SYLVANIA NEW ERA RECEIVING TUBES—

PROTOTYPES OF TOMORROW'S TUBES

As component engineering progresses to meet industry's new challenges, electronics' most experienced and refined component—the electron tube—leads the way. And when history evaluates electron tube progress, the many significant developments announced in **this** booklet may well justify a chapter on a NEW ERA in receiving tubes.

Behind Sylvania NEW ERA receiving tubes stands a uniquely positive program:

New **designs** in tube parts build-in extra efficiency and stability, as opposed to post-production selection and trying to salvage a defective tube through "burn-in." That's why Sylvania emphasizes design, strives to "build quality in, not burn it in."

New **automation concepts** implement advanced tube designs with machine designs that insure uniformity from tube to tube in production. Automation also automatically scraps faulty tube parts and assemblies when and where they occur in the tube-making process.

New **finishing systems** include automatic testing, with automatic ejection of defectives, on the packaging line.

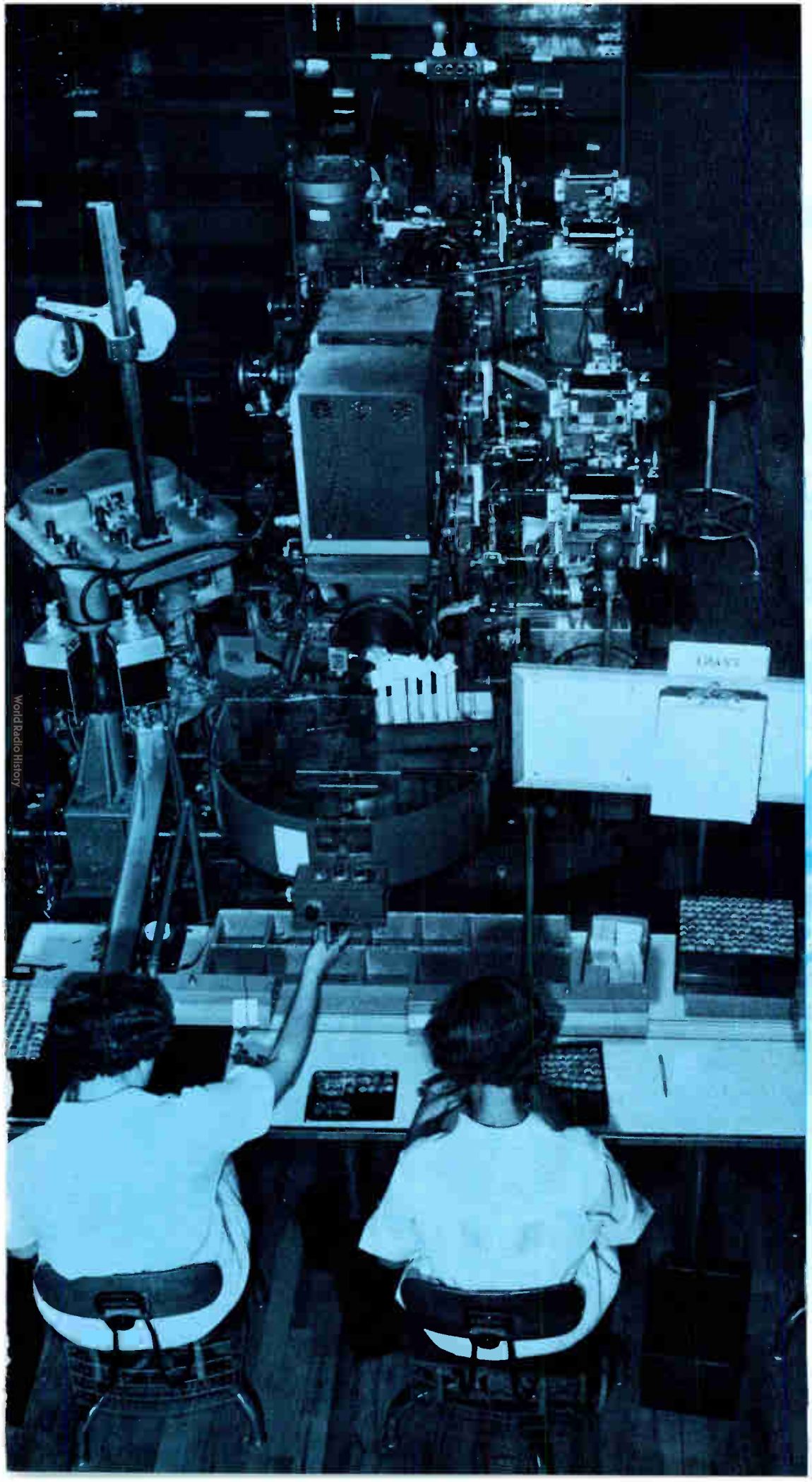
New **lines** of tubes provide types custom-designed for specific applications. Sylvania NEW ERA designs are evaluated for use in specific application-designed tube types.

A **unique engineering program** includes a production plant **just** for proving new designs, large scale life testing of new tubes in end-use equipment, materials design laboratories, and field engineering that helps both equipment manufacturers and independent Sylvania service-dealers with their tube problems.

New **plant concepts** include the Sylvania-originated "lot profile" system —a detailed performance report on each lot of tubes—keyed to a lot letter on **every** Sylvania tube. Careful control of production atmosphere through air conditioning installed in two Sylvania plants is the initial phase of a broad program which will encompass all Sylvania facilities and finally result in elimination of environmental variables.

You will find Sylvania NEW ERA concepts the building blocks for tomorrow's receiving tubes—available first from Sylvania.

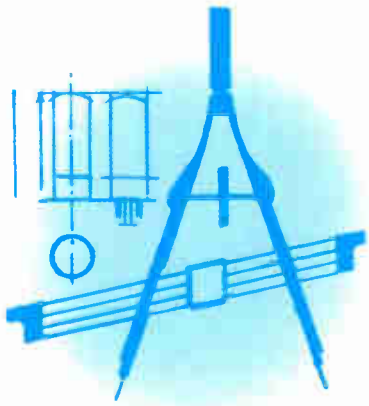
Sylvania's new automount machine... complete automatic assembly of electron tubes The automount is one of Sylvania's latest advancements in the field of automation.

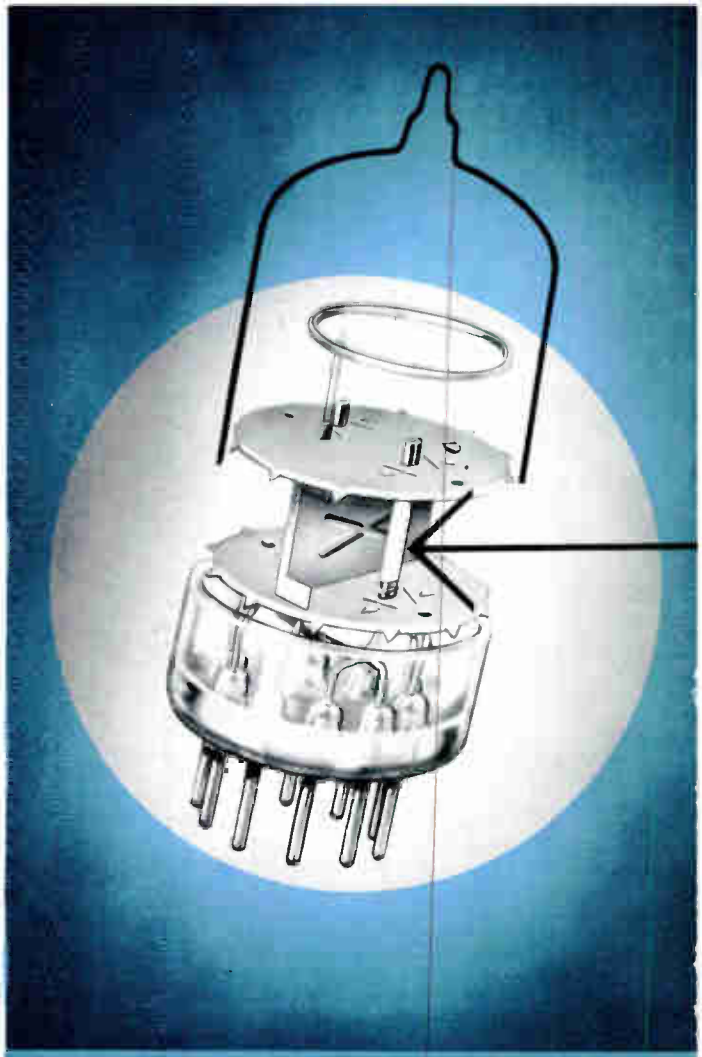


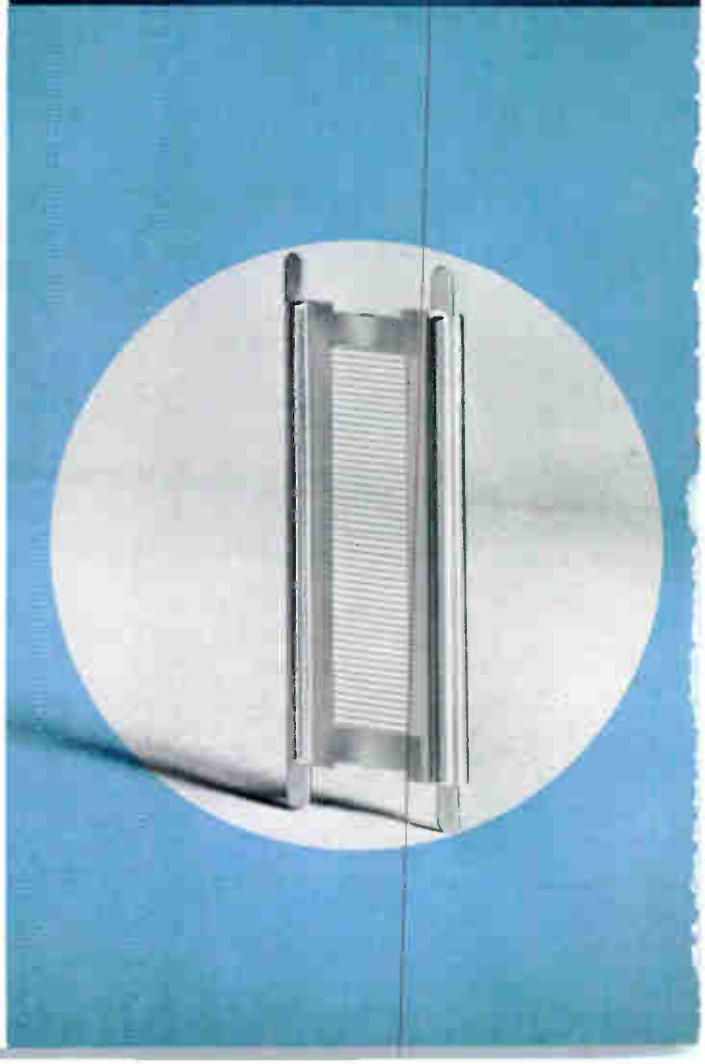
ADVANCED DESIGNS

Through design, Sylvania attains *built-in* stability, *built-in* performance improvements, *built-in* life extension—the positive kind of reliability unequalled by post-production selection and of "patching" processes.

NEW ERA designs—all Sylvania-originated—are evaluated for benefit to every Sylvania tube type, and are integrated in every type that will gain from one or more of these designs.

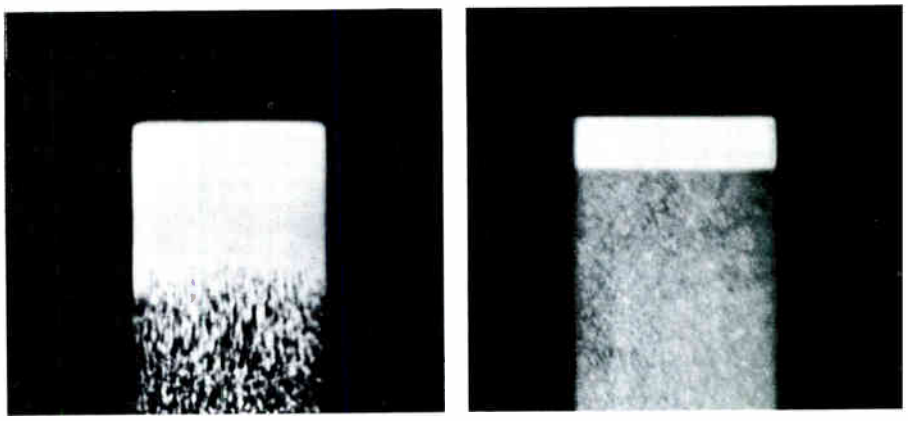






Sarong Coating

In the field of cathode coating, an exclusive Sylvania development called Sarong has improved density control from ±10% normally experienced from conventional spray coatings to a phenomenal ±1%. Sarong is an entirely new concept of carbonate precipitation which has produced an entirely different crystal formation. As a result, reduced noise, more uniform emission and higher level of GM are all inherent qualities that have provided the industry with a more uniform and reliable tube.



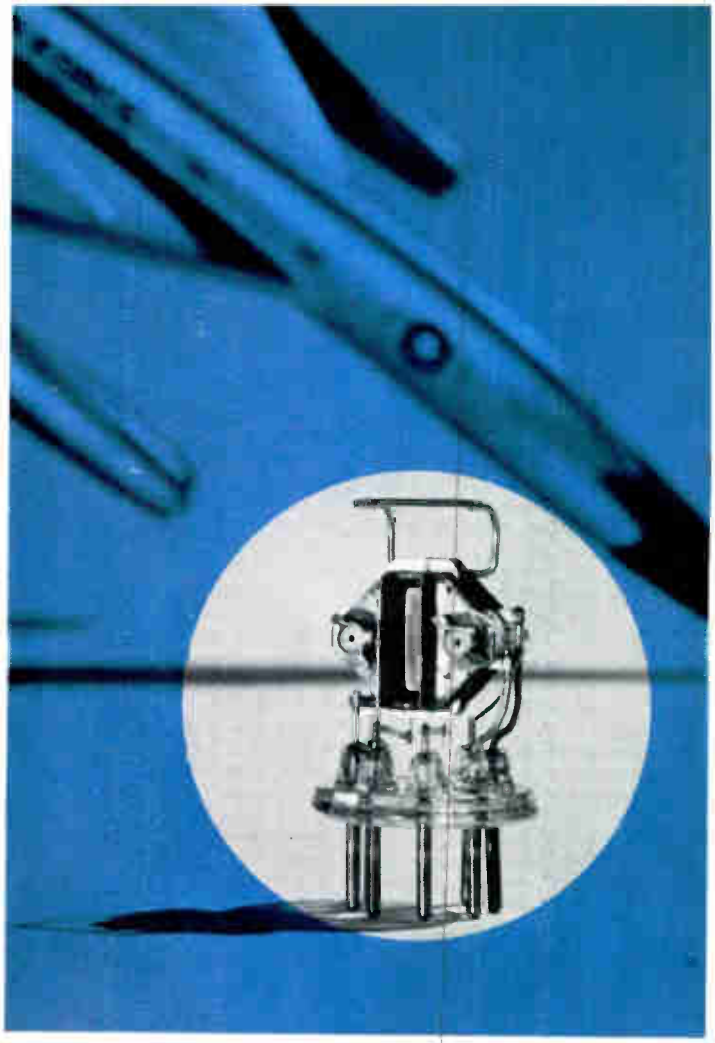
Photomicrograph comparison of a conventional cathode, left, and Sylvania's Sarong Cathode in operation shows its superior coating uniformity contributing to better emission and more uniform heat distribution

Framelok Grid

The basic structure of the Framlok Grid is a simple, rugged and functional design. The four-sided frame support for lateral wires insure both improved and stable performance throughout the life of the tube. The Framelok allows better control of cut-off, permits closer spacing for higher GM, lower knee voltage, minimized snivets, higher plate-to-screen current ratio and less chance for shorts, microphonism, noise and arcing.

Strap Frame Grid

The development of the strap-frame grid consists of making a frame, usually of molybdenum, by welding straps across the side-rods at the top and bottom of the grid, or by joining stamped metal parts to form a rigid frame. The lateral wire is then wound around the frame and fastened by brazing. Benefits derived from the use of the strap-frame grid include a reduction in noise and microphonism, and higher uniformity among tubes.

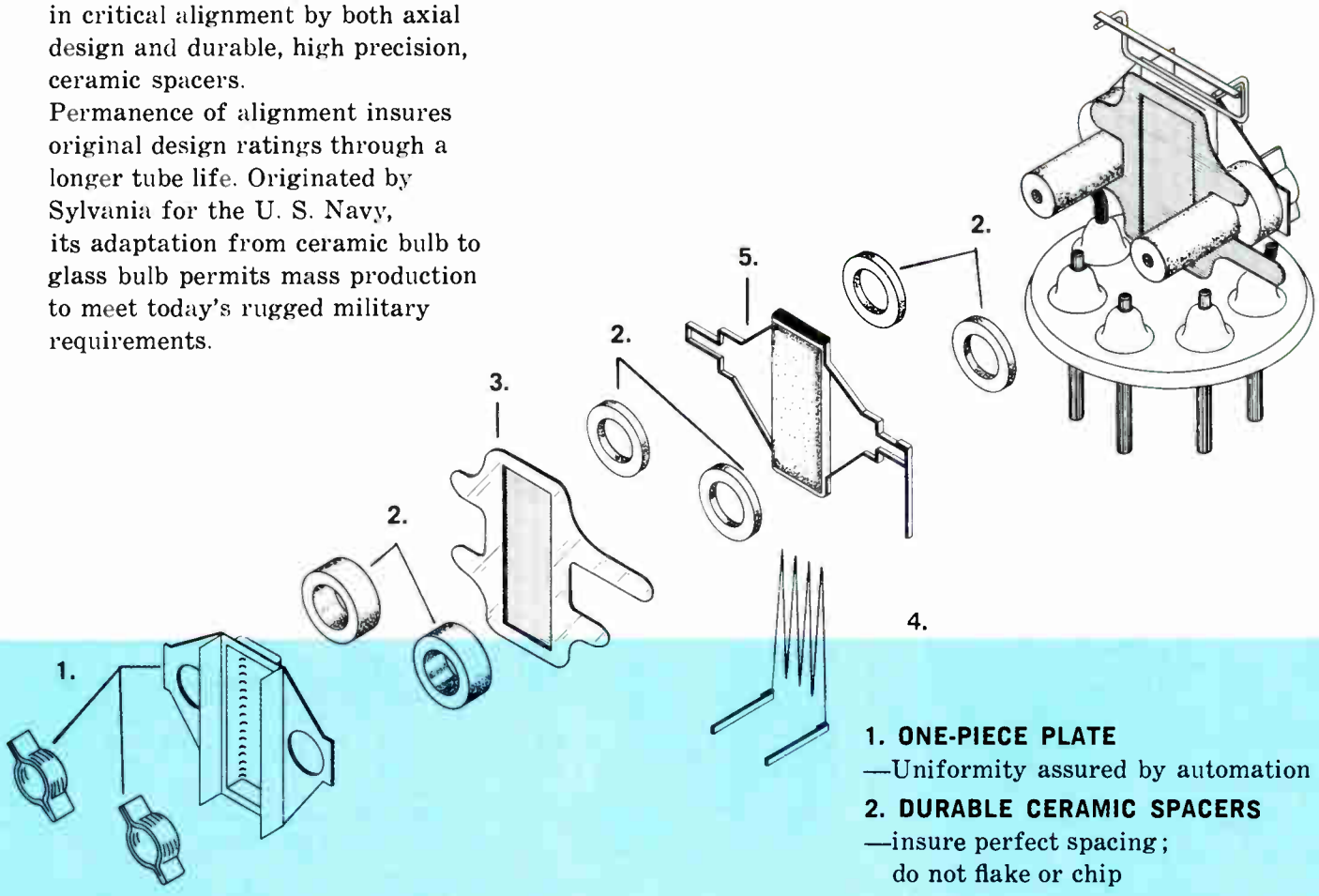


New Concept Bulb

Its uniform dome thickness and over-all tensile strength increase tube ruggedness.
An example of Sylvania automation, the New Concept Bulb is an extra benefit, at no extra cost, in all miniature and larger Sylvania receiving tubes.

Stacked Mount

Its planar structure puts mount elements in parallel planes, locked in critical alignment by both axial design and durable, high precision, ceramic spacers.
Permanence of alignment insures original design ratings through a longer tube life. Originated by Sylvania for the U. S. Navy, its adaptation from ceramic bulb to glass bulb permits mass production to meet today's rugged military requirements.



1. ONE-PIECE PLATE
—Uniformity assured by automation

2. DURABLE CERAMIC SPACERS
—insure perfect spacing; do not flake or chip

3. FRAME GRID
—ruggedized one-piece window-like frame gives rigid support to highly tensioned laterals.

4. RIGID HEATER
—uniform throughout due to Sylvania electronically controlled heater coating.

5. RUGGED CATHODE
—locked in alignment and held rigidly by welded metal supports.

AUTOMATION

In Manufacture

Sylvania automation does a precise job,
self-checks its workmanship,
and rejects causes of tube failure
as the causes appear in production.

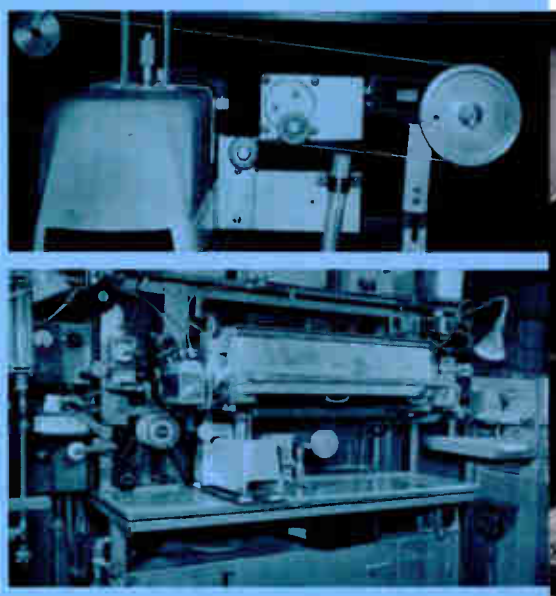
Starting from the "core" of the tube,
the heater, part by part, step by step,
science makes Sylvania tubes better
performers than any substitutes.

Cathode Processing

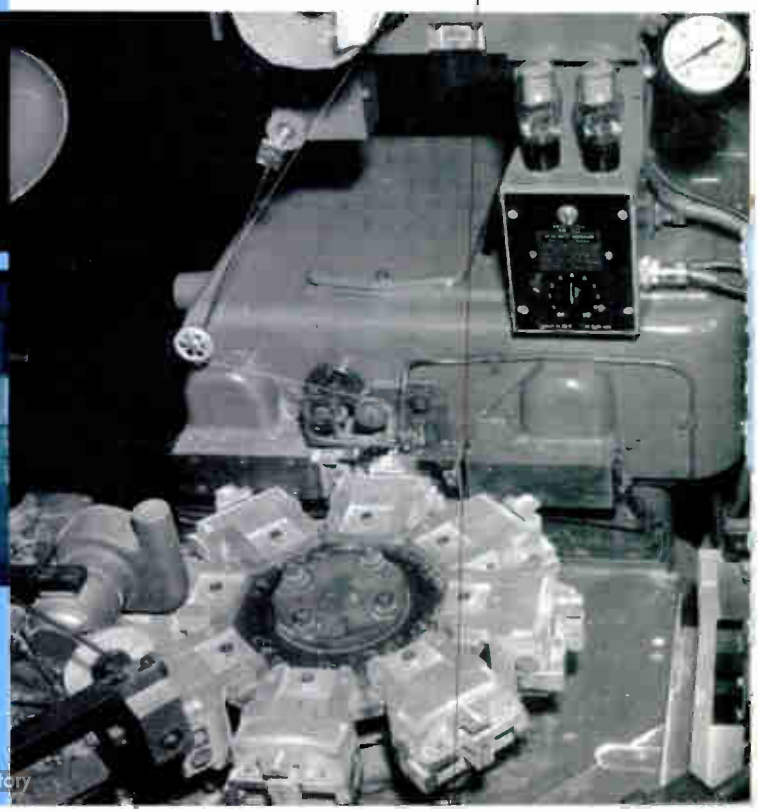
Control of cathode alloy, ultrasonic cathode sleeve degreasing, Sarong coating, controlled tab welding—all these processes dovetail to eliminate variables in cathode performance. Sarong cathode automation—soon to be integrated into full-scale Sylvania tube production—achieves a new standard in cathode efficiency and uniformity.

Heater Processing

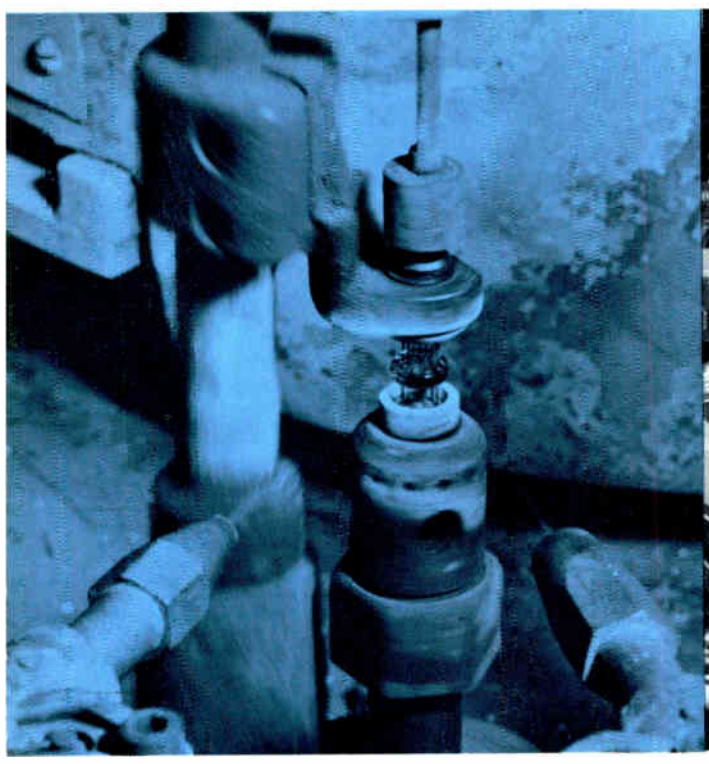
Automatic heater forming machine spade winds and precisely cuts to designed specifications—minimizes heater handling, virtually eliminates one of the causes of contamination and coating cracks.



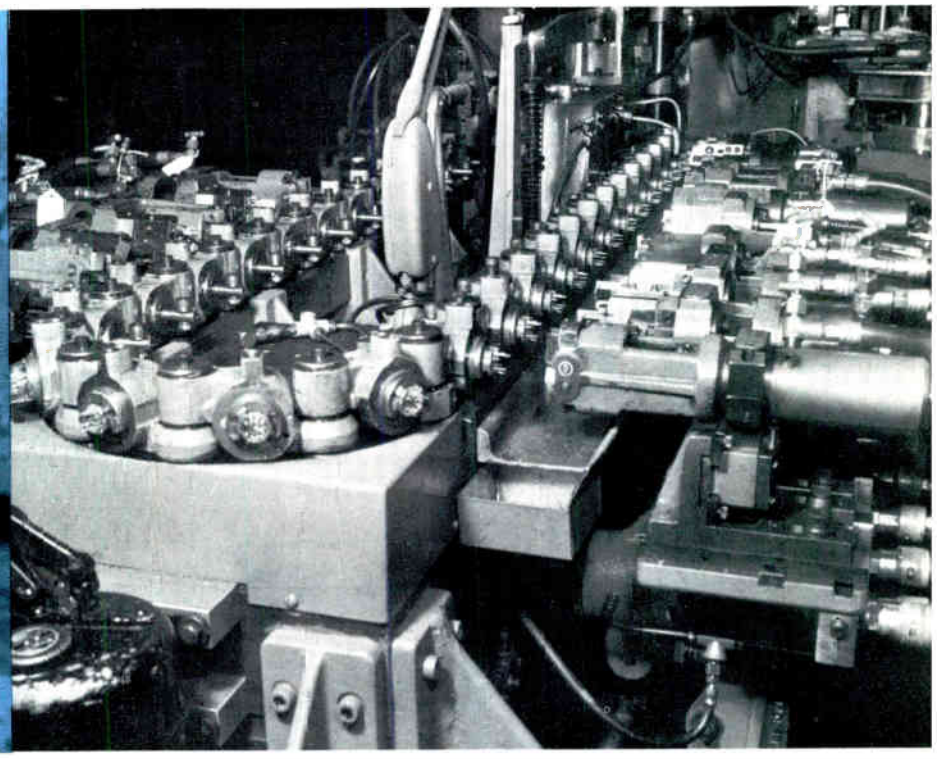
Automatic heater coating, controlled by an electronic micrometer, assures uniform coating thickness—stains imperfect coating red as rejection signal.



Stem and Lead Forming



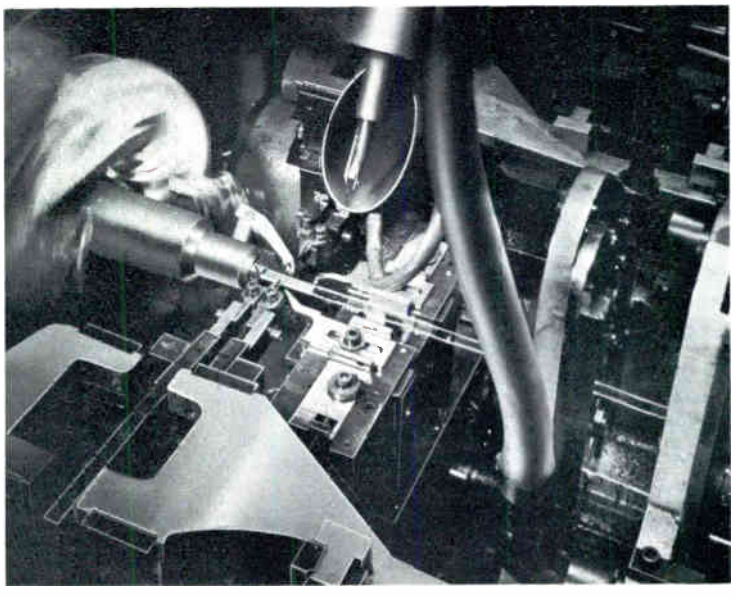
After automatic glass cutting, which insures equal mass in every stem, the famous Sylvania Wafer Stem is formed, and leads are precisely inserted on this Automatic Stem Machine.

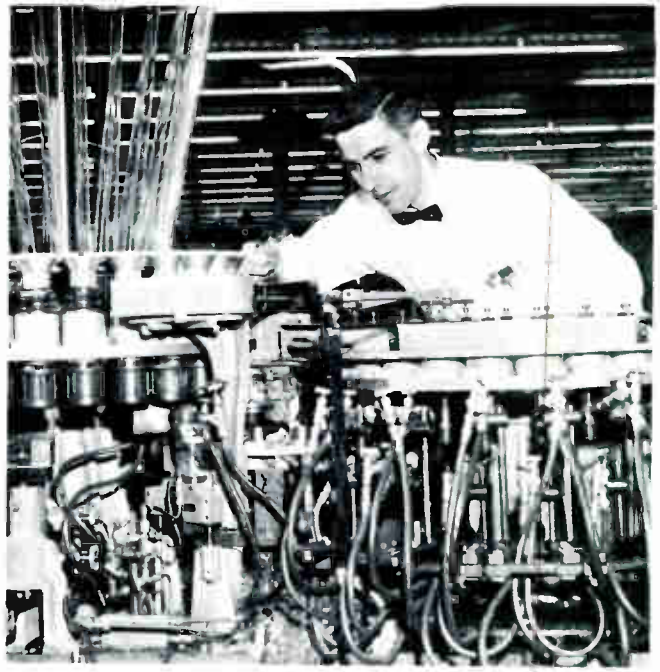


The Sylvania stem is transferred automatically from the automatic stem machine to this Automatic Lead Bender. A major advance in tube uniformity, the automatic lead bender bends every lead in the stem to the precisely desired angle and position, including lead loops that eliminate bowed heater-lead welds.

Grid Processing

The Automatic Grid machine and the FRAMELOK Grid machine—both originated by Sylvania—are designed with uniformity in mind. Whether a specific tube type calls for FRAMELOK, Strap Frame, or conventional wound grid, optimum design is automated by Sylvania equipment.

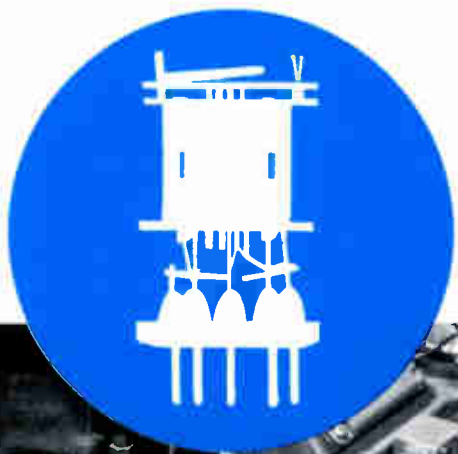




Bulb Processing

In its *New Concept Bulb Machine*, Sylvania has engineered a way to make uniformly thick, uniformly rugged bulbs—benefits achieved by precise tabulation, fire-forming the spinning dome, specially glazing the entire bulb; then, electrostatically testing *every* bulb for flaws.

Mount Assembly



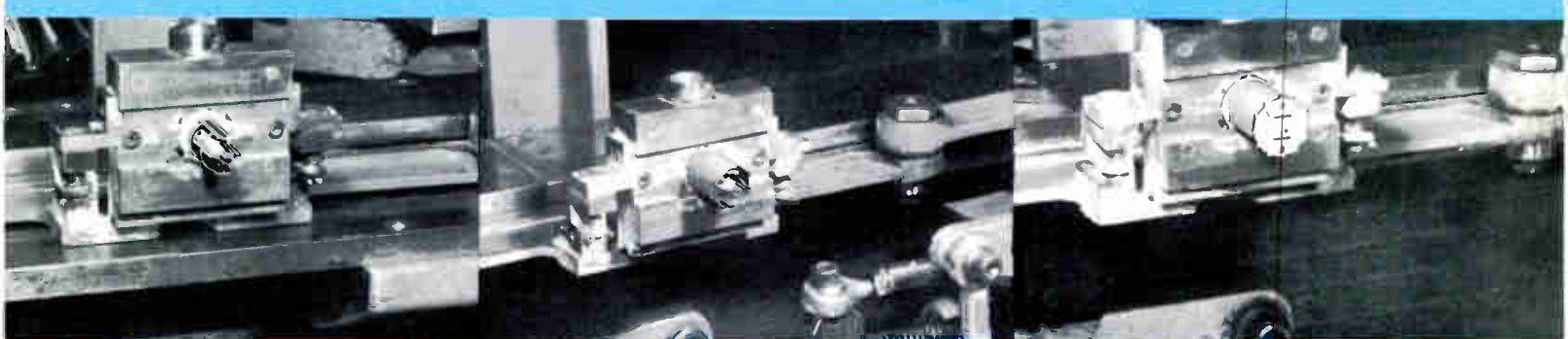
The AUTOMOUNT—Sylvania's greatest single equipment contribution to tube uniformity—represents almost 10 years of development time and millions of dollars. Shown are several stages in the assembly of electron tube.

Symmetry and alignment are checked, and every finished mount undergoes multiple inspection processes. Result: Greater protection for you against defective tubes.

First, the mica is precision-punched . . . and then mounted on a moving block.

The block moves on to the cathode stage.

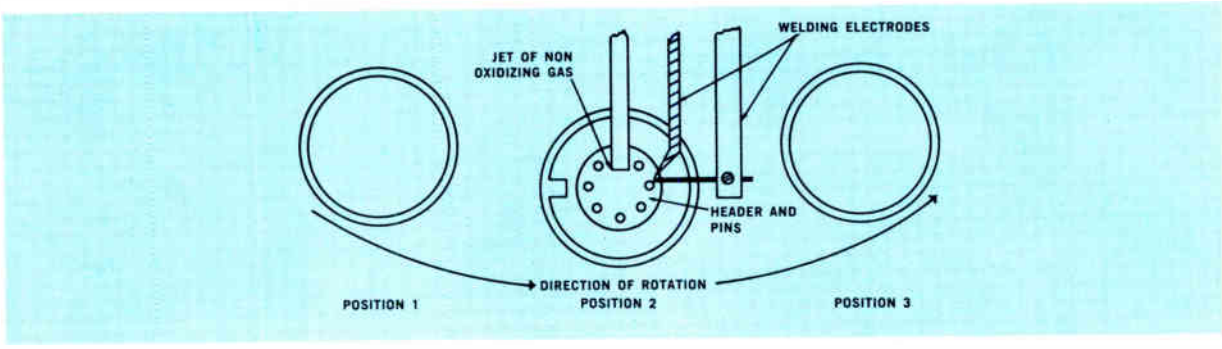
At the cathode stage, the cathode is automatically fed to a mechanism that precisely inserts it in the proper position on the moving block.

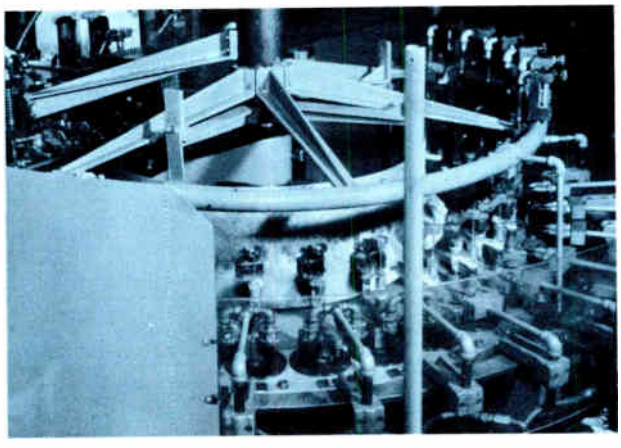


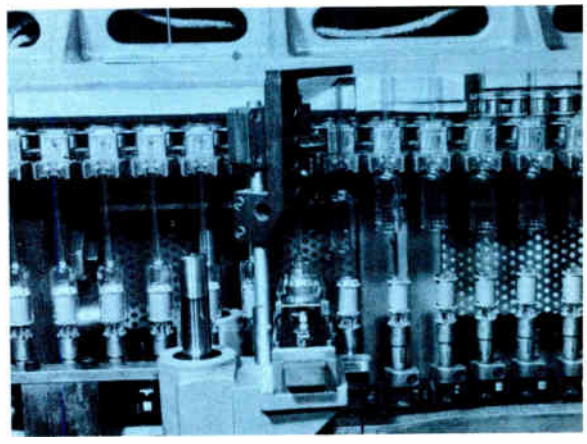
The above three stages reveal the number one grid, the assembling of the number two grid, the plate, the shield and other parts for single and multi-stage tubes. The parts are then inserted in the top mica.

The Auto-Weld

Further advancement in the field of automation is the development of an automatic welding device called Auto-Weld. This machine, welding in the absence of oxygen, automatically welds each connection of the header pin to the proper mount lead. Each weld is also controlled automatically for the required amount of heat and correct amount of pressure to be applied . . . thus assuring a better weld and directly resulting in fewer inoperatables during life. Being completely automatic, there is no chance of contamination due to human handling during the entire operation.





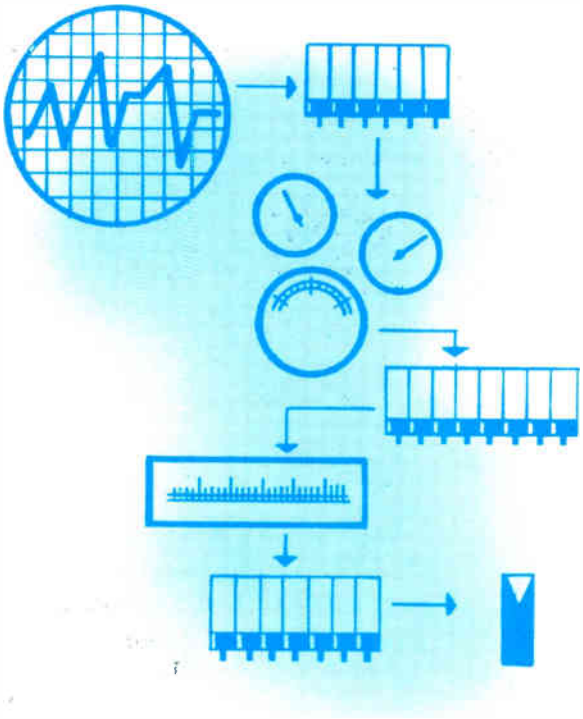


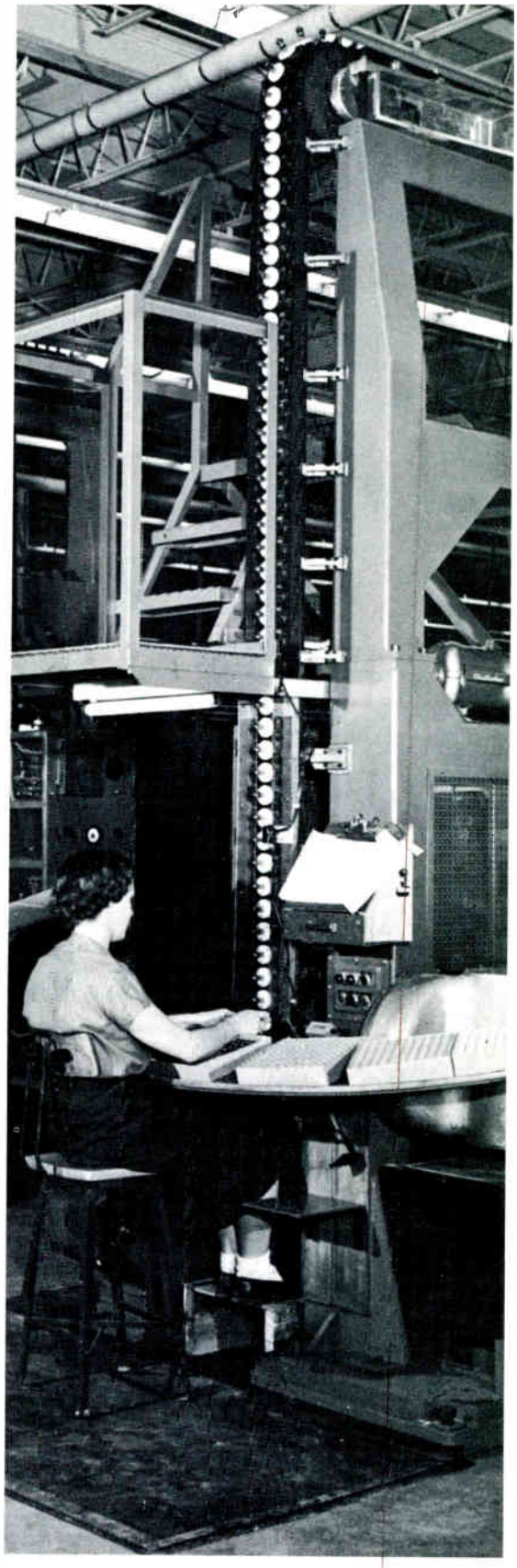
Tube Sealing

New precision is achieved in Sylvania's *Double Turret Sealex* machine. Chance is eliminated at more stages, as this equipment automatically puts the mount in the bulb and provides an improved vacuum through use of individual oil diffusion pumps at each evacuation stage. Then, tubes are conveyed automatically to the aging rack.

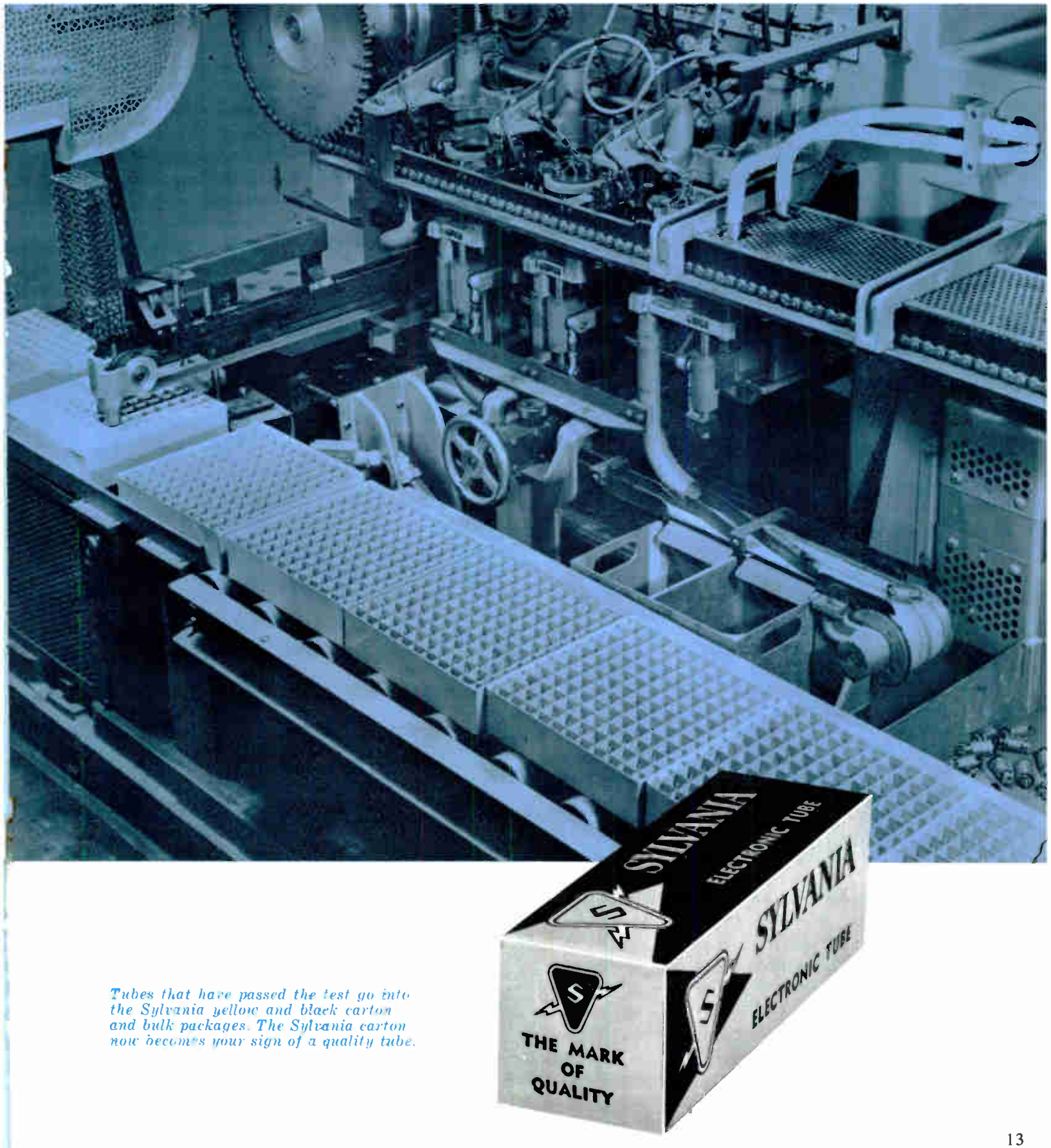
AUTOMATIC FINISHING

The tube must be a proven performer before it enters the Sylvania carton. To implement this objective, the Sylvania receiving tube packaging conveyor features "built-in" automatic electrical tests.



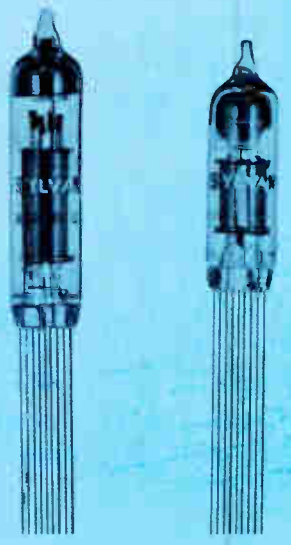


As conveyor rises, tubes pass through automatic test stages detecting opens, shorts and leakage. Each Sylvania receiving tube must pass these tests before it is packaged.



Tubes that have passed the test go into the Sylvania yellow and black carton and bulk packages. The Sylvania carton now becomes your sign of a quality tube.

TUBE LINES



Audio Tubes—

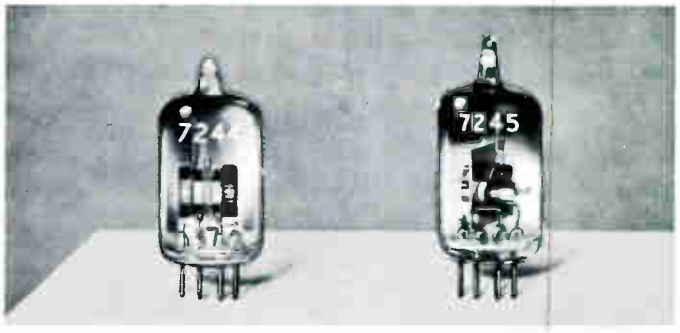
A line of reduced noise, low hum tubes for every audio application.

Pulse Tubes—

Designed specifically for pulse application.

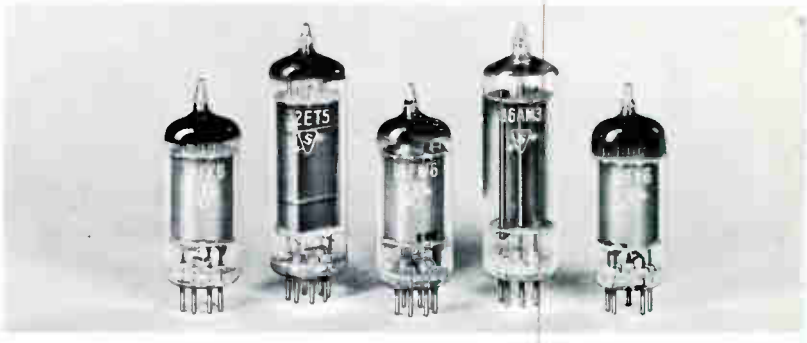
Stacked Tubes—

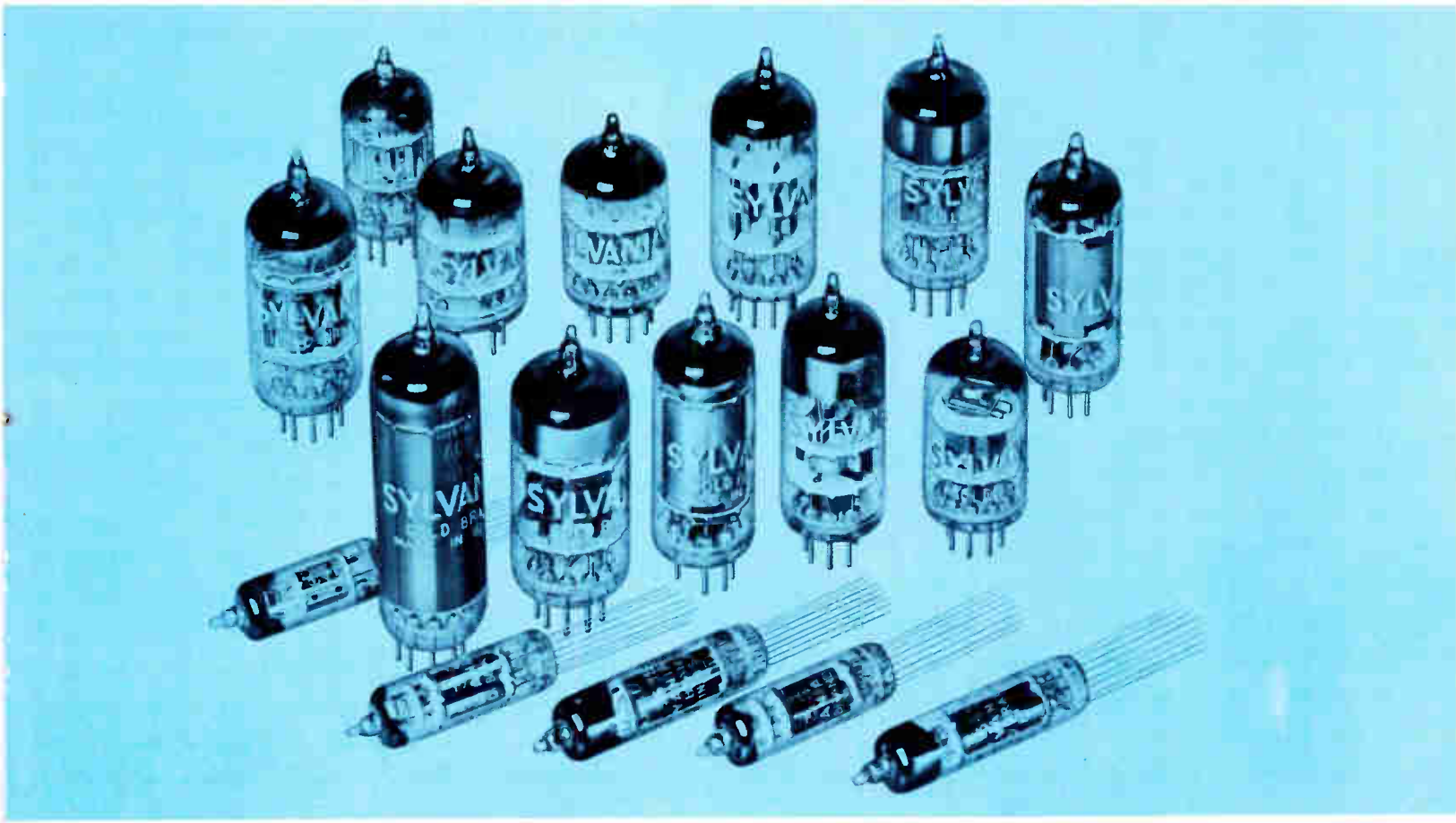
A radically new tube construction originated by Sylvania, the stacked tube has its components stacked or sandwiched in a rugged planer relationship with non-flaking gas-free ceramic spacers. Result: Greater ruggedness and resistance to both shock and vibration fatigue. Better performance. Longer life.



New All-American
100 Ma Home Radio Tubes—

To reduce cabinet heat and power consumption, Sylvania has designed a 100 milliampere All-American Five line of tubes, types 18FW6, 18FX6, 18FY6, 36AM3 and 32ET5, for five tube complement home radios. These tubes are cooler operating equivalents to 150 ma complement types 12BA6, 12BE6, 12AV6, 35W4 and 50C5.



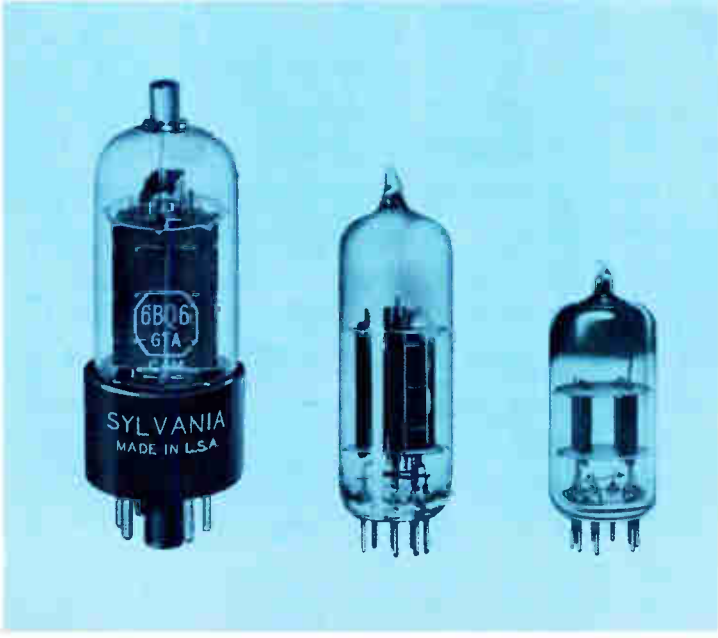


Gold Brand Reliable Tubes—

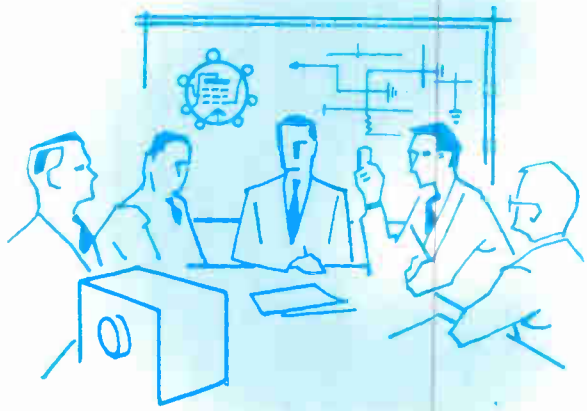
Foreshadowed by Sylvania techniques— developed for military and industrial application, Gold Brand Reliable Tubes deliver maximum performance over a long life span and under adverse operating conditions. Sylvania Gold Brand tubes include Premium Subminiatures, Subminiature Guided Missile Types, Computer Tubes and the GB prefix types designed to Sylvania reliable specifications for commercial and industrial use.

Television Tubes—

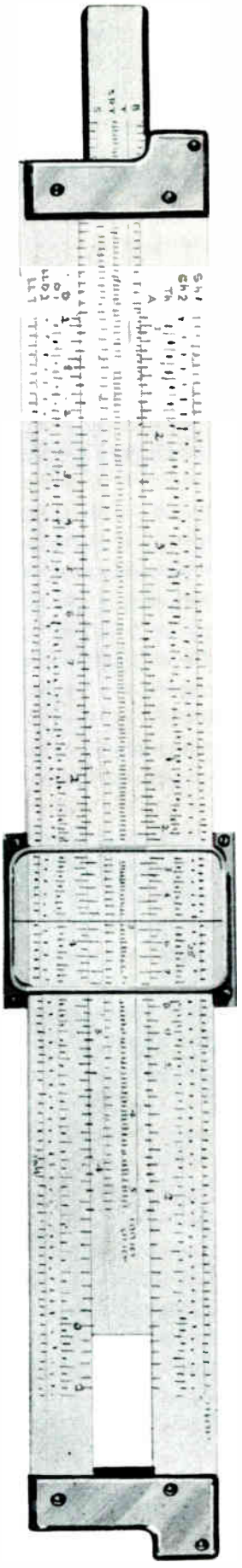
Sylvania has made numerous engineering advances in tube design and reliability on types used in television. Improved television tuner types utilizing Sylvania Sarong Cathodes, improved horizontal and vertical deflection types, newly designed rectifier tubes and low noise, low hum audio types set new performance standards for television sets, F.M. tuners, and all high fidelity equipment for the home.



SYLVANIA ENGINEERING GROUPS



—they improve today's tubes
while developing
tomorrow's types.



PRODUCT DESIGN and DEVELOPMENT

Probing every realm of tube improvement, this group implements its new designs by actually producing them in its own pilot plant. "P.D.D." tubes are then sampled and tested for both the designed improvement and all aspects of a particular type's performance.

STANDARDS, MATERIALS and MACHINES

In order to insure complete success of a design, Product Design and Development engineers work on materials research requirements with MATERIALS ENGINEERING, the group that played a major role in the development of the Sarong Cathode. At the same time, STANDARDS ENGINEERING "blueprints" a new design, specifying the tube in all its electrical parameters and physical requirements. And, at the same time, EQUIPMENT DEVELOPMENT groups consult and begin developing machines that will manufacture new tube parts automatically, complete with self-checking stages.

APPLICATION QUALITY ENGINEERING

"A.Q.E." works with end-use equipment as the standard in its laboratories. Evaluating tube performance in the application socket, Applications Quality engineers will, at times, have hundreds of television sets, computer stages, or communications equipment units operating as a dynamic life test to evaluate results from a single new tube design. On the basis of such evaluation, Sylvania tube designs are adjusted to optimum performance. "A.Q.E." laboratories include applications, advanced Applications, Ratings, Measurements, Dynamic Life Tests, Television Life Tests, and Test Equipment Design and Development.

FIELD ENGINEERING

Representing the equipment manufacturer and the electronic technician at the Sylvania plant, Sylvania Field Engineers work with all engineering groups plus Sylvania Sales Engineers to help furnish the ideal circuit match with Sylvania receiving tubes. Like all Sylvania engineers, the field group approaches tube objectives from the circuit designer's point of view, and double-checks tube performance in the end-use equipment plant insuring a more reliable, original and replacement tube.

NEW PLANT CONCEPTS

"Hospital-clean" production atmosphere, lot performance records, dynamic tests specially tailored to application parameters—these key factors play an important role in producing "The World's Finest Electron Tubes."

Letters, shown in photo, are key to an individual lot report—on file at Sylvania. Every Sylvania tube is backed by factory-proved performance data.

A Record For Reliability

Every lot of tubes produced by Sylvania is evaluated for application parameters via large-quantity lot samples. A lot portfolio is letter-keyed to a lot letter on every tube. This furnishes Sylvania with precise application data which can be compared with equipment performance for exact parameter requirements of specific equipment.

Contents of typical lot report, shown in photo, compare actual performance against design ratings—done before tubes are shipped.

"Hospital-Clean" Production Atmosphere

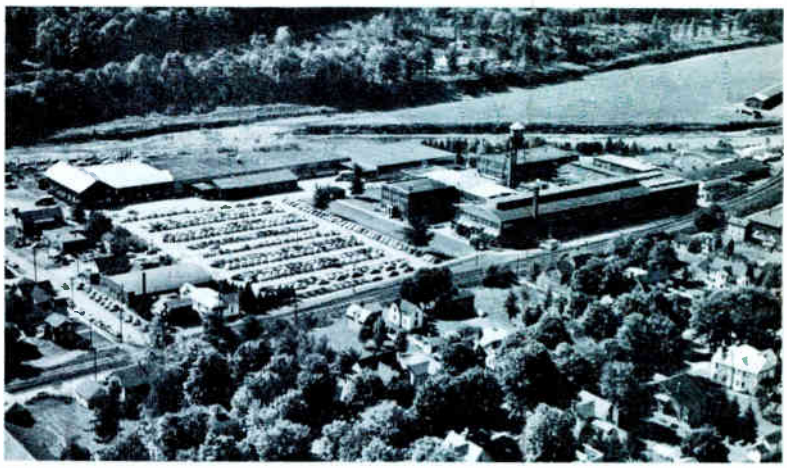
Air conditioning, power-driven lint filter, dust-repellent floor waxing—tube purity measures that began with Sylvania Gold Brand tube manufacture in Burlington, Iowa, and now are utilized at stages of production where beneficial to all Sylvania tubes.

Air conditioned room-within-an-air-conditioned-room provides extra protection for cathode coating.

For sub-miniature tube production, all employees are required to wear dust-free, lint-free dacron clothing.

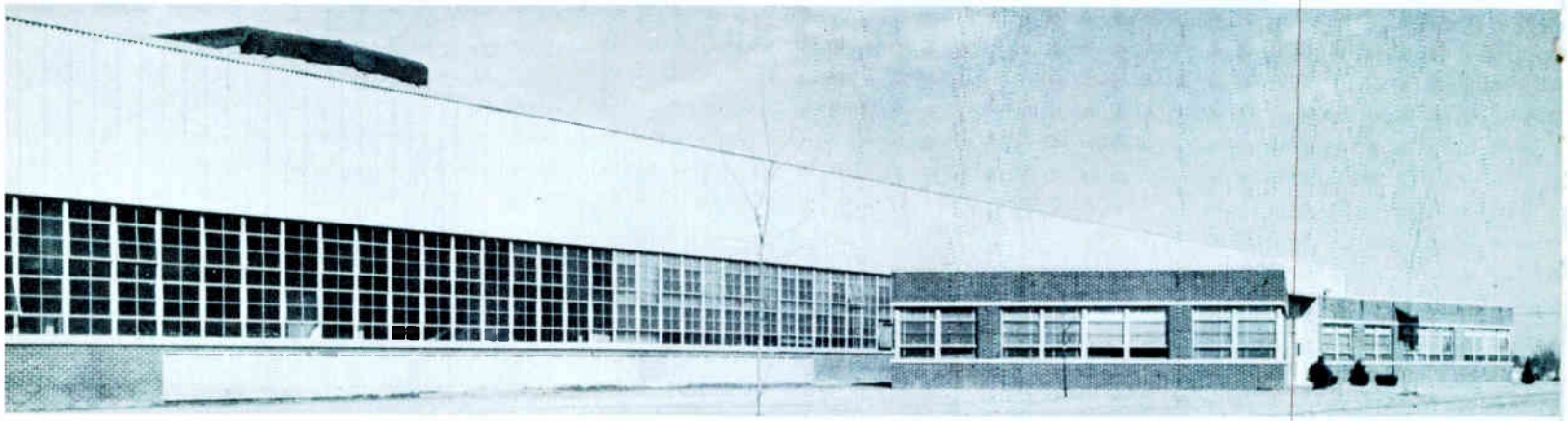
Modern Plants For Modern Tubes

Sylvania plant philosophy is based on progress. New plant concepts are tested in Emporium, Pa., then integrated in all Sylvania receiving tube facilities.
Hospital cleanliness, automation and more advanced working designs are integrated with new tube concepts. Modernization is continually integrated into all Sylvania facilities—to insure the promise that the name Sylvania represents the world's finest electron tubes.

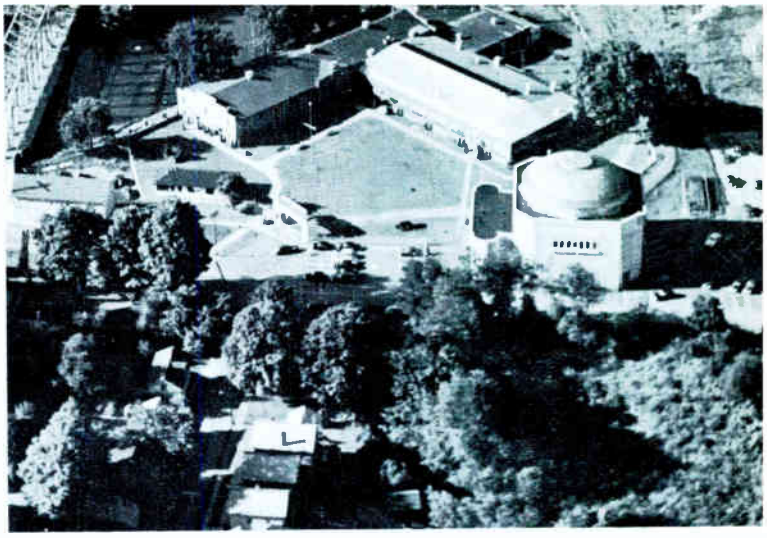


EMPORIUM, PENNSYLVANIA HEADQUARTERS FOR SYLVANIA'S FAR FLUNG RECEIVING TUBE MANUFACTURING OPERATIONS.

MILL HALL, PENNSYLVANIA

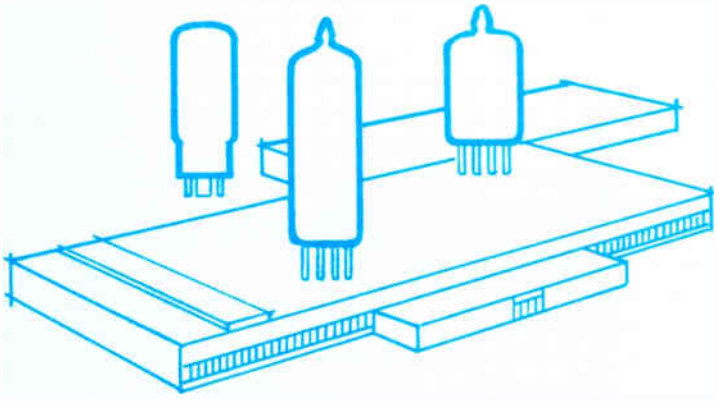


BURLINGTON, IOWA

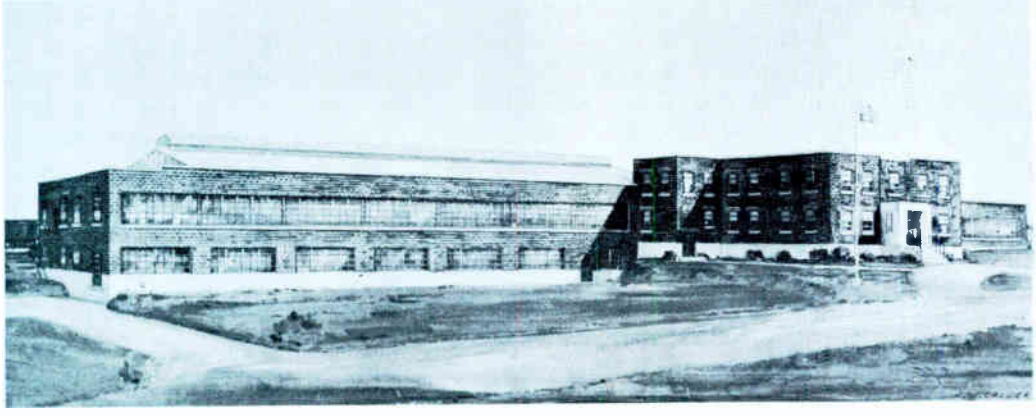


BROOKVILLE, PENNSYLVANIA

WILLIAMSPORT, PENNSYLVANIA



THE WORLD'S MOST MODERN RECEIVING TUBE MANUFACTURING CENTER IS SYLVANIA'S ALTOONA, PENNSYLVANIA PLANT.



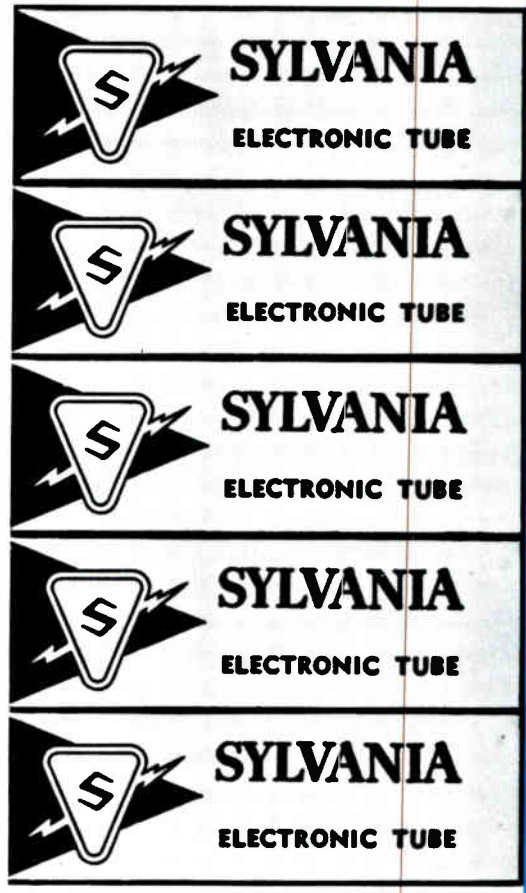
SHAWNEE, OKLAHOMA

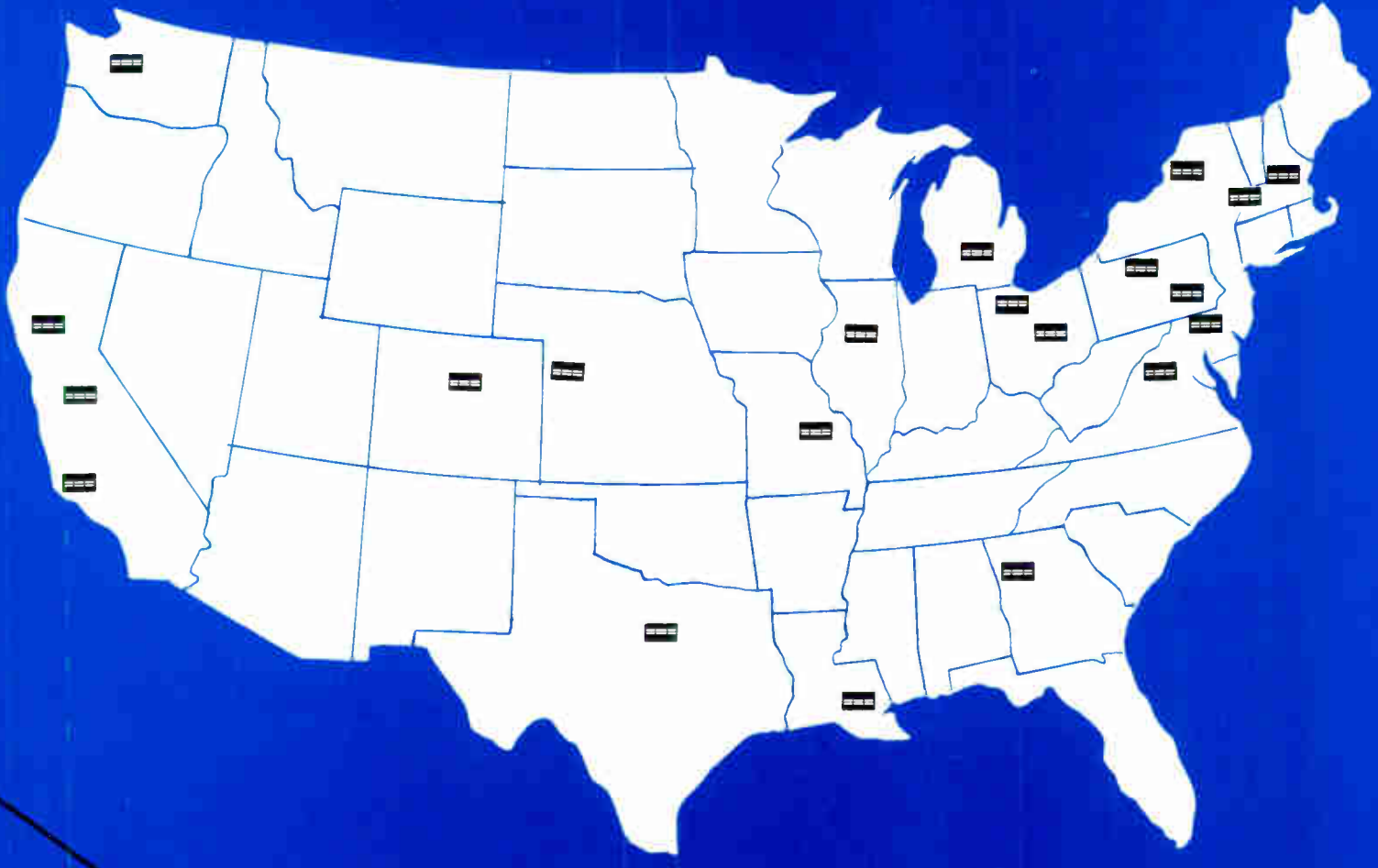
LOCAL AVAILABILITY

Sylvania local warehouses from coast to coast help make the Sylvania distributor your most complete source for dependable receiving tubes.

Equipment manufacturers also benefit from quick delivery precisely when needed for production.

Sylvania communications—a 20,000 mile private wire system links all Sylvania warehouses and plants, accelerates delivery information —brings the Sylvania plant to your door.





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