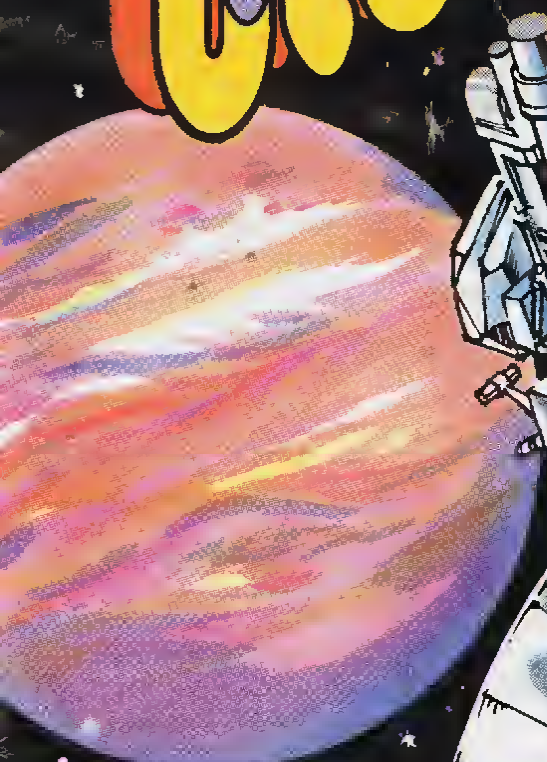
CAT. NO. 68-2028

The Science Fair® story of electronics

...the discovery that CHANGED the WORLD!



the big new edition for **Fall 1979**

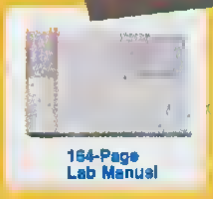
compliments of

Radio Shack

A DIVISION OF TANDY CORPORATION

U.S. Voyager I looks at Jupiter 422 million miles from Earth

—for young Science Explorers!



164-Page Lab Manual

150-in-1 Electronic Project Kit

Build e one-way telephone, wireless mike and much more — 150 projects in ell! Parts connect with spring-clips — no soldering needed. With earphone. Requires one 9V and 2 "AA" batteries. **28-248.**

With 2 Solar Panels

Solar Lab Kit

Build e solar-powered radio, transmitter, end 23 other projects powered by the sun. "Breadboard" assembly with spring-clip connectors. With menuel Some projects require one 9V and 2 "AA" batteries **28-246.**

Science Fair® Kits

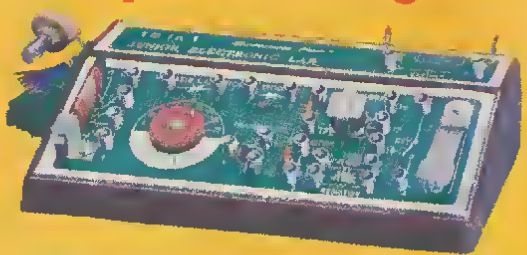
Digital Logic Lab Kit

25 experiments, including ones with "AND," "NAND," "OR," "NOR" circuits, electronic gemes end much more. With integrated circuit chip, LED (light-emitting diode), ell necessary components for solderless hookup right in the box Requires 3 "AA" batteries **28-226.**

Are For Experimenting!

Digital Computer Kit

Build your own computer! Learn about programming, binary math, cybernetics to predict weather — 100 projects in ell. All parts and programs, plus a deteiled 80-page fully-illustrated instruction manual Requires 3 "C" batteries **28-218.**



Junior Electronic Lab Kit

Build your own home AM broadcast station, learn and use Morse code with the code oscillator — 10 projects in all Easy-to-understand instruction manual explains each project No-solder spring-clip wiring. Requires one "AA" battery. **28-225.**

Sold only at

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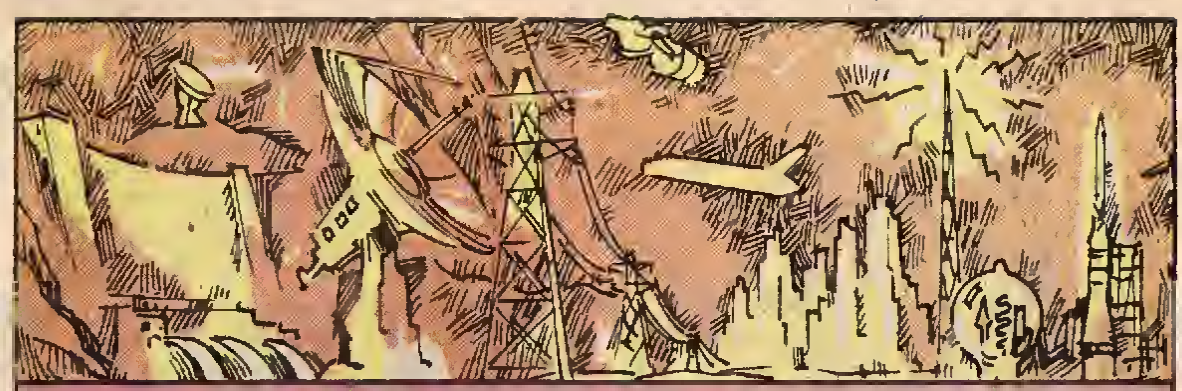
Home of Science Fair Kits



...the NEW Science Fair® story of ELECTRONICS

America is unique in the history of mankind. It is a relative of the world . . . a land built by immigrants and descendants of immigrants united in their efforts to achieve a better way of life, and united in their desire to share these benefits with people in other countries.

From America came Samuel Morse and his telegraph; Alexander Graham Bell and his telephone; Thomas Edison and his incandescent lamp; Nikola Tesla and his alternating current power generators and motors, which gave us efficient electric power for industry and home use; Charles Steinmetz the mathematical genius and his contributions to electrical engineering technology; Almon Brown Strowger, inventor of the dial telephone; Lee deForest and his three-element radio tube which first made possible the amplification of radio and long distance telephone signals; Joseph Tykocinski-Tykociner who gave the world's first public demonstration of sound-on-film movies on June 9, 1922, at the University of Illinois; Vladimir Zworkyin and his all-electronic television picture transmitting and receiving system; Karl Jansky and his discovery of radio waves from outer space—the beginning of radio astronomy; Lauren Hammond and his electric organ; Ernst Alexanderson and his famous alternator used in wireless telegraphy and his pioneer work with radio altimeters and facsimile; Joseph Henry, first secretary of the Smithsonian Institution and his discoveries in electromagnetism; Michael Idvorsky Pupin, his famed "Pupin coil" used in long distance telephone communication, and his work with X-rays; the co-invention of the transistor by William Shockley, Walter Brattain and John Bardeen, which paved the way for tiny lightweight electronic circuits found in today's solid state radios, steraos, television sets and computers. These are but a few of the contributions to electronic technology by American scientists.

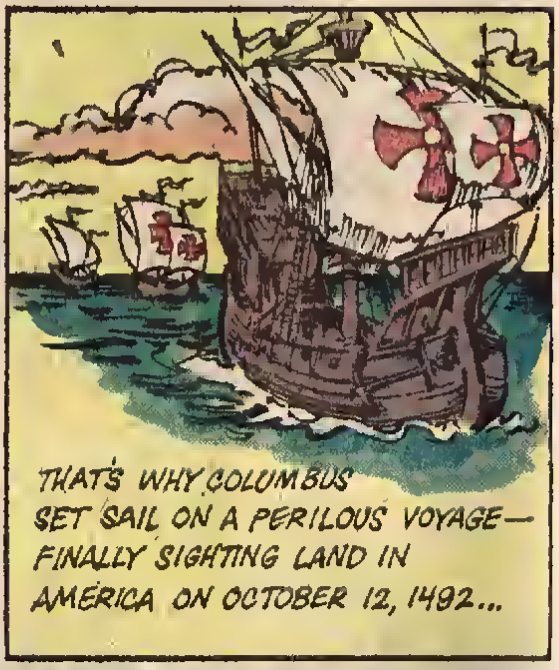
From America came the miracle of color television; the Telstar satellites which have made possible world-wide radio and television reception; and in 1969, American Astronauts Neil Armstrong and Edwin Aldrin were first to land a spacecraft on the Moon from where they talked by radio and television with the President of the United States.

It is the purpose of the *Science Fair Story of Electronics* to rekindle the national pride of our young people—to increase their awareness of America's heritage of individual and business freedom, which in a little over 200 years built our country from a tiny "developing nation" to the world's most advanced industrial nation.

CAT. NO. 68-2026

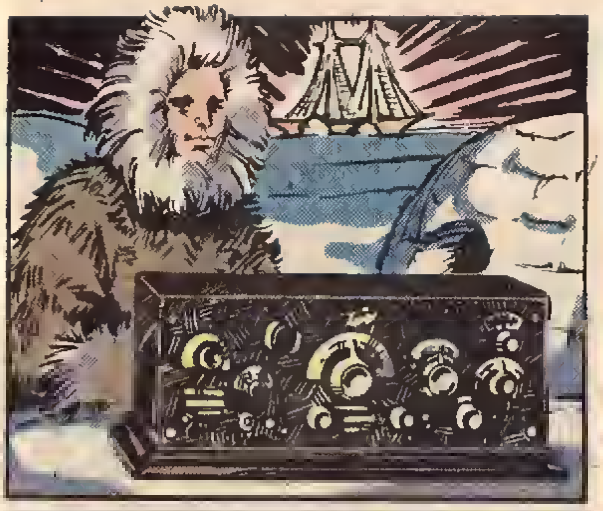
Fall-Winter 1979, Spring 1980 edition of the New Science Fair Story of Electronics — the Discovery that Changed the World. William M. Palmer, Editor. Published by the Radio Shack Division of Tandy Corporation, One Tandy Center, Fort Worth, Texas 76102, U.S.A. Narrative by William M. Palmer, illustrations by J & R Weathers, Designers. First printing July, 1979. Printed in the U.S.A.

THE STORY YOU ARE ABOUT TO READ BEGAN MANY CENTURIES AGO IN THE CURIOSITY OF OUR ANCESTORS WHO DISCOVERED MANY WAYS TO IMPROVE THE WAY THEY LIVED FROM OBSERVATION AND BY EXPLORATION OF THE UNKNOWN AREAS OF EARTH AND SCIENCE.

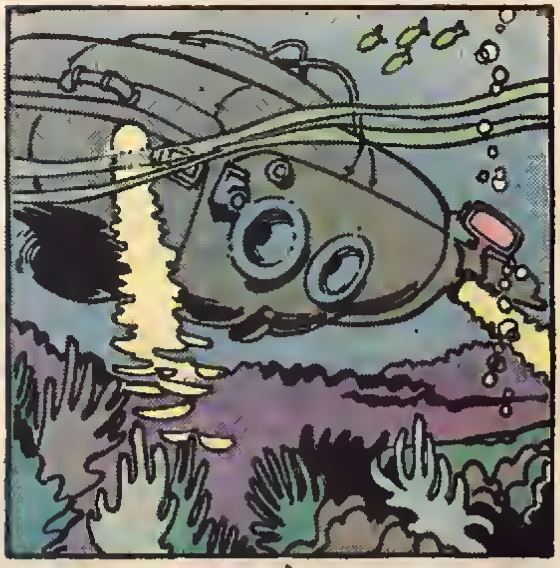


...LIKE THE DARING VIKINGS WHO TOUCHED THE SHORES OF CANADA ABOUT 1000 A.D., WE MUST CONTINUE TO EXPLORE... TO DISCOVER... TO PAVE THE WAY FOR FUTURE GENERATIONS.

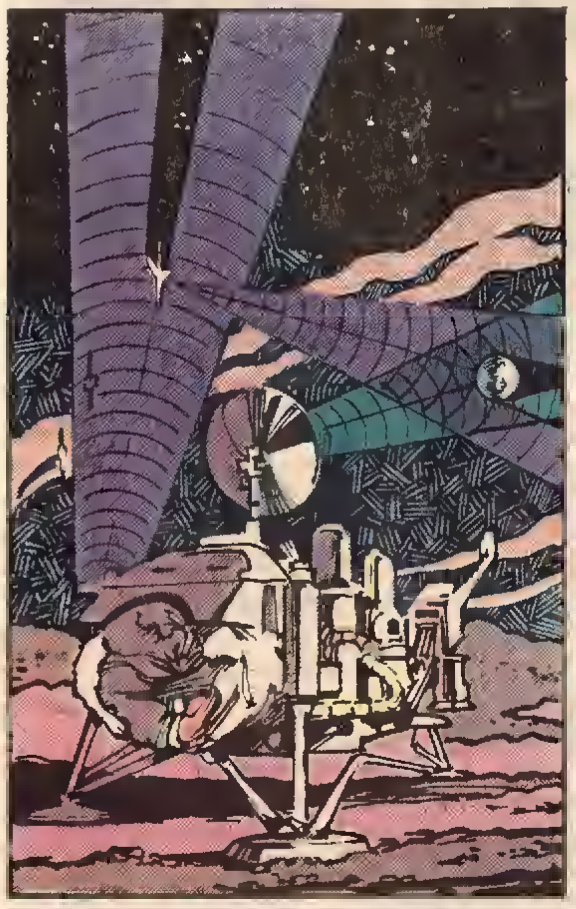
THAT'S WHY THE PILGRIMS CAME TO AMERICA IN 1620.— SEARCHING FOR RELIGIOUS FREEDOM AND THE RIGHT TO GOVERNMENT BY THE PEOPLE.



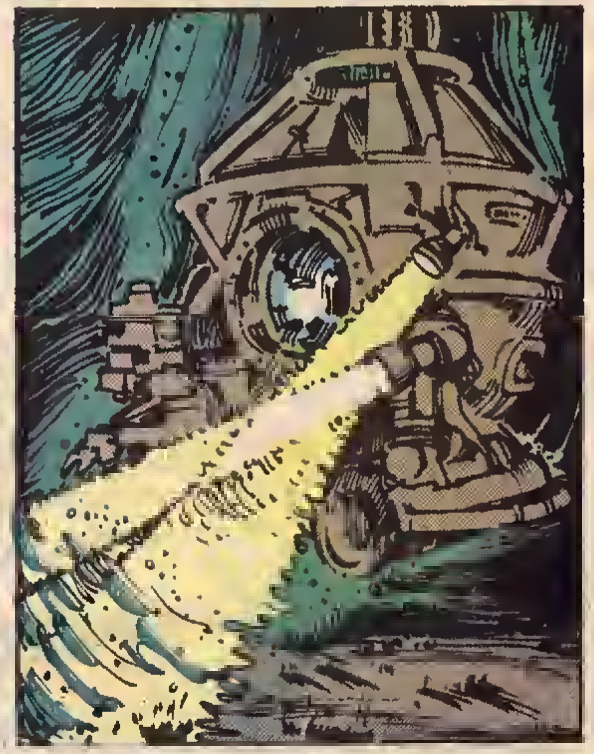
IN 1925, ADMIRAL MAC MILLAN'S EXPEDITION TO THE ARCTIC SHOWED HOW **SHORTWAVE** RADIO COULD BE USED TO COMMUNICATE OVER GREAT DISTANCES EVEN IN ARCTIC WEATHER.



TODAY, SCIENCE EXPLORERS WITH THE AID OF ELECTRONICS ARE ALSO SEARCHING THE OCEAN FLOOR FOR NEW REBOURCES AND WAYS TO RETRIEVE THEM.



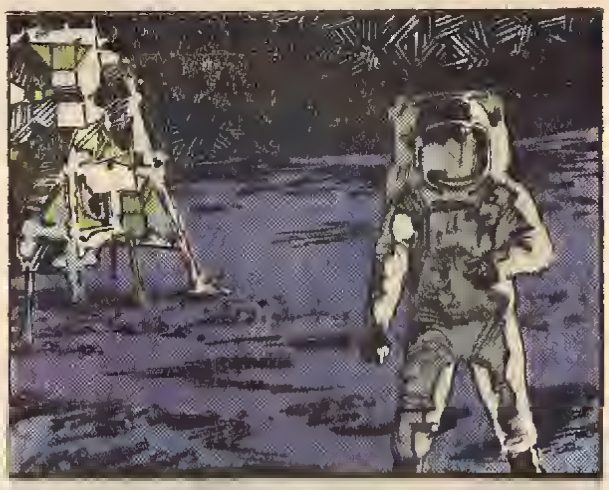
IN MODERN TIMES, AN AMERICAN VIKING – A **ROBOT EXPLORER** – TOUCHED DOWN ON THE PLANET MARS, 400 MILLION MILES FROM EARTH, JULY 20, 1976.

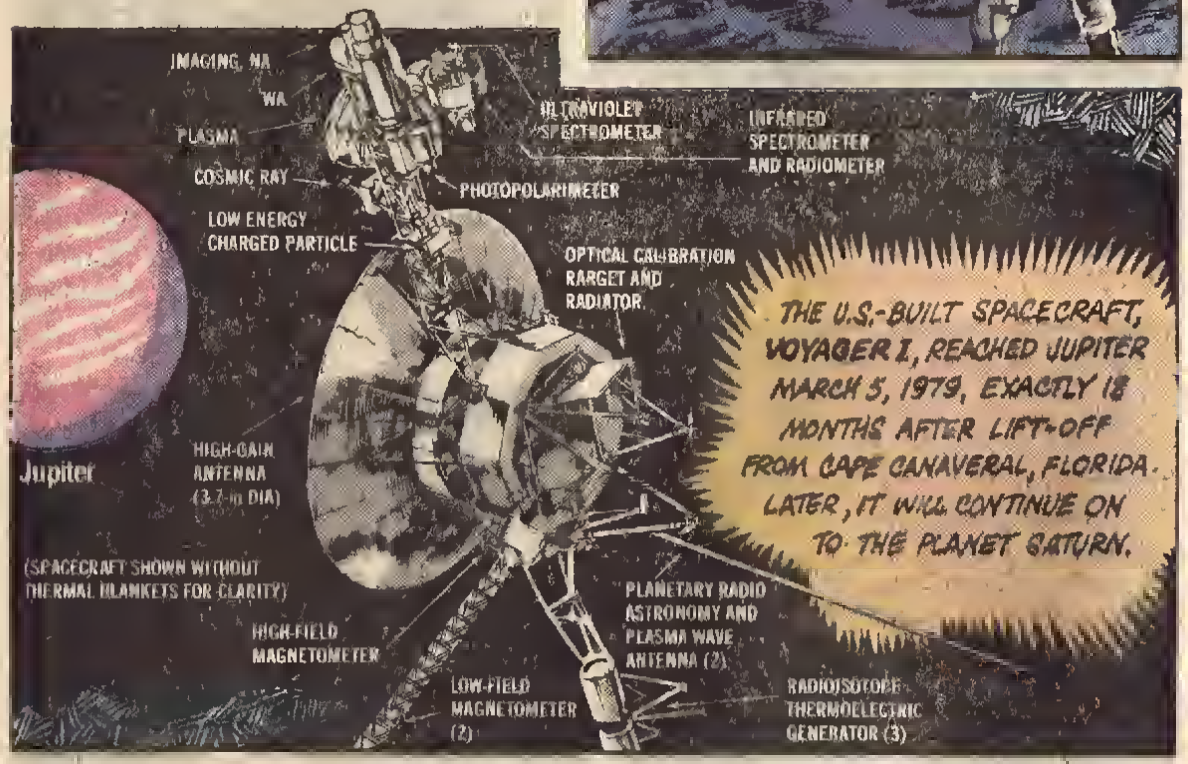


IN 1979, A U.S.-BUILT DEEP WATER CRAFT, ATMOSPHERIC ROVING MANIPULATOR SYSTEM (**ARMS-1**), SET A WORLD'S DEPTH RECORD FOR A DIVING BELL WHEN IT INSPECTED AN OIL WELL-HEAD 2,842 FEET.

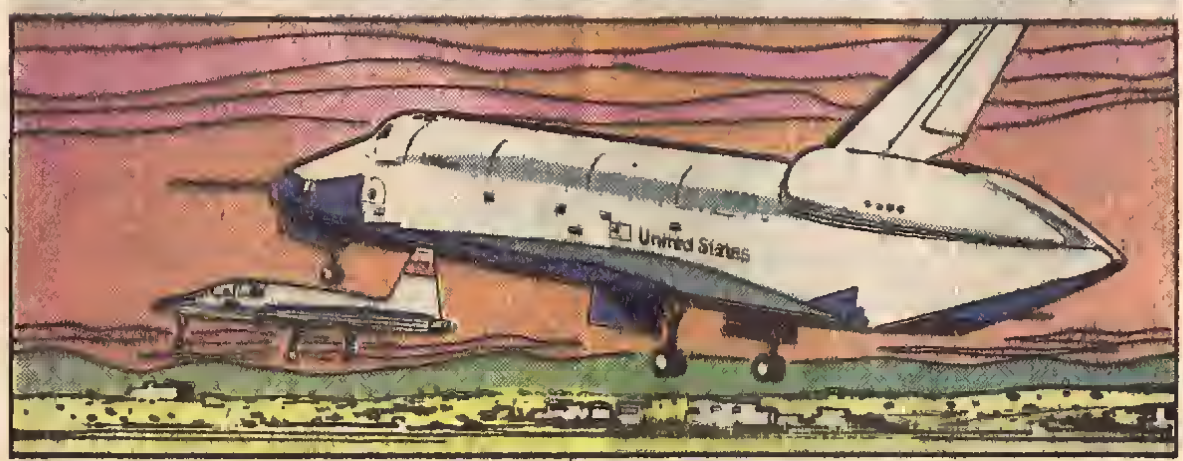
THAT'S WHY AMERICAN SPACE EXPLORERS **NEIL ARMSTRONG** AND **EDWIN ALDRIN** SET THEIR SPACE SHIP DOWN ON THE MOON'S SEA OF TRANQUILLITY IN 1969 — THEN TALKED FROM THERE BY RADIO AND TELEVISION, WITH A U.S. PRESIDENT IN WASHINGTON, D.C.

THEIR SPACE VOYAGE WAS A STEPPINGSTONE FOR OTHER EXPLORERS WHO WILL TRAVEL EVEN DEEPER INTO OUTER SPACE.



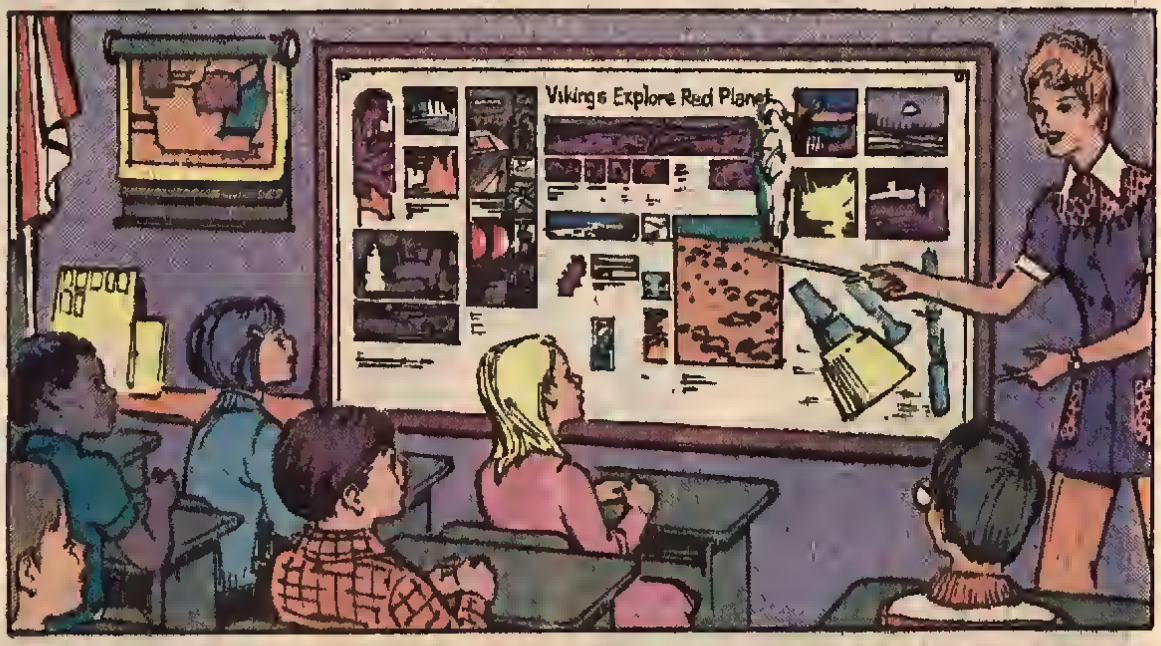


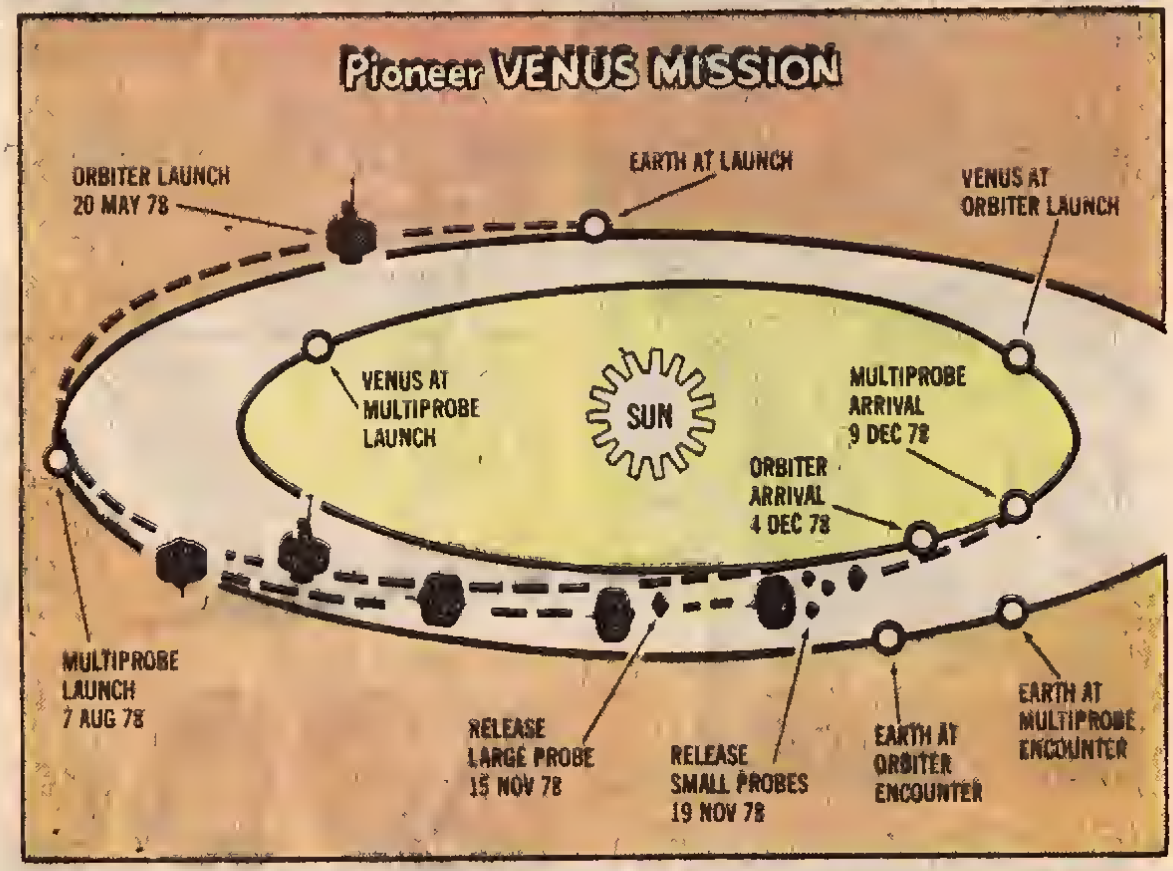
THE U.S.-BUILT SPACECRAFT, **VOYAGER I**, REACHED JUPITER MARCH 5, 1979, EXACTLY 18 MONTHS AFTER LIFT-OFF FROM CAPE CANAVERAL, FLORIDA. LATER, IT WILL CONTINUE ON TO THE PLANET SATURN.



AMERICA'S NEW SPACE SHUTTLE ORBITER "ENTERPRISE" LANDS LIKE AN AIRPLANE AFTER RETURNING FROM ORBIT AROUND THE EARTH, USING A MICROWAVE LANDING SYSTEM — MUCH BETTER THAN THE OLD "PARACHUTE LANDING" OF A CREW CAPSULE IN THE OCEAN.

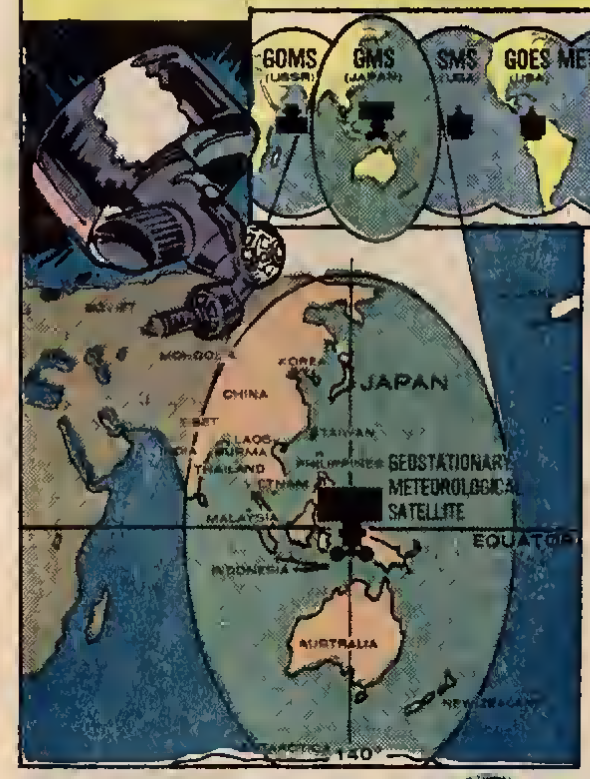
AMERICA'S SPACE EXPLORATION IS JUST AS IMPORTANT AS THE VOYAGE OF COLUMBUS IN 1492. THE DISCOVERIES THAT OUR EXPLORERS MAKE NOW ARE SURE TO BENEFIT IN MANY WAYS FUTURE GENERATIONS OF MANKIND.



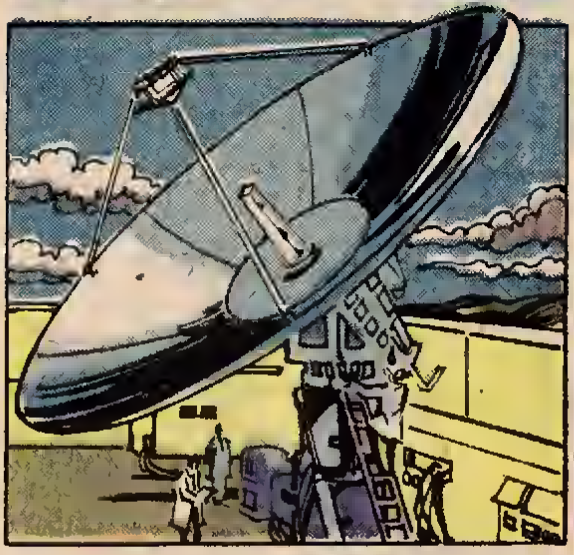


THE U.S.-BUILT PIONEER **VENUS** SPACECRAFT WAS THE FIRST PROJECT WITH THE MAIN PURPOSE OF STUDYING THE ATMOSPHERE AND WEATHER OF ANOTHER PLANET. ITS FINDINGS MAY HELP SCIENTISTS LEARN MORE ABOUT THE FORCES THAT AFFECT EARTH'S WEATHER.

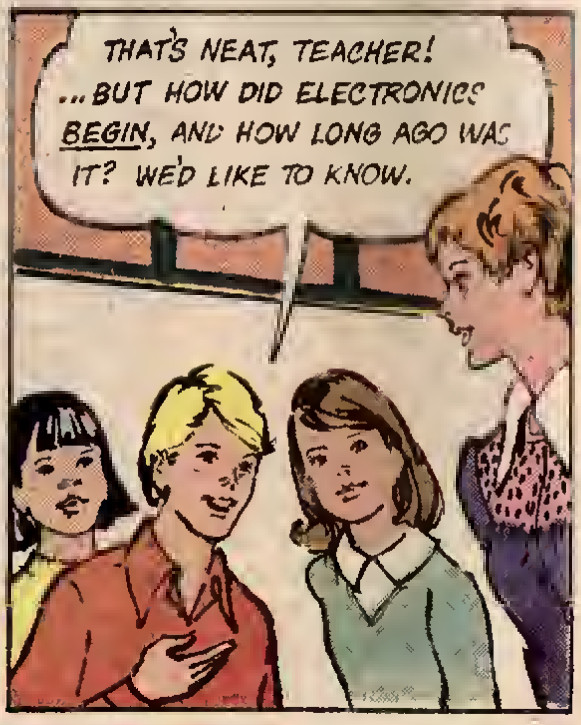
THE WORLD METEOROLOGICAL ORGANIZATION NOW HAS A "**WORLD WEATHER WATCH**" PROGRAM TO KEEP PEOPLE AROUND THE WORLD INFORMED ABOUT STORM AND WEATHER MOVEMENTS. EARLY STORM WARNINGS CAN SAVE LIVES AND REDUCE PROPERTY DAMAGE.



WE MAY SOON HAVE OVERSEAS SATELLITE **MAIL**, USING AIR ELECTRONIC MESSAGE SERVICE BETWEEN THE UNITED STATES AND OVERSEAS LOCATIONS — ANOTHER BENEFIT OF OUR SATELLITE AND SPACE EXPLORATION PROGRAM.



MOBILE SATELLITE GROUND STATIONS SENDING ELECTRONIC SIGNALS TO SATELLITES ABOVE THE EARTH LET US SEE WORLDWIDE EVENTS LIKE THE OLYMPIC GAMES ON COLOR TELEVISION... AND NEWS AND CULTURAL PROGRAMS.

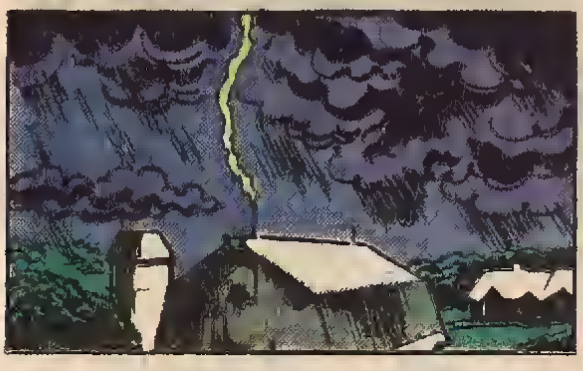


AS EARLY AS 600 B.C., **THALES** OF MILETUS, GREECE, THEORIZED A CONNECTION BETWEEN ELECTRICITY AND MAGNETISM. THE ANCIENTS EVEN TRIED ELECTRIC SHOCKS FROM **EELS** AS A TREATMENT FOR RHEUMATIC DISEASES.

ARCHAEOLOGISTS THINK THAT CRUDE BATTERIES UNEARTHED IN IRAQ IN 1936 WERE USED IN THE ELECTROPLATING OF GOLD, SILVER, AND ANTIMONY AS EARLY AS 227 B.C.

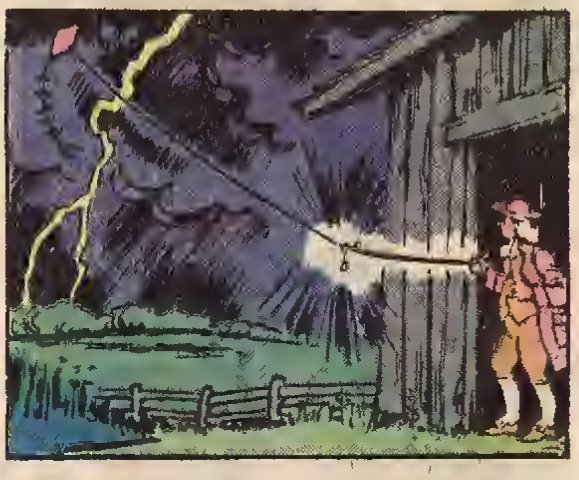
IN 1600 A.D., **GILBERT** PUBLISHED THE FIRST SCIENTIFIC STUDY OF ELECTRICITY AND MAGNETISM, CALLED "DE MAGNETE."

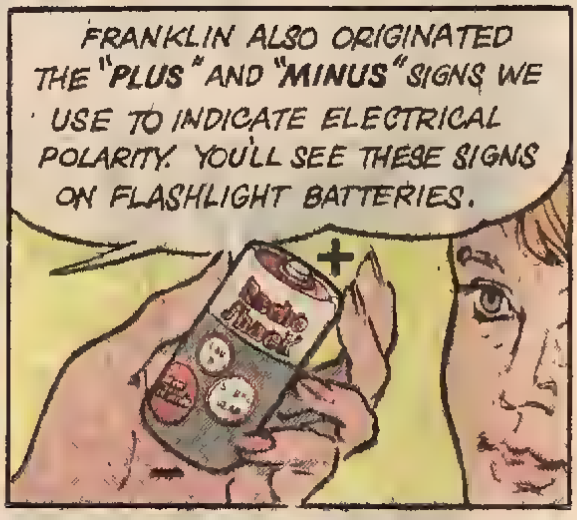
HE LEARNED IT WAS, AND THEN DEVISED HIS LIGHTNING ROD SYSTEM TO GROUND DAMAGING ELECTRIC CHARGES —— USED ON HOMES AND OTHER BUILDINGS TO THIS DAY.



AN IMPROVED BATTERY DESIGN WAS MADE BY **ALESSANDRO VOLTA** IN 1800. OTHER INVENTORS MADE IMPROVEMENTS LATER.

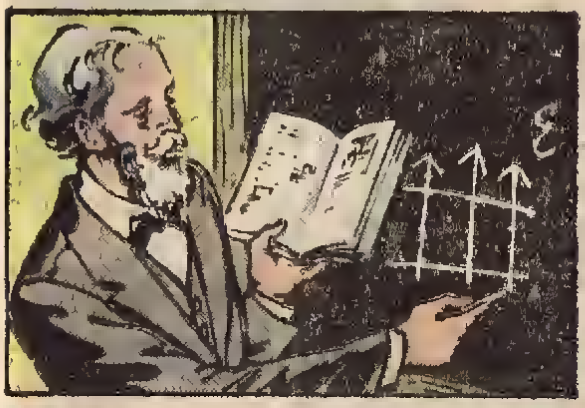
BENJAMIN FRANKLIN SET OUT TO DISCOVER IF NATURAL LIGHTNING WAS THE SAME STUFF AS ELECTRICITY IN HIS FAMOUS KITE AND WIRE EXPERIMENT.





LATER, **FARADAY** DEVISED THE FIRST MACHINE TO MAKE ELECTRICITY FROM MECHANICAL ENERGY. IT WASN'T VERY EFFICIENT ... BUT IT WORKED!

ABOUT THIS TIME, **MAXWELL** WAS STUDYING THE WORKS OF FARADAY, DAVY, AND OTHERS. HIS MATHEMATICS PREDICTED "ELECTROMAGNETIC DISTURBANCES" IN SPACE...



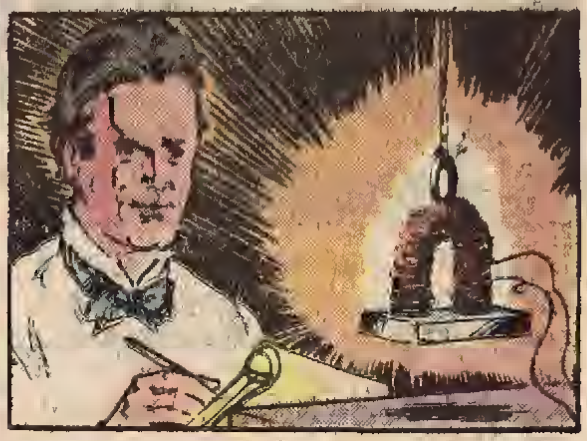
...**HERTZ** FOUND A WAY TO CREATE THE "DISTURBANCES" STUDIED BY MAXWELL, AND SHOWED THEY BEHAVED IN THE SAME WAY AS LIGHT! IT WAS THE BEGINNING OF "**WIRELESS**" (RADIO).

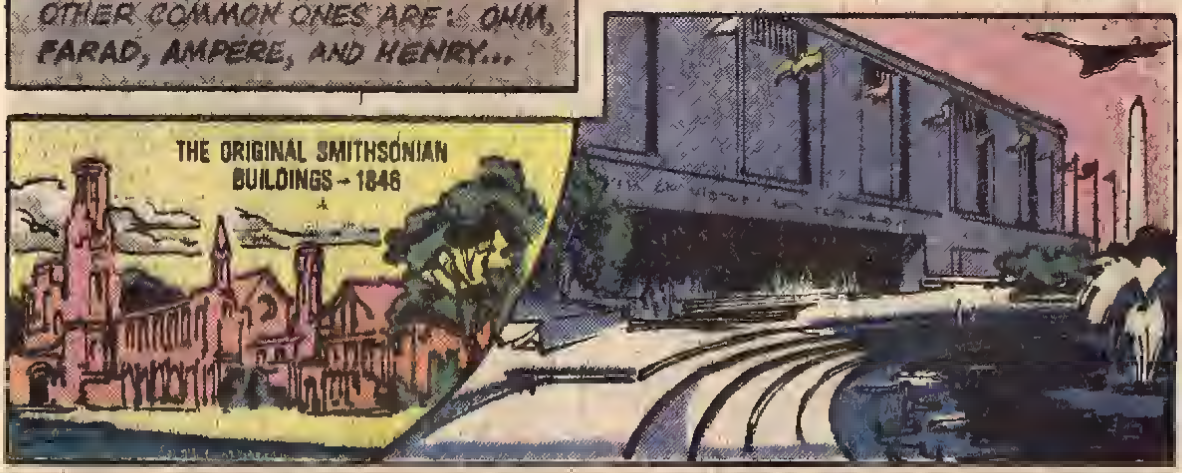
GEE! AN AWFUL LOT OF PEOPLE MUST HAVE STUDIED ELECTRICITY BEFORE ANYBODY COULD ACTUALLY USE IT!

YES, AND THEIR NAMES ARE STILL WITH US. THE "**GILBERT**" IS A UNIT OF MAGNETISM.

OTHER COMMON ONES ARE: **OHM**, **FARAD**, **AMPERE**, AND **HENRY**...

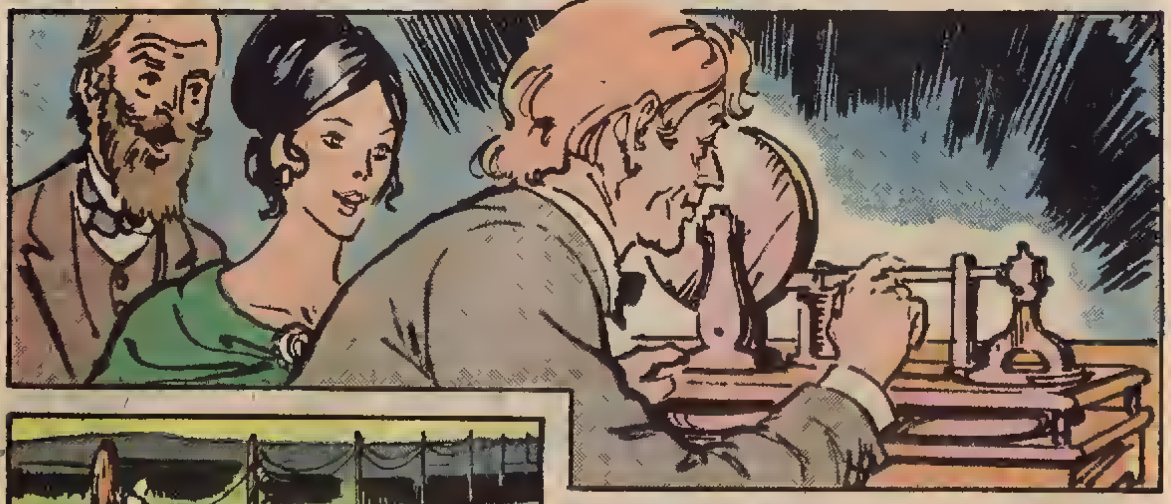
FOR **JOSEPH HENRY**, WHO ALSO BUILT THE FIRST ELECTROMAGNET, LATER USED FOR THE DIRECT CURRENT MOTOR.



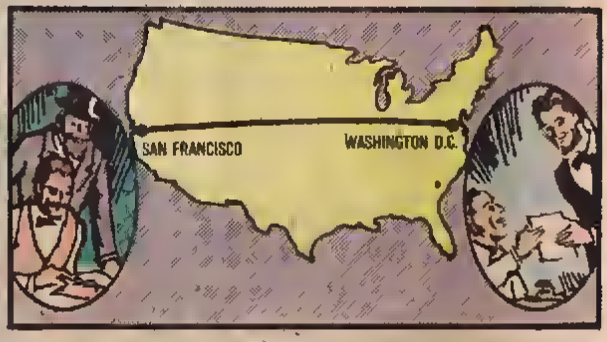


IN 1846, JOSEPH HENRY, INVENTOR AND TEACHER, BECAME THE FIRST SECRETARY OF THE **SMITHSONIAN INSTITUTION** IN WASHINGTON, D.C. THE SMITHSONIAN WAS ESTABLISHED FROM A GIFT TO THE AMERICAN PEOPLE BY JAMES SMITHSON OF SCOTLAND.

IN 1837, AT THE AGE OF 44, **SAMUEL MORSE**, A PORTRAIT ARTIST, BUILT THE FIRST PRACTICAL TELEGRAPH SOUNDER. THE FIRST TELEGRAM, "WHAT HATH GOD WROUGHT," WAS SENT FROM BALTIMORE IN 1844.



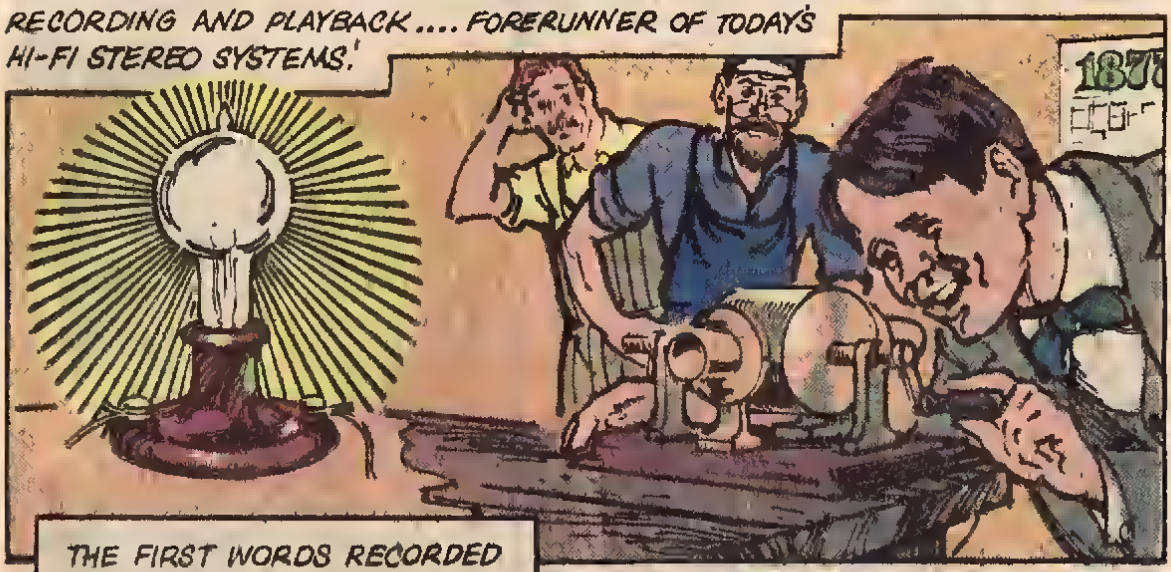
HIS WIRE TELEGRAPH WAS THE FIRST PRACTICAL LONG-RANGE COMMUNICATIONS SYSTEM. IN 1861, **STEPHEN FIELD** SENT THE FIRST TRANSCONTINENTAL TELEGRAPH MESSAGE TO PRES. LINCOLN...

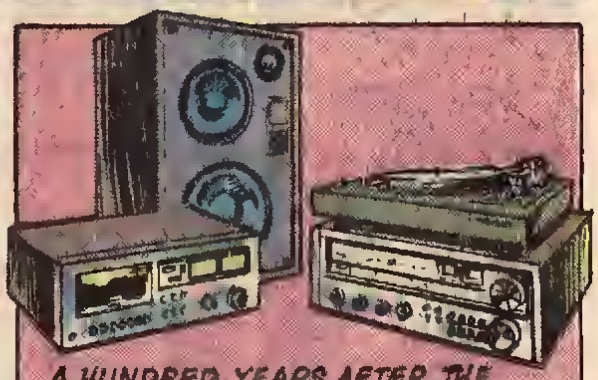


...FROM SAN FRANCISCO, CALIFORNIA TO WASHINGTON, D.C. AND THE YOUNG TELEGRAPH SYSTEM GOT ITS BAPTISM OF FIRE DURING THE U.S. CIVIL WAR WHICH BEGAN THAT YEAR.

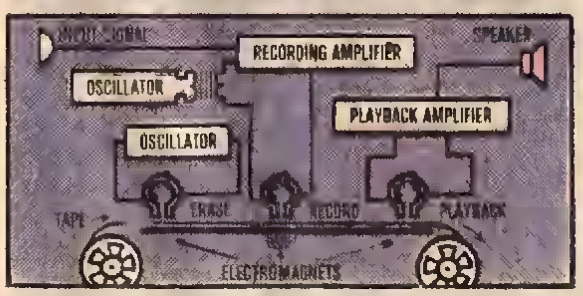
IN JULY, 1861, U.S. GEN. McCLELLAN CLAIMED FIRST USE OF THE TELEGRAPH UNDER ACTUAL BATTLE CONDITIONS. ALSO USED LATER DURING AMERICA'S CIVIL WAR WAS THE **TELEGRAPH PRINTER**, INVENTED BY **ROYAL HOUSE** OF VERMONT. IT USHERED IN A NEW ERA IN RAPID COMMUNICATIONS.

THOMAS EDISON IS BEST REMEMBERED FOR HIS INVENTION OF THE ELECTRIC LIGHT BULB. BUT JUST AS GREAT WAS HIS **PHONOGRAPH** FOR SOUND RECORDING AND PLAYBACK.... FORERUNNER OF TODAY'S HI-FI STEREO SYSTEMS!





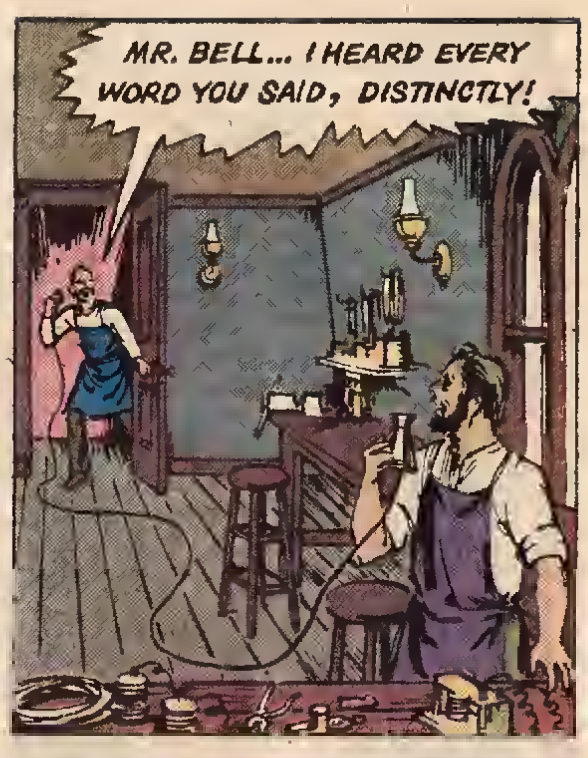
A HUNDRED YEARS AFTER THE FIRST PHONOGRAPH, SYSTEMS LIKE THIS CAN RECORD AND PLAY BACK LIFELIKE MUSIC ON A TAPE, ON RECORDS, OR PLAY AM/FM MUSIC OVER ITS RADIO.

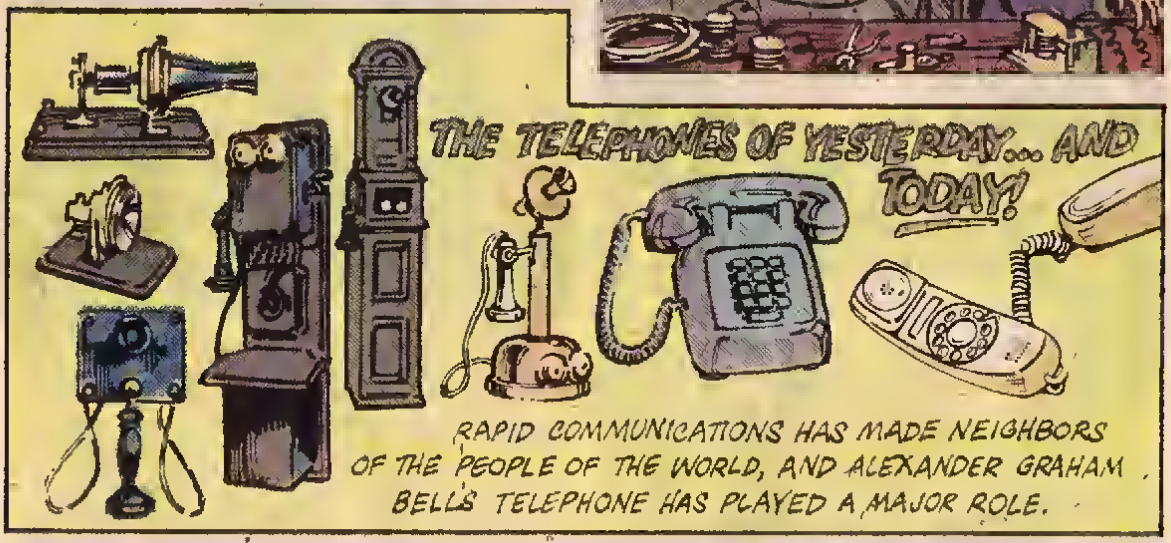


MAGNETIC RECORDING WAS INVENTED BY **VALDEMAR POULSEN** IN 1889. TAPE RECORDING WAS DEVELOPED IN THE LATE 1930'S. THIS DIAGRAM SHOWS HOW TAPE IS RECORDED.

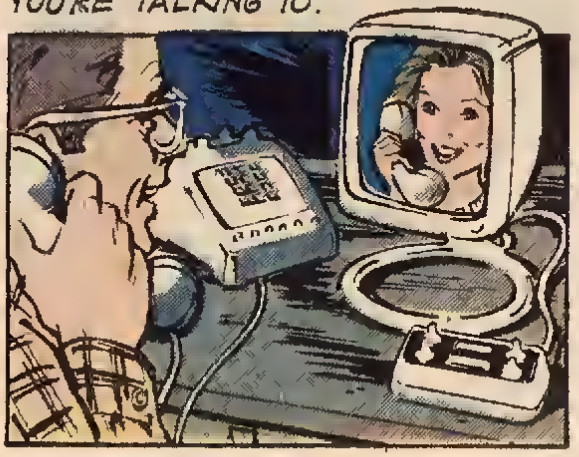
TODAY, TINY POCKET-SIZE RECORDERS ARE THE THING FOR DICTATION, FOR RECORDING MEETING OR LECTURE NOTES, LANGUAGE STUDY OR FOR RECORDING THE SOUNDS OF A VACATION TRIP.

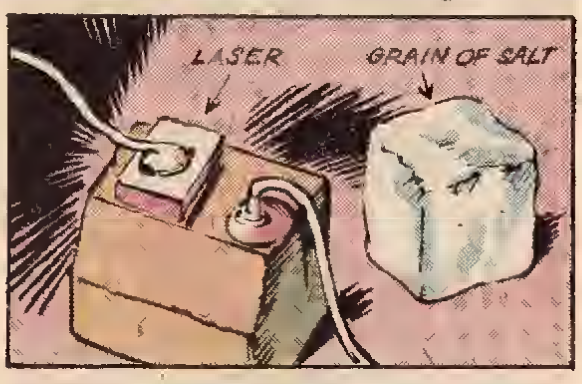
BELL'S FIRST TELEPHONE PATENT WAS ISSUED MARCH 7, 1876. JUST THREE DAYS LATER, ON THE TOP FLOOR OF A BOARDINGHOUSE AT NO. 5 EXETER PLACE, BOSTON, MASSACHUSETTS, THE TELEPHONE CARRIED ITS FIRST VOICE SOUND...



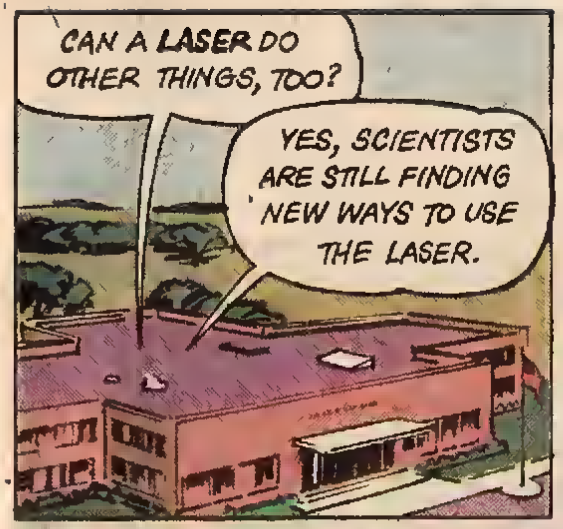


SOON MANY TELEPHONES WILL HAVE A "PICTURE PHONE" SO YOU CAN SEE AS WELL AS HEAR THE PERSON YOU'RE TALKING TO.

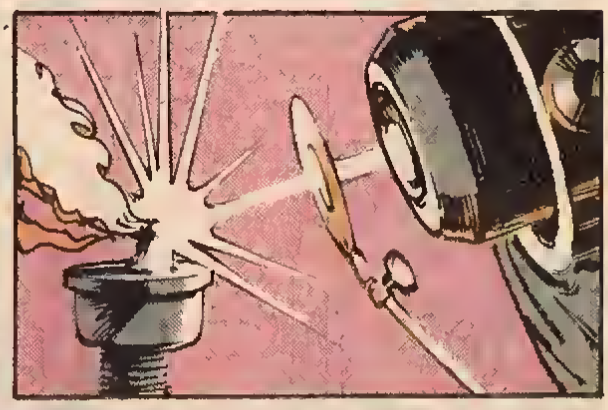




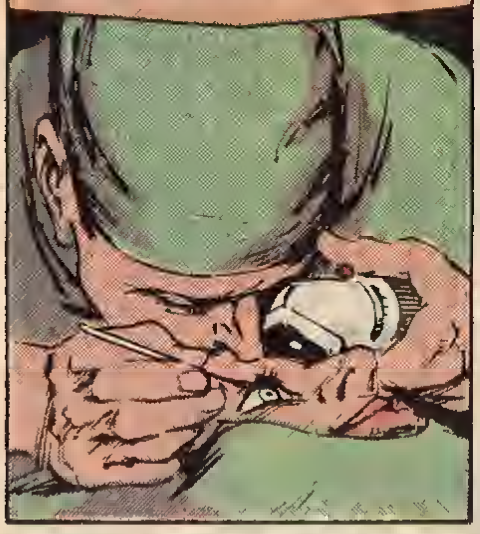
SMALLER THAN A GRAIN OF SALT, THIS SOLID-STATE **LASER** (ARROW) MAKING A LIGHT THROUGH TINY GLASS FIBERS WILL MAKE IT POSSIBLE TO "TALK BY TELEPHONE OVER A BEAM OF LIGHT." ANOTHER MIRACLE OF SCIENCE!



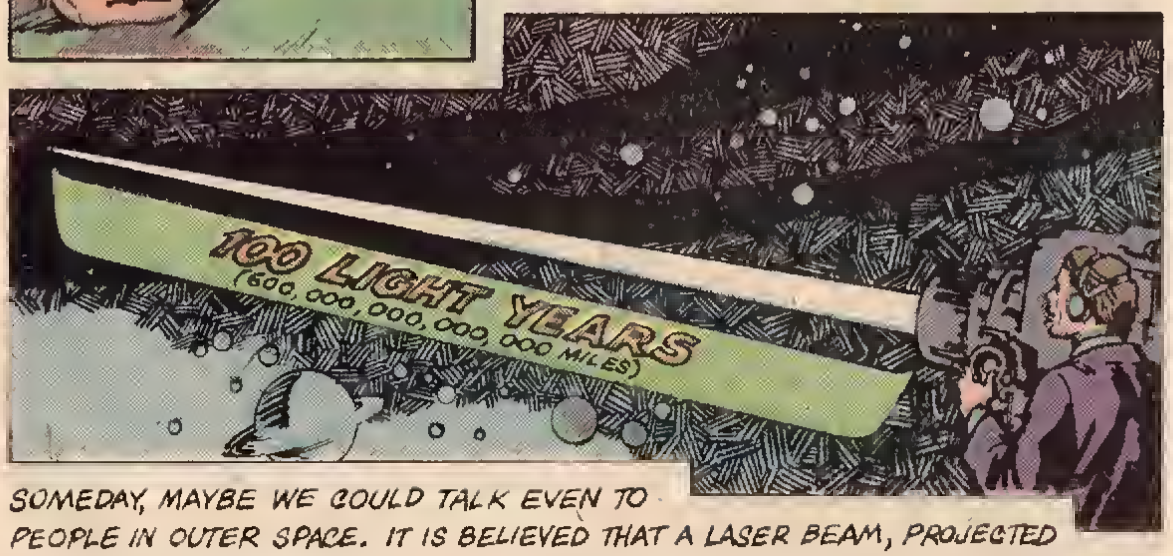
A LASER CAN FOCUS ENORMOUS ENERGY ON A VERY SMALL AREA TO CUT STEEL OR BURN HOLES IN DIAMOND WIRE DIES.



BECAUSE IT CAN BE CONTROLLED WITH GREAT ACCURACY, THE LASER IS USED IN BOTH EYE AND BRAIN SURGERY.

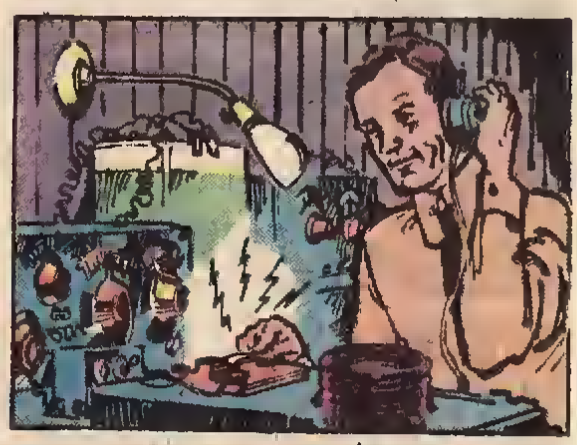


PRECISION LASER RANGE-FINDERS HELP THE ARMY PINPOINT TARGETS FOR LASER-GUIDED MISSILES, BOMBS OR SHELLS.

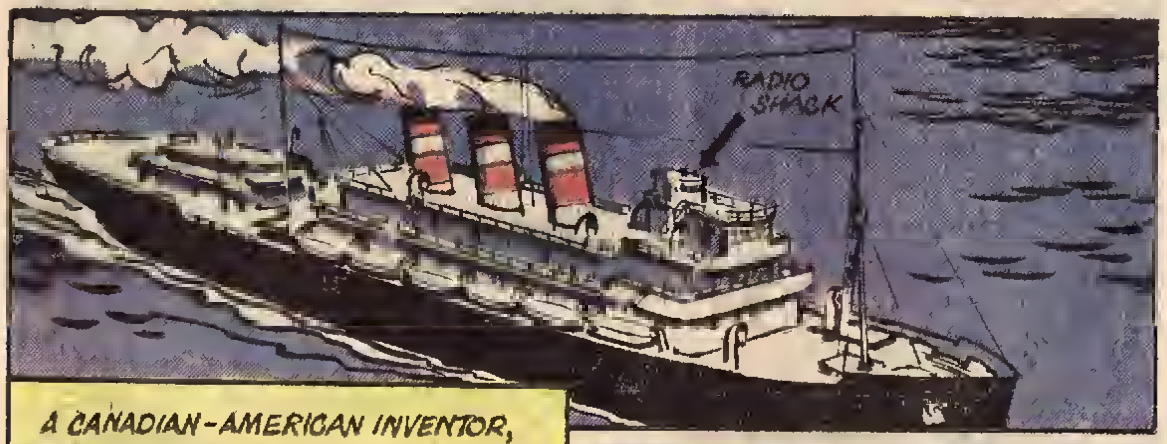


SOMEDAY, MAYBE WE COULD TALK EVEN TO PEOPLE IN OUTER SPACE. IT IS BELIEVED THAT A LASER BEAM, PROJECTED FROM EARTH, COULD STILL BE DETECTED AT 100 LIGHT YEARS DISTANCE.

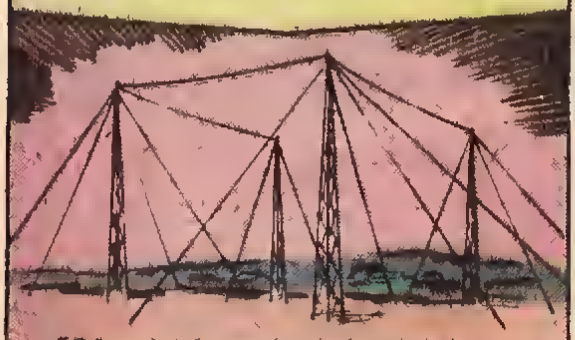
ON DECEMBER 12, 1901, **GUGLIELMO MARCONI** SENT THE FIRST TRANS-ATLANTIC WIRELESS MESSAGE FROM ENGLAND TO ST. JOHN'S, NEWFOUNDLAND. IT MARKED THE BEGINNING OF LONG-RANGE RADIO COMMUNICATION.



SEVERAL YEARS LATER, SHIPS WERE ADDING A SMALL ROOM TO THE TOP DECK TO HOUSE MARCONI'S WIRELESS RADIO SETS. THIS ROOM WAS CALLED THE **"RADIO SHACK"** BY SAILORS.



A CANADIAN-AMERICAN INVENTOR, **REGINALD FESSENDEN**, MADE HISTORY ON CHRISTMAS EVE, 1906, WHEN HE SENT THE FIRST VOICE AND MUSIC BY "WIRELESS" (RADIO)



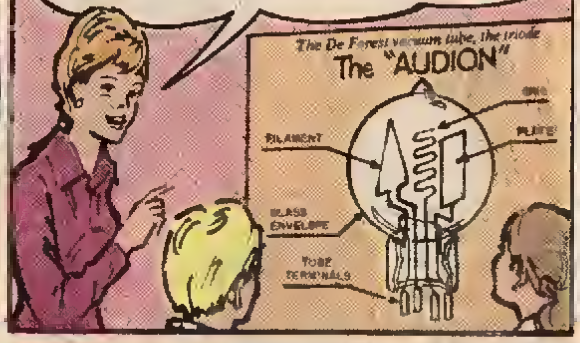
FROM A WIRELESS STATION AT BRANT ROCK, MASSACHUSETTS...

...: HEARD BY MANY AMAZED WIRELESS OPERATORS ABOARD SHIPS AT SEA HUNDREDS OF MILES AWAY.

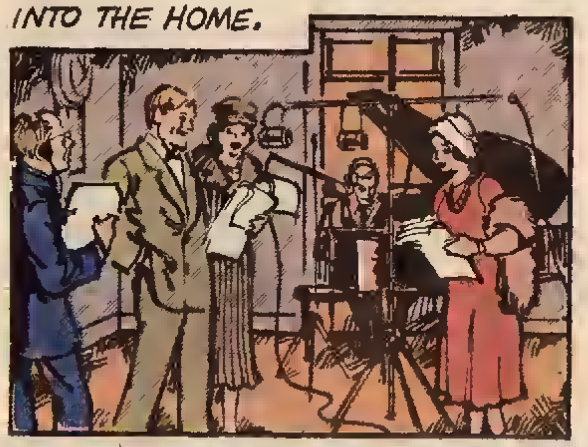
BOB, WHAT REVOLUTIONIZED ELECTRONICS A FEW YEARS AFTER MARCONI'S SUCCESSFUL TRANSATLANTIC RADIO TEST?

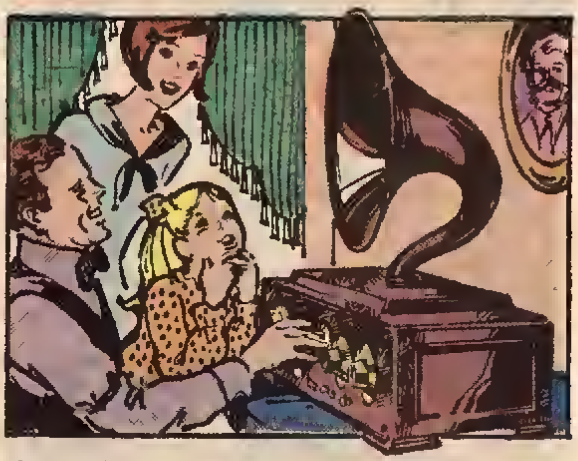
IT WAS THE DE FORREST "AUDION" RADIO TUBE IN 1915. IT MADE POSSIBLE LOUDER SOUND FROM RADIOS.

RIGHT, BOB! IN A FEW YEARS, RECEIVERS USING AUDION TUBES REVOLUTIONIZED RADIO LISTENING, —MORE STATIONS COULD BE TUNED IN... EVEN THOSE FAR AWAY!

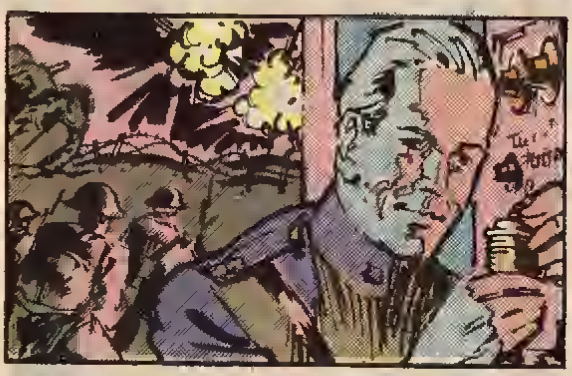


LEE DE FORREST'S INVENTION OF THE AUDION MARKED THE BEGINNING OF REGULAR RADIO BROADCASTS INTO THE HOME.



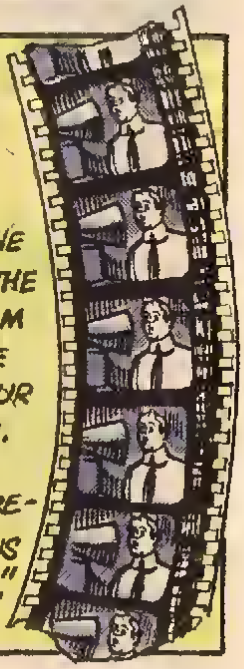


EARLY-DAY RADIO SETS WERE LARGE, AND THE LOUDSPEAKER LOOKED LIKE THE HORN OF A MUSICAL INSTRUMENT.

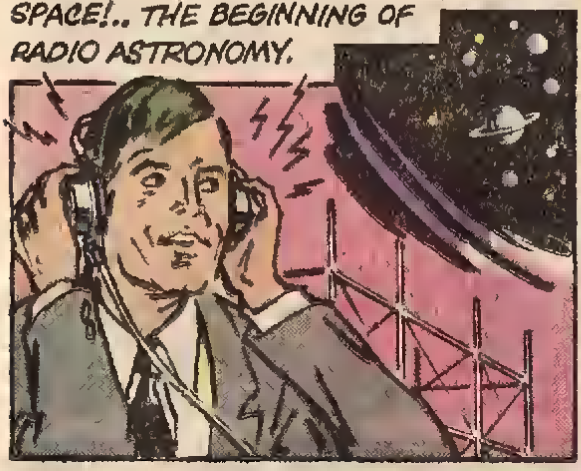


SOON, EVEN BETTER RADIO SETS WERE MADE. U.S. ARMY MAJ. **EDWIN ARMSTRONG** DEVELOPED THE SUPERHETERODYNE RECEIVER DURING WORLD WAR I. IT GAVE THE U.S. AND ITS ALLIES A GREAT ADVANTAGE. HE ALSO DEVELOPED **FM** RADIO DURING THE LATE 1930'S.

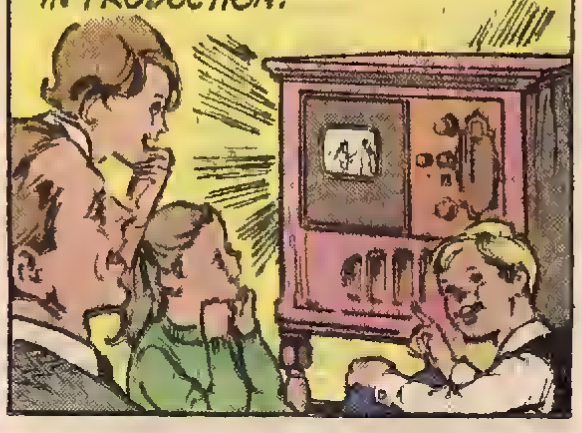
ON JUNE 9, 1922, INVENTOR/EDUCATOR **JOSEPH TYKOCINER**, (TICK-OH-SHINER), A POLISH IMMIGRANT TO THE U.S., DEMONSTRATED THE FIRST **SOUND-ON-FILM** MOTION PICTURE... THE PRINCIPLE USED IN OUR MODERN-DAY MOVIES. THE PICTURE SHOWED PROF. ELLERY PAINE RECITING LINCOLN'S FAMOUS "GETTYSBURG ADDRESS."

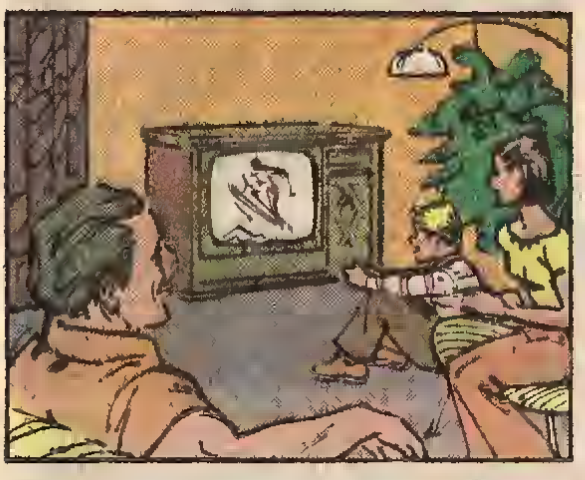


OTHER FIELDS OF ELECTRONICS BEGAN TO DEVELOP ALSO. IN 1933, **KARL JANSKY** ANNOUNCED THE DISCOVERY OF RADIO WAVES FROM OUTER SPACE!.. THE BEGINNING OF RADIO ASTRONOMY.

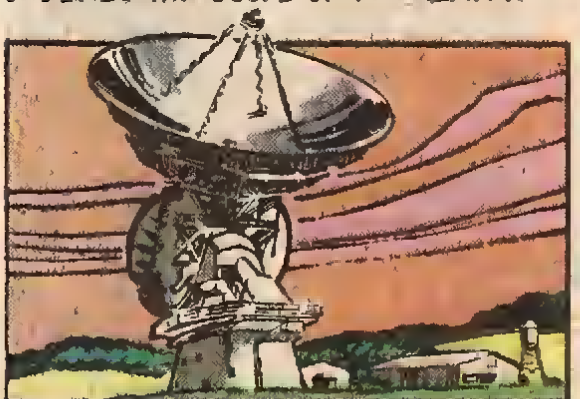


BY 1939, ELECTRONICS WAS A VERY ACTIVE BUSINESS AND INDUSTRIAL FIELD. THERE WERE EVEN SOME SMALL COMMERCIAL **TV** SETS IN PRODUCTION.



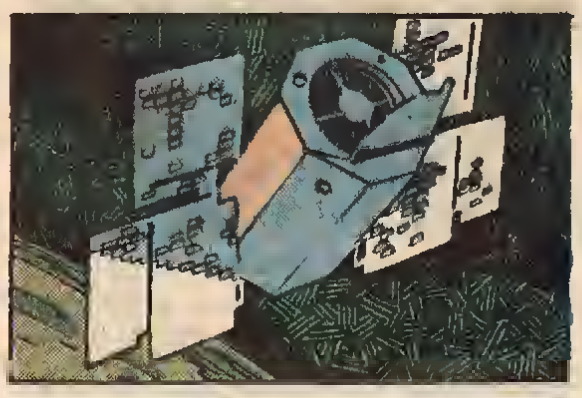


MODERN TV PICTURES CAN BE RECEIVED IN **85** COUNTRIES. NOT ONLY THAT, BUT ELECTRONIC ADVANCES HAVE WIDENED THE SCOPE OF TV GREATLY.



GIANT RADIO TELESCOPES HAVE BEEN BUILT, LIKE THE RADIO ASTRONOMY OBSERVATORY AT GREENBANK, W. VA., TO HELP US LEARN MORE ABOUT OUTER SPACE.

TV DEVELOPED RAPIDLY AFTER WORLD WAR II. ITS PORTABILITY AND ADAPTABILITY TO STRANGE ENVIRONMENT MADE TV A VALUABLE SCIENTIFIC TOOL. ON JULY 20, 1969, IT SHOWED US THE FIRST MEN ON THE MOON.

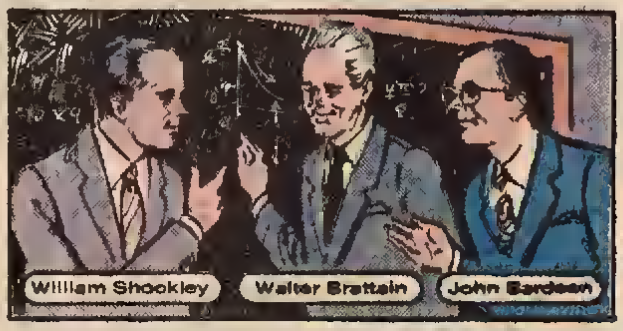


A TELESCOPE SCANNING OUTER SPACE FROM A PLATFORM-IN-ORBIT CAN SEND TV PICTURES OF WHAT IT SEES BACK TO EARTH.

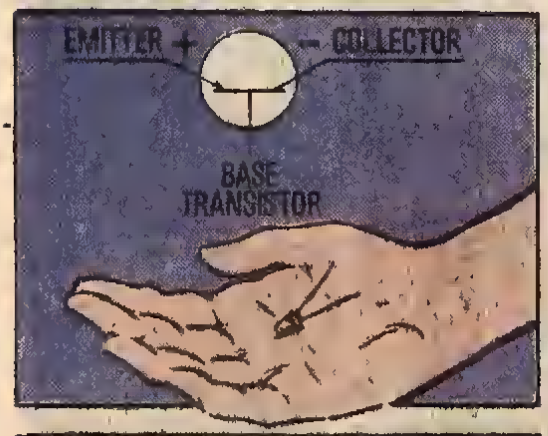
IN THE LATE 1940'S, SCIENTISTS MADE A REVOLUTIONARY DISCOVERY FOR RADIO CIRCUITS. WHAT WAS IT?

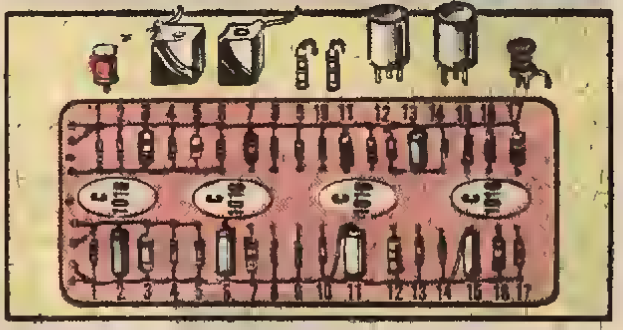
I KNOW! IT WAS THE **TRANSISTOR** IN 1948.

YES, THE NOBEL PRIZE IN PHYSICS WAS SPLIT BETWEEN THREE AMERICANS... FOR INVENTING THE TRANSISTOR: **JOHN BARDEEN, WILLIAM SHOCKLEY,** AND **WALTER BRATTAIN.** IT REVOLUTIONIZED THE ELECTRONICS INDUSTRY.



THIS IS THE SYMBOL FOR THE TINY TRANSISTOR... WHICH MADE POSSIBLE SMALL, LIGHTWEIGHT RADIOS.

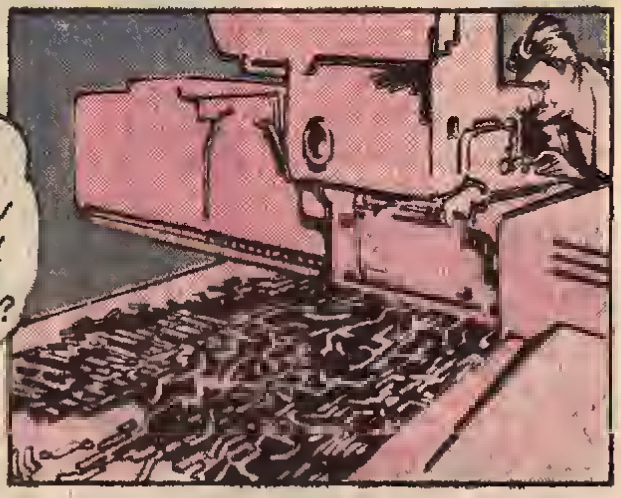




ANOTHER GIANT STEP OF THIS EVOLUTION TOWARD MINIATURIZATION WAS THAT OF **PRINTED** CIRCUITS. SOLID-WIRE CONNECTIONS AND TUBES WERE BEING REPLACED BY PRINTED CONNECTIONS ON A FLAT CIRCUIT BOARD.

THIS MAY SEEM HARD TO BELIEVE, BUT IT'S NOW POSSIBLE TO PRINT AS MANY AS 18,000 CIRCUITS ON A **ONE-INCH** BOARD.

GEEE! JUST HOW SMALL <u>CAN</u> YOU BUILD A CIRCUIT?



THIS IS KNOWN AS MOLECULAR ELECTRONICS, WHERE MATERIAL ONLY ONE MILLIONTH OF AN INCH THICK IS USED. SOMEDAY, THIS CIRCUITRY BUILDING WILL BE DONE ENTIRELY BY AN ELECTRONIC BEAM.

COMPUTER ENGINEERS WERE VERY INTERESTED IN THE TRANSISTOR BECAUSE OF ITS SMALL SIZE AND EFFICIENCY.

WOW!

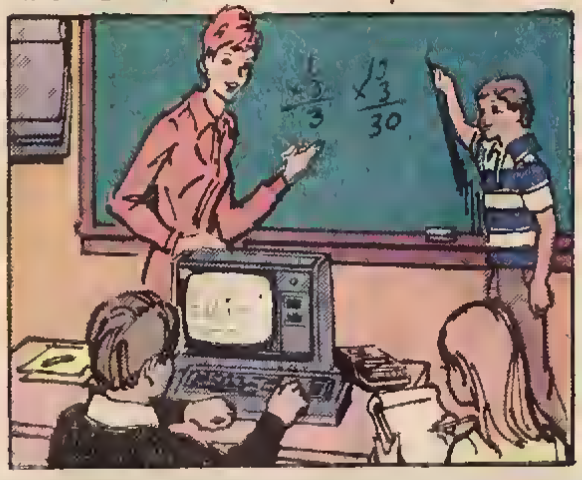
IN 1959, A COMPUTER WAS BUILT WITH 18,800 TUBES. IF IT HAD BEEN BUILT TODAY, IT WOULD HAVE NEEDED ONLY 4000 TRANSISTORS.

NOW, TRANSISTORIZED COMPUTERS CAN PREDICT WEATHER AND SEVERE STORMS. THEY CAN EVEN OPERATE SOME MACHINES IN FACTORIES.

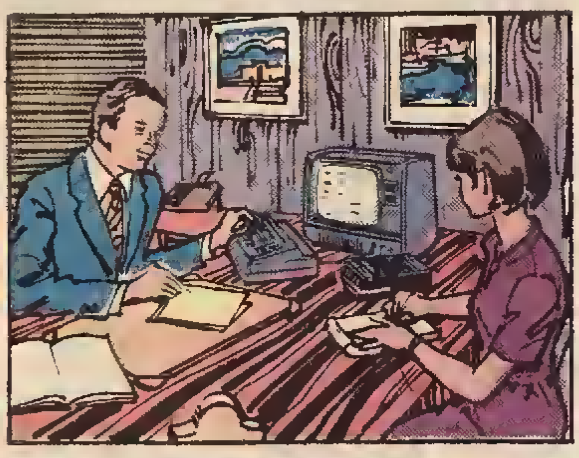
SOLID-STATE ELECTRONICS MADE POSSIBLE NOT ONLY OUR GIANT COMPUTERS, BUT ALSO OUR TINY, POCKET-SIZE CALCULATORS IN EVERYDAY USE BY STUDENTS, BUSINESSMEN, AND HOUSEWIVES... HIGHLY POPULAR IN THE U.S.

AND NOW, THERE'S EVEN A TINY COMBINATION CALCULATOR-AND-WATCH ABOUT THE SIZE OF A REGULAR WRISTWATCH.

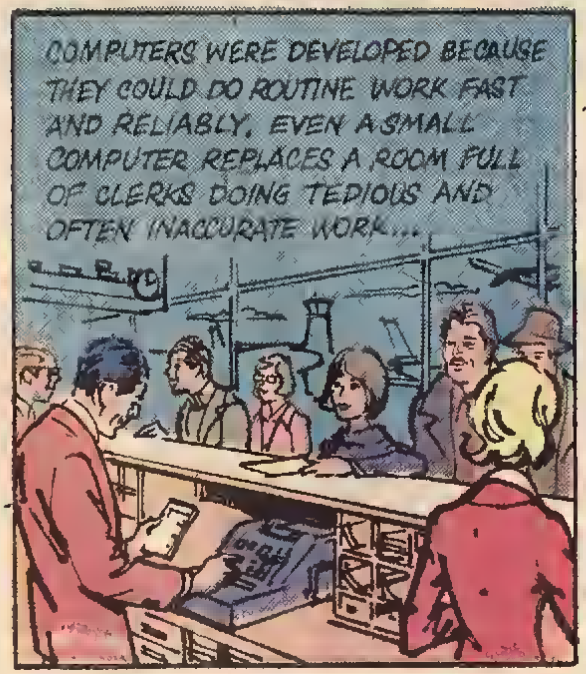
TODAY, MICROCOMPUTER SYSTEMS COSTING AS LITTLE AS A CONSOLE TV SET ARE FINDING USES IN TEACHING/LEARNING...

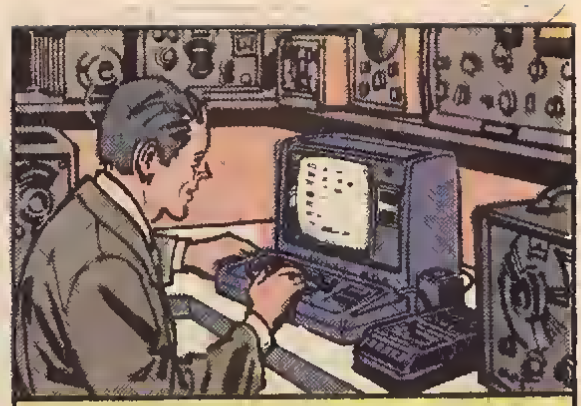


...IN REDUCING TIME AND PAPERWORK FOR SMALL-BUSINESS OPERATIONS...

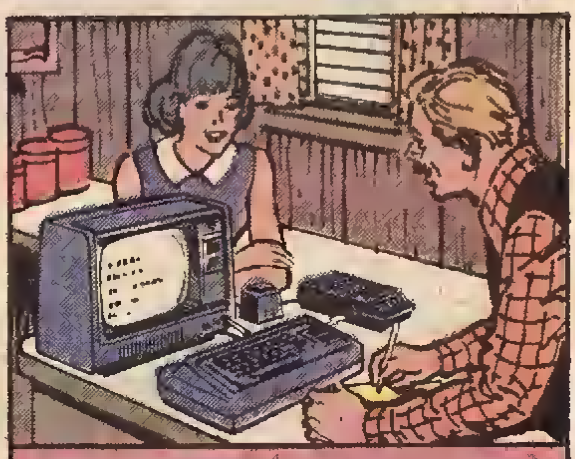


COMPUTERS WERE DEVELOPED BECAUSE THEY COULD DO ROUTINE WORK FAST AND RELIABLY. EVEN A SMALL COMPUTER REPLACES A ROOM FULL OF CLERKS DOING TEDIOUS AND OFTEN INACCURATE WORK...



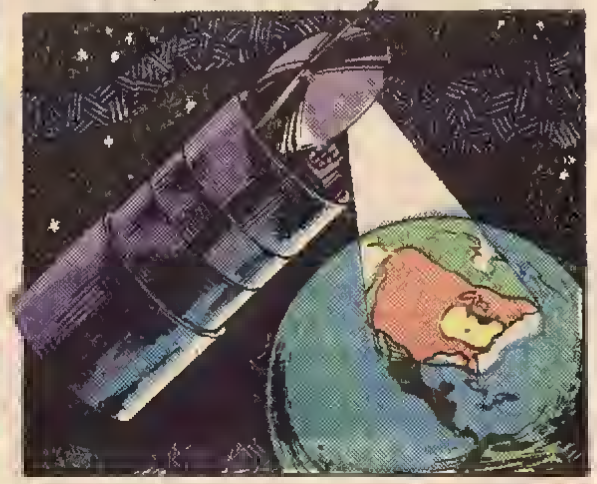


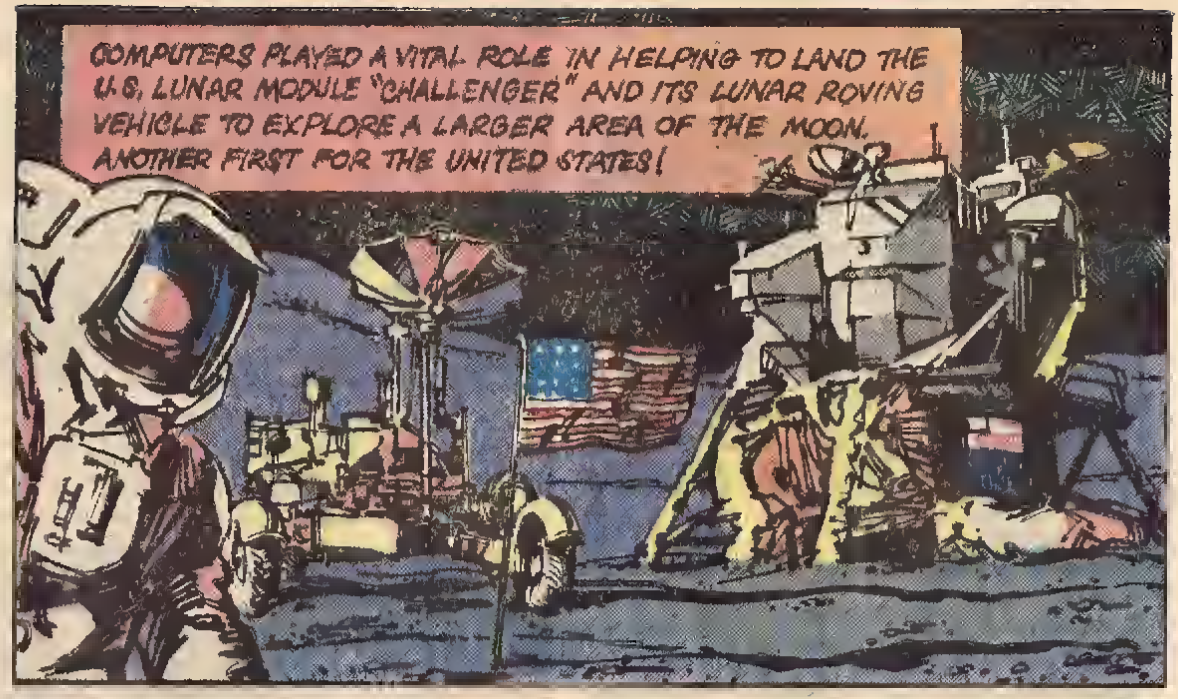
...AS AN AID IN SCIENTIFIC RESEARCH LABORATORY WORK... TO SPEED TESTING AND DESIGN PROCEDURES...



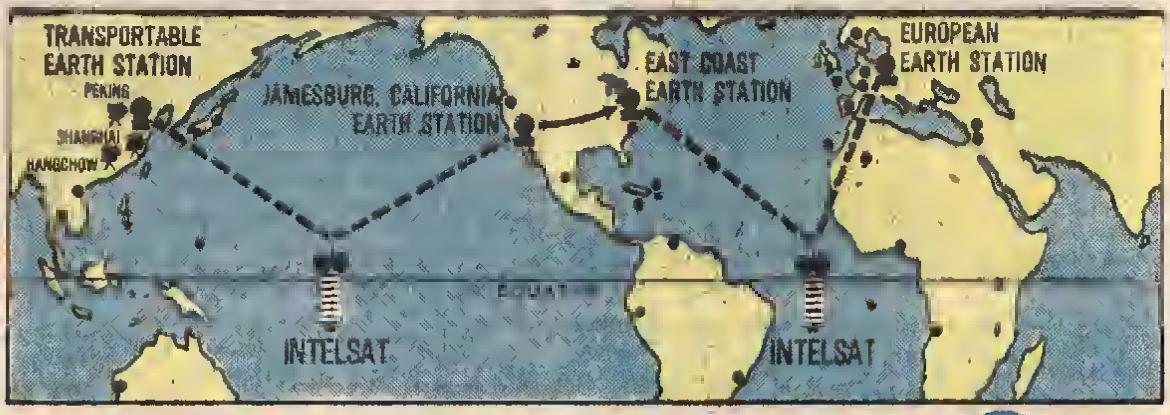
AS WELL AS USE AT HOME... FOR COMPUTING FAMILY FINANCES AND FOR PLAYING THE NEW TV GAMES.

...AND BY 1981, A SATELLITE BUSINESS SYSTEMS CRAFT WILL TRANSMIT DATA DIRECTLY TO ROOFTOP ANTENNAS OF U.S. BUSINESS AND GOVERNMENT AGENCIES FROM 22,300 MILES ABOVE EARTH.

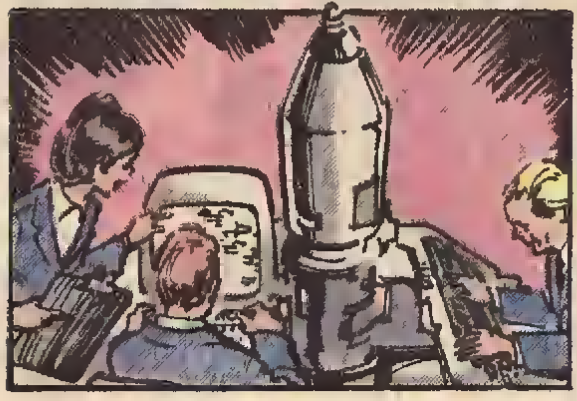


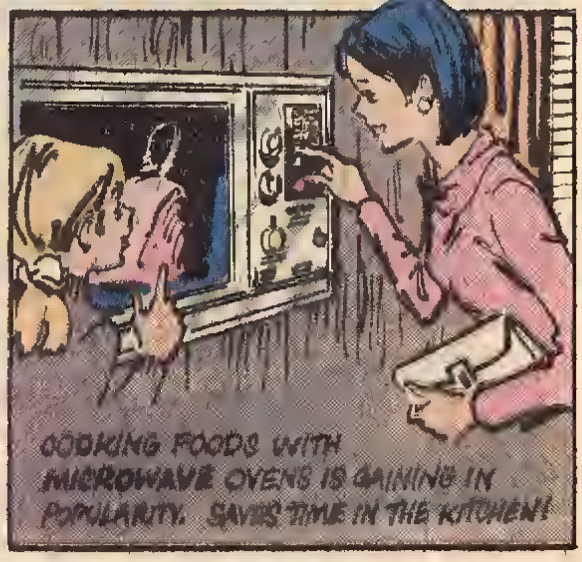


THE WORLD GREW EVEN SMALLER BY 1972, WHEN PEOPLE AROUND THE WORLD WERE ABLE TO VIEW LIVE TELECASTS OF THE U.S. PRESIDENT'S VISIT TO THE PEOPLE'S REPUBLIC OF CHINA VIA THE U.S.-BUILT **INTELSAT IV** IN ORBIT ABOVE THE EARTH.

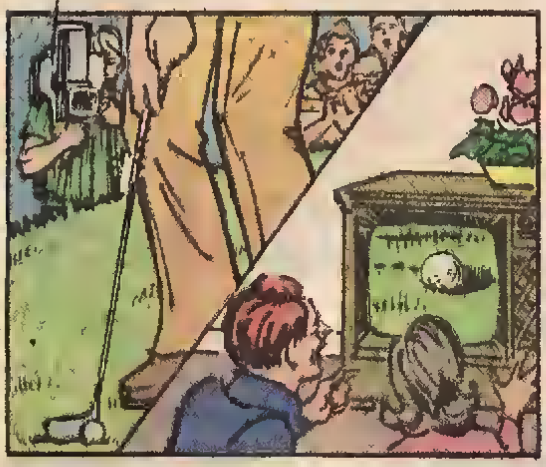


...SCIENCE OPENED A WHOLE NEW WORLD FOR MEDICAL SCIENCE WITH **ZWORYKIN'S** ELECTRON MICROSCOPE. IT VIEWS AN AREA AS MINUTE AS ONE-BILLIONTH OF AN INCH.



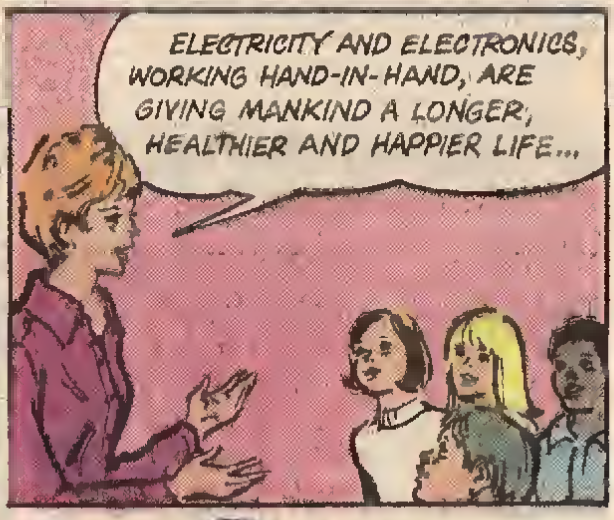


TELEVISION IMPROVEMENTS SINCE 1960 INCLUDE TELEVISION LENS ZOOMING, INSTANT VIDEO TAPE RECORDING, AND INSTANT "PLAYBACK" OF SPORTS PLAYS.

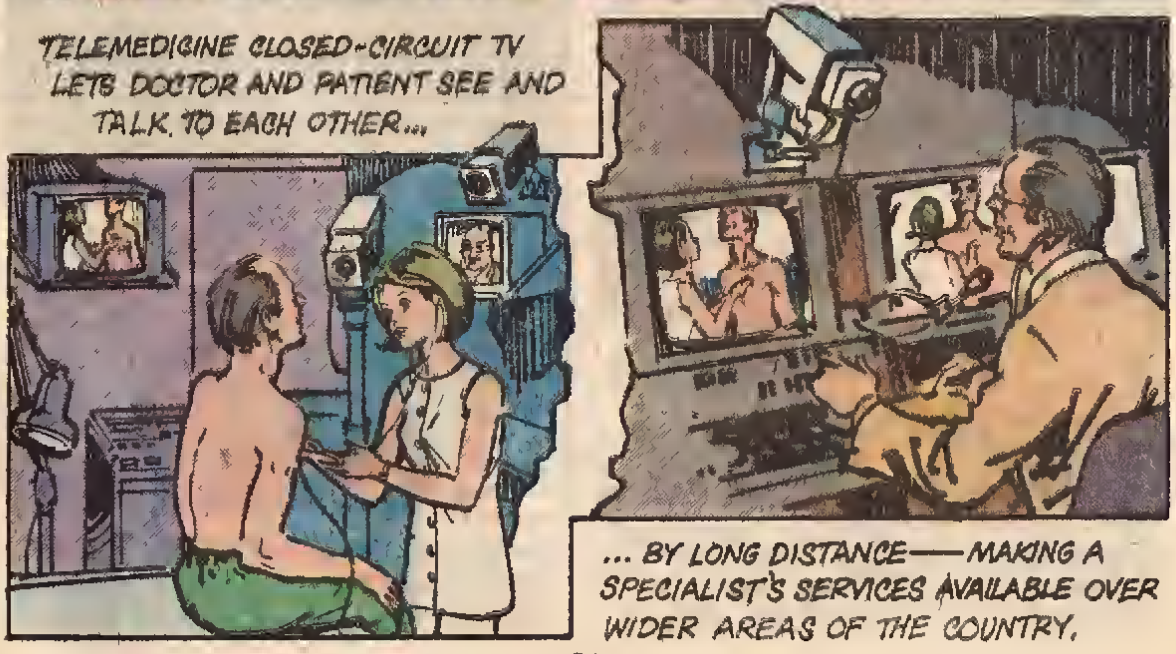


ELECTRONICS ALSO PLAYS AN IMPORTANT ROLE IN AIR SAFETY. A 747 JET CAN LAND OR TAKE OFF IN PITCH DARKNESS, RAIN, SNOW, SLEET OR FOG IN REASONABLE SAFETY.

AUTOMATIC COMPUTER-CONTROLLED "PEOPLE MOVERS" PROVIDE LOCAL TRANSPORTATION AT THE DALLAS-FORT WORTH AIRPORT.

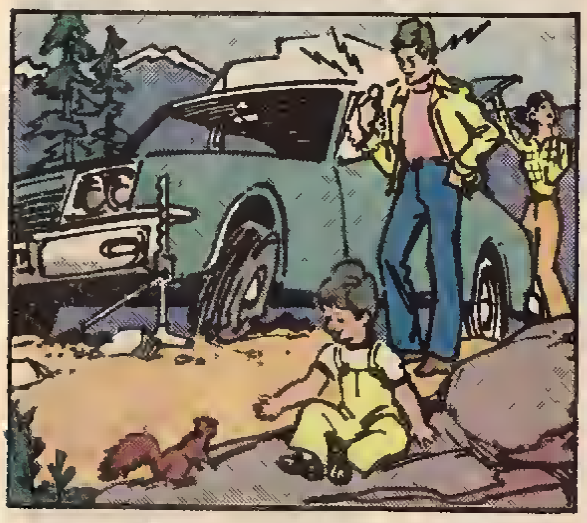


TELEMEDICINE CLOSED-CIRCUIT TV LETS DOCTOR AND PATIENT SEE AND TALK TO EACH OTHER...

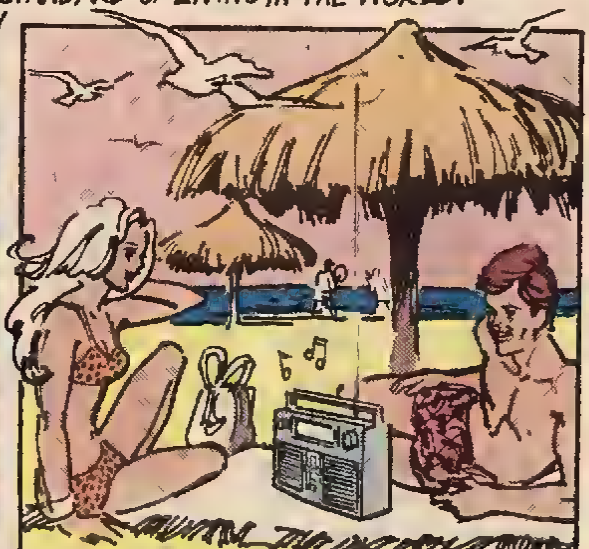


... BY LONG DISTANCE — MAKING A SPECIALIST'S SERVICES AVAILABLE OVER WIDER AREAS OF THE COUNTRY.

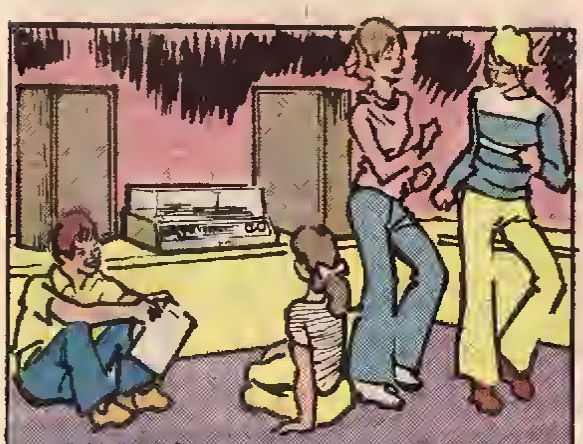
TODAY, MILLIONS OF PEOPLE IN OUR COUNTRY, THE UNITED STATES, GET TO ENJOY THE FABULOUS BENEFITS OF ELECTRICAL/ELECTRONIC APPLIANCES AND EQUIPMENT. ... IT HAS GIVEN OUR PEOPLE THE HIGHEST STANDARD OF LIVING IN THE WORLD. ELECTRONICS PROVIDES ENTERTAINMENT, TOO!



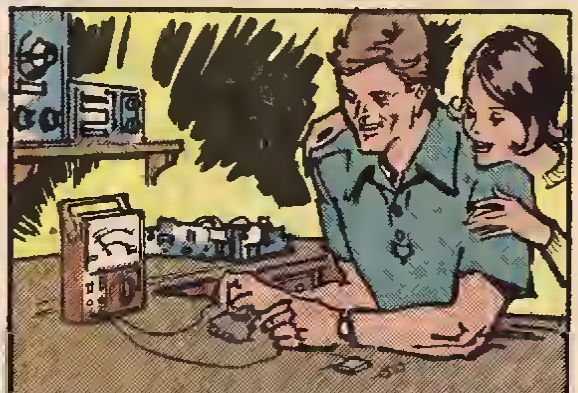
MOBILE CB - 2-WAY RADIO HELPS TO MAKE TRAVEL HAPPIER AND SAFER...



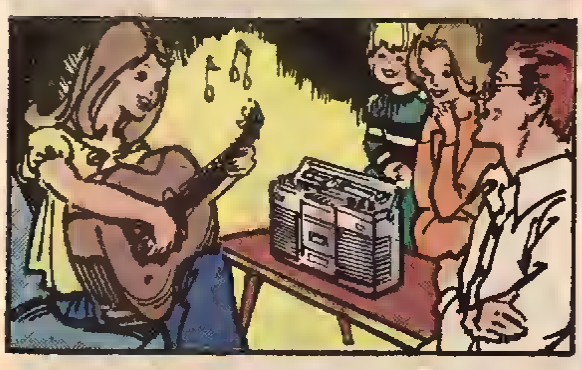
PORTABLE RADIOS FOR LOCAL AND SHORTWAVE LISTENING PROVIDE MUSIC AND NEWS OF THE DAY...



STEREO HI-FI COMPONENT SYSTEMS BRING US THE "LIFELIKE" SOUND OF MUSIC FOR HAPPY LISTENING!



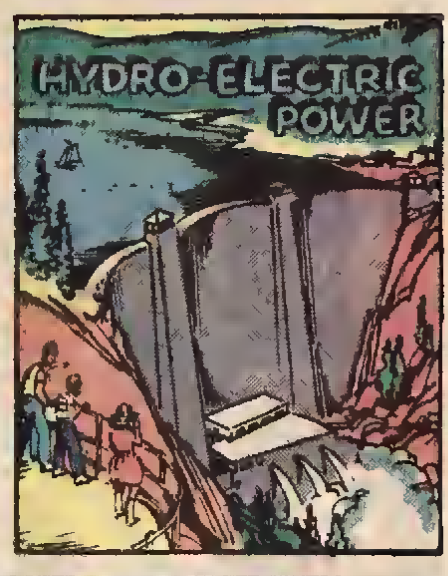
ELECTRONICS IS A POPULAR **HOBBY** ACROSS THE COUNTRY. AND IT'S A GREAT WAY TO RELAX!



PORTABLE TAPE RECORDERS MAKE POSSIBLE TAPING SPECIAL MUSICAL EVENTS AND FAMILY GET-TOGETHERS...

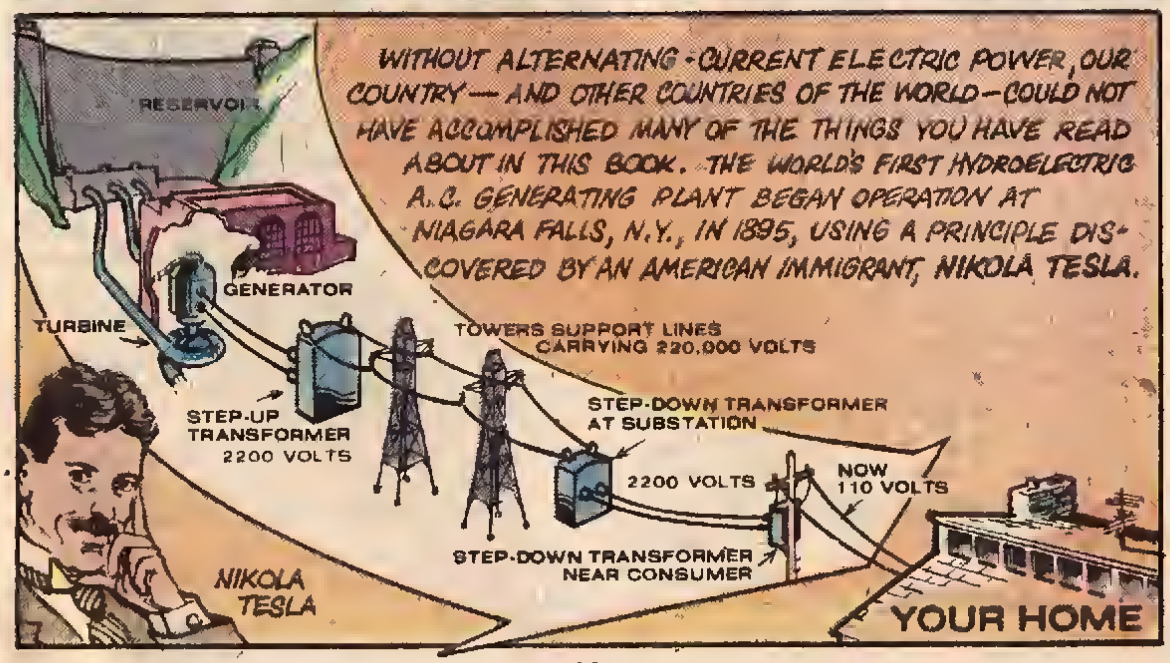
... AND NOW, THERE'S AN "**OSCAR**" IN ORBIT, THE SATELLITE USED BY HAM RADIO OPERATORS ...PIONEERS IN COMMUNICATIONS IN THE U.S.

TODAY, THE UNITED STATES PRODUCES AND CONSUMES A THIRD OF THE WORLD'S ELECTRIC ENERGY TO GIVE ITS CITIZENS THE BEST STANDARD OF LIVING EVER ACHIEVED BY MANKIND, AND WE MUST CONTINUE TO EXPLORE THE FORCES OF NATURE FOR NEW SOURCES OF ENERGY... SOLAR POWER, COAL, GAS, STEAM FROM GEYSERS, WATER-POWER, NUCLEAR POWER ... TO TURN THE TURBINES THAT PRODUCE OUR ELECTRICITY.



SOLAR HEATING PANELS HARNESS THE SUN'S RAYS TO PROVIDE ANOTHER SOURCE OF ENERGY.

WITHOUT ALTERNATING-CURRENT ELECTRIC POWER, OUR COUNTRY — AND OTHER COUNTRIES OF THE WORLD — COULD NOT HAVE ACCOMPLISHED MANY OF THE THINGS YOU HAVE READ ABOUT IN THIS BOOK. THE WORLD'S FIRST HYDROELECTRIC A.C. GENERATING PLANT BEGAN OPERATION AT NIAGARA FALLS, N.Y., IN 1895, USING A PRINCIPLE DISCOVERED BY AN AMERICAN IMMIGRANT, NIKOLA TESLA.



(answers to Science Quiz)

1. **Joseph Henry** (Dec. 17, 1797-May 13, 1878)
   Engineer-Inventor and First Secretary Smithsonian Institution
2. **Samuel F.B. Morse** (April 27, 1791-April 2, 1872)
   Inventor of the Telegraph
3. **Alexander Graham Bell** (March 3, 1847-Aug 2, 1922)
   Inventor of the Telephone
4. **Charles P. Steinmetz** (April 9, 1865-Oct. 26, 1923)
   Electrical Engineer and Mathematical Wizard
5. **Guglielmo Marconi** (Apr. 25, 1874-July 20, 1937)
   Inventor of Wireless Telegraphy
6. **Nikola Tesla** (July 10, 1856-Jan. 7, 1943)
   Inventor of AC Motors and Discoverer of the AC Principle of Electric Power Production
7. **Vladimir Zworykin** (July 30, 1889-)
   Inventor of the Scanning Principle used in today's TV Cameras and Receivers
8. **Thomas A. Edison** (Feb. 11, 1847-Oct. 18, 1931)
   Inventor of the Incandescent Lamp (Electric Light Bulb)
9. **Lee de Forest** (Aug. 26, 1873-June 30, 1961)
   Inventor of the Amplifying Radio Tube, the "Audion"
10. **Karl Guthe Jansky** (Oct. 22, 1905-Feb. 14, 1950)
    His Discoveries paved the way for today's Radio Astronomy
11. Shared Nobel Prize for their invention of the Transistor
    A. **John Bardeen** (May 23, 1908-) Inventor
    B. **Walter H. Brattain** (Feb. 10, 1902-) Inventor
    C. **William Shockley** (Feb. 13, 1910-) Inventor

(answers at bottom of this page)

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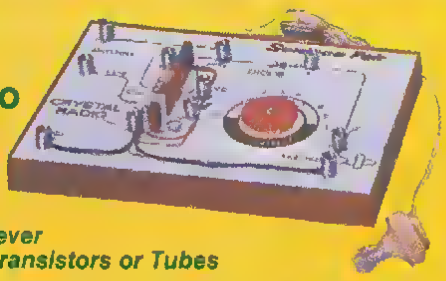
CB Monitor Receiver Kit

Listen to truckers, motorists and other CB'ers on all 40 channels. And no FCC license is required Illustrated boerd, spring-clip winng and numbered parts. Requires one 9V battery **28-238.**

Crystal AM Radio Kit



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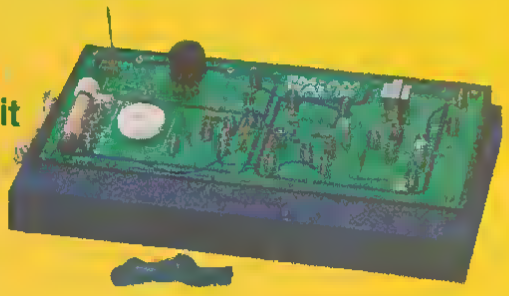
Without Transistors or Tubes

A tiny diode converts the RF signal to audio using circuitry similar to that which Marconi used in the early 1900 s. Covers 550 kHz 1600 kHz AM band. With earphone Eesy solderless assembly. **28-207.**

Science Fair® Radios

AM/FM Radio Kit



Deluxe circuitry contains 4 transistors and a transformer, pre-assembled FM tuner section, illustrated manual end numbered parts for simplified essembly with spring-clip connectors With earphone Requires 2 "AA" batteries. **28-234.**

Police/ Aircraft Monitor Kit

Monitor police frequency and hear news as it happens, listen to jumbo jets in flight. Tunes 108-135 and 147-174 MHz Safe, solderless spring clip connectors Requires one 9V battery **28-221.**

For Listening Excitement

AM Radio Broadcasting Kit

Broadcast to any standerd AM redio — up to 40' away! Includes microphones, transmitter, tuning control and entenna wire. Requires one 9V battery. **28-209.**

Solar-Powered AM Radio Kit

Solar Panel Included — Converts Light to Electricity

Solar panel converts sunlight — or any bright light — to electricity that powers this redio. Or you can use eny 9V battery Tunes the entire 550-1600 kHz AM bend With earphone No battenes needed **28-214.**

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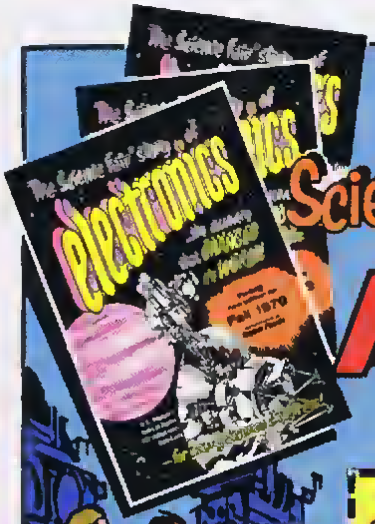

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