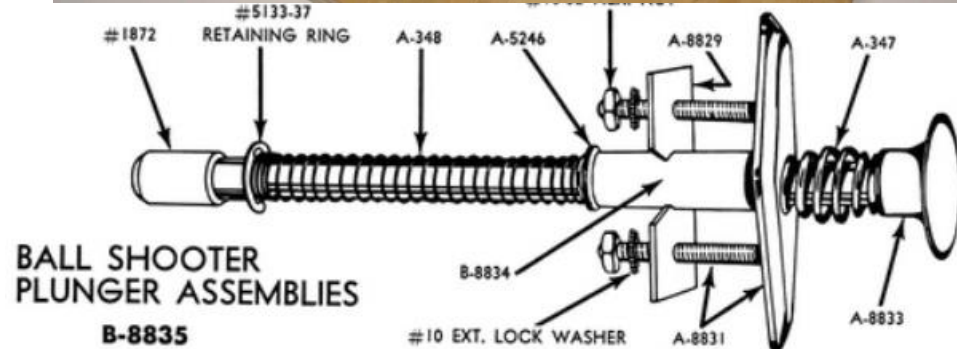
Spring compresses



Player releases knob



Ball launches



Flippers

Player pushes button on side of machine



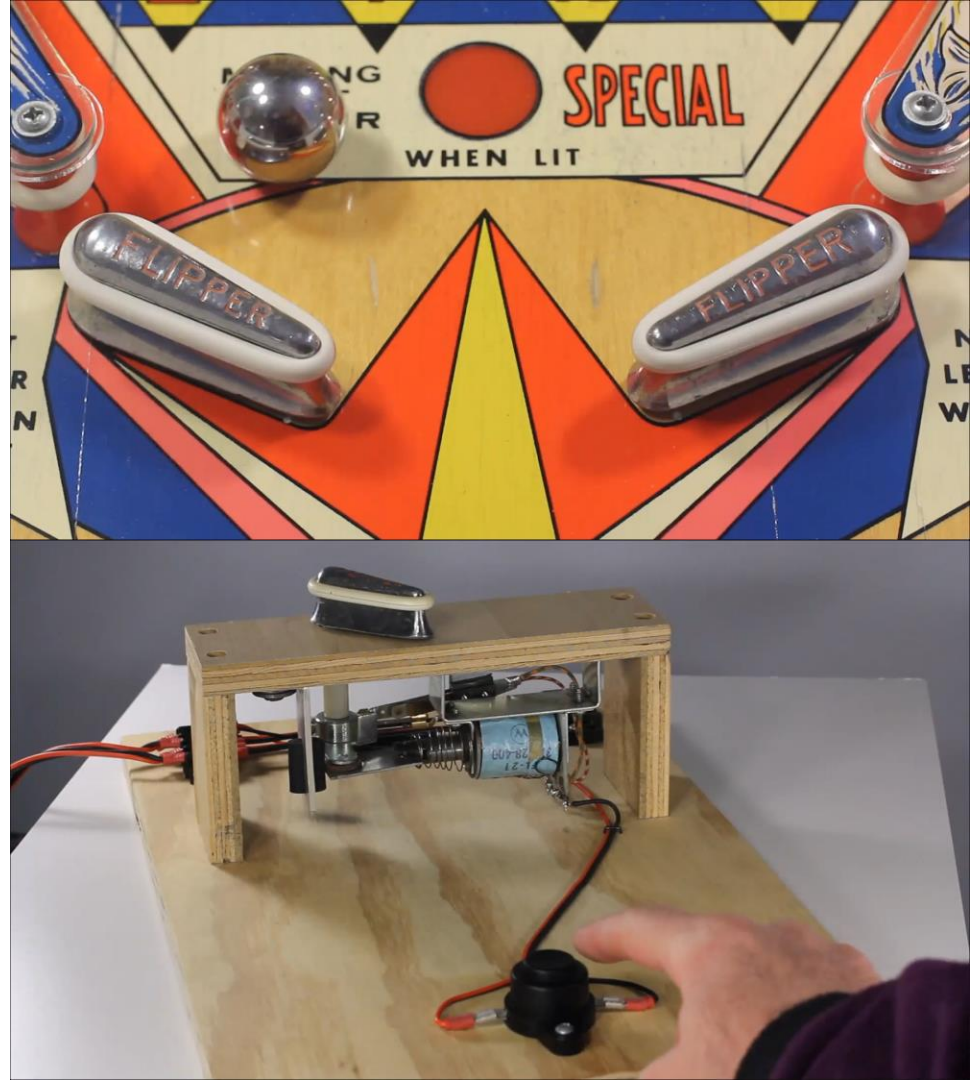
Button activates switch



Switch activates solenoid that pulls in a plunger



Plunger pull causes flipper to rotate



Pop Bumpers

Ball hits skirt under bumper



Skirt pushes down to close a switch



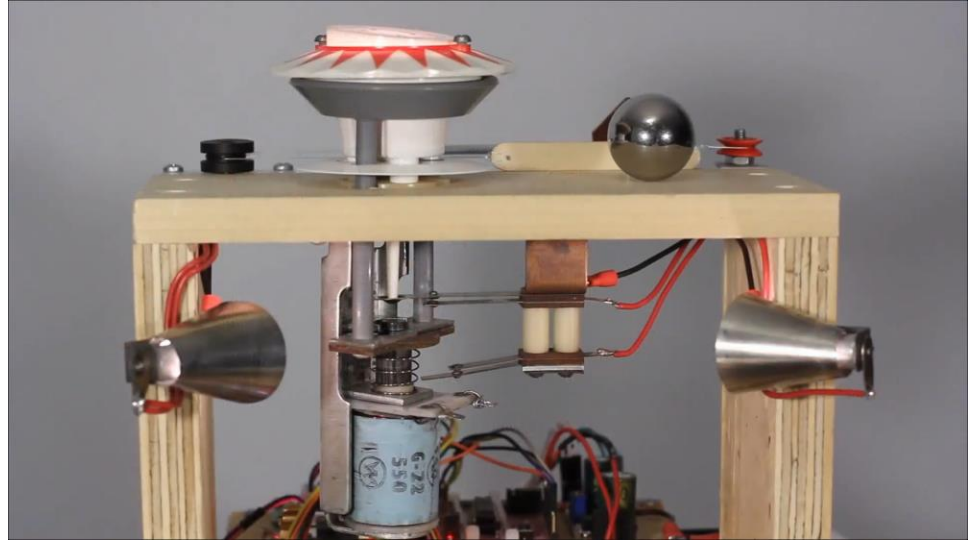
Switch activates solenoid that pulls down ring



Ring hits ball which shoots back out



Ring base opens 2nd switch which deactivates solenoid



Drop Targets

Ball hits drop target



Target is pushed back and notch falls off ledge

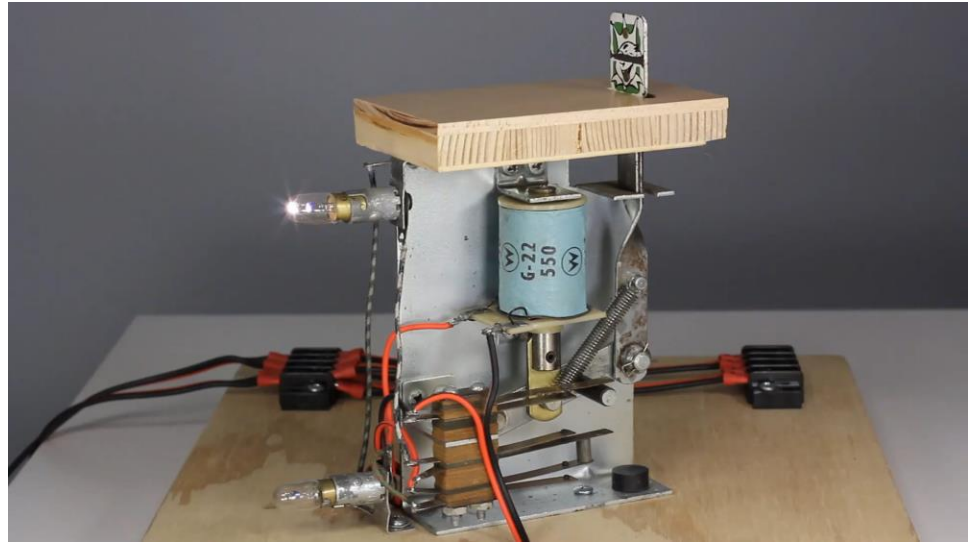


Stretched spring compresses, pulling target down



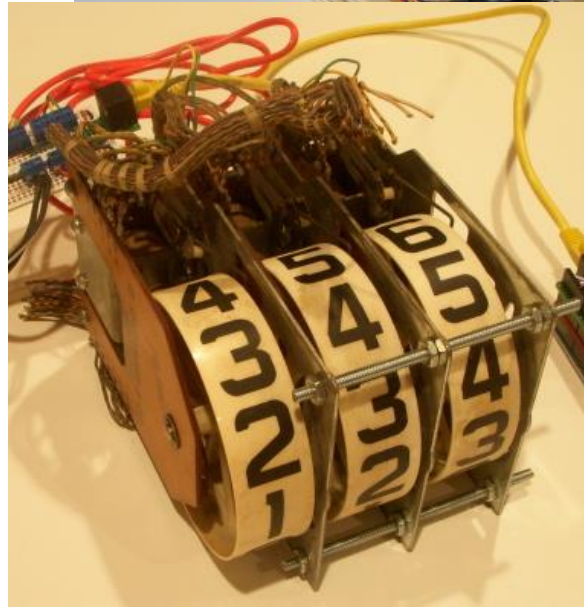
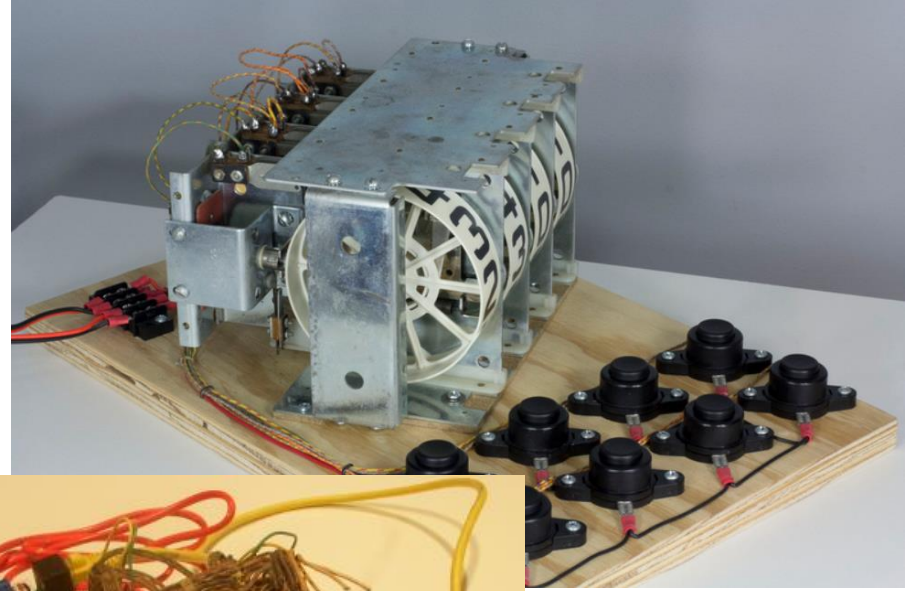
To reset target, solenoid activates and pushes target back up

Drop targets stay “up” because of a notch on them that rests on a ledge



Score Reel

- Similar to mechanical odometers
- Each reel can increase independently
 - 10
 - 100
 - 1000
- Reels increase when specific switches are triggered based on point scoring



Fun Facts

- Banned entirely or prohibited for kids in most cities from 1940s-1970s because it was “gambling”
 - Still technically banned for minors in some Maryland counties!
- Best selling game is The Addams Family (20,000+ machines produced)
- The most pinballs in any game at once is 13 in Apollo 13



References

- <https://pinballmakers.com/wiki/index.php?title=Basics>
- <https://electronics.howstuffworks.com/pinball-machine.htm>
- <https://www.capitalgazette.com/opinion/columns/ac-ce-scott-poyer-business-licensing-20220403-gvq5n7b2cvh6rhk5wdijvajyc4-story.html>
- <https://www.pinballadventures.com/how-pinball-machines-evolved/>
- <https://www.funwithpinball.com/exhibits/small-boards#PopBumpers>