



**Brochure of Information on the
Operations, Personnel, History
and Facilities of**

**VACUUM TUBE
PRODUCTS**

506 South Cleveland Street
Oceanside, California
Telephone 6567

To whom it may Concern:

1. The name of our firm is VACUUM TUBE PRODUCTS.
2. VACUUM TUBE PRODUCTS is located at 506 South Cleveland Street, Oceanside, California. (Telephone: Oceanside 6567). All invitations to bid may be mailed to this address.
3. VACUUM TUBE PRODUCTS is engaged primarily in the manufacture of vacuum tubes of all types, gaseous tubes, vacuum gauge tubes, and related products such as spot welders and other vacuum tube manufacturing equipment; however certain types of electronic equipment also are manufactured.
4. VACUUM TUBE PRODUCTS is wholly owned and managed by Mr. Harold W. Ulmer. The secretary and treasurer of the company is Olga K. Ulmer. The staff of VACUUM TUBE PRODUCTS at present consists of 9 employees. (Key personnel are listed separately, together with data detailing their respective backgrounds.) In addition, bookkeeping and accounting is performed on a contractual basis by the firm of Oots & Bauman of Oceanside, Calif., an arrangement which serves to augment the staff of VACUUM TUBE PRODUCTS on an economical basis.
5. The historical background, manufacturing experience and plant facilities of VACUUM TUBE PRODUCTS are detailed in the following sub-paragraphs.
 - a. Historical background. VACUUM TUBE PRODUCTS functioned primarily as a consulting agency and experimental development laboratory during its six-year existence prior to World War II. Activity was suspended during the war, but immediately thereafter—1946—VACUUM TUBE PRODUCTS became re-established in its present form and has since then engaged in the research, development and manufacture of various types of vacuum tubes and associated devices.
 - b. Manufacturing experience. The engineers at VACUUM TUBE PRODUCTS are well qualified, both by training and by experience, to undertake manufacturing, research and development projects in the vacuum tube field. Their ability is further indicated by the fact that over three dozen different types of vacuum tubes developed by them are now in production by various other manufacturers in addition to the various types produced by VACUUM TUBE PRODUCTS. The experience of the VACUUM TUBE PRODUCTS engineering staff in vacuum tube research, development, design and production ranges from miniature and sub-miniature vacuum tubes to klystrons and large, forced-air-cooled and water cooled transmitting tubes plus a complete line of cathode-ray oscilloscope and television picture tubes. In fact, several of the more desirable features of present-day television picture tubes were actually developed first in the laboratories of VACUUM TUBE PRODUCTS. These achievements include the production of the first rectangular picture tube (16QP4), the first "black" picture tube (produced with dyed phosphors), and the first frosted panel picture tube. Additional experience can be shown by VACUUM TUBE PRODUCTS engineers in the development of radar equipment, missile control and stabilization equipment, and such components as transformers and motors.
 - c. Plant facilities. VACUUM TUBE PRODUCTS is well prepared for both production and experimental work, being fully equipped with modern exhaust stations, glass lathes, stem machines, sealing machines, bombardiers, hydrogen furnaces, air furnaces and special furnaces, glass-working and sand-blasting equipment, settling and baking equipment for cathode-ray tube screens, plus numerous pieces of special test equipment such as a high-powered pulse generator for emission testing and curve plotting. VACUUM TUBE PRODUCTS also is equipped with machine tools for manufacture and model shop work, as well as a large ignitron fired 125KVA projection welder for the fabrication of metal tubes. Other items include miscellaneous test instruments, laboratory measuring equipment, and power supplies of many types. Of considerable value to vacuum tube research work is a complete demountable type vacuum tube complete with its own exhaust system, vacuum gauges, power supplies and vacuum assembly. This unit permits basic research to be conducted rapidly and inexpensively on theoretical, preliminary or experimental designs of tube structures. This unit has proven exceedingly useful in work on contracts entered into with the U. S. Navy Electronics Laboratory, and Convair. Much of the basic work on the "Charactron Tube" was done in the VACUUM TUBE PRODUCTS demountable system, and many design parameters are regularly studied with this research tool.

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6. VACUUM TUBE PRODUCTS herewith offers its services and facilities and requests the opportunity of bidding on the production, research or development of such items as cathode-ray tubes, TR and ATR tubes, Geiger counter tubes, gas rectifiers and thyratrons, high vacuum rectifiers of all types, and miscellaneous microwave tubes.
7. VACUUM TUBE PRODUCTS is well suited to the accomplishment of both small and medium sized production runs, as well as development work. Ample experience can be shown by VACUUM TUBE PRODUCTS personnel in the supervision of large engineering and production groups, and production experience too, gained both at VACUUM TUBE PRODUCTS and other tube companies in the production of large quantities of power tubes. Some of the radar type rectifier and clipper tubes in quantities ranging up to a million tubes, as well as some of the largest production runs of copper anode power tubes were produced under the direction of personnel now associated with VACUUM TUBE PRODUCTS. (This subject is covered in more detail in the supplementary data given with the descriptions of key personnel.)
8. VACUUM TUBE PRODUCTS is housed in a metal-clad building having 2200 square feet of floor space, all of which is utilized in the design, development and production of vacuum tubes and related products. This is supplemented by additional warehousing area of 550 square feet in another building. Located in the industrial area of Oceanside, California, VACUUM TUBE PRODUCTS is served by one major railroad (Santa Fe) and by two principal motor-freight lines (Pacific Freight Lines and the Southern California Freight Lines.)
9. VACUUM TUBE PRODUCTS is particularly well-equipped to produce vacuum tubes and related products. The following equipment is installed and in operation.
 - a. Exhaust equipment:
 - 4 production-type exhaust stations with r-f bombarders. (Units are equipped for automatic exhaust operation)
 - 1 exhaust station for gas-filled tubes.
 - 1 exhaust station for mercury vapor tubes.
 - 1 exhaust station for experimental high-vacuum tubes.
 - 2 portable r-f bombarders.
 - 1 aluminizing assembly for aluminum backed CRT's.
 - 3 Portable general purpose ionization gauge
 - 1 ultra sensitive ionization gauge
 - 1 Portable standard Pirani gauge
 - 1 Thermo couple gauge control
 - b. Glass department:
 - 1 two position hand glassworking bench
 - 3 glass lathes
 - 1 single head sealing and stem machine
 - 1 single head bottom sealing unit
 - 1 single header making unit
 - 1 glass saw
 - 1 tungsten saw
 - c. Shop:
 - 3 metal working lathes
 - 1 small milling machine
 - 1 bench type drill press
 - 2 floor-type drill presses
 - 1 rotary table and milling attachment for jig boring.
 - 1 small punch press
 - 1 25 ton hand press
 - 1 small grinder
 - 1 1/4hp. bench grinder
 - 1 metal and wood cutting band saw
 - Numerous hand tools, drill attachments, fixtures, punches and dies, etc.

d. Test

- 1 aging rack
- 1 TV and CRT test set (magnetic)
- 1 test set of electrostatic CRT
- 2 general purpose high voltage power units
- 1 universal 5-unit power supply test set
- 1 hydrogen thyratron test set
- 1 H. V. rectifier test set
- 1 demountable vacuum tube with associated vacuum pump, gauges and power supplies
- 20 laboratory type portable power supplies
 - 1 oscilloscope
 - 1 laboratory type impedance bridge
 - 1 R. F. signal generator
 - 1 ultra sensitive portable micro-ammeter (D.C.)
 - 1 3 CM radar set
 - 1 28 volt D. C. battery supply
 - 1 400cycle supply (1.5 kilowatt)
 - 1 400 cycle supply (250 watt)
 - 1 high-power square wave pulse generator for curve plotting, peak emission tests and microwave tests.
 - Miscellaneous laboratory instruments, all types.

e. Chemical Facilities

- 1 two-position cleaning sink
- 1 deep-washing sink
- 1 water-backed spray booth
- 1 multiple-position tilt-table for CRT screens
- 1 multiple-position drying-table for CRT screens
- 1 Aquadag inner wall coating fixture for CRT
- Electrolytic cleaning facilities
- Bulb handling racks
- Chemical and phosphor supplies

f. Furnace Section

- 1 low-temperature drying oven
- 1 high-temperature air furnace (small regulated)
- 1 2-inch vertical hydrogen furnace
- 1 3-inch vertical hydrogen furnace
- 1 3-inch horizontal hydrogen furnace
- 1 1-inch horizontal hydrogen furnace
- 2 vertical brazing-welding hydrogen jars
 - 1 brazing power supply
 - 1 atomic hydrogen welding supply
 - 1 hydrogen furnace control unit
 - 1 set R.F. furnace transformer and work coils.

g. Mounting Sections

- 1 125 KVA ignitron fired projection—spot welder (for metal tube welding)
- 1 5-kw spot welder
- 1 2-kw spot welder
- 4 1-kw spot welders
- 1 1-kw ignitron controlled spot welder for grid welding
- 1 lead butt welding unit
- 1 hand operated brake

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- 1 DiAcro metal shears
- 2 high-speed grinder-polishers
- Numerous hand tools—jigs and fixtures.

10 Completed Projects — Active Projects

- a. Development projects which have been completed by VACUUM TUBE PRODUCTS for other firms and agencies in recent years include:

For U. S. Navy.

- Contract N 123 s 50216 Multiple Deflection Target Tube
- Contract N 123 s 66593 Code Sorter, Voltage Sampler, Clipper Limiter
- Contract N 123 s 66586 Services for fabrication of special tubes
- Contract N 123 s 80046 Special aluminized cathode ray tubes
- Contract N 123 s 68278 300 K. V. Triode
- Contract N 123 s 83904 High Voltage Diode and Triode
- Contract N 123 s 69890 T. R. Tubes

For National Bureau of Standards. (Washington)

- Contract S-40611-52 Improved Williams Tube Development.

For Consolidated Vultee Aircraft Corp.

- Fabricate Moveable Element Vacuum Tubes
- Fabricate Positive ion tubes for Accelerometer studies
- Fabricate Electron Beam tubes for guidance studies
- Fabricate Charactron Printer Tubes (Research Models)
- Fabricate Charactron Printer Tubes (Production Models)
- Fabricate R. F. waveguide windows.

For Ryan Aircraft Corp.

- Fabricate and grind metal-glass radar antenna bearing insulators.

For Distillation Products Industries

- Design and manufacture Leak Detector tubes.
- Design and Manufacture Ionization gauge tubes (Three Types).
- Development work on Ionization gauge structures and parameters.
- Development work on a Pirani gauge tube and system.
- Development work on Thermistor vacuum gauge tubes.
- Development work on Thermocouple Vacuum gauge tubes.

For Sandia Corporation

- Design and manufacture miniature 5 inch cathode ray tubes.
- Manufacture microwave (all band) calorimetric power measuring instrument.

- b. Research and development projects, as well as production runs are now under way at VACUUM TUBE PRODUCTS for the following companies and government agencies.

- U. S. Navy Electronics Laboratory
- U. S. National Bureau of Standards
- Sylvania Electric Products, Inc.
- Eitel-McCullough, Inc.
- Distillation Products Industries
- Consolidated Vultee Aircraft Corp. (Convair)
- Land-Air Inc.
- Gilfillan Bros. Inc.

c. Special projects are under discussion with the following:

Rand Corporation
Goodyear Aircraft Corp.
Stromberg-Carlson, Inc.
Burroughs Adding Machine Co.

d. A partial list of customers using the services and facilities of VACUUM TUBE PRODUCTS follows:

Arnold Laboratories (Mr. J. C. Arnold)	Ladish Co.
Bendix Aviation Corp. (Scintilla Magenta Division)	Land-Air Inc.
Bill Jack Scientific Instrument Co.	Mare Island Naval Shipyard
Brown Corporation, Ltd.	Massachusetts Institute of Technology
California Research Corp.	National Bureau of Standards
Chromatic TV Laboratories (Dr. E. O. Lawrence)	Navy Electronics Laboratory
Columbia University	Naval Research Laboratory
Consolidated Vultee Aircraft Corp. (Convair)	Naval Purchasing Office, Los Angeles
Distillation Products Industries	Ryan Aircraft Corp.
Eitel-McCullough, Inc.	Stoddart Aircraft Radio Corp.
Electro-Circuits, Inc.	Sylvania Electric Products, Inc.
Electro-Science Industries	Trans-Sonics, Inc.
General Precision Laboratories	Walkirt Company
Gilfillan Bros. Inc.	Westinghouse Electric Corp.
Hughes Aircraft Corp.	

In addition to the foregoing many other accounts have purchased our standard line of television picture tubes, such as small manufacturers, wholesalers and dealers.

11. The operations of VACUUM TUBE PRODUCTS, while complete in themselves, are sometimes supplemented by subcontracting machine work to one or more of three local machine shops, and one optical glass grinding shop. Precision milling and engraving work also is available locally. While these services are not directly under the control of VACUUM TUBE PRODUCTS, sufficient work is supplied to these shops to maintain exceedingly satisfactory subcontract relations.

VACUUM TUBE PRODUCTS is located in an ideal spot having excellent climate, pleasant working conditions, an ample labor supply of above average ability, easy accessibility by main highway, major rail line, and principal motor-freight facilities, and is within easy reach (35 miles) of the great Navy and Aircraft facilities in the San Diego area as well as the great Los Angeles (85 miles) industrial area.

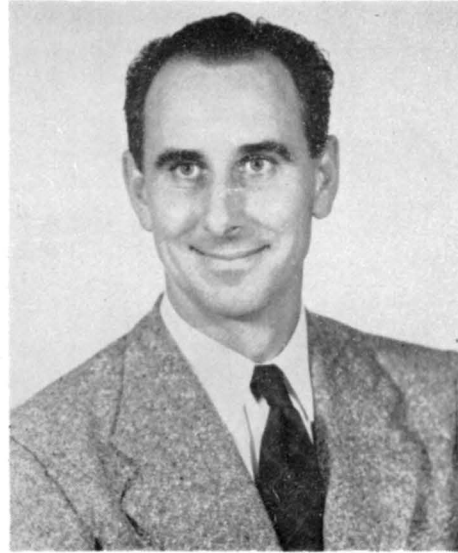
Respectfully Submitted,
VACUUM TUBE PRODUCTS,

Harold W. Ulmer, Manager.

Oceanside, California,
September, 1952.

Key Personnel: Mr. Harold W. Ulmer

Background: Mr. Ulmer, the owner-manager of VACUUM TUBE PRODUCTS, has been associated with the design, development and production of vacuum tubes and associated equipment for a period of 20 years. He first became acquainted with the industry in 1931 when he became a full time partner in the Radio Scientific Laboratories of Alhambra, California, following his attendance at Pasadena Junior College, Pasadena, Calif. His activities consisted of the design, development and manufacture of a broad line of vacuum tubes, glass apparatus and electronic equipment. Among the various projects were the fabrication of cathode-ray tubes for the Don Lee Television Station W6XAO, the first regularly scheduled TV station in the United States (1932); fabrication of fractional stills and associated equipment used in oil and gas analysis by the major oil companies in the Los Angeles area. Additional research work was performed for the California Institute of Technology, Soil and Cancer Research Institute, Western Precipitation Company and other industrial concerns.



Mr. Ulmer later terminated his association with the Radio Scientific Laboratories and resumed his previously interrupted college studies, attending Ocean-side-Carlsbad (Calif.) College during 1934 and 1935. In 1936, Mr. Ulmer established VACUUM TUBE PRODUCTS. Its operations at that time consisted of the design, development and production of various types of vacuum tubes and special electronic apparatus, including special types of medical tubes, special purpose lamps, and power type transmitting tubes. In addition, water-cooled tubes of the type used in high-powered broadcast stations were repaired. Mr. Ulmer also served as a consulting engineer on vacuum tube problems to a number of commercial firms during this period. These operations were continued by Mr. Ulmer until early 1942 when he suspended all activities of VACUUM TUBE PRODUCTS for the duration of World War II. It was at this time that Mr. Ulmer joined the engineering staff of the Federal Telegraph Company in Newark, N. J., as a senior engineer. Because of his previous experience at VACUUM TUBE PRODUCTS, Mr. Ulmer was assigned as project engineer on the design and production of the Federal 450T tube, and as assistant project engineer on the Federal 250T tube with graphite anode. A later responsibility was the development and production of the 15E tube, used in many types of radar equipment during World War II. Other projects subsequently under

Mr. Ulmer's direction included the correlation of life test data on standard production types of tubes, design of spot welder timers used in vacuum tube production, test oscillators, r-f bombarders, and prototype development on tube types 715, 803, 833 and the early model of the 200-kilowatt tube later used in short-wave transmitters of the Office of War Information.

In December, 1942, Mr. Ulmer joined the engineering staff of the Raytheon Mfg. Co., Waltham, Mass. where his initial assignment was that of project engineer on tube types RK20A, RK47, RK28A, and RK48A. Mr. Ulmer later was advanced to become Section Head in the hard glass division at Raytheon and assigned cognizance of all thoriated tungsten filament type tubes, high voltage rectifiers and clippers, mercury vapor tubes, hydrogen and Xenon thyratrons, and special purpose types such as microwave triodes, external anode tubes, etc. Considerable experience was attained by Mr. Ulmer in the mass production of these and a great number of diverse tube types. He was entirely responsible in this position at Raytheon for the completion of engineering design on any given tube type, establishment of fabrication methods, tooling and processing procedures, and compliance with Joint Army-Navy specifications.

In early 1946, Mr. Ulmer returned to Oceanside, California, later becoming associated with Consolidated Vultee Aircraft Corporation where he was placed in charge of the Vacuum Tube Laboratory, and often consulted on vacuum tube problems incident to the development of guided missiles and aircraft. In this connection, Mr. Ulmer performed considerable work on positive ion accelerometers, movable element tubes, beam deflection tubes for guidance systems, and studies of tube ruggedization requirements.

Mr. Ulmer also re-established VACUUM TUBE PRODUCTS in 1946, entering the field of specialty vacuum tube manufacture. Various types of tubes were produced, including Geiger counter tubes, external anode tubes, special purpose diodes, power tubes, etc. In early 1948, Mr. Ulmer accepted a contract with the U. S. Navy Electronics Laboratory for vacuum tube development of a classified nature. In

late 1948, the first commercial production of television picture tubes on the west coast was inaugurated under Mr. Ulmer's planning. With his assistance, the first rectangular television picture tube ever produced in the United States was achieved by VACUUM TUBE PRODUCTS. By employing dyed phosphors, Mr. Ulmer also enabled VACUUM TUBE PRODUCTS to achieve the first so-called "black" television tube.

Since 1948, Mr. Ulmer has been active in the operation of VACUUM TUBE PRODUCTS and in the development and production of tubes not only for the commercial market but also for the U. S. Navy Electronics Laboratory, Consolidated Vultee Aircraft Corporation, Sandia Corporation, National Bureau of Standards, Ryan Aircraft Corporation, California Research Corporation, Distillation Products Industries, and other industrial firms.

Key Personnel: Carl A. Schwenden

Background: Mr. Schwenden is one of the real old-timers in radio who has grown up with the art. His first introduction into radio occurred in 1908 at Los Angeles, California, when he saw an early model commercial spark radio transmitter in operation. This interested him to such an extent that it started him on his successful career of radio and electrical engineering. His first step in this direction was becoming an amateur radio operator, using the call letters CM. Under subsequent government licensing, his call was changed to 6SJ. Since then, he has held call letters 6CMB, 6JG and 6GJ. During the same period he also held a First Grade Commercial operator's license and a First Class Military Telegrapher's license. In the commercial field, Mr. Schwenden's first position was as an engineering assistant with the Westinghouse Electric and Manufacturing Company where he was first engaged in the maintenance and repair of transformers, motors, generators and special electrical systems. This position evolved into his being made a field representative by Westinghouse, his duties calling for supervision of installation and maintenance of large generators used by commercial power systems.

In World War I, Mr. Schwenden joined the U. S. Army Signal Corps where he was assigned to intercept and goniometer operation for the Radio Intelligence Service. He also became closely associated with the radio development work directed by the well-known Maj. Edwin H. Armstrong.

Following World War I, Mr. Schwenden returned to electrical engineering work in the Los Angeles area, and later joined the staff of the United Artists Studio Corporation, later transferring to Paramount Pictures Corporation as a sound engineer. In these positions he was closely associated with the design and development of high quality precision apparatus for frequency measurement and quality reproduction. This work included not only the development of wax recording equipment but also sound-on-film apparatus.

Mr. Schwenden subsequently resigned his post to join Mr. Jeffries in establishing a partnership known as the Jeffries Transformer Company. In this operation, Mr. Schwenden developed special lighting equipment and high voltage equipment for smoke and dust precipitation. In 1936 Mr. Schwenden formed his own company, the Fremont Electric Company of which he was the sole owner. This firm engaged in the development of high quality precision apparatus for frequency of patents are held by Mr. Schwenden. The first "writing" neon sign—operated by a special type of radio oscillator—was designed by Mr. Schwenden at this time. A number of special radio circuits also were developed and patented by Mr. Schwenden at his



firm, a principal item being the grounded plate oscillator circuit. Early work also was performed on the grounded grid circuit, now in common usage in radar systems.

With the advent of World War II, Mr. Schwenden joined the research staff of the M. I. T. Radiation Laboratory. His abilities were well recognized there and he was assigned responsibility for special radar development work, including research on crystal detectors, system designs and the first large dish antenna. Later at the Lakehurst, N. J., Naval Air Station, Mr. Schwenden supervised the installation of this antenna.

Later in the war, Mr. Schwenden joined the engineering staff of the Submarine Signal Company, serving as a field engineer under assignment to the U. S. Navy Bureau of Ships and Bureau of Ordnance on radar and fire control systems.

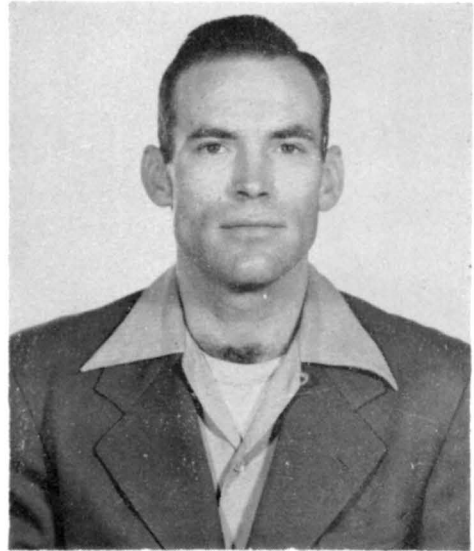
With the termination of World War II, Mr. Schwenden returned to Southern California where he has since 1946 been associated with both VACUUM TUBE PRODUCTS, Oceanside, and the Junior Tool Company, Los Angeles. At VACUUM TUBE PRODUCTS, Mr. Schwenden pioneered in development work on dyed phosphors, the forerunner of the present black-screen television tube. He also developed special techniques in tube processing, assembling, testing and aging. He also engaged in the development of equipment for vacuum production and gauging. At the Junior Tool Company, Mr. Schwenden has developed special types of electrical motors of unique design. Some of these have proven suitable for internal vacuum tube applications of a highly specialized nature. Mr. Schwenden also has designed and developed many industrial type electric motors, generators and alternators for commercial power and guided missile applications.

Key Personnel: Charles L. Giles

Background: Mr. Giles received his training in electronics at the Radio Engineering School where he enrolled in 1938. Specializing in communications engineering, Mr. Giles later obtained his FCC Radiotelephone First Class Operator's license. Upon completing his course, Mr. Giles remained at the school for seven months as an instructor of electron theory and engineering. In 1941 he accepted a post as Transmitter Engineer with Radio Broadcast Station KMA at Shenandoah, Iowa, where he remained until 1942 when he accepted the position of Chief Engineer at Radio Broadcast Station KVAK. While in the latter post, Mr. Giles also served as Communications Consulting Engineer for Police Radio Station KACA. In 1943 he was called to active duty with the U. S. Navy and given additional training at the Navy Electronics School in Chicago, Ill. Mr. Giles was then selected for instructor's training and schooled in this endeavor at the Lowell Textile Institute in Lowell, Mass. He subsequently was made a supervisor of instructors and transferred to the Amphibious Training Base at Oceanside, California where he utilized special electronic equipment in the training of combat personnel. While engaged in this work, Mr. Giles also had the opportunity to obtain research experience on missiles and on the detection of missiles in flight by radar. Mr. Giles was transferred in 1945 to the Navy's San Diego Amphibious Training Base where he served as an instructor until his release by the Navy in 1946.

During 1946 and 1947, Mr. Giles served as Communications Engineer with the City of Oceanside, California. In late 1947 he relinquished this post to establish his own firm, Electronics Maintenance and Repair. In this enterprise he serviced all types of communications equipment such as police, small craft, taxi and airplane transmitters and receivers.

In 1949 Mr. Giles joined the engineering staff of VACUUM TUBE PRODUCTS where he has developed



techniques for the application of all types of phosphors to the screens of cathode-ray tubes. He also has been responsible for developing techniques for applying organic films to the screens of cathode-ray tubes that require metal backed screens. Mr. Giles has successfully developed equipment used in applying metal-backing to the screens of cathode-ray tubes, and he has also devoted considerable effort and time to electron beam study and beam deflection study in connection with the demountable tube system at VACUUM TUBE PRODUCTS. He has performed research and development work on the Charactron tube, a high speed printer developed for Consolidated Vultee Aircraft Corporation. Mr. Giles also has fabricated induction heating units, vacuum systems, automatic exhaust, and processing equipment. In connection with the latter, Mr. Giles has developed the processing and aging techniques for different tube types. Mr. Giles also is credited with considerable development work on miniature cathode-ray tubes, miniature oil-cooled high vacuum rectifiers, vacuum gauge tubes and other highly specialized vacuum tube types.

Key Personnel: Miss Viola Springstead



Background: Miss Springstead first entered the electronics and vacuum tube field when she was employed by the Federal Telegraph Company of Newark, N. J., in 1933. She was given the post of parts preparation operator, a post in which she acquired considerable skill in glass handling, sawing and preparing of various parts for anode and grid beading used in large water-cooled transmitting tubes. As her ability increased, her work was expanded to include parts preparation for assembly in transmitting and receiving tubes, chemical cleaning of vacuum tube components, electroplating and tube basing. During the years 1933 through 1935, Miss Springstead held the unique distinction of being the first and only woman employee to be trained at Federal Telegraph Company in the handling of the many special and delicate operations required in tube manufacture. Trained by engineers and skilled technicians, Miss Springstead's abilities increased until she finally was given the responsibility for setting up and supervising parts preparation and precision assembly departments.

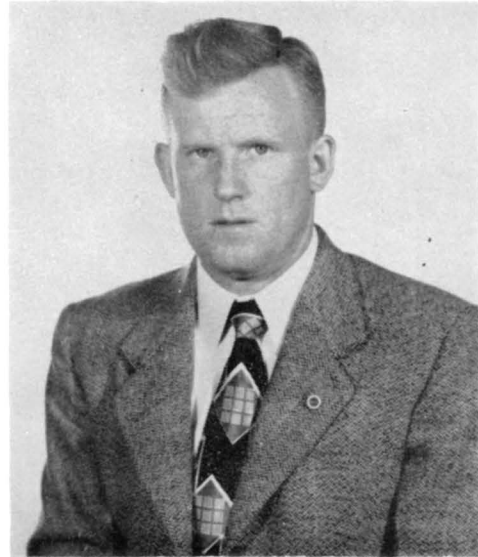
When it became necessary for the Federal Telegraph Company to expand into its new plant where it is now known as the Federal Telephone and Radio Corporation, Miss Springstead was assigned the project of determining the production floor layout so as

to use most efficiently the various departments under her supervision. With the change of plant location being effected in 1944, Miss Springstead's responsibilities were expanded to include supervision of glass cutting, glass washing, preparation of parts for air-cooled tubes, grid assembly department, degreasing, preparation of parts for water-cooled tubes, hydrogen firing, tube mounting, atomic hydrogen welding, tube basing and final X-Ray.

During World War II, Miss Springstead supplemented her broad practical experience with academic training, taking courses in general supervision, methods engineering and time study. At Rutgers University she won academic honors and credentials as an instructor, and further supplemented her knowledge of electrical engineering by taking a course in vacuum tube design. This background, combined with her many years experience in vacuum tube manufacture, serves to make Miss Springstead of exceptional value to the industry.

Since January, 1951, Miss Springstead has been employed by Vacuum Tube Products in the capacity of assistant engineer and production supervisor. Functions under her direction consist of mechanical structure assembly, welding techniques, brazing techniques, parts cleaning, hydrogen firing, atomic hydrogen welding, glass beading and tube basing.

Key Personnel: John H. Williams



Background: Mr. Williams first entered the electronics industry by taking a position as a radio maintenance engineer with the Kolb's Radio Manufacturer's Service in 1939 in Oceanside, California. His field of work included maintenance and repair of medical and industrial electronic equipment, incidental service being given radio receivers and transmitters on occasion. It was during this period that Mr. Williams' abilities were utilized in the design and construction of the radio communications system installed for the Police Department of Oceanside, California.

In 1941, Mr. Williams joined Consolidated Vultee Aircraft Corporation where he performed considerable development work on the prototype electrical system of the B-24 type aircraft. During his two-year tenure at Consolidated, Mr. Williams rose to a supervisory position which he resigned in 1943 to enter the U. S. Marine Corps. With the latter organization he served as a communications instructor assigned to the Naval Technical Training Command. He later was assigned the work of analyzing field failures of radio and radar equipment and also was utilized as a supervisor of radio-radar repair and installation.

Mr. Williams returned to Oceanside, California, upon his release by the Marines in 1946, and was

employed in a technical capacity by the City of Oceanside (Calif.) where he was given the responsibility of supervising the Fire Department radio system and its subsequent expansion.

In 1948, Mr. Williams completed his course of study at Oceanside-Carlsbad College, winning instructor's credentials in radio and electrical subjects. Subsequent supplemental training obtained at San Diego State College finally provided Mr. Williams with his general secondary teacher's credential. He later obtained his adult special secondary credential, and joined the faculty of the Oceanside-Carlsbad College where he is an instructor in radio and electrical subjects. Under Mr. Williams direction, the college has purchased, licensed and installed an educational FM broadcast station, KOEN.

In addition to his academic endeavors, Mr. Williams serves on the engineering staff of VACUUM TUBE PRODUCTS as a consulting electronic engineer. He has—in this capacity—directed special circuit work and has accomplished improvements in vacuum gauging systems.

KEY Personnel:

Don Jago



A natural interest in the electronics field was stimulated in Mr. Jago due to his close association with amateur radio. In this connection he gained knowledge and experience in the active participation of constructing and operating amateur radio station W6NWI owned by his brother. Further activities in this field were the associations and field day activities of the Palomar Radio Club.

Upon entering the U. S. Navy in 1943, it was quite natural to have Mr. Jago apply his interests and experience in his chosen field. He entered the Navy at San Diego, California, and upon completion of basic training was assigned to Radio and Radar School at Chicago, Illinois, with a classification as electronic technician. An intensive course was pursued covering all phases of basic radio, electricity and mathematics through more advanced electronic and vacuum tube theory and finally actual study and operation of standard U. S. Navy equipment. Here the finer techniques of operation and trouble shooting were mastered by Mr. Jago.

In 1944, while serving in the Pacific Theatre of Operations, Mr. Jago was honored by being selected for further advanced training aboard the AGC-90, Command Ship of the 7th Fleet. Courses now included the installation and operation, as well as maintenance of FM transmitters, and receivers, as well as high power jamming transmitters, supplementing his previous training on standard types of radio, radar, loran, sonar and navigational equipment. Under the supervision of Mr. Jago major installations were made of SQ-2 Radar and TCS-8 and SCR 608 and 610 transmitters and receivers aboard his ship. After installation, full responsibility for the operations of this

equipment was assumed by Mr. Jago's personnel. Actual combat experience was gained in activities at Mindinao and Leyte Gulf.

Upon completion of his tour of duty in the Navy, Mr. Jago returned to Oceanside, California and enrolled for an electrical engineering course at the Oceanside-Carlsbad College. While studying here, he achieved high honors in the field of Chemistry under the able guidance of Dr. James D. Wylie. Upon graduation in 1949, Mr. Jago attained the honor of being in the upper 10% of his class.

Mr. Jago further pursued his education by entering and attending Oregon State College, in the years 1950 and 1951. The field of Electrical Engineering was his major subject with an option in communications. Further valuable training was obtained in such subjects as Alternating Current Circuit Theory, Power Transmission, Vacuum Tube Theory, Wave Propagation, and antenna studies. He was afforded the opportunity of studying under the able guidance of such men as Drs. Brewer, and Hostetter, and Professors Cockerline, Starr and Lincoln, leaders in their respective fields.

Early in 1952 Mr. Jago accepted a position on the engineering staff of Vacuum Tube Products where he is engaged in research, development, and production problems on cathode ray tubes, electron beam tubes and vacuum gauges. Under Mr. Jago's supervision, special techniques in aluminizing and processing vacuum tubes are being developed.



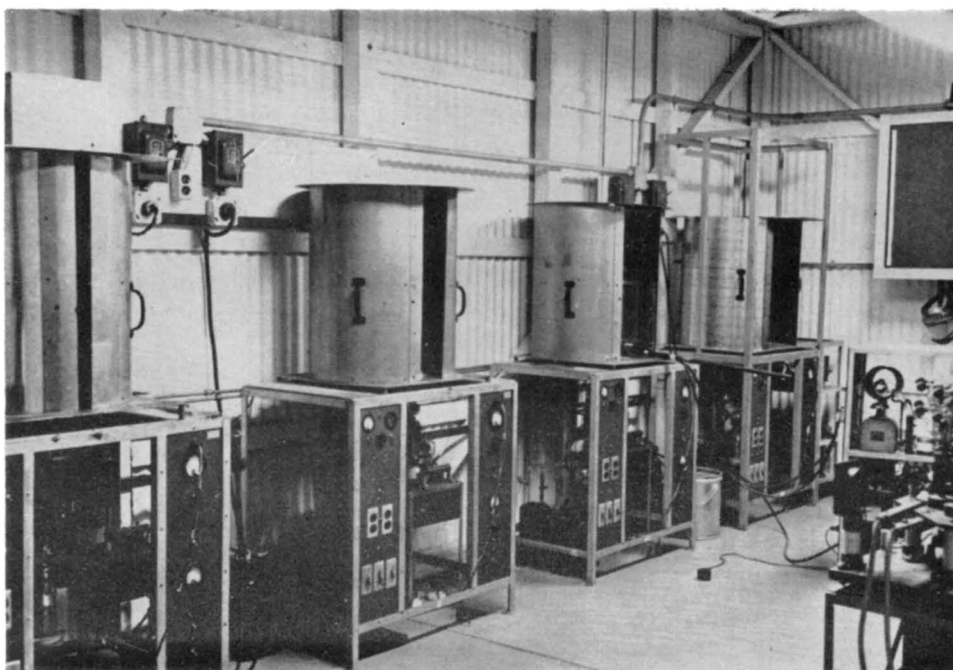
Factory Location



Mounting — Parts Preparation



Glass Lathe Sealing



Production Exhaust Department



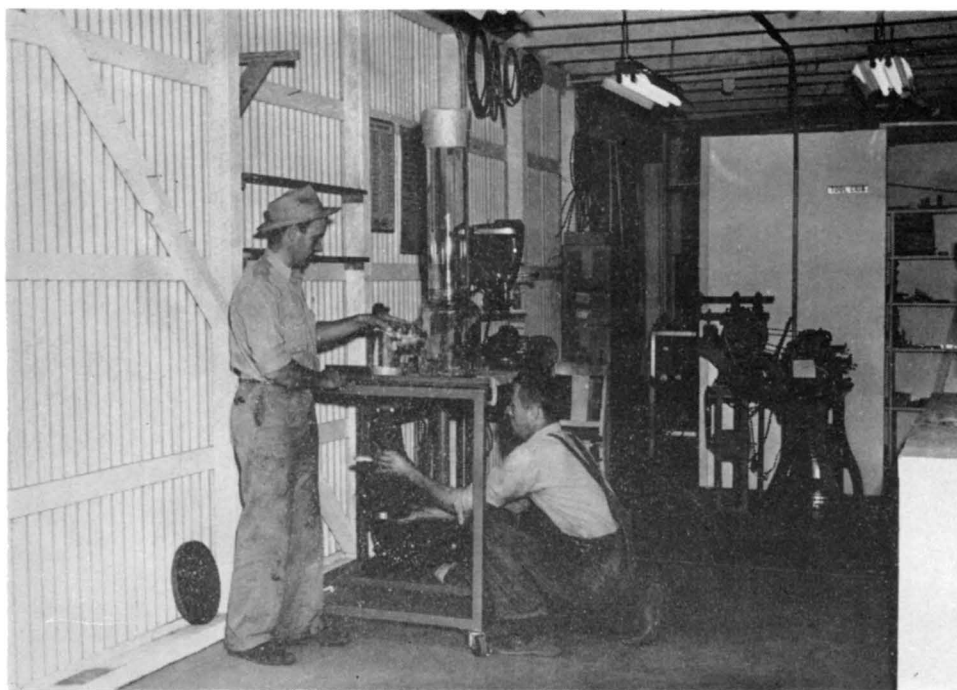
Hydrogen Firing — Brazing — Atomic Hydrogen Welding



Phosphor Settling — Inner Wall CRT Coating



Experimental Test Department



Model Shop — Development