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DIRECTORY ISSUE

Transmitter Auto. Power Control (T. D. Estes)	3
First Citizens' Telegraph (Don deNeuf)	6
The Chicago Meeting	7
Awards to Fink and Goldsmith	8
Awards to Merriam and Farrand	9
Citations to New Fellows	10
50 Years of <i>Radio-Craft</i>	11
A Tribute to Lewis Clement, 1892-1979 (Wm. H. Offenhauser, Jr.)	12
News of the Membership	16
Professional listings	21

COMPLETE MEMBERSHIP DIRECTORY

To October 1, 1979
Pages 17 to 30

THE RADIO CLUB OF AMERICA, INC.
P.O. Box 2112, Grand Central Station, New York, N.Y. 10017

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HISTORICAL INFORMATION NEEDED

R. L. (Chad) Chadbourne (M 1979) would appreciate the help of Club members in gathering material for the history he is writing of communications receivers built in the United States. He is covering sets the earliest (around 1902) to the present day. Commercial, point-to-point, marine, amateur and Army/Navy gear will be included. He plans to trace the technological development of the receivers over the period, using a large sampling of models as examples and progressing in increments of four or five years.

He especially needs material on little publicized equipment. This includes marine receivers made by Cardwell, Cutting and Washington, Kilbourne and Clark, Heintz Kaufman, Simon Radio and Wireless Egert. It also includes amateur receivers by Barrett, Davco, Galaxy, Hatry & Young, Hendricks and Harvey, McCulla, Postal, Radio Constructors, Ross, Silver, Tobe and Wireless Egert.

Now retired as head of the head writer and editor of the Navy Electronics Laboratory, San Diego (now

called Wireless Egert. He'll pay costs for wanted material, and he has facilities to copy photographs sent on loan. Naturally he'll credit any help given in the book.

Now retired as the head writer and editor at the Navy Electronics Laboratory, San Diego (now called Naval Ocean Systems Center) C. L. Chadbourne lives at 530 Midway St., La Jolla, CA 92037. He hopes to hear from those of you with first-hand knowledge of communication receiver design and manufacture.

Late Notes on the Membership

Andy Bower (M 1975) has been promoted to the position of Regional Manager for the Southeast by Repco, Inc. In his new position he will have responsibility for an area of 12 states.

Homer Huddleston (M 1979) has joined Plantronics, Inc., of Cupertino, CA, as President and General Manager of Communications Systems, Inc.

Robert I. Kimmel (M 1969, F 1979) has retired as Director of the Communications Division of the Pennsylvania State Police. Always active in a number of organizations, he reports that he is involved in a couple

of projects in the Harrisburg area—among other things, has been appointed Public Safety Communications Officer for Lower Paxton Township.

Jim McLean (M 1968, F 1977) has been elected a Director and appointed Vice President and Chief Operations Officer of Professional Video Systems of America, Century City, CA, a company involved in production of video tape and film software for education, training, medical and business applications. Jim is a former Vice president—general manger of Philco's Government and Industrial division, and was president of Stromberg-Carlson Co., and of General Dynamics/Electronics.

George J. Mitchell (M 1970, F 1977) has been promoted to Director of MAXAR Product Operations, Communications Products Division, Motorola, Inc.

Gordon V. Peck, K4RG (M 1961, F 1964) we learned died March 9, 1979. He was probably the only American other than Paul Godley to hear 1BCG in Europe during the 1921 transatlantic tests. Operating on a ship that was going through the Kiel Canal, he had just build a radio to receive amateur signals, and heard the tests the first evening he tried it out.

Automatic Power Control for Troposcatter Systems

By Thomas D. Estes*
Member 1978

Radio technology offers the engineer several system choices to meet constraints imposed by spectrum congestion and the many other variables that must be considered in system design. The choice of technique is not limited to engineering considerations—attention must be given to meeting telecommunication regulations, which are enforced to allow co-existence in, and sharing of, the frequency spectrum by numerous users. The radio engineer must ensure that the system design conserves spectrum in every possible way, whether by choice of technique or by exacting with small safety margins.

Troposcatter Fading

On occasion, a radio technique noted for extravagant use of frequency spectrum must be utilized, however. Troposcatter is one of these techniques. Troposcatter systems are characterized by large diameter antennas and high-power amplifiers. It is necessary to use high levels of radiated power because path loss can be extremely high for relatively short communicating distances. An example would be a North Sea path of 230 km at 2.5 GHz, a path loss of 246 dB for a time availability of 99.9 percent.

A high path loss, demanding large system gains, is not in itself a reason for concern over spectrum utilization, but a high path loss that varies as much as 120 dB over the course of a year causes great concern.

There are many theories concerning the mechanism of forward scatter propagation. All agree the useful re-direction of radio energy takes place within the volume of atmosphere common to the beams of the transmit and receive antennas. Several models have been proposed to explain the properties of scattering mechanisms in this common volume of atmosphere: Three models persist:

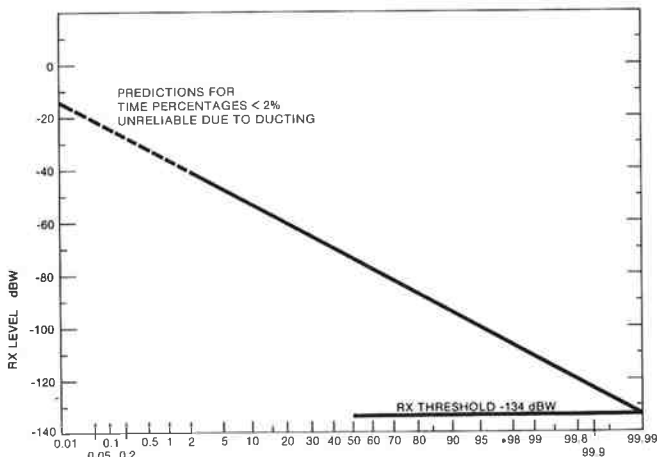


Fig. 1—Percentage of the year received signal is equal to or above a given level.

Turbulent layer scattering caused by refractive index stratification within the common volume for considerable periods of time.

Layer reflections caused by reflection of energy from randomly distributed layers formed by changes in the dielectric constant of the atmosphere in the common volume.

Turbulent scattering caused by large numbers of randomly distributed irregularities in the atmosphere. The irregularities can be described as rapid and short-term changes in refractive index, giving an overall impression of a randomly distributed atmosphere consisting of different dielectric constants.

None of these theories fully explain the complex performance of a troposcatter path. Close observation of all three (and it is possible that all three models take turns in predominance during different time periods) will yield the presence of two types of fading always seen in operating troposcatter systems.

The common volume is affected by seasonal or diurnal changes, which cause gross variations in the atmosphere and vary the intensity and spatial distribution of the scattering efficiency, precipitating a long-term variation in received signal power. When measured with hourly samplings this long-term power fade tends to approach a log normal distribution with standard deviations of 20 dB for some paths in difficult climatic areas.

Short-term variations in signal level will be evident as the received energy consists of an infinite number of components of random phase and amplitude. Measurements with minute sampling periods give a distribution in almost perfect agreement with the Rayleigh distribution.

Peculiar meteorological conditions contribute path anomalies, causing worse or better performance than expected during the periods of time these peculiarities exist. Most notable of these is the movement of weather fronts through the scatter volume, and ducting. This type of fading cannot be predicted accurately by statistical methods.

The propagation engineer must be concerned with all these phenomena and base his design on providing sufficient system gain to accommodate all losses for the desired time availability period. There are several troposcatter prediction techniques in the public domain. When used with care, these can predict path losses accurately.

Figure 1 depicts a typical cumulative distribution of long-term received signal level as predicted by a widely recognized technique. Analysis reveals that long-term power fade is intended to be compensated by adequate system gain for the desired time availability. Short-term or

*Phillips Petroleum Co., Bartlesville, OK.

Rayleigh fade is not reflected on the graph, as it is normally accommodated by diversity techniques rather than gross system gain.

Note that for appreciable periods of the year the troposcatter system exhibits more gain than required to remain above FM threshold or above desired carrier-to-noise ratio. During this time the troposcatter systems can interfere—by a considerable distance and at substantial signal levels—with other systems. For this reason troposcatter systems do not enjoy wider acceptance.

A Quality Level Control

A partial solution to the problem is the subject of this article. A method has been devised whereby the received signal is sampled for desired quality level. When the quality level is exceeded, commands are relayed to the distant transmitter to reduce system gain by inserting attenuation in the transmit chain. With less power being radiated during periods of good propagation the probability of interference to other radio networks is reduced. Although possibly not the best parameter to use for sampling propagation state, signal level is easily measured, making it attractive for this purpose.

Of primary importance to the operating system is the maintenance of channel signal-to-noise (S/N). In some systems S/N is sufficiently high when the carrier is a FM threshold. For others an effective threshold must be established above FM threshold to obtain the required operational S/N. Based on the effective threshold requirements, a received signal level can be quantified which can be used as the criterion to judge link performance. Signals above this will yield better performance than required while those below will offer substandard performance. Signal levels higher than needed to support required channel S/N ratio can be considered in excess of project requirements and wasteful in spectrum usage.

If rapid fading were not present, it would be possible to initiate commands to the distant transmitter to reduce output power at times when re-received signal level exceeds required S/N ratio. This simplistic solution cannot be implemented in real systems because of the complex fading associated with troposcatter.

Quantified Troposcatter Fading

Measurement made on many troposcatter systems in different climatic areas indicate that short down fades, caused by ducting, produce rapid level variations approaching 16 dB per minute, and 10-dB changes can occur in 7 seconds. A change of 25 dB will average 5 minutes in its excursion.

The power control system must be designed to follow these excursions instantaneously with little or no time lag, or the trigger level at which it operates must be at least 25 dB above required system S/N ratio.

The designer's choice must consider the technology used in implementing output power attenuation. If completely electronic means can be used, it may be possible to follow fading fluctuations faithfully. Care must be exercised so that noise impulses, along with other transient interferences, are not followed. Mechanical methods, such as motorized attenuators, have inherent slow time constants, which limit the systems' tracking capabilities. In this instance it would be wise to select a trigger level in ex-

cess of expected fade levels for the mechanical time constants involved.

Long-term fading is extremely slow and deep. 120-dB variations over a years time is not uncommon. Practically any method of output attenuation can be used—the fading rates pose no practical time constant limitations. Manual adjustment of output power would be possible if allowances were made for anomalous propagation as described above. A preferred method is automatic adjustment of output power, which compensates for long-term fading and anomalous propagation caused by ducting.

An Operating APC System

Marconi Communication Systems, Ltd. designed the auto power control (APC) system here described, under a development contract from Phillips Petroleum Co., Norway. It is presently in use on an operating troposcatter network between Ekofisk ("The Ekofisk Project," J. F. Walker, Sr., *Proceedings of the Radio Club of America*, Volume 52, Number 1, March, 1978) and Emden, West Germany.

The troposcatter system has an FM threshold of -134 dBW, and signals at threshold exhibit adequate S/N for project requirements. A trigger level of 95 dBW was selected for APC operation, allowing a 39-dB fade margin for rapid carrier level excursions with time durations less than APC time constant values.

During certain periods of the propagational year, long-term fading causes the signal to exhibit a median around the trigger level, and faster fading caused by anomalous propagation yields a composite carrier level exhibiting rapid fading above and below the trigger level value. Since a mechanical attenuator was chosen for output power adjustment, it was not desirable to have it constantly track small level variations around the trigger value. Steps of 5 dB appeared consistent to expected fading properties and an overall time constant of 15 seconds was selected before the step was initiated, after detecting that a correction was needed.

Received signal level is measured at IF and the detected voltage is passed to comparator circuitry, where it is compared to upper and lower limits. The lower limit is set to the previously established trigger level of -95 dBW and the upper limit is established at -87 dBW, giving an operation window of 8 dB for loop stability. The tropo system uses quadruple space/polarization diversity, consequently there are four detectors and comparators controlling two transmit power amplifiers. The outputs of the comparators are logically combined to prevent one diversity path from initiating commands on its own.

Received signals exceeding the upper limit of -87 dBW initiate voice frequency telegraph (VFT) signals in the sub baseband of the return link, commanding a reduction in transmit power. Inversely, signals dropping below the lower limit of -97 dBW initiate commands for an increase in transmit power. Signals remaining within the window—or out of the window for time periods less than 15 seconds—keep the APC system at steady rate.

The transmitting end of the link requires VFT detectors and an attenuating device to control output power. The system under discussion uses a motor driven attenuator in the 50-W power amplifier output line. Primary considera-

tions in selection of an attenuator is insertion loss, power handling capability, and attenuation range.

For amplifiers in the 1 to 10 KW range, output attenuators are not practical and drive to the amplifier must be manipulated. Care must be exercised to keep the PA out of saturation and to reduction of drive to the point where PA intrinsic noise becomes significant.

It is desirable to have 80 dB of level control range. This is difficult to attain in practice, due to present state of attenuator technology. The system under discussion has a usable control range of 45 dB.

Conclusions

Figure 2 superimposes two distributions of signal level, one modified by APC operation, the other unmodified. Note that APC offers substantial improvements in the reduction of excessive radiated power for a considerable portion of the propagational year.

To this author's knowledge this is the first APC system to be put into operation. Much was learned and it was determined that further work should be done in fading analysis and hardware development. Consideration should be given to increasing the dynamic range of power control and to improvements in attenuator technology by the use of active components. System time constants, commensurate to more accurate modeling of fading mechanisms,

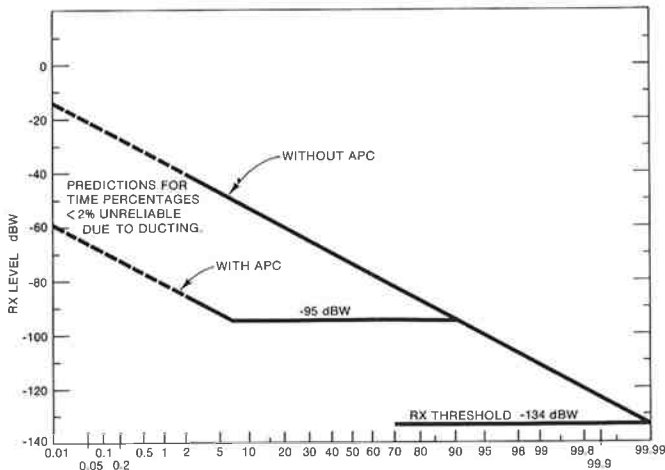


Fig. 2—Effective of automatic power control.

need to be optimized for better restriction of radiated power, while providing for the conflicting parameter of maintaining system performance integrity.

Although this article restricts APC's involvement to troposcatter links, it is possible that a system of similar concept could be used on other radio technologies, such as microwave. To be fruitful, much work would be required in fading and path-to-path correlations. The results would be worth while, resulting in coordination distances being reduced and frequency reuse expanded.

Acknowledgements

The author wishes to thank the management of Phillips Petroleum Co. for permission to publish this article, and its subsidiary Phillips Petroleum Co., Norway for funding the development of APC. Special acknowledgement is due the employees of Marconi Communication System, Ltd., especially Mr. B. S. Skingley and Mr. J. K. Johnson, without whose effort and expertise, APC might not have come to fruition.

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First Citizens' Communications System

Was for Bad News Only

By Don deNeuf
Fellow 1974

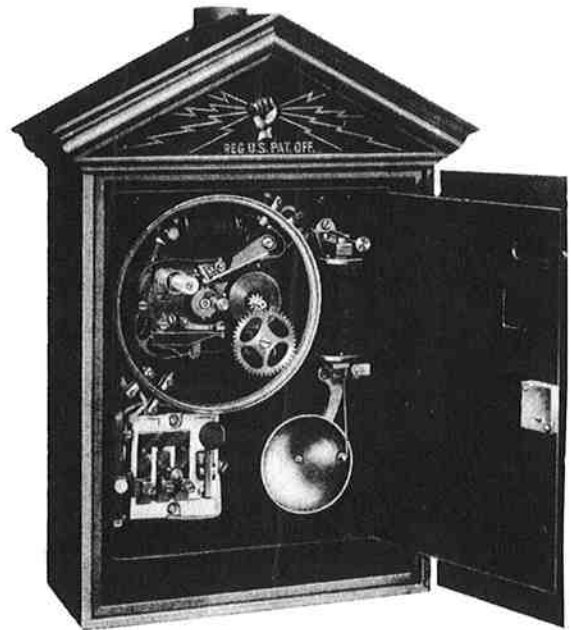
By the turn of the century—and often before—there were telegraph offices for the public; virtually every city and large town in the USA had an electric telegraph system operated by its citizens. It would send only messages of bad news and it could transmit from a number of different locations within the city. It used a telegraph code, but the sending operators did not need to even know what it was. Receipt of messages transmitted brought prompt action by groups of specialists and volunteers which often saved lives and prevented the loss of untold millions of dollars of property damage.

In 1845 Dr. W. F. Channing of Boston was intrigued with the telegraph demonstrated by Samuel F. B. Morse. He immediately saw that it could provide a solution to the age-old problem of promptly reporting and pinpointing the location of an outbreak of fire. For many years alarms of fire were sounded by the shouting of voices and the manual wild ringing of various types of bells (sometimes unheard in stormy weather) and invariably creating a problem as to the exact location of the fire. Valuable time was lost in the frequent tragic delays in the sounding of alarms and in firefighters rushing off in the wrong direction as a result of confusion or erroneous information.

Channing in 1851 established in Boston the world's first electric fire alarm telegraph system based on the principle employed by Morse. "Telegraph sending stations" available to the public were installed in strategic locations throughout the city at street intersections. These stations, eventually called "fire alarm telegraph boxes" were connected by wire lines with central fire fighting headquarters. Each box location was assigned a number which would be indicated on the circuit when activated by a person pulling down a lever.

This number was in the form of a simple code of pulses and spaces formed by a clockwork driven notched wheel that opened and closed the circuit. For example, number 243 would send two pulses, followed by a space, then four pulses, another space and finally three more pulses. These signals when received at fire headquarters would be sounded by striking gongs and other devices.

To avoid any "aural counting error"—not uncommon in the excitement of crews preparing for a dash to a fire—"indicators" or "registers" were later included in the circuits to provide a visual record of received signals. Ignorance of, or confusion as to the location of a fire was at last eliminated and the transmission of the alarm was virtually immediate.



Like Morse's conventional telegraph system, the electrical circuitry was one of a "series type" with each box pulsing over a common circuit. The first problem that developed was when two or more different boxes were activated and each attempted to send signals at the same time. This caused a jumble of signal codes and usually resulted in the alarms being unintelligible at fire headquarters. Design ingenuity soon developed a new type of box mechanism called "non-interfering," utilizing a solenoid device to "lock out" any box activated during the period another one was in the process of transmitting a signal. While this brought about a vastly more secure system, it still left the problem of a loss of signals from those boxes that were "locked out" and which were trying to report other fires. This was overcome by further development of the "successive" type of box mechanism. When a box was "locked out," it would hold its signal until the first one had finished. It would then follow with its own transmission.

As cities grew, so did the sophistication of the fire alarm telegraph systems. Circuitry eventually became so extensive it was divided into sections covering various areas. Dispatchers at headquarters received the alarms over the box circuits and retransmitted them over other circuits to the various engine houses as dictated by various factors—availability of equipment, weather, etc. In some cities dispatchers utilized the circuits when not transmitting alarm signals for inter-communication by Morse telegraphy. In San Francisco, every battalion chief was outfitted with a car driven by a chauffeur who was also a Morse telegraphist. Upon arrival at the scene of a fire he would immediately proceed to the nearest box (each of which was equipped with a key and sounder) and establish communications with headquarters, reporting the nature of the fire, whether additional equipment was required, and any other needed information.

The bane of existence to fire fighters has always been the costly and dangerous nuisance of "false alarms" sent in by pranksters and cranks. Some cities in later years have tried replacing telegraph boxes with telephones on the assump-

Continued on page 7

Kitchen, Madden, Lee and Pannell Become Fellows at March Meeting



The new Fellows: Roger Madden, Robert E. Lee, William Pannell and Jay Kitchen.



Left, seated: Commissioner Lee. Next, Jay Kitchen receiving his certificate from Club President Link, and in rear, seated, Stuart Meyer.

The banquet Thursday evening, March 29, 1979, at the Arlington Park Hilton in Chicago—as a key feature of the Vehicular Technology Society of IEEE 29th annual Conference—was put on by the Radio Club in conjunction with the VTS, and was a monumental success.

Fellow, Robert E. Lee, FCC Commissioner, was speaker—and as is always the case where Bob Lee is concerned, he was a bang-up hit.

The affair was also the forum for presentations of Fellowship Certificates to four newly elected Radio Club Fellows: Robert E. Lee, FCC Commissioner; William M. Pannell, Senior Engineer of PYE Telecom Ltd. of England; Roger Madden, President of VTS and FCC Engineer; and Emmet “Jay” Kitchen, Vice President of NABER—all of whom were on hand to be honored and receive their Fellowships from President Link. Executive VP Stu Meyer performed as Master of Ceremonies in behalf of both RCA and VTS, since Stu is Vice President of VTS as well as being Executive Vice President of the Radio Club.

The banquet, with the hospitality session pervading it, had a big turnout and was a great success. Conference Chairman Al Goldstein, Motorola executive, saw to it that everything went off perfectly.

First Citizen's Communication System

Continued from page 6

tion that personalized two-way voice communication would discourage false alarms. The results have been inconclusive. New problems develop with the telephone—such as language difficulties and phonetic errors—not present in the simple manual pulling of a lever to sound an alarm.

A new development over the past few years is the familiar red fire alarm telegraph box on the street corner with no connecting wire lines—it transmits its signals by radio. It can be spotted by the vertical antenna mounted directly above it. These radio boxes are virtually fail-safe, since they automatically transmit test signals periodically to alarm headquarters. The battery power supply in the box in many cases is recharged automatically by a set of small solar panels above the antenna, facing skyward. Maintenance of such radio systems has proven to be very economical. Reliability is high, especially because faulty or damaged wire line problems do not exist.

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Four Members Receive



Donald G. Fink

Don Fink (F 1934) was born in New Jersey in 1911. He became interested in radio early, and in 1928 received the amateur call W2AFX, which he holds to this day. He entered the Massachusetts Institute of Technology in 1929, and graduated with the degree of S.B. in Electrical Communications in 1933.

Since his second hobby was journalism (he had been editor of his high school newspaper and of the M.I.T. undergraduate journal) he found it natural to join the editorial staff of *Electronics* magazine. There he remained (with a three-year wartime leave of absence) until 1952, the last six years as Editor-in-Chief.

Taking his leave of absence from *Electronics* in 1941, he joined the staff of M.I.T. Radiation Laboratory. In 1943 he transferred to the Office of the Secretary of War as expert consultant on radio, navigation and radar, travelling more than 80,000 miles in war service, siting Loran stations for the Allied Forces.

After leaving *Electronics* in 1952, he became Director of Research for the Philco Corp. In 1956 and 1957 he was Editor of the *Proceedings* of the IRE, and in 1958 was President of the Institute. In 1963 he became General manager of the IEEE, a position he held until his retirement in 1975.

A pioneer in television, Mr. Fink was author of the first authoritative textbook on the subject, *Principles of Television Engineering*, in 1940, and five of his nine other books are on the subject. He was a member of the various standard-setting panels, and was Vice Chairman of NTSC in 1951 and 1952.

Mr. Fink is a Fellow of the IEEE, the IEE (British) and of the SMPTE, and is an Eminent Member of Eta Kappa Nu. He holds the IRE Fall Meeting plaque for "many contributions to the television industry," the Medal of Freedom, the Presidential Certificate of Merit, and the Outstanding Civilian Service Medal of the Department of the Army.



Thomas T. Goldsmith

Dr. T. T. Goldsmith (M 1939, F 1942, L 1971) a native of South Carolina, received his early education in that State, and his Ph.D in Experimental Physics and Applied Electricity at Cornell University in 1936. Joining the Allen B. Du Mont Laboratories late that year as Director of Research, he did pioneering work in the development of cathode-ray tubes, television systems, broadcasting apparatus, color television, C-R oscilloscopes and measuring equipment, and reconnaissance television and navigational equipment.

He took an important part in the formulation of standards for black-and-white television, working with the FCC and industry. He was later active in color television standardization, carrying out extensive studies, tests and systems planning on VHF and UHF frequency allocations for television, FM and broadcasting. He was particularly active in the design and construction of the early Du Mont television broadcasting facilities, including WTTG, Washington's first television station, and participated in the design and construction of the multiple transmitter and antenna installation on the Empire State Building in New York City. In color television, he did early research and experimental work, and was a member of the National Television Systems Committee (NTSC).

During World War II, Dr. Goldsmith was Chairman of the Cathode-Ray Tube Committee of the Radio Manufacturers Association (now EIA), developing standards to make cathode-ray tubes interchangeable for radar, direction finding and other military applications. He was also engaged in special wartime applications, designing C-R tubes with as many as five electron guns.

Dr. Goldsmith is a Fellow of the Institute of Radio Engineers (now IEEE) and of the Society of Motion Picture and Television Engineers (SMPTE), and was a member of the Joint Technical Advisory Committee and the Radio Technical Planning Board, as well as NTSC.

Radio Club Awards



Robert W. Merriam

Bob Merriam (M 1963, F 1973) started his radio career as a boy, dismantling and reconstructing radio sets and faithfully studying Hugo Gernsback's *Short Wave Craft*. He has been a ham since his youth, having received his present call, W1NTE, in 1941. Bob is a multinational ham—while a student in the University of Oslo just after World War II, he became, he believes, the first non-Norwegian to receive a ham call, LA1EB, in Norway. Vacationing in France last summer, he obtained and worked with the call FØEYT.

He left Harvard during World War II to serve in the Signal Corps in Europe, returning to finish work on his SM degree. He then taught electrical engineering at Swarthmore College from 1950 to 1953. In that year he started a general marine electronics business, which he now operates.

Having a fantastic collection of radio equipment dating from his first E.I. Co. crystal detector, he and his wife Nancy developed the idea of starting a radio museum. On October 3, 1964, it was officially opened by Rhode Island's governor, John H. Chaffee, with a single building devoted to the preservation of radio and electrical history.

Bob Merriam was also deeply immersed in the traditions of steam engineering (his father was a mechanical engineer who at one time taught a course in steam engineering at Harvard) so a second building devoted to steam engineering was added. A third building—an old New England meeting house (the Frenchtown Baptist Church) was moved a short distance to its present site on the museum grounds in 1972, to serve as the library. Containing more than 20,000 books, it may be the second most extensive radio library in the country, and is under the special care of Nancy Merriam.

Merriam was the founder of the National Marine Electronics Association. In 1973 he and his wife Nancy were jointly awarded the Harry Houck Award from the Antique Wireless Association for the preservation and documentation of wireless material.



Clair L. Farrand

Clair Farrand was born in Newark, NJ in 1895. In 1908 he constructed his own wireless station, which he operated under the call letters WN, and in 1911 sailed as wireless operator for United Wireless on the trial trip of the battleship Utah. Returning to Philadelphia (the Utah was constructed in the shipyards of Camden, across the river) he got a job as operator at Wanamakers. His fellow operator was Tom Appleby, later author of *Mahlon Loomis-Inventor of Radio*. During the Titanic disaster, he spent the night copying lists of survivors for the Philadelphia papers, as David Sarnoff was doing at Wanamakers in New York, for the New York papers.

In 1912 he became a Marconi inspector in New York, and while there made a trip to New Orleans on Southern Pacific lines to test a shipboard Bellini-Tossi direction finder. During World War I he worked in the Marconi engineering department at Alden, NJ, designing receivers and wireless telephone equipment for the Navy.

In 1920 Farrand and Roy Weagant of Marconi jointly developed an enormous static-reducing directional antenna system, composed of two 400-foot loop antennas spaced 400 feet apart, with the signals applied to a Bellini-Tossi direction finder. It was while at Aldene that he invented the moving-coil cone loudspeaker (in 1918). It was patented for some time before competitors discovered that Siemens had described a moving-coil transducer in the nineteenth century.

In 1925 he started the Farrand Manufacturing Co., making radio equipment for amateurs and for broadcast reception. In 1927 he made talking motion picture equipment and Farrand radio receivers. It was during this period that he manufactured the famous Farrand loudspeakers.

Later he established the Farrand Optical Company, making improved bombsights for the Navy and Air Force during World War II. He is still actively working in that company, developing new approaches in laser and Inductosyn technology.

CITATIONS TO NEW FELLOWS

E. F. Boehm, *Vice President and General Manager, Phelps-Dodge Communications Co., Marlboro, NJ.*

For his contributions in the field of land-mobile communications and in formulating antenna performance and characteristic standards.

John H. Caperton, *Louisville, KY*

For his long and dedicated efforts in the preservation of the history of radio, especially broadcast radio.

Joseph H. Chislow, *Bell Telephone Laboratories, Holmdel, NJ*

For his numerous contributions to the art of telecommunications over a long period of years.

James A. Craig, *Albuquerque, NM*

For his pioneering work in the field of land-mobile communications relating to frequency re-use, selective calling systems and antenna design.

Paul K. Dawes, *Hazeltine Corporation, Greenlawn, NY*

For his work in the field of command and control systems and his contributions in the field of secure communications.

John F. Dirmann, *Land Mobile Communications, RCA Corp., Meadowlands, PA*

For his continuing activity in the planning of Public Safety, Industrial and Land Transportation two-way radio systems.

Ephriam F. Duskis, *New York City, NY*

For his pioneering and continuing interest in the Radio Club of America and other related electronic communications organizations.

Robert Harvey, *Regency Communications, Inc. Satellite Beach, FL*

For his continuing activity in the planning and implementation of industrial two-way radio systems.

James P. Hervey, *ITT, Raleigh, NC*

For his technical and administrative services in the fields of Industrial, Citizens and Amateur Radio Communications Systems.

Dean George Hill, *Myse & Hill, Washington, DC*

For his contributions in the design of multi-tower directional antennas and technical/legal activity with the Federal Communications Commission.

Robert M. Johnson, *Vice President, General Electric Radio Services Corp., Lynchburg, VA*

For his services in liaison with Federal Government Agencies that impact on the Land-Mobile Radio services.

Robert I. Kimmel, *Communications Consultant, Harrisburg, PA*

For his contributions to the design and implementation of large scale public safety mobile two-way radio systems.

Emmett B. Kitchen, *Executive VP, National Association of Business and Educational Radio, Washington, DC*

For his contributions in the field of spectrum management and frequency coordination and assignments in the land-mobile radio services.

Jorman I. Koski, *Fort Worth, TX*

For his activities in the development of Public Safety Consultant and Amateur Radio Emergency Communications Systems.

Robert E. Lee, *Commissioner, Federal Communications Commission*

For more than a quarter century of service as a commissioner of the Federal Communications Commission.

J. H. Levergood, *Vice President, Communications Group, Scientific Atlanta, Atlanta, GA*

For his leadership and contributions in the field of specialized communications.

Roger Madden, *Federal Communications Commission, Washington, DC*

For his leadership roles in the field of land-mobile communications with the FCC and the Vehicular Technology Society of IEEE.

Edward S. Mathieu, *Vice President, Marketing, Repco, Inc., Orlando, FL*

For more than 20 years active involvement in communications.

George F. McClure, *Manager, Support Electronics, Martin Marietta, Orlando, FL*

For telecommunications systems design activities, improvements in telephone systems and associated work in mobile communications engineering.

Nathan McClure, *President, Association of Public Safety Communications Officers.*

For his leadership role in Public Safety communications systems and related activities.

George Don Meserve, *Prairie Village, KS*

For more than half a century of dedicated service in the fields of Amateur Radio and Governmental communications.

John W. Morrissey, *Consultant, Park Ridge, NJ*

For his pioneering work in the field of "high-vacuum" techniques and cathode ray tubes and for his international activity in radio and television broadcasting.

William Pannell, *Pye Telecommunications, Cambridge, England*

For his pioneering work in the field of increased spectrum efficiency in the land mobile radio services.

Roger E. Persson, *Persson Communications, Elmwood, MA*

For his contributions and activity in the field of Radio Paging.

William R. Randall, *Consultant, Berea, OH*

For his activity in the base station and vehicular antenna segment of the land-mobile communications industry.

Donald O. Reinert, *RCA Corporation*

For his contributions in the land mobile communications industry.

Floyd O. Ritter, *President, Regency Electronics, Indianapolis, ID*

For his leadership role in the design and manufacture of cost-effective Citizens Band and Business Band land-mobile communications equipment.

Milton Schwartz, *Flushing, NY*

For his contributions in the field of communications related to International Civil Aviation Safety.

Henry L. Shenier, *New York City, NY*

For his pioneering work in Navy Radio and contributions in the development of proximity fuses.

Sheldon A. Yefsky, *Consultant, Skokie, IL*

For important contributions in Law Enforcement Communications Science and Technology.

Radio-Craft—Radio-Electronics Marks 50 Years of Radio-TV



The magazine *Radio-Electronics* is celebrating its 50th year of publication with a special 32-page of its October 1979 issue devoted to the history of the magazine and of electronics for the past 50 years. The publisher, Harvey Gernsback (Fellow 1975) has kindly supplied us with pictorial and other material from that section.

The influence of the magazine (which during its first 20 years was called *Radio-Craft*) has been fantastic. Part of this is no doubt due to the unique nature of its founder. While always giving lip-service to the ideals of practical business, Hugo Gernsback was nevertheless a dreamer, never a "practical" man. His curiosity was that of a child, and his imagination led him into the impossible. From the beginning he printed serious articles on such chimera as television (a word he is credited with introducing into the English language) and communicating by radio with other planets.

The refusal to be "practical" may be the secret of the extraordinary effect 2 radio-electronics of the magazine, especially on the youth who were led to enjoy radio through it. The result: it is hard to find a group of three or four (elderly) electronics leaders without learning that at least one of them came into the

field by way of *Radio-Craft* or its sister publication. John Pierce, formerly of Bell Laboratories, says:

"A number of years ago I was talking about Hugo Gernsback with several prominent members of the National Academy of Sciences—Lloyd Berkner and Detlev Bronk, former president of the Academy and then president of Rockefeller University, were among them. All had been introduced to radio by buying things from Gernsback's Electro Importing Company and through his early publications. As a result of that conversation, Bronk called Gernsback and had a pleasant conversation with him."

Another old-time engineer and writer, Bob Hertzberg (Member 1977), states:

"He was the pioneer publisher of radio magazines in the United States. He was the father of the entire science-fiction cult, a visionary who far outdid Jules Verne. Many of his "wild ideas," as incredulous readers called them, materialized years later: network broadcasting, television, radar, moon-bounce transmission, guided missiles, jet propulsion, nuclear fission, to name a few.



"Hugo Gernsback was camera-shy. People who read his magazine for half a century had no idea of his appearance. This picture of him is a rarity, and I happen to have it because I took it myself in his office in 1931, when he was only 47 years old. It was one of those sneaky "candid" shots, and no one was more surprised then I was after I developed and printed it.—Robert Hertzberg"

Harry G. Boyle

1918-1979
(Member 1970)

Harry G. Boyle, who had retired last year as an RCA Mobile Radio Systems account executive, died July 16 of cancer in a hospital in Morristown, New Jersey. He was born in New York City 61 years ago. During his long career in mobile radio, he had worked as Motorola, Dumont and RCA manufacturer's representative. Earlier this year, he had passed the California real estate license examination and had planned to move to Southern California from his home in Boonton, New Jersey.

Mr. Boyle was an outstanding person who knew how to get the job done. Back in 1953 when he was a regional sales manager for RCA, he was called on the carpet for hiring an attorney on his own to delay the award of a contract to a competitor for a police radio system until it could be determined if the competitor met the procurement specifications. While being criticized by a vice president, an executive vice president stepped into the room and said, "Harry, I am glad that there is a 'man' working for RCA".

Among the big systems sold by Mr. Boyle for RCA was the bus radio system for New York City, which uses 19 base stations and more than 5000 mobile units.

During his long tenure at RCA, Boyle served as a regional sales manager and as national sales manager. When he faced a problem, he did not hesitate to go to the very top of RCA or of a customer firm to find a solution.

He was a past chairman of the New York Metropolitan Chapter of the IEEE Vehicular Technology Society and a member of The Radio Club of America. His hobby was raising Airdale dogs and visiting his property in Spain.

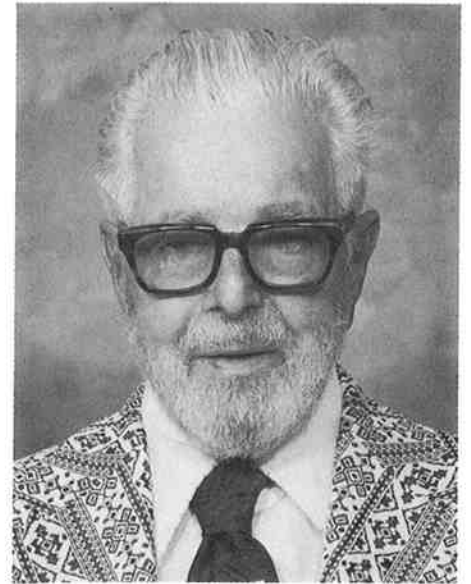
Harry Boyle was a rare individual. He will be remembered as a man who got the job done. He will be missed.

Lewis M. Clement

1892-1979

An appreciation of a great engineer and administrator

By W. H. Offenhauser, Jr.



Lewis Mason Clement, the last surviving member of a trio of inventive creative native-born American geniuses who have left an indelible mark of honor upon American and even world history through their priceless contributions to the radio art, died at his home in Pompano Beach, Florida, on August 22, 1979. He was 87.

He had common roots with two other God's gentlemen who also had a deep reverence for the Golden Rule and the Ten Commandments as a chosen way of life. Edwin Howard Armstrong of the east and Columbia University and The Radio Club was one; the other was Haraden Pratt, a classmate at the University of California, a State University that gave excellent instruction without any tuition fees whatever.

Clement was born in Oakland, California on Jan. 25, 1892 and like Pratt, had his heart set upon electrical engineering by the time he reached the university. During his pre-university years, he was greatly influenced by his grandfather, a former sea captain and pioneer. Not only did he obtain a love for navigation then, but he also had impressed upon him that a sea captain in the earlier days was a very lonely man indeed when he was out of sight of land, because he was out of communication with home for a long period of time, and what little he might know of where he was

at any time could only be learned by star recognition. The sextant was a captain's best friend. But a star in a sextant looks cold; it was not as warming to the heart as a message from home.

It is hardly strange, then, that he was tacitly encouraged to become interested in wireless, and when he fired up his transmitter, he soon learned how to tap the key of his rotary gap outfit without putting out the lights in the Clements' one-family house along with the lights of several neighbors as well as had been the case earlier. And from what we have heard since, his classmates such as Haraden Pratt learned the same too, even before they started their studies of electrical engineering. He was in good company; each admired the work of the others, concentrating upon what he felt he could do best and admiring what each of the other men did that was superb and unique. All three became the outstanding leaders at the front of a very rapidly moving, changing and progressive art that has led today to virtually instantaneous round-the-world communication as well as communication with real men on the Moon and radio space probes that bid fair to reach the very limits of the universe.

From 1914 to 1916 Clement was with the Marconi Wireless Telegraph Company as both operator and engineer for installation and opera-

tion. He found that the detector that Marconi furnished was both poor and unreliable, so he "sneaked in" a detector that would work, rather than the Marconi detector that didn't—especially, it seemed, when the operator at the distant transmitter had much traffic "to get off the hook". Fortunately Marconi inspection (to assure the use of only Marconi apparatus) was virtually nonexistent; Pratt and Clement would have felt frustrated beyond human limits, had they been compelled to remove their "bootleg" substitutes. At that early stage both Clement and Pratt sought reliability of the highest sort to satisfy their inner drive to "make things work consistently at the highest level over the longest period of time".

In 1916 Clement moved over to Western Electric as Engineer in charge of electrical design for the communication equipment of Army and Navy. At Western Electric he found a situation quite the opposite of that in Marconi; the telephone industry sought excellence and reliability on a 24-hour-per-day, 7-day-per-week schedule and had already begun manufacturing devices such as line finders that sought to operate reliably for 1 million operations without failure. Western Electric manufacturing was outstanding for built-in quality and its manufacturing methods had already stabilized to the point

where a handset, bellbox, line finder, and central station equipment could be installed just anywhere in the USA and work day in and day out in the moisture of the Mississippi delta region or 40-degree temperatures in Montana for example, without failure due to either corrosion or electrical leakage due to poor insulation.

By 1918 he was in charge of design and development of radio receivers and transmitters—and making certain that the prototypes worked as they should and that subsequent units work equally well. In 1925, Clement left Western Electric Research and Development (later called Bell Laboratories) for a three-year stint with F.A.D. Andrea as Chief Engineer for broadcast radio receivers.

His patent numbers start with 1,353,145—Device for Varying Electrical Coupling (issue 1920) and include 1,395,390—Oscillation Generating system; 1,415,992—Receiving Station; 1,443,007—Control of Electric Circuits—1,590,346 Radio Direction Finding and about ten more, all fundamental in a manner to meet the oath requirement of a US Patent of a “full, clear and exact description that will enable one skilled in the art to which it pertains to make and use the same;—and that he is the first to so disclose such.

From 1928 to 1930 he was at Kolster Radio (broadcast receivers) as V-P and Chief Engineer; then at Westinghouse as Asst. to Manager of the Radio Department to 1931; then the Federal Telegraph-ITT and International Standard Electric as European Chief Engineer until 1935, from 1932. Each year he would return to the USA, brief interested companies and their engineers in the USA on what European companies were doing—and take back with him to Europe much that he learned that would be useful there. He was proud of this activity and loved it.

In about 1935, he had a phone call from E. T. Cunningham of RCA asking him to lunch; Cunningham was under the impression that Clement was looking for a new job—and he was not. RCA-Camden was providing Cunningham with a prize headache:

—Cunningham was unable to obtain reliable information of what the company was doing because of in-

ternecine squabbles and (knowing Clement “from the early days”), wanted him as Vice President in charge of Research and Engineering. But something stood in the way: Sarnoff had an understanding with Sosthenes Behn of ITT that neither would “raid” the other’s engineering staff. And generally speaking, such agreements stuck—even if the engineers concerned were “stuck” with the result. Neither Clement nor Cunningham considered this to be more important than that the Company get the best man for the job—and that such a good man should not be hog-tied against his will. Something was worked out to clear up the dilemma and Clement joined RCA Camden in 1935 and stayed until 1940.

In RCA he found communication between different portions of the company virtually paralyzed: he started *The Scanner*, a House organ that told what was being done in engineering so that everyone in other parts of the company could know, and full communication be restored internally. Briefings from one branch to another cleared up most of the problems—and the “little kingdoms” within the company melted away. Truth, crushed to earth, did rise again. With superb results: quick deliveries on 50-KW transmitters, with top quality and with much improved broadcast sets—and everything else. RCA became something of another Bell Labs in its day-to-day operations. People communicated with one another!

In 1940 he moved from RCA to Crosley in Cincinnati as Vice-President of Research Development and Engineering, where he pulled the organization together just in time to start as the First Prime Contractor for the VT Proximity Fuze for the Navy Bureau of Ordnance.

On October 28, 1941, Dr. L. R. Hafstad of Section T, Office of Scientific Research and Development, representing the US Navy Bureau of Ordnance, visited Crosley and asked to see the Chief Engineer; he was accompanied by a BuOrd man from the local Ordnance District. Since it was apparent that the USA would enter WW2 with the Allies, the Crosley organization had been streamlined—stripped for action—and was ready. Dr. Hafstad and party,

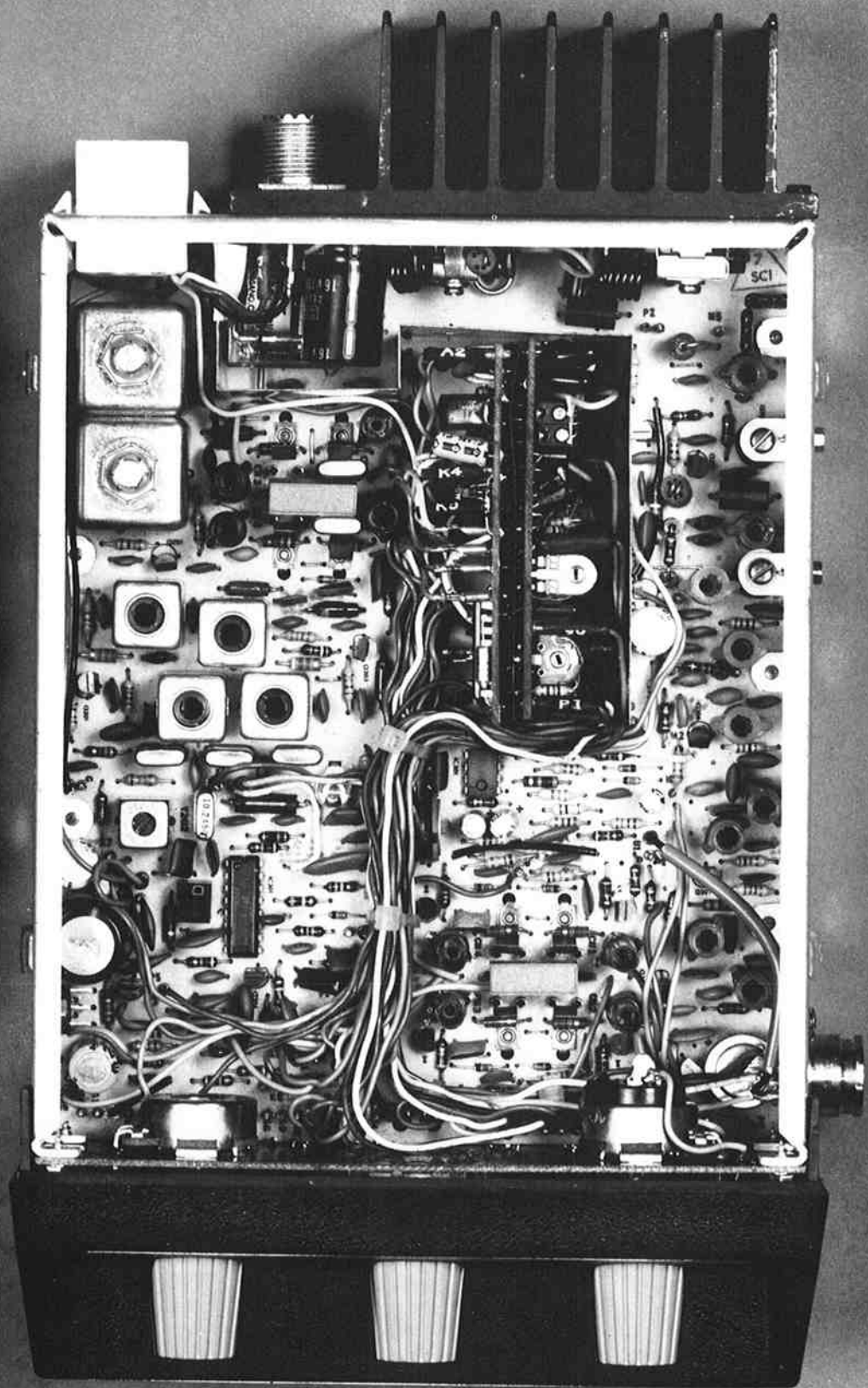
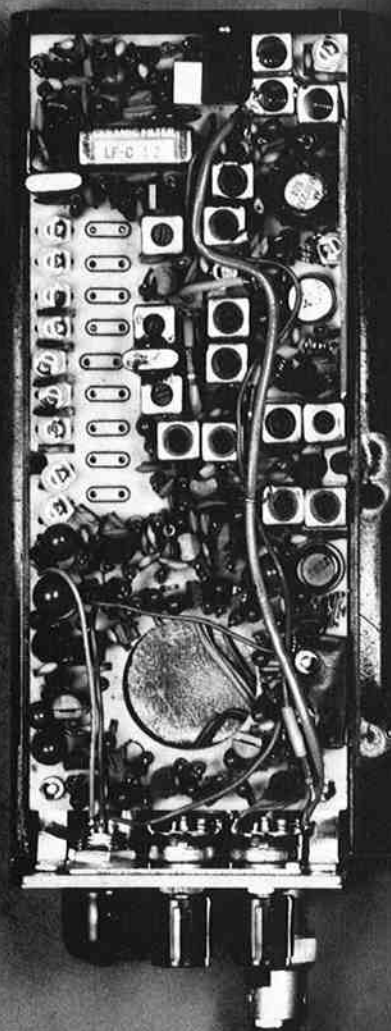
met with the engineers, the facilities and qualifications of Crosley as Prime Contractor were examined—and Crosley was approved for the VT Proximity Fuze by verbal agreement on the same day. “Crosley is our kind of people.” They were embarked as the first production manufacturers of the first “smart” ordnance fuze in world history—the fuze that “knows when to go off”—it is triggered by the presence of the target itself.

On November 17, 1978 Lewis Mason Clement, together with all the proximity fuze pioneers available, met at the Sheraton Hotel, New York City, for a tape recording session—A Historical Review “I WAS THERE”—of the history through which all concerned had lived. The binaural tape was transcribed through Jerry Minter of the Radio Club with an assist from Harold Schwede, another club member, and a further assist from your humble servant, Bill Offenhauser. The entire text is being edited by the Navy Historical Center in Washington, will soon be available to all who took part, and is slated for later publication.

In the evening of the same day, many of those present in the afternoon recording session were at the Clement table at the Radio Club Annual Dinner when The Club awarded Lewis Mason Clement its Pioneer Award, and soon afterward, Admiral Gravely of the Defense Communications Agency, gave the dinner address that has already been published by the Club.

Lewis Mason Clement was an extraordinary man, as modest as he was brilliant and ingenious. His concept of how to do things was so clear that he was able to cut the time between the start of a project and delivery of the first approved end-result to a *small* fraction of what others did. And with the *best* end-result in addition.

Well done, thou good and faithful servant, Lewis Mason Clement. The Radio Club of America and many many others salute you in Valhalla for your dedication to truth and to your service of your fellow man. None of your hard work was in vain; it has left an indelible chapter in the growth of that good Nation of ours that cannot be overlooked, since its fruits today are everywhere in the world.



Can a low cost 2-way radio be truly well built?

Yes.

We've spent a lot of time and money making sure one brand is. Here's why it is. And why it's important to you.

Money.

As a 2-way radio buyer, you're more interested in using radios than fixing radios. So it's important that the radios you use be well built. Easy, you say. There are some very expensive 2-way radios that are very well built. But with most costs going through the ceiling, it sure helps to economize. And if you can get the performance you need for less, why not? So where can you get well built inexpensive radios? Read on.

Higher Volume Means Lower Costs.

At Regency we've built over 1.6 million FM Scanners. That means we buy a lot of resistors, capacitors, circuit boards . . . you name it. It also means the prices we pay for these parts are very low. Lower by a long shot than what some 2-way radio manufacturers pay to use the same parts in their radios. You don't need to be an expert in economics to see why we can offer a comparable radio for less. Yet our secret doesn't just end there.

Well Built Starts With Well Engineered.

We had one big advantage when we started in the 2-way radio business. We'd never done it before. So we didn't start from the high end and work down. Our radio was built from the ground up. And it even surprised us how many sacred cow ideas we could eliminate without changing the performance or the quality. That's not to say that *all* our radios will work *everywhere*. They weren't designed to. But then, for example, how often do you have a radio operating in the middle of a 3 million population city. Not much? Then keep on reading.

The Factory is the Main Factor.

Even a well designed radio doesn't stand a chance in a poorly run factory. That's not the case at our plant. The work's well organized, everyone knows their job, and they do it well. Plus we're highly mechanized. And what about quality control? We've got enough inspectors to field a small scale FBI. Our plant works, and so does our radio. But we'll soon be making some changes.

Staying Ahead Means Starting Now.

You'll be seeing a lot of new things from Regency. Like even more of the results from our pioneering work in integrated circuits and microprocessor technology. There'll be other changes you probably won't see. For example, we'll have computers to sequence the components other computers will insert in circuit boards. Even with all these changes, though, you'll still be seeing more of the same from us: more high quality low cost radios.

Take Advantage.

We started with a well built little radio. We've come a long way since then. And we plan to go a lot farther. So if you're planning to buy Regency Radios, plan to take advantage. And if you're not considering us, we think you might want to change *your* plans.



Communications, Inc.
1227 S. Patrick Dr.
Satellite Beach, FL 32937

Communications Problem

That the best of communications can get fouled up enough to exceed Murphy's Law came to light this quarter when John Dearn VK3GL of the Melbourne AUSTRALIA area planned to contact President Fred Link W2ALU on 20 meters. He wanted a phone patch via Stu Meyer W2GHK, but unfortunately in May his rig was down "at the moment". So he lined up VK3AZN and VK3BAF to look for Fred on 14255 kHz between 1200 and 1300 GMT. Since Dearn VK3GL had a CW rig working he contemplated working directly but doubts began to show up, because in his letter he wrote, "I am not sure that you are a CW man Fred." Besides the frequencies given were in the SSB band but recalled, "I know you are a FM man from way back--".

Being a great letter writer, Fred decided to explain by direct mail. So on July 4th he threw a batch of mail into the scoop mail box in front of the Pittstown NJ post office, along with a few checks mailed to the bank. Later some celebrator came along and threw a cherry bomb into the mail which blew the contents into smithereens and shredded his checks.

If you hear a couple of guys from Australia calling W2ALU on 20, tell them to stand by a couple of months.

Ero, KA9DYS

Our member VK3GL reports that he is monitoring 14255 on SSB, looking for W2GHK, Stu Meyer;

W2ALU, Fred Link; W2PN, Nat Schnoll, or other interested American hams. Listen for him—also for VK6FR, Frank Greenslade.

Charles Betz Writes

The Radio Club of America Scholarship was awarded this year to Charles M. Betz, NØAKC, of Caledonia, MN. The selection was made from among deserving amateurs by the Foundation for Amateur Radio. Mr. Betz wrote to the Research and Scholarship Awards Committee:

Dear Mr. Rider:

I have received notice from the Foundation for Amateur Radio, Inc. Scholarship Committee that I have been chosen as a recipient of the 1979 Radio Club of America scholarship. I would like to thank you and the Radio Club of America for sponsoring the \$250 scholarship, which I will be using for educational purposes for the coming year at the Milwaukee School of Engineering, where I will be studying for my BS in Electronics. The scholarship is very much appreciated.

Charles M. Betz, NØAKC

BOOK BY CLUB MEMBER

Basic Telephone Switching Systems, Second Edition, by David Talley. Hayden Book Co., Inc., 50 Essex St., Rochelle Park, NJ 07662. 6 x 9 inches 192 pages. Softcover \$7.95.

The second edition of this standard

work introduces material on new signalling methods and switching techniques; E & M signalling interface for electronic central offices, automatic number identification methods, CCIS and CCSS, tandem centers, traffic service position and automatic message accounting.

The person not familiar with the first edition will find the intricacies of telephone switching explained concisely and clearly, without mathematics, and with ample illustrations.

NEWEST MEMBERS

Since the Directory was made up, eight more persons have become members of the Club:

Cohen, Theodore J., N4XX. Defense Group, ENSCO, Inc., 5408A Port Royal Rd., Springfield, VA 22151

Franklin, Robert E., W50X. Owner and manager, Robert E. Franklin Co., Franklin Mobilephone Co., P.O. Box 2241, Houston, TX 77057

Lynn, George A., WA4JQD. Manager, International Marketing, Regency Communications, Inc., 1227 South Patrick Drive, Satellite Beach, FL 32937

Miller, Harry E., W4EEN. General Manager, All Florida Communications Co., 145 Madeira Ave., Coral Gables, FL 33134

Taggart, Harold E. Project Engineer, National Bureau of Standards, Div., 723, Boulder, CO 80303

Tosch, Robert L. Electronic Engineer, FCC, Office of Science and Technology, Room 7218, 1919 M St., N.W., Washington, DC 20554

Weinstein, Jay W. Director, Digicom Systems, E-Systems, Inc., P.O. Box 226031, Dallas, TX 75266

Wynne, W. Avery, K4RU. President, radio station WEED, Nashville Highway, Rocky Mount, NC 27801



Left to right: Harry Dannals, President of ARRL; Fred Link, President, Radio Club of America; Harry Gartsman, President, Quarter Century Wireless Association, and Ray Myers, President, Old Old Timers Club.

All are Fellows of the Radio Club of America.

LEONARD R. KAHN, PE

Communications
Consultant

839 Stewart Avenue
Garden City, New York 11530

(516) 222-2221

RADIO CLUB OF AMERICA

Membership September 15, 1979

(Also see "Newest Members" on facing page)

- Abrams, Stephen J.** (M 1961), 3 Charlotte Drive, Spring Valley, NY 10977
- Akin, R.M., Jr.** (M 1924, F 1973, L 1974), 28 Evergreen Way, No. Tarrytown, NY 10593
- Albers, R.H.** (M 1978), 5597 Seminary Rd., Falls Church, VA 22041
- Albertson, Fred W.** (M 1975, F 1973, L 1974), 310 Harbor Dr., Bay Biscayne, FL 33149
- Alexander, Bob** (M 1973), Box 26370, Dallas, TX 75226
- Alf, Edward A.** (M 1975), 400 S. Flower #84, Orange, CA 92668
- Alimpich, Nicholas** (M 1972, F 1972), Michigan Bell Tel. Co., 23500 Northwest Hwy., Southfield, MI 48075
- Allen, Hugh S., Jr.**, 3601 Royal Woods Drive, Sherman Oaks, CA 91403
- Amocato, Tom** (M 1973, L 1975), Amtol Radio Communications, 150-47A 12th Rd., Whitestone, NY 11357
- Anderson, Donald I. W5TGS** (M 1978), 641 Circleview Dr. South, Hurst, TX 76053
- Anderson, Jack G.** (M 1970, F 1973), 24 Winston Drive North, Port Jefferson, NY 11777
- Apfel, George J. W2GHV** (M 1976, F 1979), 105 Riverdale Rd., Park Ridge, NJ 07656
- Ardery, James E.** (M 1973), 111 Warfield Road, Lynchburg, VA 24503
- Armitage, Alan L.** (M 1969, F 1977), c/o Hunterdon Co. Comms. System, Admin. Bldg., Main St., Flemington, NJ 08822
- Arnold, John W.** (M 1929, F 1938, L 1971), 623 East Broad Street, Westfield, NJ 07090
- Ashby, Frank W6AJU** (M 1977), Palitron Corp., Box 3716, Modesto, CA 95352
- Ashton, Shirley S., Jr.** (M 1972, F 1974), P.O. Box 31231, Washington, DC 20031
- Atchley, Dana W., Jr.** (M 1970), Concord Road, Lincoln, Mass. 01773
- Atwood, Horace, Jr.** (M 1956, F 1961), 13 Valhalla Road, Montville, NJ 07045
- Augustus, L.M.** (M 1969, F 1972), 1680 Cliffs Landing Dr., Ypsilanti, MI 48197
- Aull, Wilson, Jr.** (M 1920, F 1926, L 1971), 40-14 149th Street, Flushing, NY 11354
- Austin, Richard C.** (M 1978), 245 Winding Way, Camp Hill, PA 17011
- Avallone, Alfonso** (M 1956), 882 First Ave., Franklin Square, NY 11010
- Babkes, Jack** (M 1974), 7410 S.W. 20th St., Plantation, FL 33317
- Bach, Norman G.** (M 1969, F 1971), 7807 Moorland Lane, Bethesda, MD 20014
- Bade, Clifford E.** (M 1978), 26565 Locust Drive, Olmsted Falls, OH 44138
- Bailey, H.E.** (M 1977), REPCO, Inc., 1940 Lockwood Way, Orlando, FL 32854
- Bailey, Wm. F.** (M 1960), 37 Chestnut St., Garden City, NY 11530
- Baker, Bentley G.** (M 1969), 3559 Primrose Road, Philadelphia, PA 19114
- Baker, James H.** (M 1976), Forest Industries Comms., Box 5446, Eugene, OR 97405
- Bane, Clayton F.** (M 1976), 155 Saint Elmo Way, San Francisco, CA 94127
- Barber, Alfred W.** (M 1952, F 1957, L 1972), 32-44 Francis Lewis Blvd., Flushing, NY 11358
- Barber, John** (M 1979), Philips TMC Ltd., Clarinda Road, Clayton, Melbourne, Victoria, Australia 3168, 13 Acunha St., Mt. Eliza, Melbourne, Vic. Australia 3930
- Barlow, Niles L.** (M 1975), Harris Corp., RF Comms., 1680 University Ave., Rochester, NY 14610
- Barnes, Frank P., Sr., V.P., ITT** (M 1969, F 1970), 320 Park Ave., New York, NY 10022
- Barnhill, Robert B.** (M 1970), 15 Piping Plover, Hilton Head Island, SC 29928
- Barrett, Richard F. W6CFK** (M 1978), 1520 Santa Maria Avenue, San Jose, CA 95125
- Bassett, Rex W4QS**, (M 1972, F 1977), Box 4163, Fort Lauderdale, FL 33304
- Bates, Frank, III, AA6C/W61PB** (M 1979), West Valley Electronics, 2081-M Bering Dr., San Jose, CA 95131
- Batts, Robert L.** (M 1972, F 1977), 13 Todd Way, Imperial Terrace, Tavares, FL 32778
- Baughman, Robert J.** (M 1977), Phillips Petroleum Co., 601 Armstrong, Bartlesville, OK 74004
- Bechberger, Paul F.** (M 1976), 51 Palmer Ave. Tenafly, NJ 07670
- Becken, Eugene D.** (M 1975, F 1976), 52 Rutland Road, Glen Rock, NJ 07452
- Becker, Herb** (M 1971), 12522 Foster Road, Los Alamitos, CA 90720
- Beeferman, Steven J., K2VW1** (M 1977), 12 Northfield Gate, Pittsford, NY 14534
- Behr, Joseph** (M 1948, F 1952), 15 Fox Den Road, Danbury, Conn. 06810
- Bellar, Bobby J., K5AHT** (M 1979), Bellar Communications Co., 10920 Indian Trail, No. 104, Dallas, TX 75229
- Belock, Harry, W2JSW** (M 1979), 21 Chapel Place, Great Neck, NY 11021
- Bernard, H.W.** (M 1942, F 1959, L 1971), P.O. Box 537, Oak Hill, FL 32759
- Best, Lewis E.** (M 1971), 5676 Hollyleaf Lane, San Jose, CA 95118
- Beverage, Harold** (M 1920, F 1926, L 1971), P.O. Box BX, Stonev Brook, NY 11790
- Beverly, Jack G.** (M 1974), 125 Highland Park, Excelsior Springs, MO 64024
- Bhagat, Jai P.** (M 1978), 140 Redwood Ave., Wayne, NJ 07470
- Biggs, Alan, K4AA** (M 1949, L 1971), Box 565, Horse Shoe, NC 28742
- Billings, Ray H.** (M 1973), 1948 W. Mercer Ave., College Park, GA 30337
- Bishop, William T.** (M 1973), 4936 N. Kansas Ave., Kansas City, MO 64119
- Bitcon, William A.** (M 1971), 4 Garden Walk, Histon, Camb., ENGLAND CB4 5hh
- Black, John C.** (M 1978), 14312 N.E. 16th Place, Bellevue, WA 98007
- Black, Robert S.** (M 1971, F 1976), 5304 Holly, Bellaire, TX 77401
- Bloor, Robert E.** (M 1974), 24338 Smith Avenue, Westlake, OH 44145
- Bodson, Charles D., W4PWF** (M 1976), 233 N. Columbus St., Arlington, VA 22203
- Boehm, Edward F.** (M 1976, F 1979), Phelps Dodge Comms. Co., Route 79, Marlboro, NJ 07746
- Bohman, Albert K.** (M 1926, F 1952, L 1970), R.D. #1, Box 319, Horse Shoe, NC 28742
- Bolin, Ray E.** (M 1959), 26 Twin Springs Lane, St. Louis 17, Mo. 63124
- Bondon, David L.** (M 1977), Prodelin, Inc., P.O.Box 131, Hightstown, NJ 08520
- Bondon, Lewis A.** (M 1974, F 1976), Prodelin, Inc., P.O. Box 131, Hightstown, NJ 08520

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- Borden, Edward W.** (M 1969, F 1975), 22 College Ave., Upper Montclair, NJ 07043
- Borman, William M.** (M 1976, F 1978), 18 Orchard Way North, Rockville, MD 20854
- Borst, John M.** (M 1934, F 1940, L 1971), 335 West 88th St., New York, NY 10024
- Bose, John H.** (M 1938, F 1940, L 1978), Maquam Shore, Swanton, VT 05488
- Bottani, Aldo, A., Jr.**, (M 1979), 116 Union St., Emerson, NJ 07630
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- Bradshaw, Carl T.** (M 1972, F 1973), Oak Industries Inc., P.O.Box 28759, Rancho Bernardo, CA 92128
- Brizzolari, A.J., W2TG/K4TG** (M 1972), 5648 N.E. 5th Avenue, Fort Lauderdale, FL 33334
- Broad, Monroe M.** (M 1975), 81-34 Kent St., Jamaica, NY 11432
- Brodie, William A.** (M 1973), Brodie Communications Co., P.O.Box 687, Brandon, FL 33511
- Brown, Louis E.** (M 1970, F 1972), Decible Products, Inc., 3180 Quebec, Dallas, TX 75347
- Brunet, Meade**, (M 1928, F 1952, L 1971), Millsdale Farm, Mendham, NJ 07945
- Bryant, John A., W4UX** (M 1974), 1542 Linden Avenue, Owensboro, KY 42301
- Bryson, William B.** (M 1969, F 1972), 403 Middle Rd., Hazlet, NJ 07730
- Bucknell, James M.** (M 1975), Pye Telecommunications, Ltd., National Sales Division, Newmarket Rd., Cambridge, England
- Bunday, Dale**, (M 1973), Rt. 1, Box 719-C, Bagdad Rd., Leander, TX 78641
- Burchard, Earl O.** (M 1971), 2017 Sumter Ave., Tallahassee, FL 32301
- Burns, George D.** (M 1979), Motorola Inc., 1303 E. Algonquin Road, Schaumburg IL 60010
- Burton, Jan A.** (M 1970), 14231 E. 4th Ave., Aurora, Co 80011
- Busignies, Henri G.** (M 1973, F 1974), 71 Melrose Pl., Montclair, NJ 07042
- Buster, Claude T., Jr.** (M 1969), 5407 Richenbacker Ave., Alexandria, VA 22304
- Campbell, Bernard J.** (M 1977, F 1978), 167 Fisher Court, Calimesa, CA 92320
- Campbell, James W.** (M 1978), 18121 Blue Ridge Drive, Santa Ana, CA 92705
- Campobasso, Thomas A.** (M 1975, F 1976), Rockwell International, M.S. 407-225, Dallas, TX 75207
- Canavacioli, Frank E.** (M 1934, F 1941, L 1971), 7119 Juno St., Forest Hills, NY 11375
- Caperton, John H.** (M 1969, F 1979), 3114 Boxhill Court, Louisville, KY 40222
- Capone, John J., Jr., WAQADV** (M 1979), CW Electronic, 1401 Blake, Denver, CO 80202
- Carella, Daniel J. W2ENV** (M 1979), 39 Mechanic St., Milburn, NJ 07041
- Carini, Louis F.B.** (M 1930], F 1942, L 1971), 246 Wolcott Hill Road, Wethersfield, Conn. 06109
- Carlton, John W., G2GEP** Pye Telecommunications Ltd., St. Andrews Road, 37 Forest Road., Cambridge, ENGLAND
- Carr, Vivian A.** (M 1973, F 1975), 645 Hoey Ave., Long Branch, NJ 07740
- Carter, Thomas F.** (M 1969, F 1969), North Highway 90, Gun Barrel, TX 75147
- Caspers, George E.** (M 1975), Coolidge Dr., Box 333, Lake Nebagamon, WI 54849
- Cassidy, Francis T.** (M 1976, F 1976), 1668 East 56th St., Brooklyn, NY 11234
- Cassidy, Hugh**, (M 1974), 77 Coleman Drive, San Rafael, CA 94901
- Castanera, Juan R.** (M 1975), P.O. Box 331, Luquillo, PR 00673
- Caywood, William**, (M 1972), 5740 Beulah Lane, Murrysville, PA 15668
- Cervantes, Howard T.** (M 1939, F 1974, L 1971), 421 47th St., No. St. Petersburg, FL 33713
- Chadbourne, H.L.** (M 1979), 530 Midway St., La Jolla, CA 92037
- Chalfin, Norman L., K6PGX** (M 1948, F 1974), 460 San Juan Pl., Pasadena, CA 91107
- Champ, Johnny L.** (M 1978), Champ Communications Inc., 1373 Old Bayshore, San Jose, CA 95112
- Childers, Aubrey A.** (M 1969, F 1971), 5208 North 31st Road, Arlington, VA 22207
- Chislow, Joseph H.** (M 1970, F 1979), 61 Phillips Ave., Deal, NJ 07723
- Chittick, Kenneth A.** (M 1941, F 1953, L 1972), 8020 College Ave., Indianapolis, IN 46240
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- Chris, William H., W2FRD** (M 1979), Bell Labs, Room WB 2C109, Holmdel, NJ 07733
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- Christie, Donald E.** (M 1973) 9610 Newberry, Round Rock, TX 78664
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- Cobb, Howard L.** (M 1934, F 1944, L 1971), 250 Rockaway Ave., Boonton, NJ 07005
- Cohen, Leslie L.** (M 1970), 440 West Broadway, Cedarhurst, NY 11516
- Cohen, Monte, AA4MC** (M 1975), Box 860, Chicopee, MA 01014
- Cohn, Hugo** (M 1939, F 1953, L 1971), 905 West End Avenue, New York, NY 10025
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- Colen, Roy** (M 1969), 115 Morning Sun Ave., Mill Valley, CA 94941
- Collamore, Jerry A.** (M 1976) 4881 Donald St., Eugene, OR 974505
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- Connor, George C.** (M 1936, F 1942, L 1971), P.O. Box 528, Weirsdale, FL 32695
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- Cook, Lloyd F.** (M 1975), 70 Sadler Road, Bloomfield NJ 07003
- Cooley, Austin, G.** (M 1971, F 1973), 690 West Second St., Reno, Nev. 89503
- Cooper, Robert B.** (M 1976), Rt. 5, Box 782, Guthrie, OK 73044
- Coprich, Franklin F.** (M 1975), 6317 Beechwood Dr., Columbia, MD 21046
- Copson, J.M.** (M 1975), 101 Rampton Road, Cottenham, Cambridge, ENGLAND CB4 4JT
- Corbin, David N.** (M 1969), P.O. Box 1246, Littleton, CO 80161
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- Cote, Andre F.** (M 1972), 1901 North Moore St., Suite 602, Arlington, VA 22209
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- Cowan, Stuart D.** (M 1971), Box 596-North St., Rye, NY 10580
- Crabb, Robert C.** (M 1973), 3780 So. Hill St., Los Angeles, CA 90007
- Crady, Tony O.** (M 1978), A.I.E. Corp., 10 Grantie St., Batesburg, SC 29006
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- Cramer, Bruce G.** (M 1955), 511 Cheltona Avenue, Jenkintown, PA 19046
- Crawford, John D.** (M 1939, F 1957, L 1972), 16 Lodge Road, Great Neck, NY 11021
- Crawford, Robert V.** (M 1940, F 1953, L 1970), 11 Crest Circle, Murray Hill, NJ 07971
- Cunniff, Leo C.** (M 1958, F 1963), 35 Hillcrest Rd., Cedar Grove, NJ 07009
- Cushman, Roy T.** (M 1977, F 1978), 4301 Rancho Road, Shingle Springs, CA 95682
- D'Airo, Leonard J.** (M 1971), 383 Pittsburgh Ave., Massapequa Park, NY 11762
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- Dane, Paul N.** (M 1977), 146 Coleen, Livermore, CA 94550
- Daniel, Jack**, (M 1977) 1549 Tam O'Shanter, Ontario, CA 91761
- Dannals, Harry J., W2HD** (M 1973, F 1974), 16 Arbor Lane, Dix Hills, NY 11746
- Dano, Jerome** (M 1977), Hazeltine Corp., Bldg. 1, Greenlawn, NY 11740
- Darrell, Robert D.** (M 1946, L 1971), F 1972), Balmoral, The Vly, Stone Ridge, NY 12484
- Davis, E. Stuart** (M 1955, F 1975), 1149 Weber St., Union, NJ 07083
- Davis, J.M.** (M 1971), P.O. Box 798, Orange City, FL 32763
- Davis, Leonard** (M 1979), Pye Telecommunications, Ltd., St. Andrews Road, Cambridge, ENGLAND
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- Davison, Charles H., Jr.**, (M 1971), 11 Moline Rd., E. Brunswick, NJ 08816
- Dawes, Paul K.** (M 1971), F 1979), 36 New Mill Road, Smithtown, NH 11787
- Dearn, Trevor John, VK3GL** (M 1979), Philips T.M.C. Ltd., Clarinda Road, Clayton, Victoria 3168 AUSTRALIA
- DeCoste, Ernest A.** (M 1975), 1959 Conrad Ave., Ottawa, Canada K1H 6V7
- deCubas, Jose** (1973), 2148 Maney Dr., Jacksonville, FL 32216
- deNeuf, Donald K., WA1SPM**, (M 1972, F 1974), P.O. Box 329, Southbury, CT 06488
- Dettra, John E., Jr., WB4NBF** (M 1976), 7906 Foxhound Rd., McLean, VA 22101
- Detwiler, Royce D.** (M 1976), 3668 El Grande Dr., San Jose, CA 95132
- Detwiler, William L.** (M 1976, F 1978), 304 Palm Court, Indialantic, FL 32903

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DeVries, James F. W7LKT (M 1979), 29455 Laguna, Niguel, CA 92766
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Edwards, Henry M. (M1975), Phelps Dodge Comms. Co., 1420 Monterey Pass Rd., Monterey Park, CA 91754
Eggert, Jack (M1977), 203 Golf Road, Deal, NJ 07723
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Eitel, William, WA7LRU(M1974, F1975, L1975), P.O. Box G, Dayton, NV 89403
Elder, William E. (M1974), 3322 Albion Court, Fairfax, VA 22030
Eldridge, Albert B. (M1958), 23 Fern Rd., Sparta, N.J. 07871
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Drive, Redding, CA 96001
Ellis, I.M. (M 1971), 6615 Pemberton Dr., Dallas, TX 75230
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Ettinger, Les (M 1977), 3835 Perie Lane, San Jose, CA 95132
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Fowler, Henry L., Jr. (M 1956), 37 MacSpar Drive, Mt. Fern, NJ 07801
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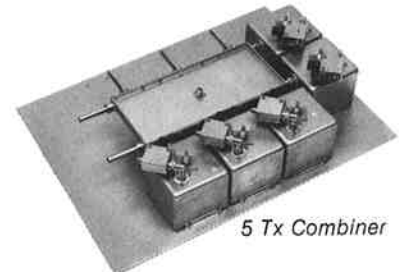


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- Freeman, Robert J.** (M 1972), 11660 S. Half Moon Drive, Phoenix, AZ 85044
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- Friedberg, Randall J., WB8KSR** (M 1977), Antenna Inc., 26301 Richmond Road, Cleveland, OH 44146
- Fruehauf, Milton C., W8TZ** (M 1969, F 1975), 5325 Ponderosa Dr., Columbus, OH 43229
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- Fuson, Francis J.** (M 1977), Communications Eng. Inc., 3420 Spring Mtn. Rd., Las Vegas, NV 89102
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- Gilbert, Robert H.** (M 1970), 521 North East 134, North Miami, FL 33161
- Girard, Paul A., KP4CB** (M 1975), 303 Colly Toste St., Hato Rey, PR 00918
- Gironda, Augustin J., W2JE** (M 1978), 1417 Stonybrook, Mamaroneck, NY 10543
- Glaser, Marcus** (M 1941, F 1957, L 1975), 50 Colgate Dr., Plainview, NY 11803
- Glodell, Leroy M.** (M 1975), 143 Institute Rd., Worcester, MA 01602
- Goebel, Eugene S.** (M 1972), 934 Pleasant St., Oak Park, IL 60302
- Goldberger, Gerald N.** (M 1977), 1015 Greenbay Road, Highland Park, IL 60035
- Golding, Malcolm F.** (M 1978), Keats Crescent, Pierrefonds, PQ, Canada H9H 3M7
- Goldsmith, Arthur** (M 1972), 4303 Wynnwood Dr., Annandale, VA 22003
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- Graham, Charles B., W1HFI** (M 1960), 4 Fieldwood Drive, Bedford Hills, NY 10507
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- Gray, Gary David, P.E.** (M 1971, L 1974), Orange County Communications, 481 The City Drive So., Orange, CA 92668
- Grebe, Alfred H.** (M 1935, F 1959), 1219 J Gaskins Road, Richmond, VA 23233
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- Gregory, Glydus** (M 1971), 1501 London St., Sacramento, CA 95822
- Griese, Raymond H.** (M 1973, F 1977), 405 Giannini Drive, Santa Clara, CA 95051
- Griffith, Percy E.** (M 1970), Route 1, McCrory Lane, Kingston Springs, TN 37082
- Grim, Edgar P.** (M 1970, F 1971), 7400 Roosevelt Blvd., Apt. P-306, Philadelphia, PA 19152
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- Grogg, Burnell L.** (M 1979), 4120 East Main, Lineboro, MD 21088
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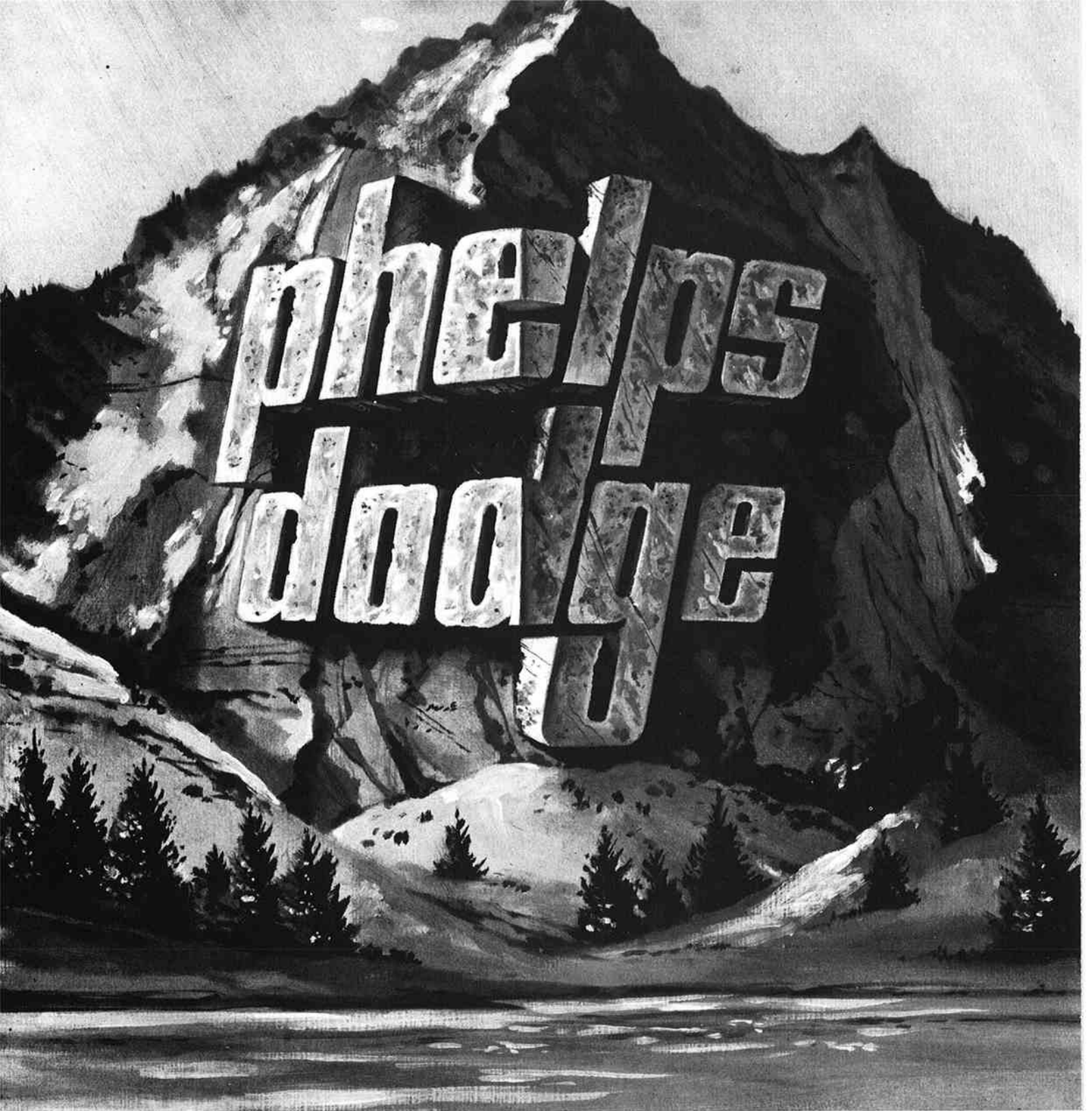
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Pannell, William M. (M 1978, F 1979), Pye Telecommunications Ltd., Newmarket Road, Cambridge, ENGLAND
Papamarcos, George (M 1941, F 1953), 2841 S.W. 5th St., Boynton Beach, FL 33435
Parten, Merle B. (M 1976), 341 Laurel St., San Carlos, CA 94070
Patterson, Allen C. (M 1972), 14428 S.E. 49th St., Bellevue, WA 98006
Pavek, Joseph R., W00EP (M 1977), 243 Blake Road So., Hopkins, MN 55343
Pearson, Donald R. (M 1976), U. S. Forest Service, North Fork, CA 93643
Pearson, Thomas A. (M 1979), Pye Telecommunications Ltd., Service H.Q., Gloucester St., Cambridge, ENGLAND
Perlmutter, Louis (M 1974), 437 Golden Isles Dr., Hallandale, FL 33009
Perretto, Armand (M 1954), 23 Sunnylands Court, Little Silver, NJ 07739
Persson, Roger E. (M 1971, F 1979), 147 West St., Elmwood, Mass. 02337
Peterson, Marvin (M 1975), Route 1, P.O. Box 125, Saline, LA 71070
Petersen, Philip C., WB9NIU (M 1979), 677 Darlington Lane, Crystal Lake, IL 60014
Petrutsas, George (M 1977), FCC, IPSR Division, Washington, DC 20554
Pfeffer, Nathaniel, W2AIM (M 1970, F1977), 1085 Park Ave., New York, NY 10028
Phillips, Harold L. (M 1972), RCA - Suite 214, 16400 W. 12 Mi. Rd., Southfield, MI 48076
Phillips, Ronald (M 1975), 1925 Baltimore Ave., Kansas City, MO 64108
Piller, S. Edwin (M 1957, F 1976), 80 Birchwood Park Drive, Syosset, NY 11791
Place, Roy E. (M 1976), c/o Repco, Inc., P.O. Box 7065, Orlando, FL 32804
Plessinger, Richard L. (M 1979), Miami Valley Radiotelephone, 1591 Boyle Road, Hamilton, OH 45013
Pomeroy, Thomas P (M 1978), 14104 S.W. 42nd Terrace, Miami, FL 33175
Pomporelli, Joseph J. (M 1978), Radio Page Communications, 2 Pendleton Drive, Cherry Hill, NJ 08003
Poor, Alberta J. (M 1979), 3529 Country Club, Bakersfield, CA 93306
Poor, Thomas R. (M 1979), Comms. Enterprises Inc., 2315 "Q" St., Bakersfield, CA 93301
Popkin, Samuel, K2DNR (M 1976), Rte. 1, Box 43 - Augusta Dr., Hopewell Jct., NY 12533
Poppele, J. R. (M 1941, F 1942, L 1970), 145 Main Avenue, Clifton, NJ 07014
Powell, Richard A., W60ML (M 1976), 13764 Recuerdo Drive, Del Mar, CA 92014
Powell, Robert L., W3QHF (M 1979), 5506 Durvin Road, Bethesda, MD 20014; Powell-Pendergraph Inc., 7979 Old Georgetown Road, Bethesda, MD 20014
Preston, Lester, W2IKY (M 1976), Motorola, Inc., Comms., 85 Harristown Rd., Glen Rock, NJ 07452
Price, Larry E., W4RA (M 1977), P.O. Box 2067, Georgia Southern College, Statesboro, GA 30458
Prior, William A. (M 1974), Aerotron, Inc., U.S. Highway One North, Raleigh, NC 27608
Prystup, Edward, WB6IMS (M 1970), 686 Gish Rd., San Jose, CA 95112
Puckeylow, Harold D., W6ZGO (sM 1977), 14721 Van Avenue, San Leandro, CA 94578
Puett, J.W.F. (M 1974), 2779 Beechmont Dr., Dallas, TX 75228
Pulley, Luther S. (M 1975), 3910 Cedarbrush Dr., Dallas, TX 75229
Quantz, Richard G. (M 1976, F 1977), 20015 Marine View Dr., S.W., Seattle, WA 98166
Quiat, Marshall (M 1978), 1624 Market, Denver, CO 80202
Quinby, Edwin J. (M 1959, F 1963, F 1976), 30 Blackburn Road, Summit, NJ 07901
Quintal, Richard (M 1977), 29 High St., Ipswich, MA 01938
Quist, A. H. (M 1940, F 1957, L 1976), 717 Aviary Way, Homestead Run, Toms River, NJ 08753
Raitt, Gordon S. (M 1978), 8808 - 146th St., Edmonton, Alta., CANADA
Randall, William R. (M 1972, F 1979), 194 E. Bridge St., Berea, OH 44017
Raser, Edward G, W2ZI (M 1972), 19 Blackwood Dr., Wilburtha Gardens, Trenton, NJ 08628
Redding, Paul B. (M 1972), 6304 Lansbrook Lane, Oklahoma City, OK 73132
Reed, Richard, W6PGD (M 1978), 21292 Wavcrest Circle, Huntington Beach, CA 92646
Reeves, Hazard, E., K2GL (M 1979), Ridge Road, Tuxedo Park, NY 10987
Regan, Thomas O. (M 1970), 293 Blake Ave., Bohemia, L.I., NY 11716
Reiner, Alvin (M 1972, F 1974), 11243 Bybee St., Silver Spring, MD 20902
Reinert, Donald O (M 1970, F 1979), 23910 Via Flamenco, Valencia, CA 91355
Reinhardt, Nicholas J. (M 1956, F 1961), RD #2, Box 220 D, Catskill, NY 12412
Reinheimer, George (M 1975), GE Co. Mobile Radio Dept., 10700 Beaverton Hillside Hwy., Beaverton, OR 97005
Reiser, John W. (M 1977), Box 19424, Washington, DC 20036
Renner, John J. (M 1971, F 1973), 5501 North 15th St., Arlington, VA 22205
Replogle, D.E. (M 1937, F 1937, L 1971), 925 New Garden Rd., #1102, Greensboro, NC 27410
Rettenmeyer, F.X. (M 1928, F 1929, L 1971), 740 Stanwick Rd., Moorestown, NJ 08157
Rhoades, I. Otto (M 1975), 150 Durkin Drive, #11, Springfield, IL 62704
Richardson, Avery G. (M 1941, F 1944, L 1971), 115 Vreeland Ave., Boonton, NJ 07005
Richardson, Kenneth (M 1974, F 1976), 254 Vincent Ave., Lynbrook, NY 11563
Richardson, Richard G. (M 1976), City of Minneapolis Communication, 313 South 3rd St., Minneapolis, MN 55415
Richardt, John W., W2WIY (M 1952, F 1973), 94 Bald Eagle, Hackettstown, NJ 07840
Rider, John F., W2RID (M 1932, F 1937, L 1970), 9800 East Bay Harbor Dr., Miami Beach, FL 33154
Rietzke, Eugene H. (M 1969, F 1970), 7301 Georgetown Pike, McLean, VA 22101
Riise, Denis A., K5AVT (M 1979), 3713 E. Cranston Ct., Irving, TX 75062
Risse, Joseph A. (M 1965), International Textbook Co., Scranton, PA 18515
Ritter, Floyd O. (M 1972, F 1979), 1045 Millwood Court, Indianapolis, IN 46260
Rivkin, David H. (M 1970), 473 Long Hill Drive, Short Hills, NJ 07078
Roberts, Carlos V. (M 1979), 7215 Hyde Road, Falls Church, VA 22043
Roberts, William W. (M 1952, F 1959), c/o Sperry, 1755 So. Jefferson Davis Hwy., Arlington, VA 22202
Robichaud, Joseph A. (M 1976), TEMSCO, 6623 Backlick Rd., Springfield, VA 22150
Robinson, John T. (M 1975, F 1977), 6204 Greely Blvd., Springfield, VA 22152
Robinson, Russell V. (M 1976), 8832 Steel, Detroit, MI 48228
Rodgers, L.M. (M 1968), 23 Bettwood, Norwalk, CN 06851
Rogers, Albert P. (M 1970), Florida Highway Patrol, Box 15025, West Palm Beach, FL 33406
Rogoff, Mortimer (M 1977), 180 East End Avenue, New York, NY 10028
Rohde, Ulrich L. (M 1976), Rhode & Schwarz Sales Co., Inc., 14 Gloria Lane, Fairfield, NJ 07006
Ronald, T.T. (M 1946, L 1971), 77 Stocker Road, Essex Fells, NJ 07021
Root, L. Eugene (M 1974, F 1978), 1340 Hillview Drive, Menlo Park, CA 94025
Rose, Frank L., W3RO (M 1975, F 1978), 12506 Knowledge Lane, Bowie, MD 20715
Rose, Joseph (M 1974, F 1974), 4203 Sandhurst Court, Annandale, VA 22003
Roselle, William F. (M 1976), Motorola Comms. & Elecs. Inc., 1170 Chess Drive, Foster City, CA 94404
Rosenberg, Arnold (M 1970), 1700 Old Meadow Road, McLean, VA 22102
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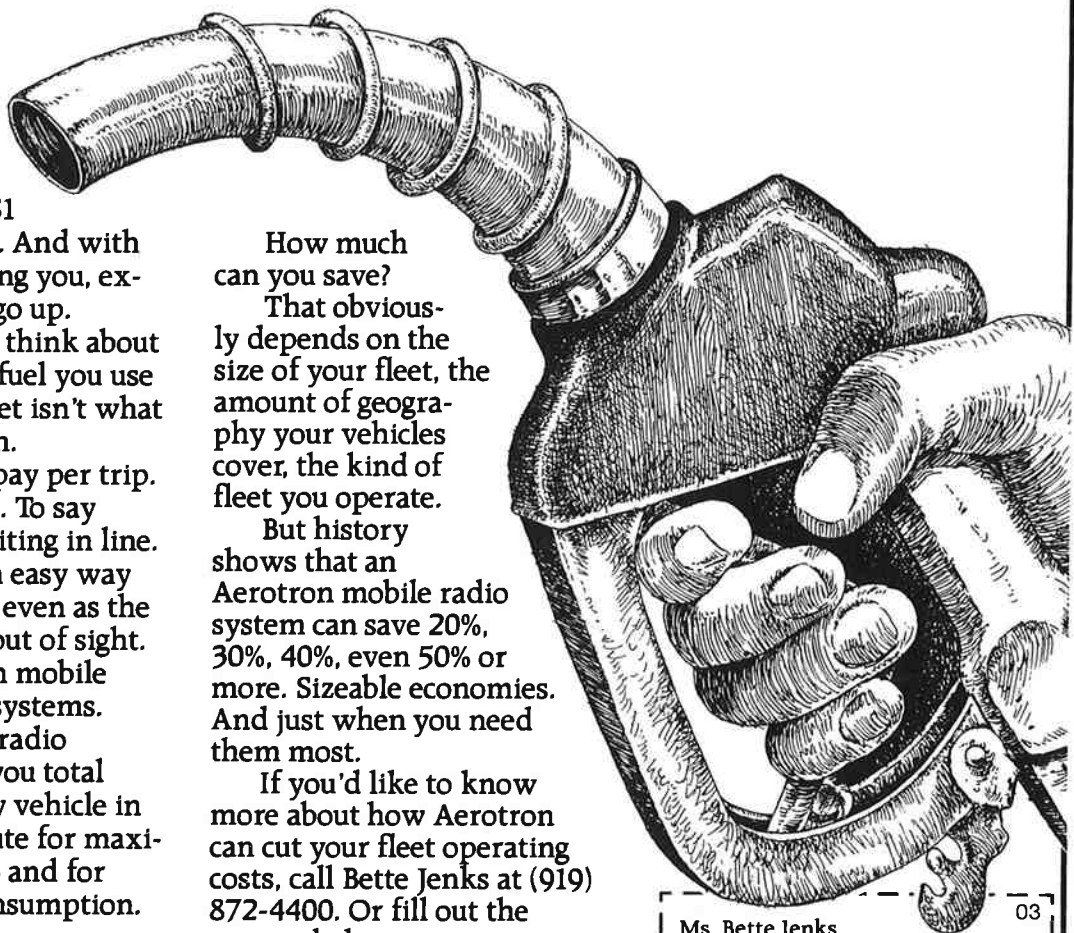
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Russel, W. Gordon (M 1926, F 1953, L 1973), 2929 S.E. Ocean Blvd., Apt. 103-10, Stuart, FL 33490

Rutherford, R.E., Jr. (M 1961, F 1964), P.O. Box 13, New Canaan, CT 06840

Ryals, Byron G. (M 1977), 442 Madera #3, Sunnyvale, CA 94086

Ryan, George A. (M 1971), Communications Service Co., 23 Willow Rd., Mapleshade, NJ 08052

Rykala, Theodore (M 1973, F 1976), American Natural Gas System, One Woodward Ave., Detroit, MI 48226

Rypinski, Chandos A. (M 1973, F 1974), 6 Knoll Lane, Mill Valley, CA 94941

Sage, Maurice G. (M 1979), BPA, 3 Dene St., Dorking, Surrey, UK

St. Clair, Byron W. (M 1969), 10150 W. 74th Place, Arvada, CO 80005

Salsberg, Arthur P. (M 1973), 15 Range Dr., Merrick, NY 11566

Samuels, Ruel P. (M 1972), 42 Lords Rd., Kingston 5, Jamaica, W.I.

Sands, Leo G. (M 1960, F 1969), 7379 Caminito Carlotta, San Diego, CA 92120

Sanford, Bernard E. (M 1971), 5411 Falls of Neuse Rd., Raleigh, NC 27609

Savajian, Robert L. (M 1978), RCA Corp., Mobile Comms., 6739 West 44th Avenue, Wheat Ridge, CO 80033

Sawvel, John Jr. (M 1978), Ohio Edison Co., Gen. Office, 76 South Main St., Akron, OH 44308

Schermerhorn, Romain W. (M 1976), 207 Slade Drive, F2, Longwood, FL 32750

Schimmelo, Eric J. (M 1976), 6216 Hollins Dr., Bethesda, MD 20034

Schimpf, Luther G., WA2FTR (M 1979), 31 Winding Brook Way, Holmdel, NJ 07733

Schleicher, George P., W9NLT (M 1976), Illinois Bell Telephone Co., 225 West Randolph St., Chicago, IL 60606

Schmidt, Harry L., VE3BRH (M 1978), 907 Vistula Drive, Pickering, Ont., CANADA L1W 2L6

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Schomburg, Richard A. (M 1957, F 1971), Rt. 2, Box 86A, Hillsboro, OR 97123

Schwartz, Milton (M 1971, F 1979), 166-36 24th Rd., Flushing, NY 11357

Schwede, Harold F. (M 1969, F 1970), R.F.D. #2, West Redding, CT 06896

Scoggin, James F., Jr. (M 1975), The Citadel, Elec. Eng. Dept., Charleston, SC 29409

Scoggins, Joseph E. (M 1970), 195 N.E. 131st St., No. Miami, FL 33161

Scott, William W. (M 1978), 3206 Plantation Road, Raleigh, NC 27609

Seitz, Frank A. (M 1977), 20 Peters Road, Riverside, CT 06878

Selenius, O. Eric (M 1971), Box 909, Apple Valley, CA 92307

Walter, Serniuk, K6HQE (M 1978), 7555 De Foe Dr., Cupertino, CA 95014

Shackelford, Benjamin E. (F 1943, L 1971), 743 Mosswood Ave., Orange, NJ 07050

Shafer, John (M 1974, F 1975), 941 Teller Circle, Boulder, CO 80302

Shalkhauser, Eric G., W9CI (M 1977, F 1978), 527 Spring Creek Road, Washington, IL 61571

Shand, William A. (M 1970, F 1976), S.A. Co., Business Consultants, 207 McHenry St., Vienna, VA 22180

Shaw, Willard K. RCA Mobile Comms. Div., Meadowlands, PA 15347

Shenier, Henry L. (M 1952, L 1970, F 1979), 230 Park Ave., New York, NY 10017

Shepard, F.H., Jr. (M 1936, F 1932, L 1970), 19 Morris Court, Summit, NJ 07901

Shepherd, Neal H. (M 1977, F 1978), 1914 McGuffey Lane, Lynchburg, VA 24503

Sherman, Eleanor (M 1975), 106 Verona St., Elmira Heights, NY 14903

Shortt, Hubert L. (M 1945, F 1973, L 1975), 3018 Cambridge Rd., Winston-Salem, NC 27104

Shunaman, Fred (M 1968, F 1972), 933 E. 7th St., Plainfield, NJ 07062

Siegel, Hyman L. (M 1977), Radio Shack, 1400 One Tandy Center, Fort Worth, TX 76102

Sieminski, Edward (M 1935, F 1953, L 1973), 134-14 Franklin Ave., Flushing, NY 11355

Simkins, Robert (M 1970), 69 Auburn Lane, East Norwich, NY 11732

Simmons, A.C. (M 1971, F 1975), 6342 Eldergrove, Dallas, TX 75232

Simons, Leon, K2MJN (M 1976), 303 E. 57th St., New York, NY 10022

Sims, Joseph R., K4IPN (M 1969, F 1971), 302 Country Club Dr., Tequesta, FL 33458

Singer, Edward (M 1978), NYC Fire Dept., Comms. Div., 110 Church St., 7th Floor, New York, NY 10007

Sirls, Robert E. (M 1971), 637 So. Waukegan Rd., Lake Forest, IL 60045

Skipper, Lionel C. (M 1946, F 1973), 4 Belvidere Crescent, Aberdeen, AB2 4NH SCOTLAND

Sloop, W.B., W4AAE (M 1973), 1204 Glen Eden Drive, Raleigh, NC 27612

Smith, Arthur V. (M 1960, F 1969, L 1974), 530 Fifth Ave., New York, NY 10036

Smith, Carl E. (M 1979), Smith Electronics, 8200 Snowville Rd., Cleveland, OH 44141

Smith, George E., W4AEO (M 1968, F 1969), Brevard Spring, 1816 Brevard Pl. Camden SC 29020

Smith, Myron T. (M 1934, F 1942, L 1970), P.O. Box 36, Cape Rd., South Casco, ME 04077

Smith, Sanford H. (M 1977), 1116 Ritters Lake Rd., Greensboro, NC 27406

Smith, Theodore A. (M 1975, F 1970), 1208 Limberlost Lane, Gladwyne, PA 19035

Somers, Richard G. (M 1977), 9197 Crescent Drive, Los Angeles, CA 90046

Spence, Raymond E., W4QAW (M 1976, F 1977), Rt. 1, Box 69, Ashburn, VA 22011

Stanley, Joseph J. (M 1920, F 1926, H 1967), 213 Harvard Avenue, Point Pleasant Beach, NJ 08742

Stapleton, James W. (M 1974), 226 Fulton St., North Babylon, NY 11704

Stealet, Ricard E. (M 1979), AT&T, Room 5216A2, 295 N. Maple Ave., Basking Ridge, NJ 07020

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Steen, Jerome R. (M 1947, F 1957, L 1971), 472 Sidney St., Madison, WI 53703

Stevens, Thomas W. (M 1974), P.O. Box 976, Edmond, OK 73034

Stilgenbauer, Shirley (M 1976), 4 Briggs Lane, Armonk, NY 10504

Stodola, E. K. (M 1958, F 1964), P.O. Box 534, Eatontown, NJ 07724

Stokes, Houston H. (M 1972), 1700 E. 56th St., Apt. 2007, Chicago, IL 60637

Stokes, W. E. D., Jr. (M 1909, F 1926, L 1971), Thistlewood Farm, Box 864, Lenox, Mass. 01240

Stoll, Eric, K2TO (M 1976), 117 Hillside Ave., Teaneck, NJ 07666

Stone, W. Robert (M 1974), Brown-Ferris Co., 250 No. Central Ave., Wayzata, MN 55391

Stoner, Don L., W6TNS (M 1979), 6014 E. Mercer Way, Mercer Island, WA 98040

Stover, Jerry S., W5AE (M 1972, F 1975), Communications Industries, Inc., 1100 Frito-Lay Tower, Exchange Park, Dallas, TX 75235

Stromberg, Roy T., W6GQD (M 1976), 2286 Villanova Road, San Jose, CA 95130

Stroube, Kenneth A. (M 1979), 2059 San Miguel Drive, Walnut Creek, CA 94596

Sudia, Andrew T. (M 1974), 1556 Putty Hill Ave., Towson, MD 21204

Suffield, Frederick G. (M 1978), 5875 Overlake Avenue, San Diego, CA 92120

Summers, Charles E. (M 1972, F 1976), 484 Waycross Place, Sunny Hills, FL 32428

Surina, Robert C., W4KZQ (M 1976), 2605 Ridge Road Drive, Alexandria, VA 22302

Sutter, Walter E. (M 1978), Corland Corp., 12th Floor, 11300 Rockville Pike, Rockville, MD 29852

Swafford, John H. (M 1974), 2025 N. Kensington St., Arlington, VA 22205

Swigart, James F. (M 1972), 7646 Lakeside Drive, Riverside, CA 92509

Swinyard, W. O. (M 1941, F 1957, L 1973), 3612 Kempner Road, Salt Lake City, Utah 84109

Talley, David, W2PF (M 1949, F 1957), Harbour House #1533-S, 10275 Collins Avenue, Bal Harbour, FL 33154

Talley, Edward S. (M 1977, L 1979), 762 Preston Road, East Meadow, NY 11554

Tarbell, Harry (M 1976), Pacific Paging, 10400 S.W. Allen Blvd., Beaverton, OR 97005

Tary, John J. (M 1974, F 1978), 7739 Spring Dr., Boulder, CO 80303

Taylor, Charles L. (M 1979), City of Portland, B.E.S., 1130 S.W. 17th Avenue, Portland, OR 97205

Taylor, Lewis E. (M 1977), 424 Wanaque Ave., #19, Pompton Lakes, NJ 07442

Taylor, Ward D., W4CTU (M 1978), G.E. Co., Mobile Comms., 190 Lincoln Highway, Menlo Park, NJ 08817

Taylor, Willis H., Jr. (M 1920, F 1927, L 1971), 330 Madison Avenue, New York, NY 10017

Telcher, Theo. F. (M 1975), 8146 Bayshore Drive, Seminole, FL 33542

Thomas, Harry R., Jr., WD4OZT (M 1979), 6377 15th Ct., South, West Palm Beach, FL 33406

Thomas, Leslie, G. M 1928, L 1971, F 1975), 200 Ocean Lane Drive, Key Biscayne, FL 33149

Thompson, Owen E. (M 1972), P.O. Box 63, Belmont, CA 94002

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- Tischler, Louis** (M 1965), 785 Hyslip Avenue, Westfield, NJ 07090
- Tongue, Ben** (M 1971, F 1977), 41 Ferris Dr., West Orange, NJ 07052
- Torbick, Wm.** (M 1978), General Electric Mobile Radio, Lynchburg, VA 24503
- Towns, Mirabeau C. Jr., K6LFH** (M 1975), 13055 Regan Lane, Saratoga, CA 95070
- Treado, Marshall J.** (M 1971, F 1972), National Bureau of Standards, Law Enforcement Standards Lab., Washington, DC 20234
- Trenkle, William J.** (M 1975), 172-70 Highland Ave., Jamaica, NY 11432
- Troe, James L., W2GRX** (M 1978), 111 Skyline Drive, Morristown, NJ 07960
- Troster, John G.** (M 1975), 82 Belbrook Way, Atherton, CA 94025
- Trott, Raymond C.** (M 1976, F 1978), Antenna Systems Eng. Co., 2639 Walnut Hill Lane, Dallas, TX 75229
- Tsao, T. C.** (M 1966, F 1973), 351 E. 84th St., New York, NY 10028
- Tucker, Robert A.** (M 1977), Telecom Ventures Ltd., Des Plaines, IL 60016
- Tuckerman, Lucien P.** (M 1928, F 1942, L 1970), 3001 Veazey Terrace, N.W. Washington, DC 20008
- Turdo, Malcolm M., WB2ANM** (M 1973) 3106 Harrison St., Wall, NJ 07719
- Turner, Derek** (M 1975), Pentland North Rd., Whittlesford, Cambridge, ENGLAND
- Tuxen, Niels** (M 1953, F 1972), 24 Nordica Drive, Croton-on-Hudson, NY 10520
- Tyne, Gerald F. J.** (M 1966, F 1974), 40 Kline Place, So., Berkley Heights, NJ 07922
- Ulm, Ernest H.** (M 1950, F 1957), 372 Demarest Drive, Orange, CT 06477
- Van Beuren, John M.** (M 1942, F 1944, L 1975), 6155 Catina St., New Orleans, LA 70124
- Vargas, John F., W2ULO** (M 1979), 49 Fairview Avenue, Park Ridge, NJ 07656
- Vashrow, Leo M., W2ZPO** (M 1975), 284 Vly Road, Schenectady, NY 12309
- Vette, Wm. J., K6TXR** (M 1978), 175 Harold Avenue, San Jose, CA 95117
- Viele, James H., W1BRG** (M 1978), 101 Henry St., Burlington, VT 05401
- Villastrigo, Judith** (M 1979), RCA Corp., 1901 N. Moore St., Arlington, VA 22209
- Villers, Ralph I.** (M 1975), 1645 Oregon Ave., P.O. Box 1, Steubenville, OH 43952
- Vogel, William H., Jr.** (M 1940), L 1971, F 1972), Strawberry Lane, New Preston, CT 06777
- Voorhis, Harold V. B.** (M 1964, F 1976), 115 New England Ave., Summit, NJ 07901
- Vorporian, Harry** (M 1941, L 1971), 60-20 B 194th St., Flushing, NY 11365
- Vrana, Othal D. W0WYP** (M 1978), 800 Peterson St., Wichita, KS 67212
- Waite, Amory H., W2ZK** (M 1974, F 1976), 3248 Valencia Road, Venice, FL 33595
- Walker, A. Prose** (M 1971, F 1972), 1087 Tung Hill Drive, Tallahassee, FL 32301
- Walker, Joseph, Sr., W5ZPO** (M 1977, F 1978), Phillips Petroleum Co., 6 D-2 Phillips Bldg., Bartlesville, OK 74004
- Walker, Robert E.** (M 1971), 607 E. Brevard St., Tallahassee, FL 32308
- Wallenburg, Robert C.** (M 1970), 1349 Mithra St., New Orleans, LA 70122
- Wallin, Gary P.** (M 1970), 1092 Union St., Manchester, NH 03104
- Wallower, Donald R.** (M 1975), MT1., Box 735, Camp Hill, PA 17011
- Walters, Charles W. W4HMO** (M 1970), Apt. C-5, Talla Villa, 925 East Magnolia Dr., Tallahassee, FL 32301
- Walton, Robert C., W6CYL** (M 1972), 680 South 15th St., San Jose, CA 95112
- Warner, Edward J., K3RPH** (M 1979), Warner Associates, Inc., 9911 Carter Road, Bethesda, MD 20034
- Warshaw, David** (M 1974, F 1975), Box 141, Quaspeck Blvd., Valley Cottage, NY 10989
- Warshwa, Marguerite**, Box 141, Quaspeck Blvd., Valley Cottage, NY 10989
- Watson, Herbert M.** (M 1971, F 1972), 76-955 Sandpiper Dr., Indian Wells, CA 92260
- Waughaman, William** (M 1978), 53 Broken Arrow Bend, Medford, NJ 08055
- Wayman, N. Jack** (M 1970, F 1972), 3612 Ridgeway Terrace, Falls Church, VA 22044
- Wehking, Ralph T.** (M 1977), 1987 Fossway Court, Cincinnati, OH 45230
- Weisburger, Joseph S.** (M 1974), Motorola, Inc., National Accounts Dept., 85 Harrison Rd., Glen Rock, NJ 07452
- Weisz, William J.** (M 1976, F 1976), Apple Tree Lane, Glencoe, IL 60022
- Wells, Ray, G3RIN** (M 1979), Philips Research Labs Systems, Redhill, Surrey, ENGLAND RH1 5HA
- Wentsel, Amandus G.** (M 1975), 318 Gardner Ave., Trenton, NJ 08618
- West, Gordon V., WB6NOA** (M 1977), 2414 College Drive, Costa Mesa, CA 92626
- Wheel, William E.** (M 1976), Pye Telecommunications Ltd., Newmarket Rd., Cambridge, ENGLAND
- Wheeler, Harold A.** (M 1936, F 1936, L 1971), 59 Derby Place, Smithtown, NY 11787
- White, Charles M., W5LPU** (M 1979), 5618 Valerie, Houston, TX 77081
- White, Lowell, W2CNQ** (M 1972, F 1976), 1318 Meadowbrook St., Missimmee, FL 32741
- Whiting, John V.** (M 1977), Repco, Inc., 1940 Lockwood Way, Orlando, FL 32804
- Wickline, William A.** (M 1976), 29017 W. Willowick Drive, Willowick, OH 44090
- Wiesner, Edward P.** (M 1977), Communications, 1900 West Yale, Englewood, CO 80110
- Wilford, Cleates L.** (M 1978), P.O. Box 8903, Houston, TX 77009
- Williams, Dorsey** (M 1971, L 1972), 1815 S.W. 98th Court, Miami, FL 33165
- Williams, Col. G. A., USA (Ret)** (M 1974, F 1975), 119-P Via Estrada, Laguna Hills, CA 92653
- Williams, Ralph O.** (M 1978), 371 King of Prussia Rd., Wayne, PA 19087
- Williams, Val J.** (M 1970, F 1977), NABER, 1330 New Hampshire Ave., N.W., Washington, DC 20036
- Wilner, John T.** (M 197, F 1978), RD 1 Continental Lane, Titusville, NJ 08560
- Wilson, William A.** (M 1970), Star Route 1, Box 117, Union, WA 98592
- Winans, Henry M., W5NKY** (M 1976), 3707 Gaston Ave., Suite 220, Dallas, TX 75246
- Winter, David, W.** (M 1971), 84-26 87th St., Woodhaven, NY 11421
- Wiskoff, Marc B., WA2JDK** (M 1978), 3090 Voorhies Ave., Brooklyn, NY 11235
- Witt, Frederick E.** (M 1961), R.F.D. 1, Claper Hollow Rd., Jefferson, NY 12093
- Witt, Leonard T.** (M 1971, F 1978), Box 890, Amagansett, NY 111930
- Wofford, Delbert R.** (M 1975), 624 Suffolk Dr., Owensboro, KY 42301
- Wolfe, Benjamin** (M 1977), 6300 Red Cedar Pl., Apt. 402, Baltimore, MD 21209
- Woodin, R. H., KL71HH** (M 1970), 1020 East Bluff Dr., Apt. 441-21, Anchorage, AK 99501
- Worthen, Kent J.** (M 1972), 100 Jocelyn Court, Santa Cruz, CA 95060
- Wright, G. R., W3KUH** (M 1979), 202 Piping Rock Dr., Silver Spring, MD 20504
- Wright, Winter W.** (M 1973), 141 Black Rock Rd., Hampstead, MD 21074
- Yeager, Clair J.** (M 1972), 502 Davis St., Endwell, NY 13760
- Yefsky, Sheldon A.,** (M 1971), 5033 Morse St., Skokie, IL 60076
- Yellen, Anthony G.** (M 1957), 84-46 117th St., Richmond Hill, NY 11418
- Yocum, Charles H.** (M 1927, F 1952, L 1973), 463 Adamsville Rd., Central Village, MA 02790
- Zaret, Matthew E.** (M 1951, F 1961, L 1975), 2225 Walter St., Ann Arbor, MI 48104
- Zauderer, Jerome** (M 1970, F 1972), Hazeltine Corp., Greenlawn, NY 11740
- Zayac, Frank R.** (M 1948, F 1955, L 1972), R.D. #3, Box 55, Boonton, NJ 07005
- Zellmer, Allen M. K6MGO** (M 1977), 5311 Callister Ave., Sacramento, CA 95819

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