

HOW DOES IT WORK?



SCHOOL SERVICE

WESTINGHOUSE ELECTRIC CORPORATION
306 FOURTH AVENUE, BOX 1017
PITTSBURGH 30, PA.

ATOMIC POWER

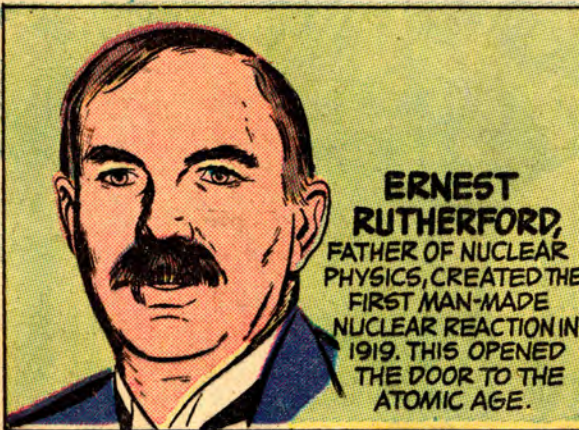


SINCE TIME BEGAN
ENERGY ON EARTH HAS COME FROM
NUCLEAR REACTIONS ON THE SUN. THESE CHANGE
THE SUN'S MASS INTO ENERGY.

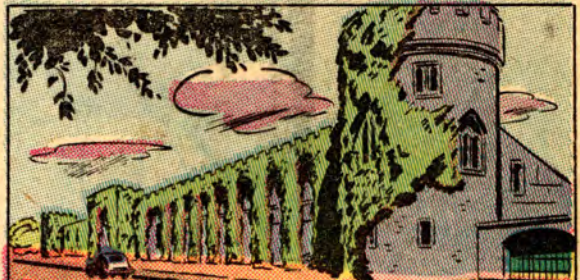


THE SUN IS SO HUGE ONLY 1/100 OF
1% OF ITS MASS WILL BE USED UP IN
1,500,000,000 YEARS.

57,000 FREIGHT CARS
WOULD BE NEEDED TO
HAUL AWAY THE MASS
THE SUN USES UP IN
ONE SECOND!

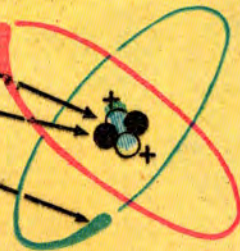


ERNEST RUTHERFORD,
FATHER OF NUCLEAR
PHYSICS, CREATED THE
FIRST MAN-MADE
NUCLEAR REACTION IN
1919. THIS OPENED
THE DOOR TO THE
ATOMIC AGE.



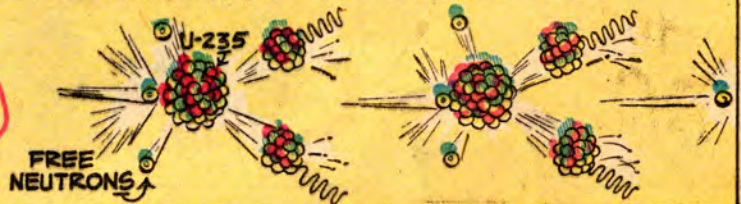
DECEMBER 2, 1942-BENEATH CHICAGO'S STAGG
FIELD MEN FIRST HARNESSSED THE POWER OF
THE ATOM. MUCH OF THE URANIUM USED IN
THIS FIRST NUCLEAR REACTOR CAME FROM
THE WESTINGHOUSE LAMP RESEARCH LABORATORIES.

ATOMS
PROTONS AND
NEUTRONS ARE IN THE
NUCLEUS, AND
ELECTRONS ARE IN ORBITS
OUTSIDE.



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WESTINGHOUSE ELECTRIC CORP.

WHEN STRUCK BY A FREE NEUTRON, SOME HEAVY NUCLEI
SPLIT INTO TWO PARTS AND RELEASE VAST AMOUNTS OF ENERGY.
IN A URANIUM PILE, THIS NUCLEAR FISSION CAUSES A
CHAIN REACTION -- KEY TO ATOMIC POWER.

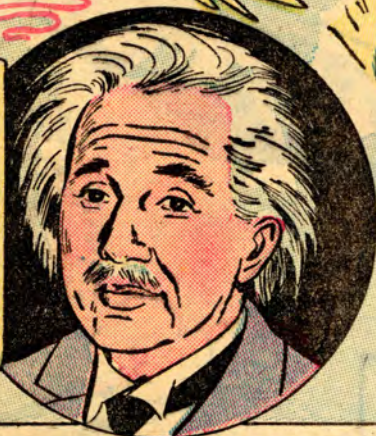


ATOMS ARE TINY. YOU CAN PUT TWO BILLION OF THEM ON THE POINT OF A PIN.

$$E=Mc^2$$

--1905--

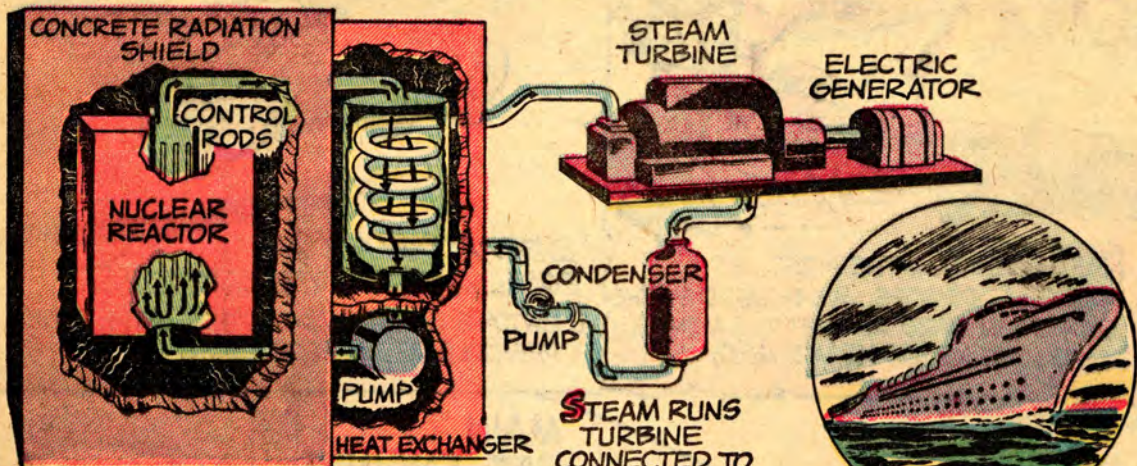
ALBERT EINSTEIN'S FORMULA SHOWS THAT ENERGY (E) IS EQUAL TO MASS (M) TIMES THE SQUARE OF THE SPEED OF LIGHT. (C²)



COMPLETELY CHANGED TO ENERGY, ONE OUNCE OF ATOMS WOULD PRODUCE A YEAR'S SUPPLY OF ELECTRICITY FOR A CITY OF 500,000.



HOW NUCLEAR ENERGY CAN PRODUCE ELECTRICITY



FISSION INSIDE REACTOR, OR PILE, SUPERHEATS A FLUID.

FLUID CHANGES WATER IN COILS TO STEAM.

STEAM RUNS TURBINE CONNECTED TO ELECTRIC GENERATOR.

WESTINGHOUSE SCIENTISTS AND ENGINEERS NOW ARE BUILDING A NUCLEAR REACTOR TO POWER SHIPS.

Things to DO...

① MAKE DIAGRAMS OR MODELS OF THE SIMPLER ATOMS, SHOWING THE PROPER NUMBER OF PROTONS, NEUTRONS, AND ELECTRONS.



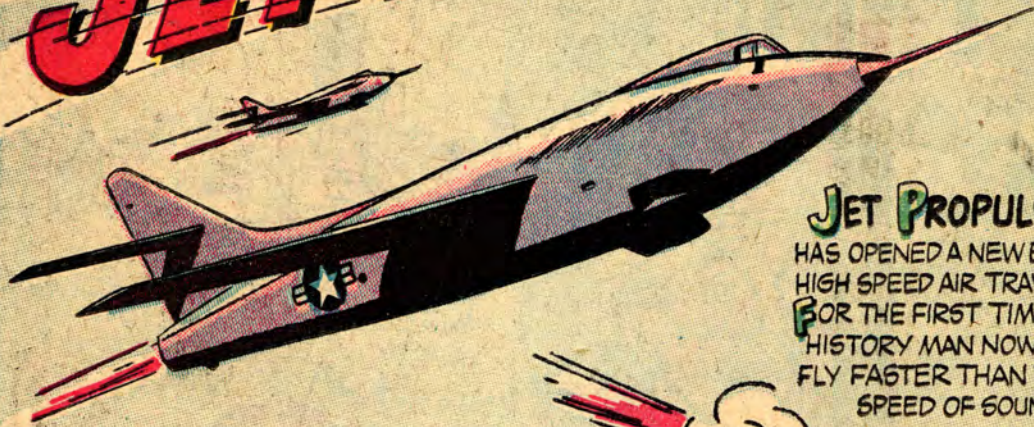
② BUILD A MODEL OF A NUCLEAR REACTOR.

③ FIND OUT WHAT YOU CAN ABOUT THE NEW "MAN-MADE" ELEMENTS. WHY ARE THEY NOT FOUND IN NATURE?

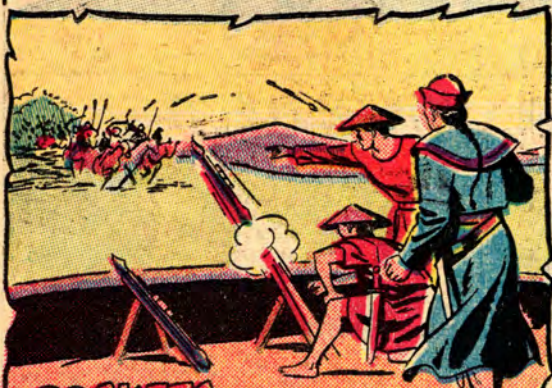
④ THERE ARE SEVERAL KINDS OF ATOM SMASHERS. LEARN WHAT THEY CAN DO AND HOW THEY ARE USED IN ATOMIC RESEARCH.

⑤ WHAT PRODUCTS COME FROM A URANIUM PILE? HOW ARE THEY USED IN MEDICINE AND INDUSTRY?

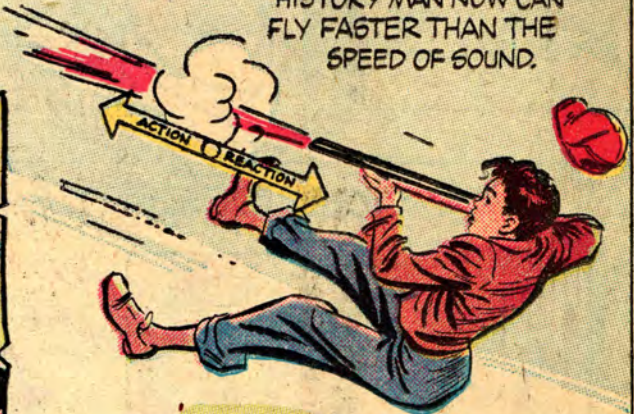
JET PROPULSION



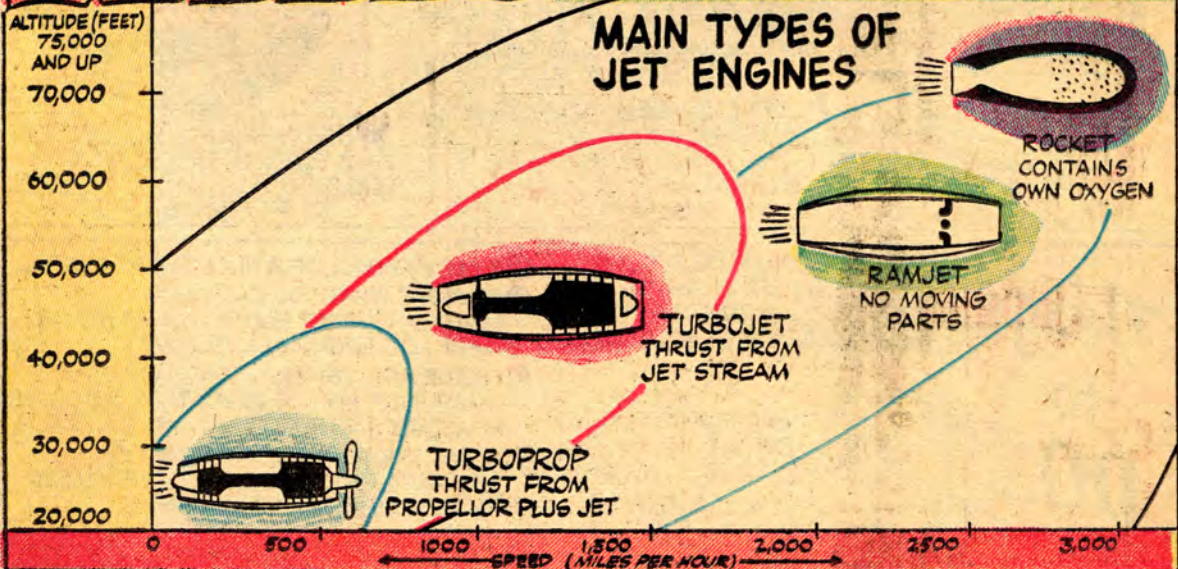
JET PROPULSION
 HAS OPENED A NEW ERA OF
 HIGH SPEED AIR TRAVEL.
FOR THE FIRST TIME IN
 HISTORY MAN NOW CAN
 FLY FASTER THAN THE
 SPEED OF SOUND.



ROCKETS... THE FIRST JET
 PROPELLED DEVICES... WERE USED BY THE
 CHINESE IN WARS AGAINST THE MONGOLS
 AS LONG AS 700 YEARS AGO.



"EVERY ACTION HAS AN
 EQUAL AND OPPOSITE REACTION..."
 NEWTON'S THIRD LAW OF MOTION... IS THE BASIC
 PRINCIPLE OF JET PROPULSION.





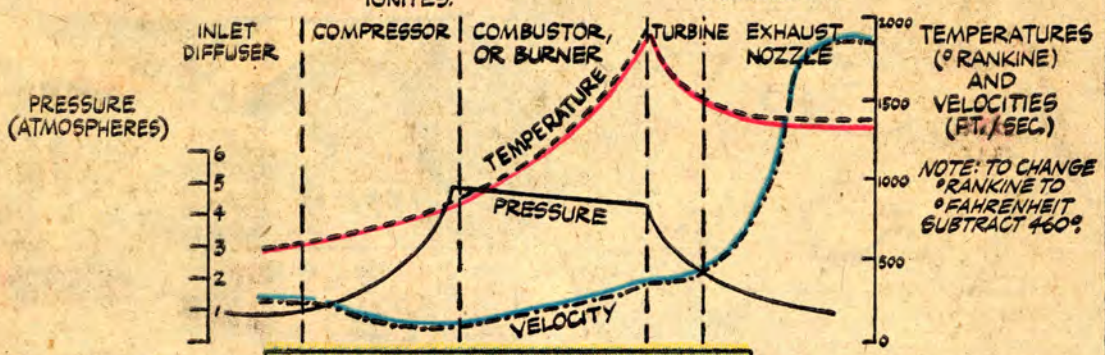
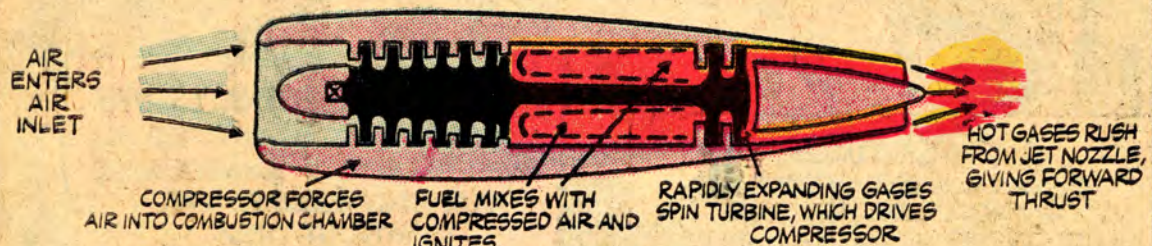
FIRST ALL-AMERICAN TURBOJET...

DEVELOPED BY WESTINGHOUSE... HAS THREE MAIN PARTS: AIR COMPRESSOR, COMBUSTION CHAMBER, TURBINE.



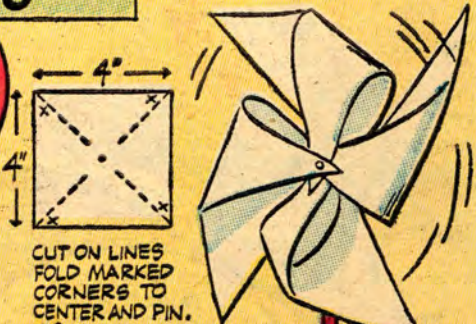
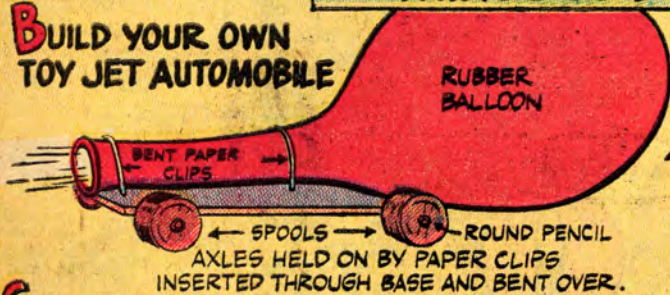
THE TURBINE

IS A LITTLE BROTHER OF TURBINES BUILT BY WESTINGHOUSE TO RUN HUGE ELECTRIC GENERATORS. IN A TURBOJET HOT GASES SPIN THE TURBINE AT 17,000 REVOLUTIONS PER MINUTE.



THINGS TO DO

BUILD YOUR OWN TOY JET AUTOMOBILE

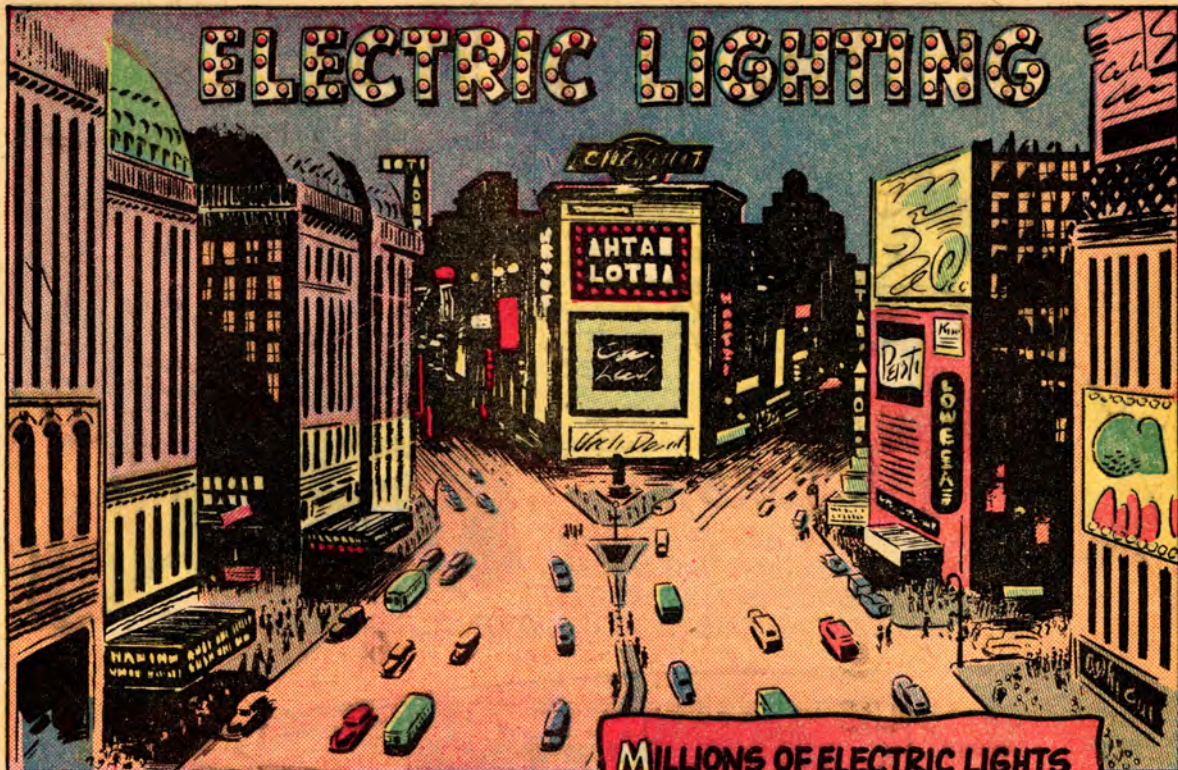


COLLECT PICTURES OF AS MANY JET-PROPELLED AIRPLANES AS YOU CAN AND MAKE A SCRAPBOOK.

EXAMINE A ROTARY LAWN SPRINKLER, EXPLAIN HOW IT IS SIMILAR TO A JET ENGINE.

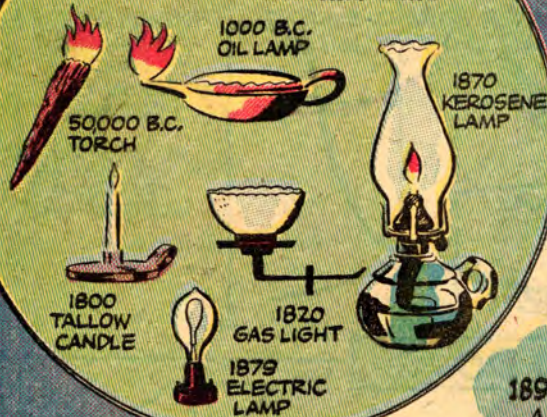
MAKE A PIN WHEEL OF PAPER, HOW DOES IT RESEMBLE A REAL TURBINE?

ELECTRIC LIGHTING



MILLIONS OF ELECTRIC LIGHTS
TURN NIGHT INTO DAY IN CITIES ALL
OVER THE WORLD. **IMAGINE WHAT**
YOUR TOWN WOULD BE LIKE
WITHOUT THEM.

FOR CENTURIES
MAN WORKED TO IMPROVE
ARTIFICIAL LIGHT BEFORE HE
DISCOVERED THE ELECTRIC LAMP



1893-COLUMBIAN WORLD EXPOSITION—
A SPECTACULAR ELECTRICAL INSTALLATION,
BUILT BY WESTINGHOUSE, DRAMATIZED TO
THE WORLD THE VALUE OF ALTERNATING
CURRENT FOR ELECTRIC LIGHTING.

THERE ARE THOUSANDS OF DIFFERENT
KINDS OF ELECTRIC LAMPS

FLASHING
QUARTZ KRYPTON
LAMPS...BRIGHT AS
50 MILLION 60-WATT
LIGHT BULBS...HELP PILOTS
LAND PLANES SAFELY
THROUGH FOG.



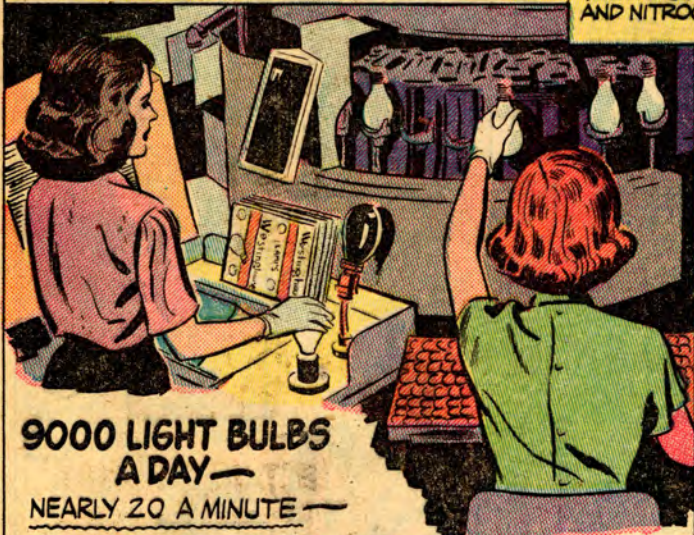
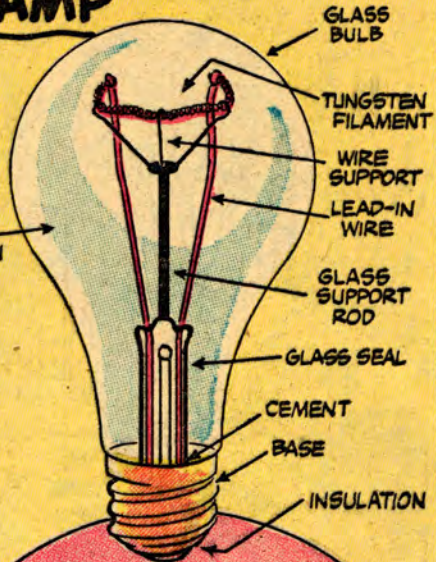
GRAIN-OF-WHEAT
LAMP (SHOWN HERE, ACTUAL
SIZE) IS USED BY DOCTORS
TO SEE INSIDE YOUR STOMACH.

DEEP SEA DIVERS
USE SPECIAL LAMPS
TO LIGHT THE OCEAN
FLOORS.



INCANDESCENT LAMP

TWO FEET OF TUNGSTEN WIRE, COILED, FORMS A FILAMENT THAT OPERATES AT 4530°F IN A STANDARD 60-WATT LAMP.



**9000 LIGHT BULBS
A DAY**

NEARLY 20 A MINUTE

ARE TURNED OUT BY AUTOMATIC MACHINES AT THE WESTINGHOUSE LAMP DIVISION. HUNDREDS OF SUCH MACHINES ARE NEEDED TO HELP MAKE THE 2 BILLION LIGHT BULBS USED IN THE U.S. EACH YEAR.

60-WATT LAMPS

1900

1950

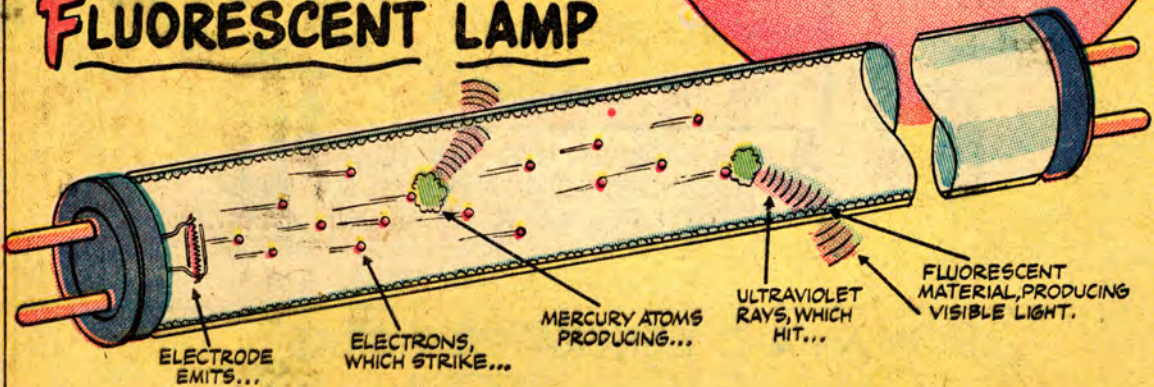


\$1.75

12¢

37 CANDLEPOWER 66.5 CANDLEPOWER

FLUORESCENT LAMP



THINGS TO DO...



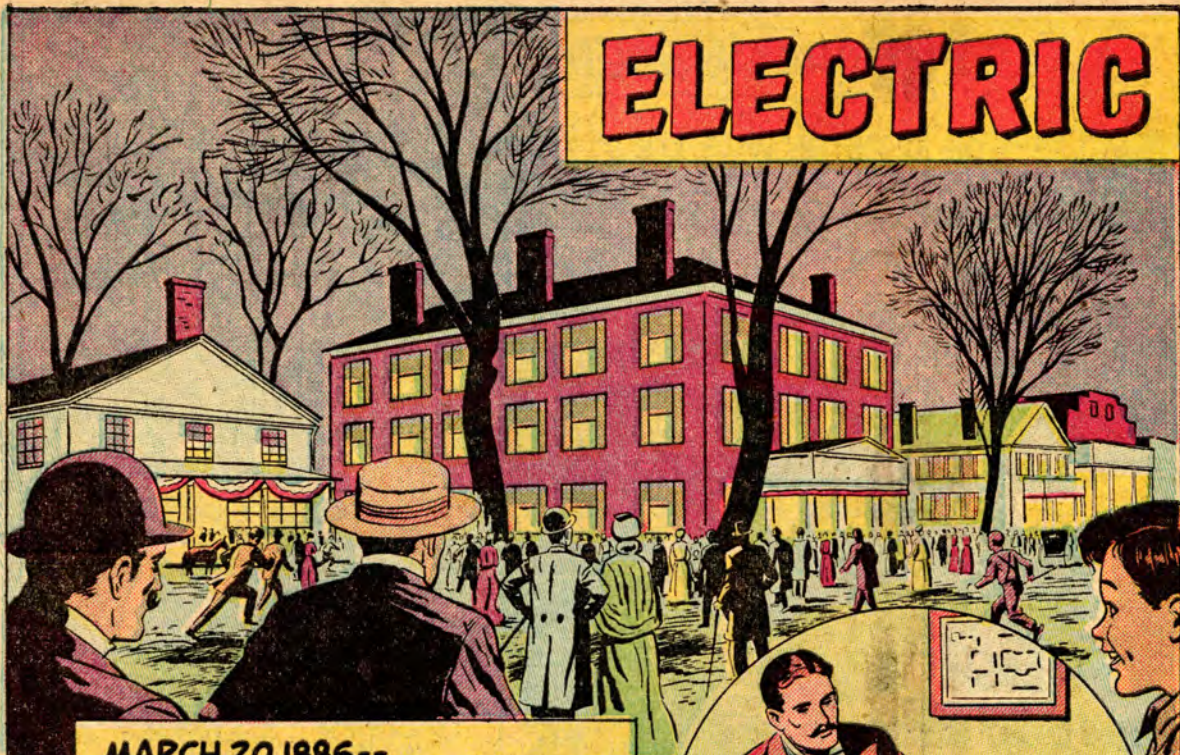
USING COPPER LEADS, HOOK A SHORT STRAND OF IRON PICTURE WIRE TO A DRY CELL.

WHY DOES THE IRON HEAT? HOW IS THIS APPLIED IN THE ELECTRIC LAMP?

FIGURE OUT HOW MUCH IT COSTS, AT YOUR LOCAL RATES, TO RUN YOUR HOME STUDY LAMP FOR 2 HOURS EACH DAY FOR A MONTH.

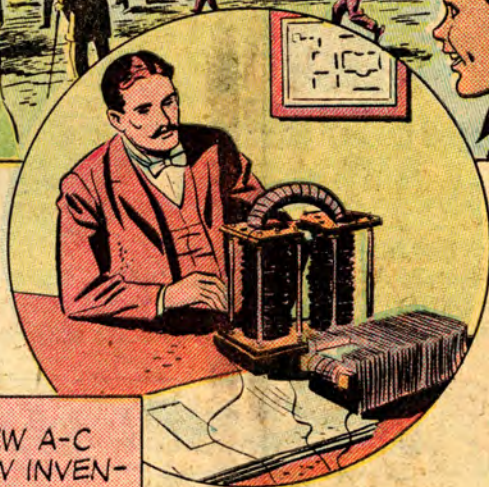
FIND OUT THE RECOMMENDED LIGHTING LEVELS FOR VARIOUS AREAS IN THE HOME. DOES YOUR OWN HOME HAVE THIS AMOUNT OF LIGHT?

ELECTRIC

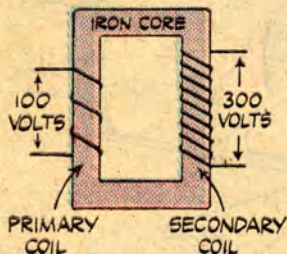


MARCH 20, 1886--

WILLIAM STANLEY, A WESTINGHOUSE ENGINEER, CLOSED A SWITCH, LIGHTING THE MAIN STREET OF GREAT BARRINGTON, MASS. THIS WAS THE FIRST ALTERNATING CURRENT (A-C) POWER SYSTEM IN AMERICA.



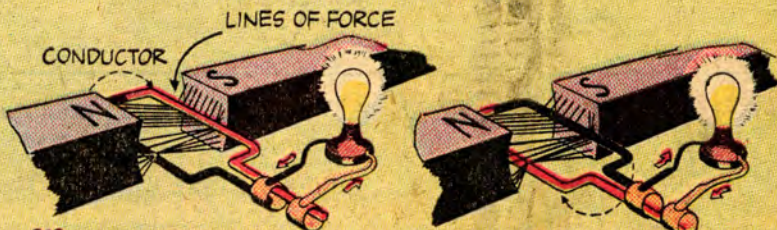
HEART OF THE NEW A-C SYSTEM WAS A NEW INVENTION—THE TRANSFORMER.



A TRANSFORMER STEPS UP VOLTAGE FOR SENDING ELECTRICITY LONG DISTANCES, OR STEPS IT DOWN FOR LOCAL USE, DEPENDING ON THE NUMBER OF TURNS ON THE PRIMARY AND SECONDARY COILS.

HOW AN A-C GENERATOR WORKS

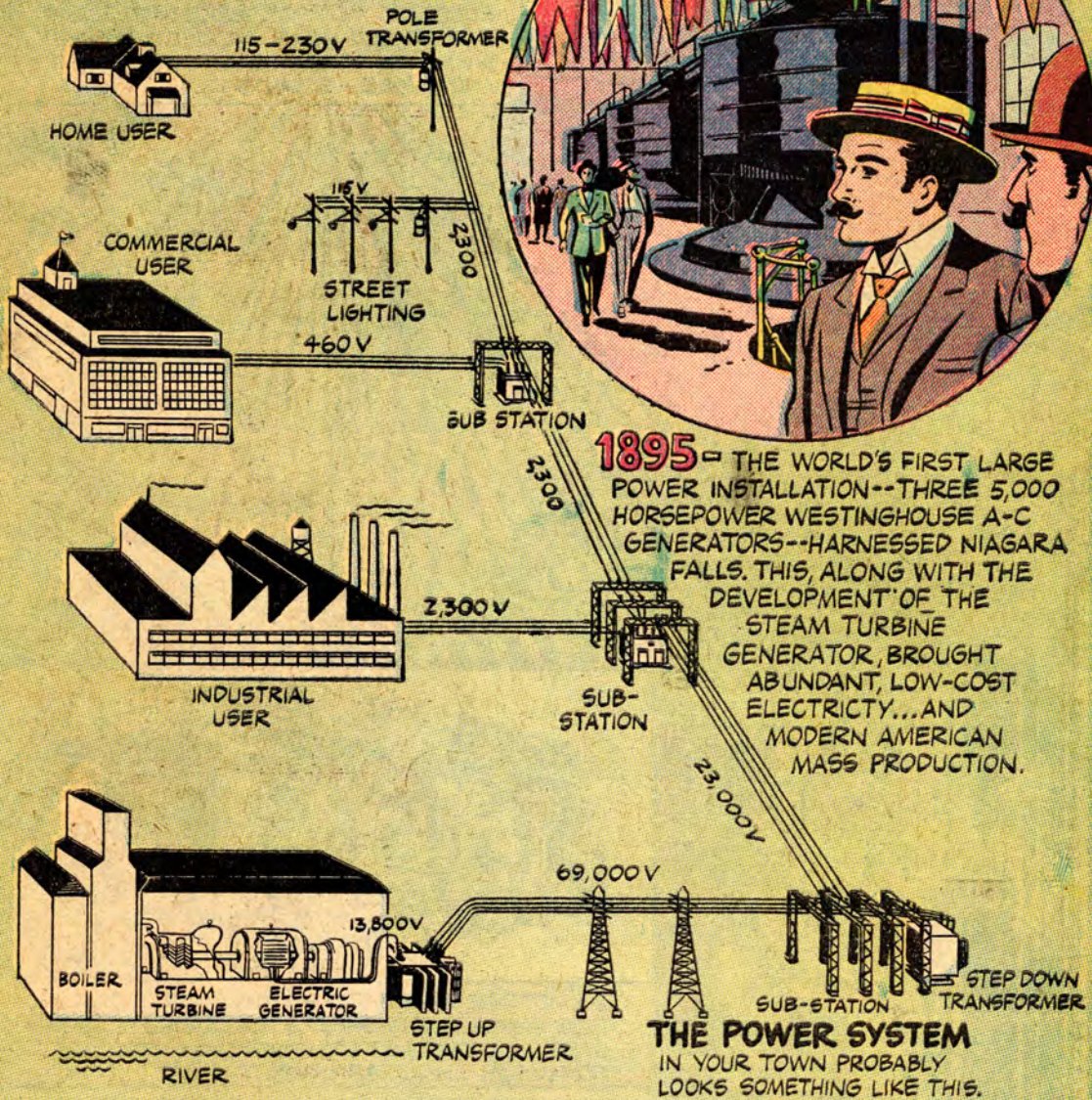
A GENERATOR CHANGES THE ENERGY OF RUSHING STEAM OR FALLING WATER INTO ELECTRICITY. A-C GENERATORS MAKE 99.85% OF THE ELECTRICITY PRODUCED IN AMERICA.



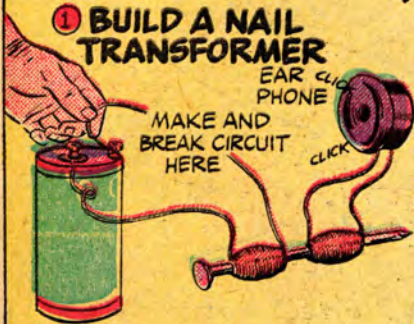
WHEN A CONDUCTOR CUTS MAGNETIC LINES OF FORCE, A VOLTAGE IS SET UP OR INDUCED, IN IT. IF THE CONDUCTOR IS MADE INTO

A LOOP AND REVOLVED IN A MAGNETIC FIELD, AN ELECTRIC CURRENT IS GENERATED. THE DIRECTION OF THE CURRENT REVERSES EACH HALF REVOLUTION, SO IT IS CALLED ALTERNATING CURRENT (A-C).

POWER



THINGS TO DO

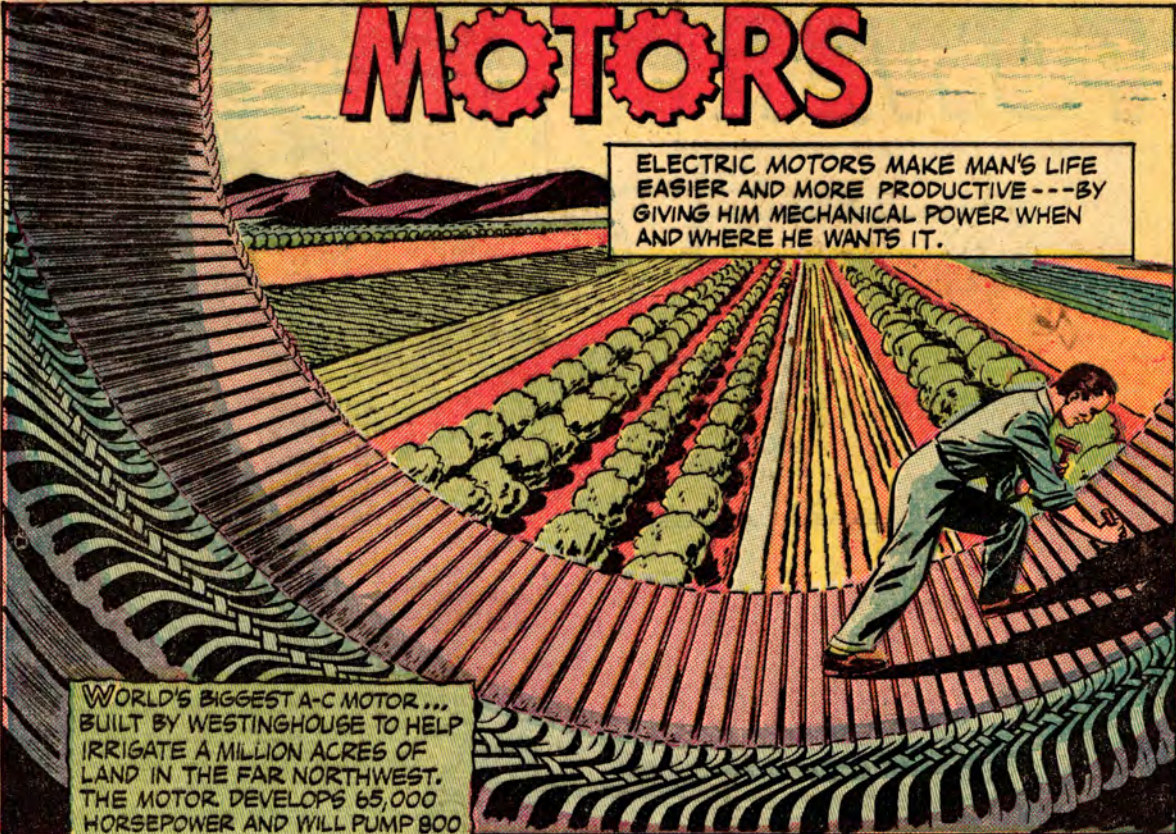


1 BUILD A NAIL TRANSFORMER

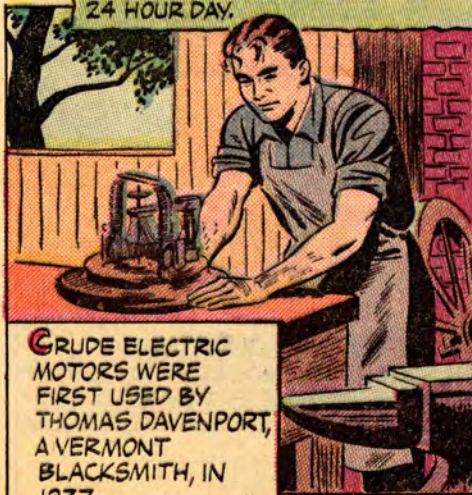
- 2 FIND OUT WHAT IMPORTANT THINGS ELECTRIC POWER DOES FOR YOU IN YOUR HOME?
- 3 MAKE A LIST OF SOME INDUSTRIES WHICH USE VAST QUANTITIES OF ELECTRIC POWER. WHAT DOES ELECTRICITY DO IN EACH CASE?
- 4 PREPARE A REPORT ON YOUR LOCAL GENERATING STATION. FIND OUT HOW ELECTRIC POWER IS MADE AND DISTRIBUTED IN YOUR TOWN.
- 5 YOUR HOME HAS EITHER TWO OR THREE ELECTRIC WIRES COMING IN FROM THE POWER LINE..CAN YOU EXPLAIN THE DIFFERENCE BETWEEN THE TWO SYSTEMS,

MOTORS

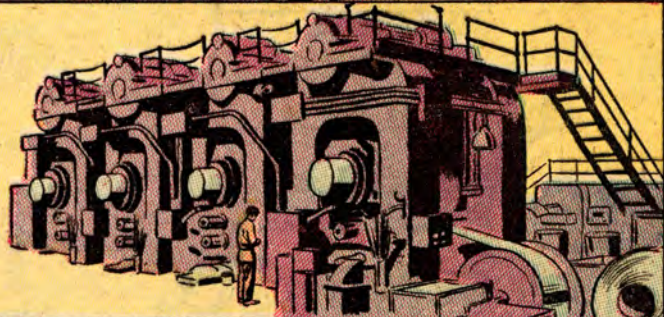
ELECTRIC MOTORS MAKE MAN'S LIFE EASIER AND MORE PRODUCTIVE --- BY GIVING HIM MECHANICAL POWER WHEN AND WHERE HE WANTS IT.



WORLD'S BIGGEST A-C MOTOR... BUILT BY WESTINGHOUSE TO HELP IRRIGATE A MILLION ACRES OF LAND IN THE FAR NORTHWEST. THE MOTOR DEVELOPS 65,000 HORSEPOWER AND WILL PUMP 800 MILLION GALLONS OF WATER IN A 24 HOUR DAY.



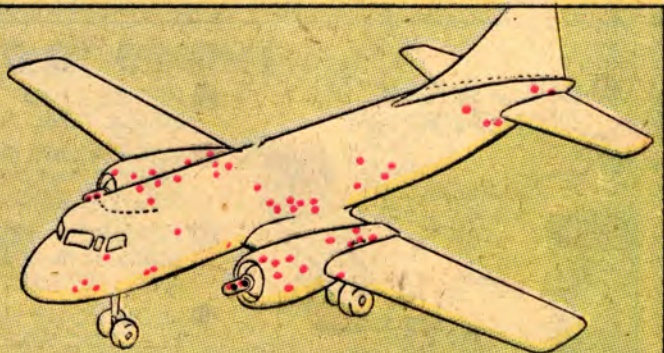
CRUDE ELECTRIC MOTORS WERE FIRST USED BY THOMAS DAVENPORT, A VERMONT BLACKSMITH, IN 1837.



13 MOTORS, WITH 11,500 HORSEPOWER, TURN OUT OVER HALF A MILE OF SHEET STEEL A MINUTE IN THIS STEEL MILL. THE AVERAGE AMERICAN WORKMAN COMMANDS 7½ HORSEPOWER TODAY.



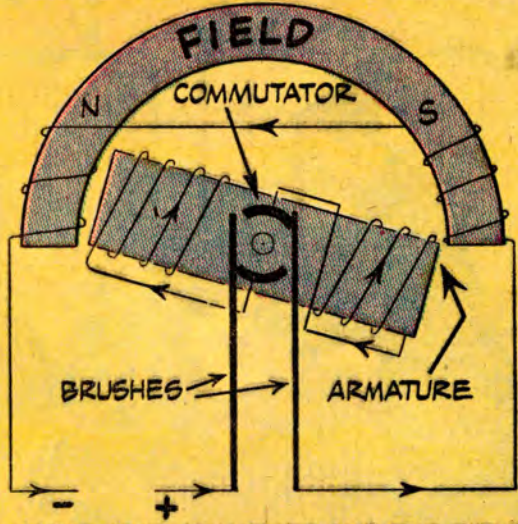
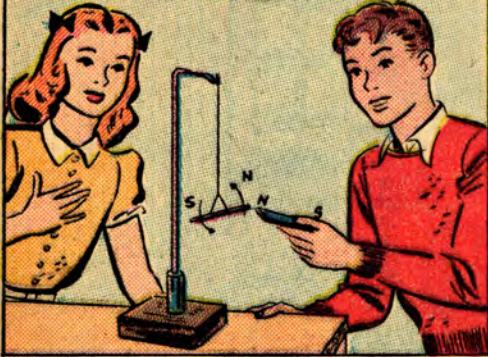
THE FIRST PRACTICAL A-C MOTOR WAS DEVELOPED AT WESTINGHOUSE BY NIKOLA TESLA IN 1888. MOST MOTORS USED TODAY ARE A-C MOTORS.



ELECTRIC MOTORS FLY. IN THIS PLANE -- 53 ELECTRIC MOTORS DO EVERYTHING FROM PUMPING FUEL TO CHANGING THE PITCH OF THE PROPELLORS.

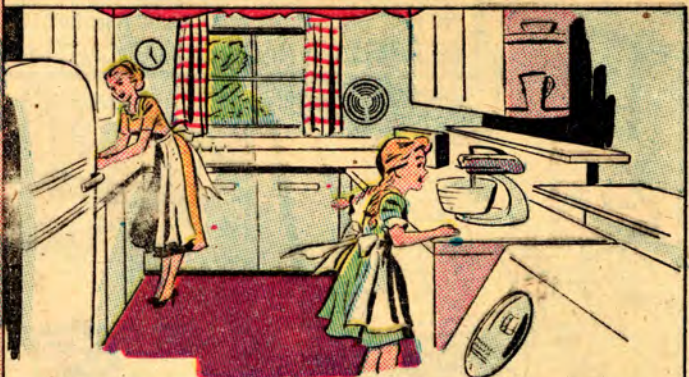
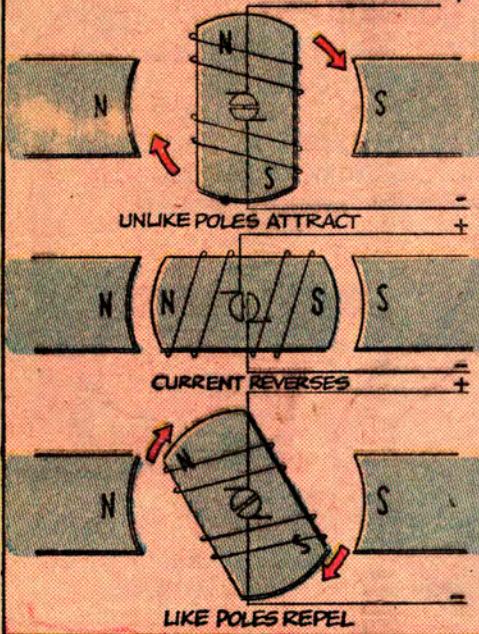
HOW AN ELECTRIC MOTOR WORKS

EVERY MAGNET HAS A NORTH AND SOUTH POLE. UNLIKE POLES ATTRACT... LIKE POLES REPEL.



THE **COMMUTATOR** REVERSES THE CURRENT IN THE ARMATURE WHEN THE N POLE IS NEXT TO THE S POLE OF THE FIELD. THIS REVERSES THE N AND S POLES OF THE ARMATURE, CAUSING IT TO ROTATE.

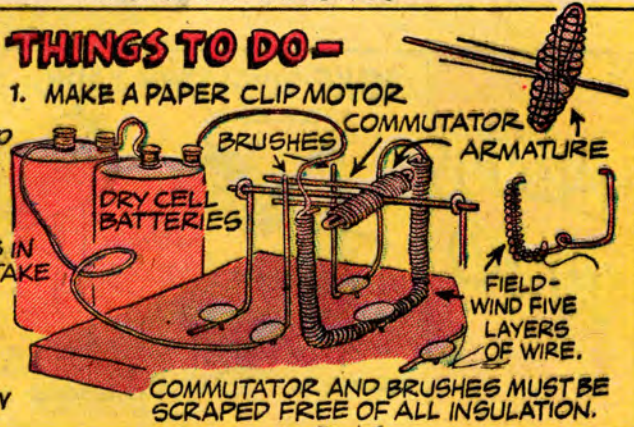
IN A MOTOR, THE ARMATURE AND THE FIELD ARE **ELECTROMAGNETS**. DIRECTION OF CURRENT IN THE COILS DETERMINES WHICH POLE IS NORTH AND WHICH IS SOUTH.



ELECTRIC MOTORS RUN MANY LABOR-**SAVING** DEVICES IN THE HOME. THEY ALSO RUN ELEVATORS, STREET CARS, AND THOUSANDS OF IMPORTANT MACHINES IN INDUSTRY.

THINGS TO DO-

1. MAKE A PAPER CLIP MOTOR
2. FIND OUT HOW ELECTRIC MOTORS ARE PUT TO WORK IN A STEEL MILL, PAPER MILL, OR OTHER PLANT NEAR YOU.
3. WORKING HARD, A MAN CAN DEVELOP 1/10 HORSEPOWER. ESTIMATE THE HORSEPOWER OF ALL THE ELECTRIC MOTORS IN YOUR HOME. HOW MANY MEN WOULD IT TAKE TO DO THE SAME JOBS?
4. WHY ARE ELECTROMAGNETS, INSTEAD OF PERMANENT MAGNETS, USED IN ELECTRIC MOTORS?
5. THERE ARE MANY TYPES OF ELECTRIC MOTORS. MAKE A LIST OF THEM AND HOW THEY DIFFER.



COMMUTATOR AND BRUSHES MUST BE SCRAPED FREE OF ALL INSULATION.

RADIO



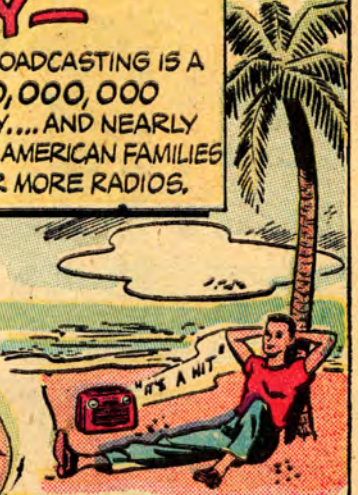
THE **1920** PRESIDENTIAL ELECTION RETURNS... BROADCAST OVER WESTINGHOUSE RADIO STATION KDKA IN PITTSBURGH... MARKED THE BIRTH OF REGULAR RADIO BROADCASTING.

TODAY —

RADIO BROADCASTING IS A \$1,500,000,000 INDUSTRY... AND NEARLY 40,000,000 AMERICAN FAMILIES OWN ONE OR MORE RADIOS.



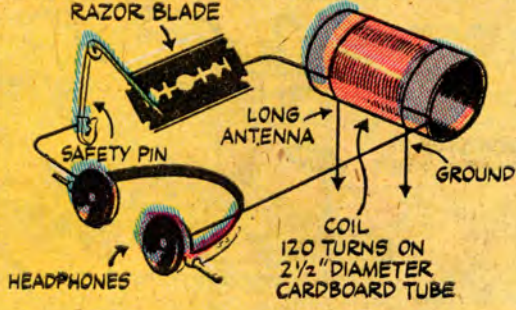
"CLEAR TO LAND ON RUNWAY 2 ZERO-OVER"



RADIO IS A MAJOR LINK BETWEEN PEOPLE EVERYWHERE.

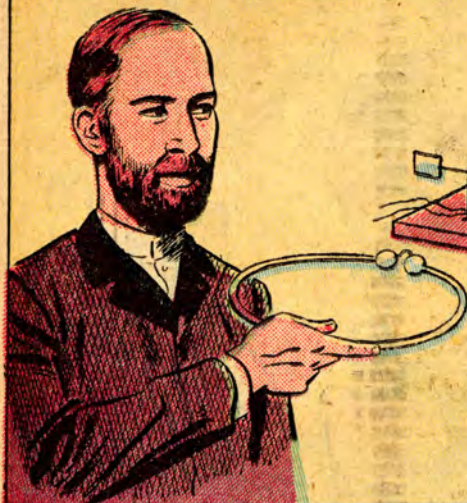
THINGS TO DO

1. MAKE YOUR OWN RADIO



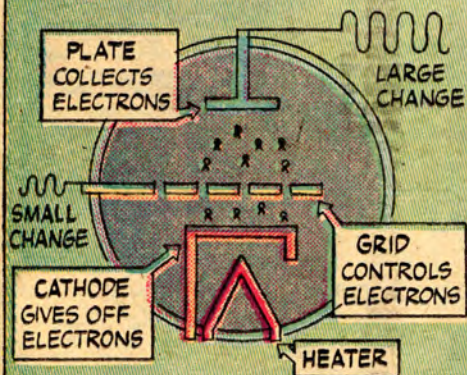
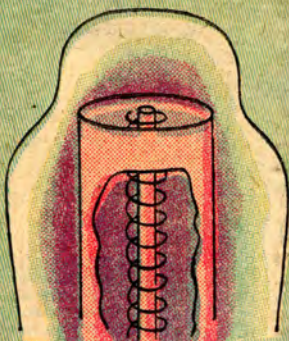
2. COLLECT PARTS OF RADIOS. MOUNT THEM AND TELL WHAT EACH IS FOR.
3. VISIT A LOCAL RADIO STATION AND SEE HOW A PROGRAM IS PUT ON THE AIR
4. FIND OUT AND EXPLAIN HOW A RADIO PROGRAM IN LOS ANGELES REACHES LISTENERS IN NEW YORK
5. SOUND TRAVELS ABOUT 1100 FEET A SECOND IN AIR. HOW FAR WILL IT GO IN THE TIME IT TAKES A RADIO WAVE TO TRAVEL AROUND THE EARTH?

BASIC PRINCIPLES OF RADIO



1887...HEINRICH HERTZ SHOWED THAT WAVES SENT OUT BY AN ELECTRIC SPARK PRODUCED ANOTHER SPARK IN A NEARBY LOOP OF WIRE.

HERTZIAN WAVES ARE THE RADIO "CARRIER" WAVES YOU TUNE IN ON YOUR RADIO. THEY TRAVEL 186,000 MILES PER SECOND.



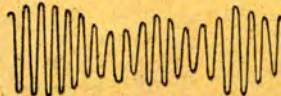
HEART OF RADIO

BROADCASTING AND RECEIVING IS THE ELECTRON TUBE. IT AMPLIFIES AND CONTROLS ALL KINDS OF ELECTRICAL WAVES. ELECTRON TUBES ALSO ARE NEEDED IN TELEVISION, RADAR, INDUSTRIAL ELECTRONICS, AND SCIENTIFIC RESEARCH.



A MICROPHONE

CHANGES SOUND INTO AN ELECTRICAL "AUDIO" WAVE. THIS GOES TO A TRANSMITTER WHERE IT MODULATES, OR VARIES, THE CARRIER WAVE AND IS BROADCAST.



IN **AM** RADIO... THE AUDIO WAVE CHANGES THE AMPLITUDE, OR STRENGTH, OF THE CARRIER WAVE.



IN **FM** RADIO... THE AUDIO WAVE CHANGES THE FREQUENCY OF THE CARRIER WAVE.

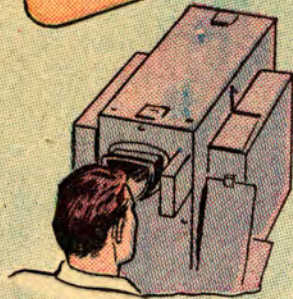
YOUR RADIO RECEIVER

SORTS OUT THE AUDIO WAVE, AMPLIFIES IT, AND FEEDS IT INTO A LOUD SPEAKER. THE SPEAKER TURNS IT BACK INTO SOUND.



MEN WORKED MORE THAN **60 YEARS** TO PERFECT TELEVISION AND BRING IT TO THE PUBLIC. NOW IT IS THE NATION'S **FASTEST GROWING INDUSTRY.**

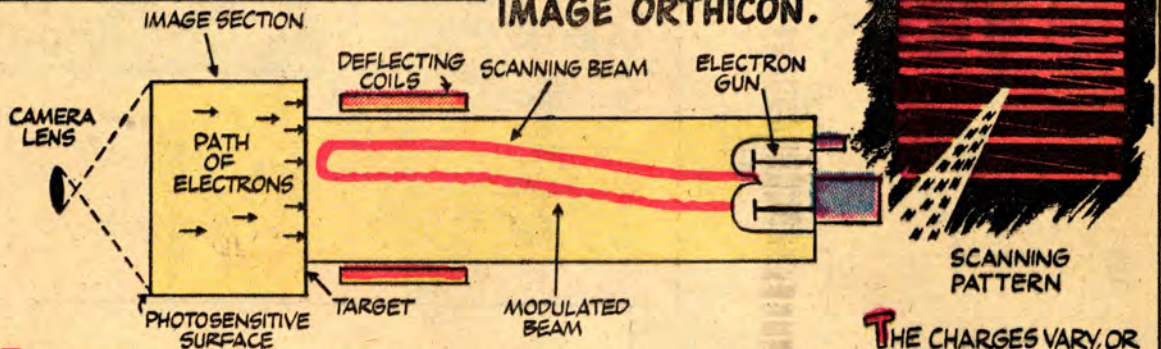
TELEVISION



A TELEVISION STUDIO IS A MAZE OF BRIGHT LIGHTS, STAGE PROPS, MICROPHONES, AND CAMERAS.

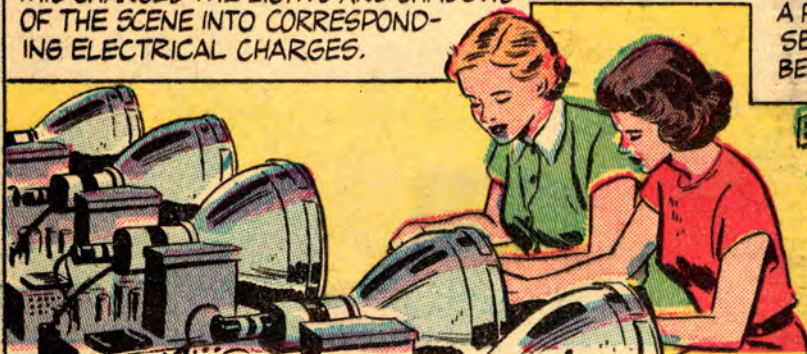


IN EACH CAMERA IS AN ELECTRONIC CAMERA TUBE CALLED AN **IMAGE ORTHICON.**



THE SCENE IS FOCUSED ON THE PHOTOSENSITIVE SURFACE OF THE IMAGE SECTION. THIS CHANGES THE LIGHTS AND SHADOWS OF THE SCENE INTO CORRESPONDING ELECTRICAL CHARGES.

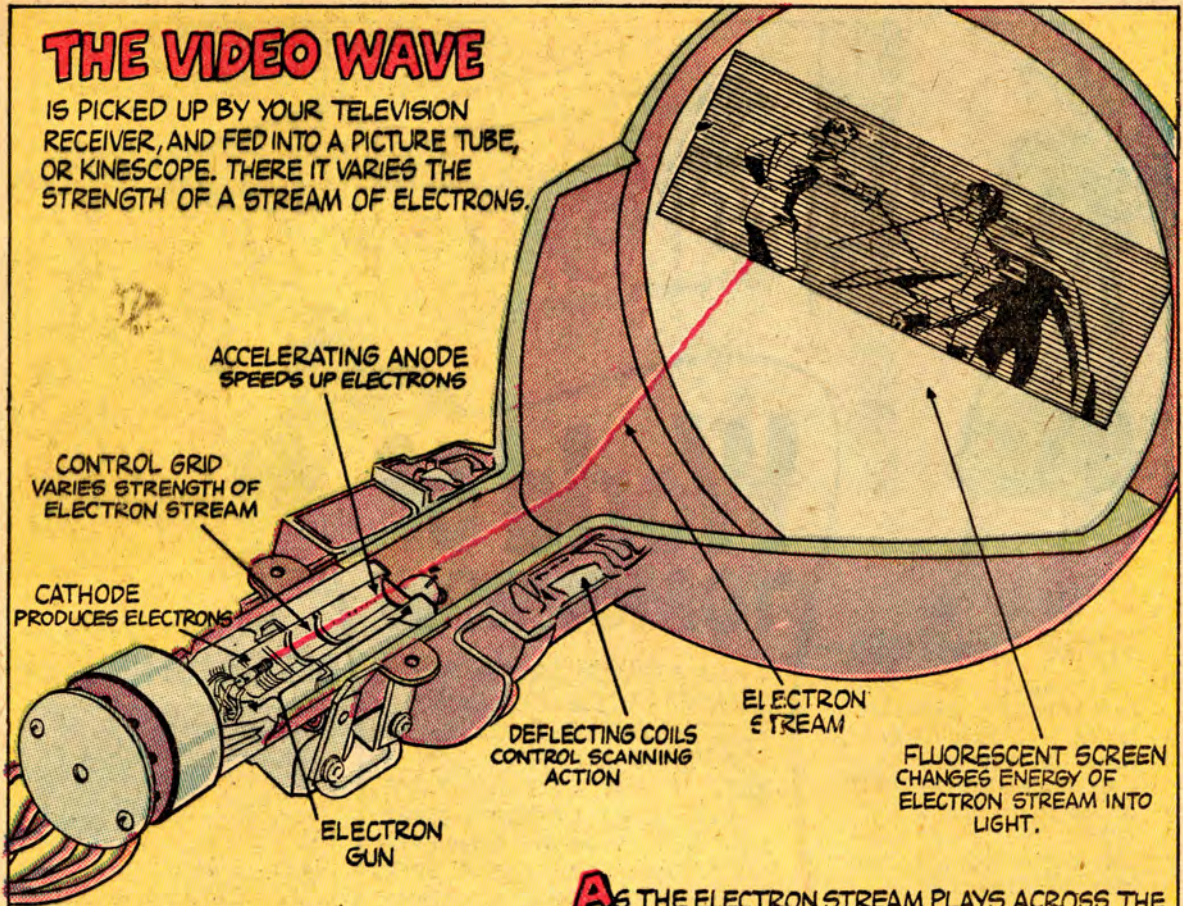
THE CHARGES VARY, OR MODULATE, AN ELECTRON BEAM THAT SCANS THE TARGET SURFACE OF THE IMAGE SECTION 525 TIMES A PICTURE—30 PICTURES A SECOND. THE MODULATED BEAM IS THE **VIDEO WAVE.**



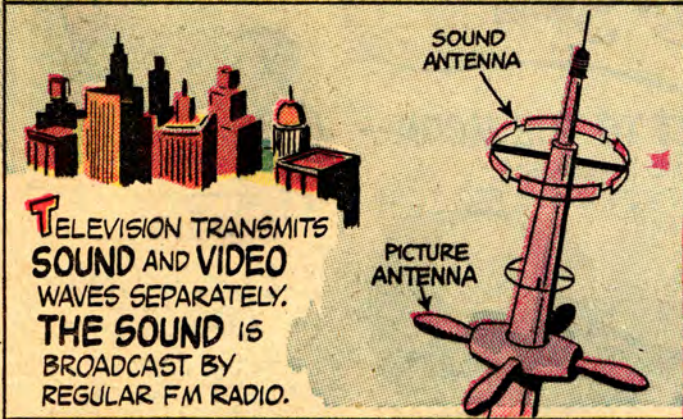
EACH OF THESE WESTINGHOUSE TELEVISION RECEIVERS HAS **750 PARTS**... MORE THAN **FOUR TIMES** THE NUMBER OF PARTS IN A FINE WATCH.

THE VIDEO WAVE

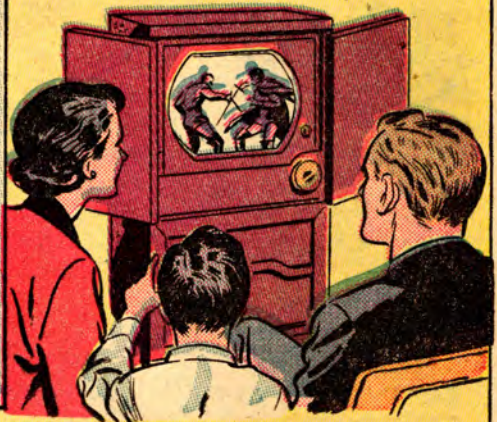
IS PICKED UP BY YOUR TELEVISION RECEIVER, AND FED INTO A PICTURE TUBE, OR KINESCOPE. THERE IT VARIES THE STRENGTH OF A STREAM OF ELECTRONS.



AS THE ELECTRON STREAM PLAYS ACROSS THE FLUORESCENT SCREEN AT THE WIDE END OF THE TUBE, IT PAINTS THE SAME PICTURE SEEN BY THE CAMERA.



TELEVISION TRANSMITS SOUND AND VIDEO WAVES SEPARATELY. THE SOUND IS BROADCAST BY REGULAR FM RADIO.



- THINGS TO DO -

1. COLOR TELEVISION IS MUCH LIKE BLACK AND WHITE TELEVISION. SEE IF YOU CAN FIND OUT HOW IT WORKS.
2. IF POSSIBLE, VISIT A TELEVISION STUDIO AND SEE A PROGRAM BEING TELEVIEWED.
3. TELEVISION ANTENNAS ARE PLACED AS HIGH IN THE AIR AS POSSIBLE. WHY IS THIS?
4. WHY IS IT NOT SAFE TO REMOVE THE BACK FROM A TELEVISION RECEIVER WHILE IT IS PLUGGED IN?
5. THERE ARE MANY USES OF PHOTO-SENSITIVE MATERIALS BESIDE TELEVISION. WHAT ARE SOME OF THEM?

AT THE TURN OF A DIAL, TELEVISION BRINGS SPORTS EVENTS, PLAYS, NEWS, AND EDUCATIONAL PROGRAMS RIGHT INTO YOUR LIVING ROOM.



MOOD LIGHTING--

WESTINGHOUSE EXPERTS PREDICT THAT BY USING FLUORESCENT LAMPS AND SPECIAL FABRICS, THE WOMAN OF TOMORROW WILL BE ABLE TO CHANGE THE COLOR OF ANY ROOM IN HER HOUSE TO SUIT THE TIME OF THE DAY, THE SEASON, OR HER MOOD BY THE FLICK OF A SWITCH.



WEEK-END BIG GAME HUNTING

LARGE JET-PROPELLED AIRCRAFT WILL BRING BIG GAME HUNTING IN AFRICA AND SWIMMING OFF THE SHORES OF THE RIVIERA WITHIN REACH OF WEEK-ENDING AMERICANS.

World of TOMORROW

A HALF A CENTURY AGO, FEW PEOPLE DREAMED OF TELEVISION, RADIO, FLUORESCENT LIGHT, ATOMIC POWER, AND JET PROPULSION. YET THESE ARE COMMONPLACE IN THE WORLD OF TODAY. RIGHT NOW, SCIENTISTS AND ENGINEERS ARE WORKING OUT THE WONDERS OF THE WORLD OF TOMORROW.

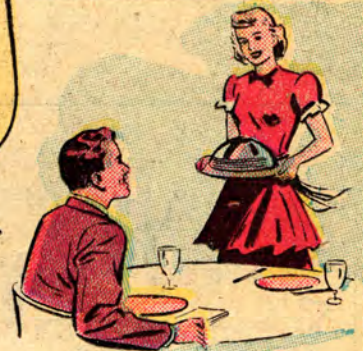
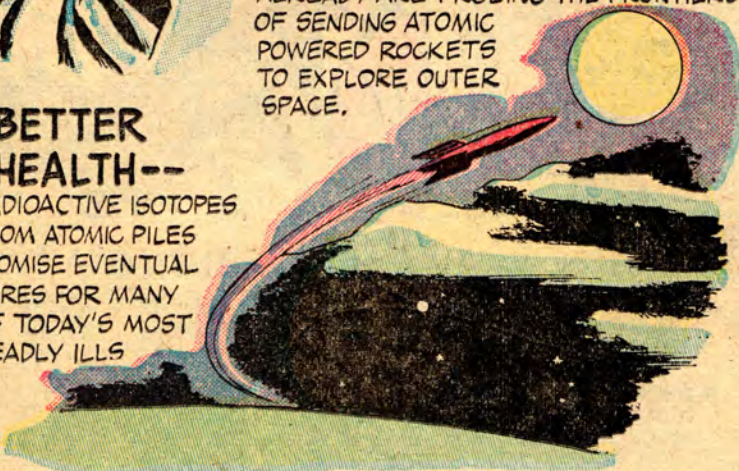


BETTER HEALTH--

RADIOACTIVE ISOTOPES FROM ATOMIC PILES PROMISE EVENTUAL CURES FOR MANY OF TODAY'S MOST DEADLY ILLS

ROCKET TO THE MOON--

SCIENTISTS AND ENGINEERS ALREADY ARE PROBING THE FRONTIERS OF SENDING ATOMIC POWERED ROCKETS TO EXPLORE OUTER SPACE.



ELECTRONIC COOKING--

ELECTRONIC COOKING--TO REDUCE THE TIME OF COOKING DINNER FROM MINUTES TO SECONDS--AND ULTRASONIC WASHING--TO CLEAN CLOTHES IN SECONDS WITHOUT A DROP OF WATER--WILL GIVE ADDED LEISURE TO THE AMERICAN HOMEMAKER.