

TECHNICIAN ENGINEER

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INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS — AFL-CIO



FOUNDING OF THE UNITED MINE WORKERS OF AMERICA COLUMBUS, OHIO — JANUARY 25, 1890

A labor union which has had a profound impact both on the economy of the nation and on the trade union movement is the United Mine Workers of America. That influence dates almost from the time of the establishment of the UMW in Columbus, Ohio, January 25, 1890.

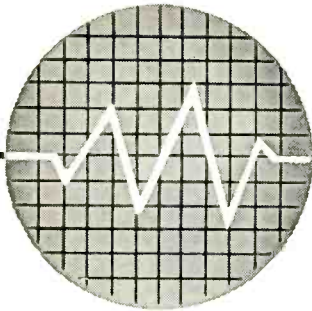
During the 1880's efforts were increased on the part of miners to form a strong national group. Two organizations were active then: miners in the Knights of Labor and the National Progressive Union of Miners & Mine Laborers. The former was in the Knights, an organization destined soon to pass from the scene; the latter is the emerging American Federation of Labor under Samuel Gompers.

These two unions joined forces to form the new union and they represented some 25,000 miners. The new union devel-

oped and carried forward—as it always has—a progressive program. The adherence to trade union principles, even during storms of political and economic adversity and the development of strong leadership, have marked the UMW. The Miners' Union has been a training ground for union leadership. Not only has it produced strong leaders of its own—such as John Mitchell, John L. Lewis and others—but it has provided men who added to their leadership talents beyond the mine workers' group—William Green and Philip Murray are only two of the men who came from the UMW.

Although in and out of the Federation the UMW has had a strong influence on labor and the nation. It reached its membership peak of 750,000 in 1923. The founding of the UMW can be noted as a landmark of labor, coming in the early days of modern trade union organization.

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TECHNICIAN ENGINEER

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ALBERT O. HARDY, Editor

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the cover Stereo FM on the air is featured on our July cover. Bill Ohl, station engineer of WEEM, Chicago, rides gain at the console, while Paul Prokes makes measurements for the engineering log. Both men are members of Local 1220. (For more on stereo FM turn to Page 4.)

index For the benefit of local unions needing such information in negotiations and planning, here are the latest figures for the cost-of-living index, compared with 1960 figures: June 1960—126.7; June, 1961—127.6.

<i>indices to key cities</i>	<i>As we go to press, the Bureau of Labor Statistics has released the City Consumers' Price Index for June, also. They are as follows:</i>	
	<i>Atlanta</i>	127.4
	<i>Baltimore</i>	129.8
	<i>Chicago</i>	129.7
	<i>Cincinnati</i>	124.6
	<i>Detroit</i>	125.8
	<i>Los Angeles</i>	131.4
	<i>New York</i>	125.8
	<i>Philadelphia</i>	127.8
	<i>St. Louis</i>	129.0
	<i>San Francisco</i>	133.8

COMMENTARY

A couple of months ago the newspapers were recklessly assaulting the building trades unions with big headline stories charging labor with responsibility for America's missile lag.

These stories supposedly were based on testimony at McClellan committee hearings. Yet the leading witness at those hearings testified flatly that the unions were not to blame, that the responsibility lay in lack of decision on the part of both the government and industry.

Sen. Wayne Morse (D., Oreg.), in a major address to the U. S. Senate, has placed the facts in their proper

focus.

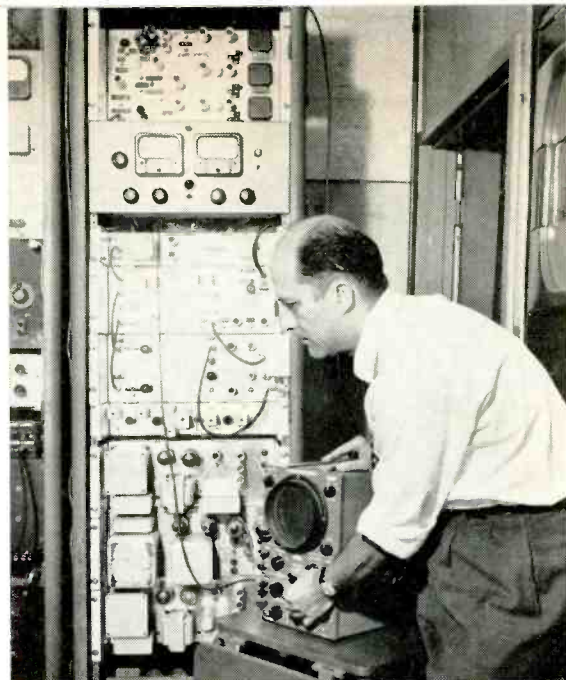
Without condoning the strikes that did occur, he said that an exhaustive investigation clearly proved the missile lag is due to non-labor factors, such as confusion and changes in Pentagon plans, inability of our scientists to match Soviet Russia in developing missile booster power and lack of sufficient appropriations.

This is the unchallengeable truth. Yet to the best of our knowledge the newspapers that ran the original attacks have not carried a line of Morse's speech.

AFL-CIO News

FM Stereo Standards Adopted

*Commission Adopts System
Proposed by
Zenith and General Electric*



Joe Bratko, WEFM engineer, checks out Zenith stereo FM exciter unit as station prepared for first historic broadcast.

THE FCC has reported that more than 250 FM stations were authorized to operate a multiplex system and that something more than 200 such stations were actually providing subsidiary services as of February 1, 1961. The great majority of such stations use multiplex for background music service. Thus the recent decision by the Commission, setting up standards for FM stereophonic broadcasting, was complicated by the necessity of continuing subsidiary services already existing. (In May 1960, the FCC authorized SCA multiplex subchannel use for background music, storecasting, special time signals and for relaying program material to other stations, remote control telemetering functions associated with STL operation, remote cueing, etc.). The FCC now predicts that the next few years will find the majority of FM stations on the air involved in some subsidiary use of a subchannel and, with the adoption of stereophonic standards, seems confident of the growth of this new "hi fi" medium.

The Electronic Industries Association organized the National Stereophonic Radio Committee more than three years ago. The Committee's conclusions led to its submission of seven system possibilities to the FCC. The interest of the industry is indicated by more than 2500 comments being received by the Commission, urging adoption of one or another of the systems. Field tests were conducted by the NSRC, under FCC observation, and of the Commission's original eight-system outline, six of the systems' performances largely account for the final conclusion. (Of the eight proposals initially outlined by the FCC, two were withdrawn by their proponents.)

Briefly put, the Standards provide that the instantaneous frequency of the SCA subcarrier for stereo broadcasting must be within the range of 53 to 75 kc., the arithmetic sum of the modulation of the main car-

rier by SCA subcarriers shall not exceed 10 per cent and FM modulation of the main carrier by the subcarrier operation (in the frequency range of 50 to 53,000 cycles) must be at least 60 db below 100 per cent modulation.

The modulating signal for stereo consists of the sum of the left and right channels, with a pilot subcarrier at 19 kc. (plus or minus 2 cycles) frequency-modulating the main carrier between the limits of 8 to 10 per cent. The stereo subcarrier must be amplitude-modulated, the second harmonic of the pilot subcarrier and capable of modulation frequencies from 50 to 15,000 cycles, with the stereophonic subcarrier suppressed to a level of less than 1 per cent modulation of the main carrier. The characteristics of the stereophonic subchannel, as to pre-emphasis, must be identical with those of the main channel, with respect to phase and amplitude—at all frequencies. Cross-talk into the main channel, caused by modulation of the stereo subchannel must be attenuated by at least 40 db below 90 per cent modulation and the maximum modulation employed must be 90 per cent (excluding the pilot subcarrier) rather than the 100 per cent specified by Section 3.254 of the FCC Rules and Regulations.

The Zenith Radio Corporation filed voluminous reports and data with the Commission and came to conclusions as the result of its utilization of its existing FM station in Chicago, WEFM. (*Ed. Note: WEFM has, from the time of its initial broadcast in the early 40's, had an agreement with L. U. 1220, IBEW*). Excerpts from its briefs to the FCC reveal data worth quoting here.

During this research and experimentation, Zenith has developed and is now on the air with supplemental stereophonic multiplex FM transmitting equipment which is

not only compatible with existing monophonic FM receivers, but is also capable of transmitting background music, facsimile (or any similar existing SCA service) simultaneously with stereophonic broadcast programming. The main carrier and two subcarriers multiplexed by this system are all within the 200 kilocycle channel licensed to any FM broadcast station. Like some other proposed FM systems, this system of course permits compatible high fidelity stereophonic broadcasting within the framework of existing FM allocations. However, unlike any other known FM system, the Zenith system permits such broadcasting:

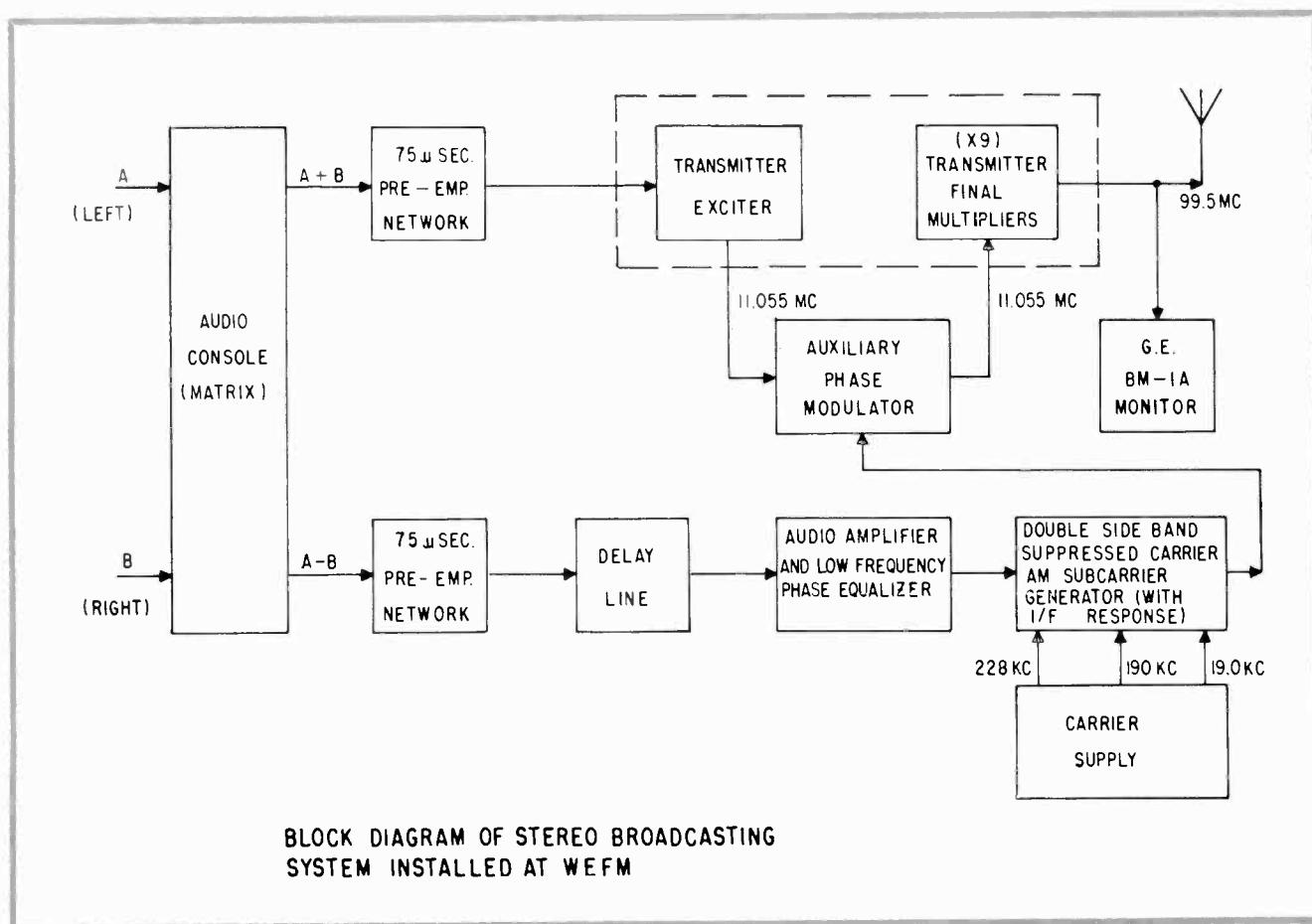
- (1) without displacing Subsidiary Communications Services that now provide a major source of economic support for many, if not most, FM broadcasters,
- (2) without degradation of the stereo transmission when multiplexed with Subsidiary Communications Services, and
- (3) without significant reduction in station coverage areas for existing monophonic FM receivers.

It is desirable to maintain the main channel modulation level on stereophonic transmissions as high as possible, because it is unsatisfactory to the monophonic listener to experience substantial changes in audio level when tuning his receiver across the FM broadcast band. Furthermore, the attention of the listener tends to be

drawn to the louder stations, with the result that the stations which have less apparent loudness suffer a loss in listening audience.

The use of a sum (left plus right) modulation on the main channel and a difference (left minus right) modulation on a suppressed-carrier amplitude modulated subcarrier, as used in the Zenith system, maintains an adequate level for the monophonic listener. With this system it is possible to fully modulate the radiated carrier (except for approximately 1 db reduction to allow the transmission of a pilot sub-carrier) with the sum signal and also to fully modulate the radiated carrier with the difference modulated stereophonic subcarrier. This is possible because of the nesting or interleaving of these two signals with each other.

Experience has shown that the problem of cross-talk is greater in the stereophonic receiver than in the transmitter apparatus in any form of stereo multiplexing. Such cross-talk reduces final stereo channel separation. At the present state of the art of disc reproduction, separation between the left and right stereo channels is commonly less than 20 db, which is considered adequate separation. Assuming that separation in FM stereo multiplexing systems should be in excess of 20 db and realizing that delay and amplitude differences in the entire transmission system between the main channel and stereophonic sub-channel also play a role in the



matter of separation, it is not unrealistic to adopt standards regarding cross-talk as set forth above.

These requirements have been exceeded by a substantial amount in two separate installations at Zenith Radio Corporation: one at WEFM (KS2XFJ) Chicago, Illinois; and the other in the Laboratory in Chicago, Illinois, with closed-circuit apparatus.

The sum of the original left and right stereophonic program channels, as used in the Zenith system, will produce an aurally balanced program with monophonic receivers. Furthermore, this sum and difference process is compatible with many new techniques employed in audio reproducing apparatus.

The system of stereophonic FM broadcasting which has been developed at Zenith had its inception in a time-division multiplex switching system between left and right stereophonic channels. The signal was analyzed mathematically and it was discovered that this system was basically a sum and difference system. The sum of the left and right stereophonic channels appeared as audio modulation on the main channel whereas the difference between the left and right stereophonic channels appeared as suppressed carrier amplitude modulation of a series of odd harmonics of the switching rate. It was decided, in view of the narrow modulation bandwidth of some FM modulators, to generate the subcarrier with only the fundamental component appearing. This allowed a more direct approach to be used in the generation of the signal.

Basically, the signal on the air is comprised of a main radiated channel frequency modulated by left plus right and a left minus right amplitude modulated suppressed-carrier subcarrier. For synchronizing purposes at the receiver, a pilot carrier is also added.

The following measurements are listed for the installation of the Zenith system at Station WEFM, operating as Experimental Station KS2XFJ.

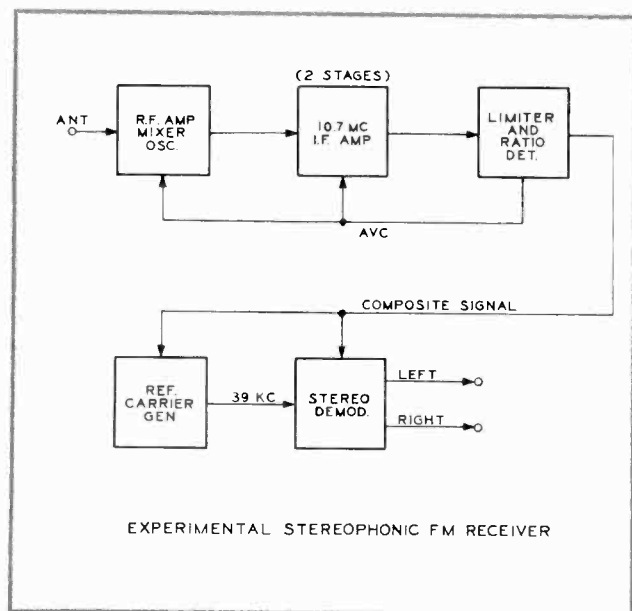


Chart I.

Modulation	Distortion	Signal-to-Noise	Separation
Left Signal (400 CPS) ..	0.78%	—57 db	22 db
Plus 10% Pilot Carrier			
Right Signal (400 CPS) ..	1.2%	—51 db	23 db
Plus 10% Pilot Carrier			
Left Plus Right			
Signals (400 CPS)	1.2%	—65 db	..
Plus 10% Pilot Carrier			

Since these measurements were taken, it was discovered in the laboratory that the signal-to-noise ratio could be improved if hum was eliminated. Since this is a matter of equipment design, it was decided not to include hum in the evaluation of system performance.

The following measurements were made in the laboratory on equipment identical to that at WEFM except for the type of main channel exciter and the power output.

Chart II.

Distortion of Closed-Circuit FM-AM System

Frequency (CPS)	% Distortion On Main	% Distortion On Left	% Distortion On Right
800	0.2	0.3	0.75
1,000	0.18	0.26	0.76
1,500	0.15	0.25	0.72
3,000	0.13	0.26	0.56
6,000	0.22	0.36	0.42
10,000	0.27	0.54	0.46
S/N	—65 db	—61 db	—61 db

It is evident from the information in CHART II, that the system is capable of low distortion for the monophonic listener receiving only the main channel, or the stereophonic listener receiving the left or right stereophonic channels. The distortion of the stereophonic subcarrier is not listed because the type of demodulator used derives the left and right stereophonic signals directly.

In contrast to the results shown in CHART II, the distortion measurements made on an FM-AM system using a sum and difference technique with the radiated carrier modulated 70 per cent by the sum signal and 30 per cent by the difference modulated FM subcarrier were not very good. It has been determined that the major cause of distortion is the phase characteristic of the subcarrier filter required in the demodulation process.

Broadcasting magazine reported on July 24 that an NAB survey of some 50 per cent of 594 member-FM stations now plan to utilize stereo programming and that more than 35 per cent have no such plan. Seventy-seven stations reported plans to begin stereo in 1961, 44 in 1962. Two stations are currently on the air with regular programs.

(We are indebted to Zenith for the material and pictures furnished for this report to our readers.)

Local Union 292 Completes VTR Course



Self-Help Instruction Benefits Minneapolis-St. Paul Members

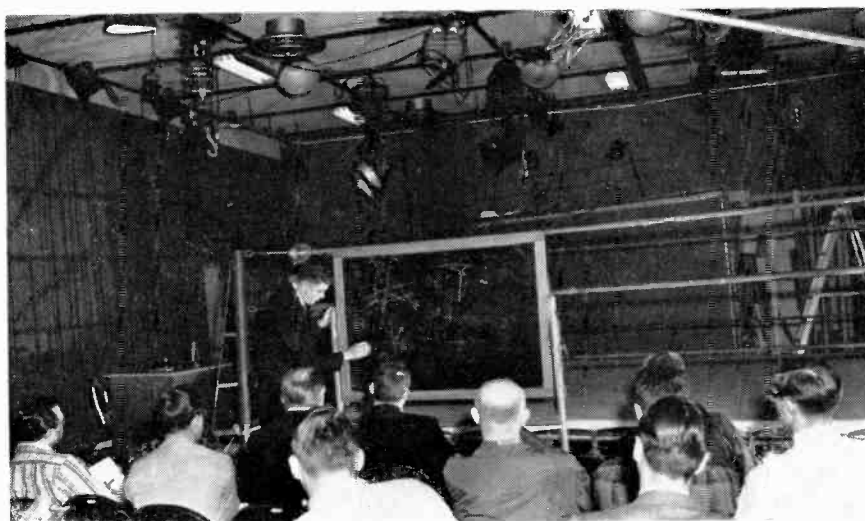
ATEN-WEEK course on the maintenance and operation of video tape recorders was recently sponsored by Local Union No. 292 of Minneapolis-St. Paul, Minnesota, and, it was well received and well attended.

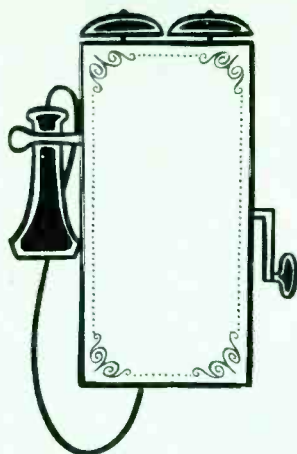
The instructor for the ten-week session was Gordon Benson, supervisor of magnetic testing at the Minnesota Mining and Manufacturing Company. Mr. Benson was formerly the chief engineer of KMSP-TV and holds an honorary withdrawal card issued by Local Union 292. He patterned the course after the Ampex, Redwood City, California, course and used Julian Bernstein's *Video Tape Recording* (John F. Rider Publisher, Inc., New York) as a general text. The classes

were held in the studios of KMSP-TV, where the necessary equipment was available for use and observation.

This course was one of a continuing series in which the membership has an interest. Attempts are made to have at least one per year and the subject of each is selected by referendum. So far, in addition to the VTR course, there have been two courses on transistors, one on micro-wave and one dealing with television generally. (Photographs are by James Halverson, WCCO-TV)

Photos on this page show Gordon Benson conducting the course on VTR in a studio of KMSP-TV.





The telegraph, introduced into general use, changed the whole character of American national life. News and information travelled from coast to coast in seconds now where, previously, it had taken weeks, even months. The pace of business and commerce was accelerated. Investments were speeded; trading in the stock markets boomed. Indirectly the telegraph brought on the financial panic of 1837 because it contributed to the too-rapid development of The West.

The U. S. was just beginning to boom when the Civil War broke out. Telegraphy played an important part in a major conflict for the first time in history. After the conflict was over, the headlong flight to progress was continued, aided by the promise of free lands just over the horizon.

In the forty years from 1860 to 1900, the U. S. Patent Office granted 676,000 patents; many of them important inventions. The era of the "tycoons" was started and the foundations of many astronomical fortunes was being laid. One of the most valuable patents to be granted was that on the telephone.

Alexander Bell's TELEPHONE

"If I could make a current of electricity vary in intensity precisely as the air varies in density during the production of sound, I should be able to transmit speech telegraphically."

—Alexander Graham Bell statement, 1874.

AFTER Samuel F. B. Morse developed his method of making and breaking an electrical current over a wire to operate electromagnets at a distance and, thus, send a series of signals which could be translated into messages in 1835, many intelligent people believed the art of distance communicating had gone as far as possible.

Alexander Graham Bell, a teacher of vocal physiology at Boston University, the son of a teacher of defective speech and the grandson of another such teacher, is listed as the inventor of the telephone. He filed for a patent on his invention on February 14, 1876. The same day, a few hours later, Elisha Gray filed a "caveat" (no longer used in patent procedure) which was a formal notice of intent to file a patent. Both men were on the same footing on that day because neither had successfully built nor, of course, used the devices which they were describing.



AN ARTIST'S CONCEPTION of the historic scene when Alexander Graham Bell and Mr. Watson realized their success.

Technician-Engineer

Little-known in telephone history is the fact that, fifteen years before, a German scientist had already transmitted speech electrically!

Bell was a young man of 27 when, on a vacation trip into Canada, he described to his father a type of apparatus consisting of a piece of steel, attached to a membrane, which when actuated by a voice, would vibrate in front of a magnet. Theoretically this would produce an undulating magneto-electric current which could transmit speech. Bell himself doubted it would be strong enough to be practical and, for almost a year, made no effort to build it.

On June 2, 1875, while working on another invention, he heard the twang of a steel spring over an electric wire and realized that it had been transmitted by a current strong enough to be useful. He outlined to his assistant, Thomas A. Watson, how to build it and they transmitted voice sounds over it the next day, June 3, 1875. Additional experiments produced, on March 10, 1876, an instrument which transmitted the first complete sentence along 40 feet of wire:

"Mr. Watson, come here, I want you!"

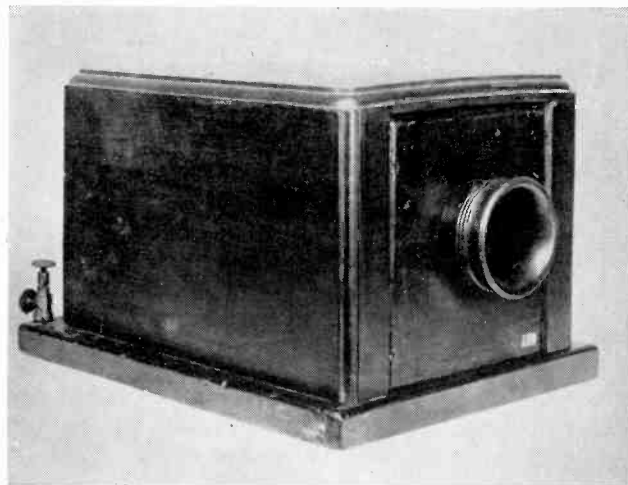
The circumstances of this transmission have been well-publicized by the motion picture based on Bell's life; he had upset a container of acid on himself. In fact, there may still be those who believe Don Ameche invented the telephone!

LATER, in August, 1876, while on a vacation trip to his father's home in Brantford, Ontario, Bell got permission to experiment with his new invention over the telegraph wires. Bell's father and uncle recited Shakespeare while Bell listened from Paris, a town eight miles away. "We had to buy up all the stovepipe wire in Brantford to make our line long enough" said Bell later in recounting the event. "We tacked the wire to the fence 'til we reached the telegraph line."

Bell was without funds to promote his patented device and he acquired Thomas Sanders and Gardiner G. Hubbard as backers and business associates. He married Hubbard's daughter, who prevailed on her father to stay with Bell despite early financial difficulties.

The public apathy was the worst hurdle. No one seemed to recognize the worth of the telephone; they considered it a toy. Telephoning was done over a single iron wire with a ground return. Bell and his backers started lending or leasing telephones in pairs for direct connections between users. In 1878 the first crude telephone switchboard was put into use at New Haven, Connecticut, with eight lines and 21 subscribers.

Meanwhile the Elisha Gray camp was fighting the Bell group in the courts. There were more than 600 separate court actions but the Bell interests finally won. It was not until 1881 that the claims of Bell and Gray came into direct conflict in court and this was resolved by an out-of-court settlement. Gray's rights had been



THE FIRST COMMERCIAL TELEPHONE was a simple box affair for both talking and listening. It housed a big horseshoe magnet.

bought by Western Union, which surrendered them to the Bell company for a substantial consideration and agreed to withdraw from the telephone field.

It was not, incidentally, until 1881 that Bell revealed his "Mr. Watson, come here, I want you" message. It had been sent over a device which very closely resembled the one developed by Gray.

But fifteen years before either Bell or Gray transmitted the human voice over a wire, Philipp Reis of Germany had done so. He made no effort to refine, develop, or promote his device, yet the record must show that Reis actually sent a human voice along a wire even before Bell. This fact was attested by the written testimony of a dozen or more respected men of science who successfully participated in voice transmissions. Reis' invention was even known in Scotland, for in 1865 Dr. Stephan Yeates of Dublin improved on the performance of the Reis device by causing a drop of water to adhere to the contact points of the transmitter while it was operating.

Bell's patent, issued March 7, 1876, covered an electrical device to transmit speech over a wire. His device was in essence, a telephone receiver operating in reverse. Gray's device, which competed with Bell's consisted of a diaphragm, to which was attached a rod, the lower end of which was immersed in water. Vibrations of the diaphragm actuated by the voice of the speaker changed the depth of immersion in the water and thus the electrical resistance of the transmitter.

Bell led an interesting life. After successfully inventing and helping to begin the promotion of the telephone, he also invented the photophone; a device for sending voice transmission over a beam of light, and of phonographic apparatus. Later he interested himself in the problem of mechanical flight. He traveled extensively, giving many lectures. He was a president of the National Geographic Society and was appointed a regent of the

The Telephone.

THE proprietors of the Telephone, the invention of Alexander Graham Bell, for which patents have been issued by the United States and Great Britain, are now prepared to furnish Telephones for the transmission of articulate speech through instruments not more than twenty miles apart. Conversation can be easily carried on after slight practice and with the occasional repetition of a word or sentence. On first listening to the Telephone, though the sound is perfectly audible, the articulation seems to be indistinct; but after a few trials the ear becomes accustomed to the peculiar sound and finds little difficulty in understanding the words.

The Telephone should be set in a quiet place, where there is no noise which would interrupt ordinary conversation.

The advantages of the Telephone over the Telegraph for local business are

1st. That no skilled operator is required, but direct communication may be had by speech without the intervention of a third person.

2d. That the communication is much more rapid, the average number of words transmitted a minute by Morse Sounder being from fifteen to twenty, by Telephone from one to two hundred.

3d. That no expense is required either for its operation, maintenance, or repair. It needs no battery, and has no complicated machinery. It is unsurpassed for economy and simplicity.

The Terms for leasing two Telephones for social purposes connecting a dwelling-house with any other building will be \$20 a year, for business purposes \$40 a year, payable semiannually in advance, with the cost of expressage from Boston, New York, Cincinnati, Chicago, St. Louis, or San Francisco. The instruments will be kept in good working order by the lessors, free of expense, except from injuries resulting from great carelessness.

Several Telephones can be placed on the same line at an additional rental of \$10 for each instrument; but the use of more than two on the same line where privacy is required is not advised. Any person within ordinary hearing distance can hear the voice calling through the Telephone. If a louder call is required one can be furnished for \$5.

Telegraph lines will be constructed by the proprietors if desired. The price will vary from \$100 to \$150 a mile; any good mechanic can construct a line; No. 9 wire costs 8½ cents a pound, 320 pounds to the mile; 34 insulators at 25 cents each; the price of poles and setting varies in every locality; stringing wire \$5 per mile; sundries \$10 per mile.

Parties leasing the Telephones incur no expense beyond the annual rental and the repair of the line wire. On the following pages are extracts from the Press and other sources relating to the Telephone.

GARDINER G. HUBBARD.

CAMBRIDGE, MASS., May, 1877.

For further information and orders address

THOS. A. WATSON, 109 COURT ST., BOSTON.

THE FIRST TELEPHONE ADVERTISEMENT, above, offered "telephones for the transmission of articulate speech through instruments not more than 20 miles apart."

Smithsonian Institute by Congress. He did not enjoy the hot Washington summers and devised an "air conditioner" for his home there. A big insulated box in his attic was packed with blocks of ice and an insulated duct let the cold air settle down to his study. He died August 2, 1922, at the age of 75, at his summer home near Baddeck, Nova Scotia.

Despite the fact that his first success was attained with a transmitter quite similar to Gray's, Bell continued

with his receiver-type transmitter. The first telephones put into general use consisted of one receiver, used alternately at the ear and the mouth for sending and receiving. Later two receivers were hung on the instrument; one to be used as a transmitter.

The development of the loose-contact microphone type of transmitter was to come later, developed in part by Thomas A. Edison. Gradual improvements saw the passing of the old magneto-type telephone with its

wooden wall case and crank handle, the upright instrument with the earphone hung on a hook, and refinements in the construction of microphones and receivers until voice transmission today is quite natural. Many other refinements have taken place. One can now use a telephone in a speeding train, while driving his own car, in a boat in coastal waters or even aboard a liner on the high seas. It is possible that, if economics dictated it, telephone conversation in airliners would be possible.

MOST telephone conversations are still carried by wires but much overland transmission is now by microwave relay stations. Where wires or microwaves cannot reach (such as boats) the 'phone call goes to an overseas transmitter station. Here the telephone call is routed over as many as four or five radio frequencies in order to get clear transmission. Overseas phone service was inaugurated in 1927 with a call from New York to London. Today 96 per cent of all the world's telephones can be connected. Sometimes the calls go partly by radio, partly by underseas cables. That first overseas call cost \$75 but today the three-minute rate to most overseas points is \$12. Some are as low as \$4.50, some as high as \$15. There are about 1,500,000 overseas calls every year. The Bell System operates about 175 radio circuits.

The transmission lines of the overseas station at Lawrenceville, N. J., reach almost a mile long. Voices may be too strong or too weak for the transmitting device so a "vogad" is used. This stands for "voice-operated gain adjusting device." If the voice is too strong or too weak, "vogad" automatically adjusts it.

"Repeaters" are used in underseas telephone cables. Spaced about every 40 miles, they are built into the cable and expected to operate for at least 20 years without any attention. Each boosts the voice signal about a millionfold before passing it to the next repeater. Each has about 60 electrical components mounted in a series of lucite cylinders and composes a flexible unit about 80 feet long.

Direct distance dialing and automatic message accounting are the two latest improvements of telephone service. In DDD, as it is called, the caller first dials three "area code numbers" which cover the whole United States. New York City is 212, San Antonio, 512; Atlanta, Georgia, 404. After dialing the three code numbers, the caller then dials the number he wishes to speak with. Sometimes an operator comes on and asks for his number; sometimes not. But he is connected immediately with the number he called. More than 19 million subscribers can now use DDD.

If he does not know the number, in some instances he can call "Information" in the distant city at no expense. If he wants the number of a subscriber in Chicago, he would dial the Chicago area code, 312, then 555-1212. Chicago's information operator will come on



EARLY SWITCHBOARD OPERATORS often had a difficult time making connections, often "getting their wires crossed."

the line and give him the information he needs. He then hangs up and, after dialing 312 again, he can dial the Chicago number given him by "Information".

Automatic Message Accounting, AMA for short, automatically makes a full record of every toll call on a Braille-like perforated tape. It automatically records the number called, the time, the date, and how long you talk. It then sorts out your calls from all the others on the tape and prepares your bill. Today eight out of ten telephones in the U. S. are dial-operated and, within a few years, 99 per cent will be.

Bell laboratories developed the transistor and the solar battery, which latter converts the sun's rays to useful amounts of electricity. This type of sun-powered communications equipment has already been sent into outer space. More fantastic developments are certain to follow.

IN many countries the telephone system is a government operation. In this country it is a private operation but is under strict government control. At one time in development of the telephone communications system in the United States, two telephone companies would be simultaneously operating in the same city. This developed to be an intolerable condition until interconnection of the companies' facilities was worked out.

Of all the 133,600,000 telephones in the world, possibly each man or woman values the use of their own

TELEPHONE STATISTICS

Location	Number of telephones	Number per 100 Population	Average con- versations per person per year
World	133,600,000	4.6	63
Selected Countries			
Canada	5,439,023	30.85	530.3
France	4,084,843	9.06	n.a.
Japan	4,864,858	5.21	138.5
Sweden	2,637,336	35.30	337.1
Russia	4,022,633	1.91	n.a.
United States	70,821,000	39.51	496.1
Mexico	491,800	1.46	29.7
Switzerland	1,562,360	29.65	216.7
Angola	7,865	.17	n.a.
Selected Cities			
Chicago	1,894,012	53.9	(not listed)
Anchorage	18,278	22.3	
Honolulu	138,142	38	
Las Vegas	41,922	66.5	
New York	4,411,922	57.2	
Los Angeles (Ext)	3,103,322	53.9	
Washington, D. C.	621,327	83.3	

Source: American Telephone and Telegraph Co.

the most. It is a link with business and social acquaintances; a source of information, a protection in time of need or peril. But of all the world's telephones, it is easy to select that one instrument which is, by far and away, the most vital and important. It is a brilliant red and it sits on a desk far underground at the headquarters of the Strategic Air Command. If this country is ever attacked, a hand will go out, lift the instrument from its cradle, and a voice will speak the words:

"Bomb your targets!"

This is the second of a series outlining the development of communications. The next installment will consider the development of radio communications.

Bargain Hunters' Luck

When is "a bargain" not a bargain?

A friend of ours, passing through a supermarket recently, saw what looked like a bargain. It was a substantial-looking 60-watt soldering iron with a copper tip, metal-grille body to dissipate heat, and a well-shaped black pistol-grip handle.

The device, made abroad, sold for only 67 cents! Figuring that such a price would not break him one way or the other and being frankly curious to know if a dependable item could be made abroad, shipped to this country, duties paid, expenses of distribution met and still sold for 67 cents, he bought one.

He went to work on his radio equipment and was well satisfied with the heat generated and the feel and balance of the soldering iron.

Unfortunately, after exactly an hour and five minutes, the iron burned out!



IBEW Leader Suggests Liaison Renewal

The following is excerpted from an article in the May 15 Electrical Union World, published by New York Local 3 IBEW, entitled "Labor and the Intelligentsia" by Harry Van Arsdale, Jr., Business Manager of the Local Union and President of the New York City AFL-CIO.

DURING the thirties there existed what has been called the "labor-liberal alliance." Historically, this was a significant event in America. This alliance had enormous influence on public opinion and helped make possible the growth and acceptance of trade unionism in America. I am not suggesting that the labor-liberal alliance was fashioned in a wholly altruistic spirit. Nevertheless organized labor learned a great deal from its friends and supporters in the universities, the foundations, in government, the churches and synagogues.

By the end of the war, this alliance had crumbled. Today, with the exception of those intellectuals who specialize in labor-management relations, the intellectual force in America feels as alienated from the labor movement as the labor movement feels alienated from the intellectuals. However, I think the time has come to see if the breach between us can be repaired, not in the name of some doctrinaire philosophy or vague ethic but because this isolation, this sulking in our split-level tents, is a luxury we can no longer afford.

Organized labor needs closer relationship with the American intelligentsia—not because we in labor are wholly without ideas or without some sense of what the world is about. We need this closer relationship because the intellectual's existence is necessarily a commitment by definition to the pursuit of truth. Where this existence is committed to something else than the pursuit of truth, the intellectual has betrayed his vocation.

Labor and the intelligentsia have more in common than we suspect, because we both live by common assumptions. If somehow we can come together, as we were once; if this mood of nostalgia can be transformed into the fact of a new alliance, if our monologues can become a dialogue, if discourse is still possible between us, I suggest that we shall be able to do something about strengthening the democratic way of life, establishing new goals in a threatened society and, even, give purpose anew to so many young people who are today rebels without a cause.

Technician-Engineer

Business Advisers Bolt Commerce Dept.

The big-business-dominated Business Advisory Council to the Commerce Dept. has severed all ties with the government rather than submit to Administration directives to open its operations to public scrutiny and supervision.

The Commerce Dept. indicated the secessionist business leaders had lost their right to the advisory council name, and had forfeited their quasi-official status and its accompanying tax exemption.

Commerce Under-Secretary Edward Gudeman also indicated that the business leaders would promptly be replaced by a new advisory unit, presumably with a completely new roster of members.

The disaffiliation announcement was made in New York by U. S. Steel Chairman Roger M. Blough, who has headed the 165-member advisory unit since last February when Board Chairman Ralph E. Cordiner of the General Electric Co. quit under fire in the wake of the multi-billion-dollar price-fixing scandal involving GE.

Several other companies indicted and convicted in the price-rigging case—including Westinghouse Electric Corporation—also were represented on the advisory body either by officials or board members.

The business leaders' secession followed an open rift with Commerce Secretary Luther H. Hodges. The Secretary had demanded that:

- BAC meetings addressed by government officials be open to the press.
- All sessions be attended by government officials, with meeting agendas approved in advance by the government and with minutes of all sessions made available to the Justice Dept. In the past there have been no minutes of proceedings.
- The Commerce Secretary have the authority to name council members, instead of following the past practice of rubber-stamping choices submitted by business leaders.
- The BAC's membership list be overhauled to give better representation to small business. Hodges pointed out that the bulk of the committee's 65 active and 100 "graduate", or honorary, members came from big business.

Hodges also had been critical of the fact that many of the super-secret BAC meetings were actually business-pleasure affairs at vacation resorts such as Sea Island, Ga., and Hot Springs, Va. He had directed the council to end a practice of paying the resort expenses of government officials invited to address the meetings.

In announcing the secession, Blough said the group would function under the new name of the Business Council, and described it as an "independent organization of private individuals."

Blough said the group would make available "such

advisory services as may be requested" by any government agency, including the State, Defense and Treasury Departments as well as Commerce.

The plan to shift the group to private status, in the wake of Hodges' insistence on bringing the advisory unit under closer government control, was disclosed to President John F. Kennedy at a White House meeting of the business leaders. It was subsequently affirmed by the unanimous vote of 82 of its members at a private meeting in New York.

The council came into being in June 1933, in the early days of the New Deal, to serve as a semi-official link between the business community and then Commerce Secretary Daniel Roper.

Through the years the council's operations have been subjected to mounting criticism because both its sessions and its recommendations to the government were shrouded in secrecy.

The criticism came to a head in 1955 when a House committee headed by Rep. Emanuel Celler (D., N. Y.) sought to conduct a public investigation of the BAC's activities. The probe was blocked by refusal of BAC officials to testify on the council's affairs and refusal of the Eisenhower Administration to open the BAC's records for public scrutiny.

'Work' Sponsors Again Distort FDR, Gompers

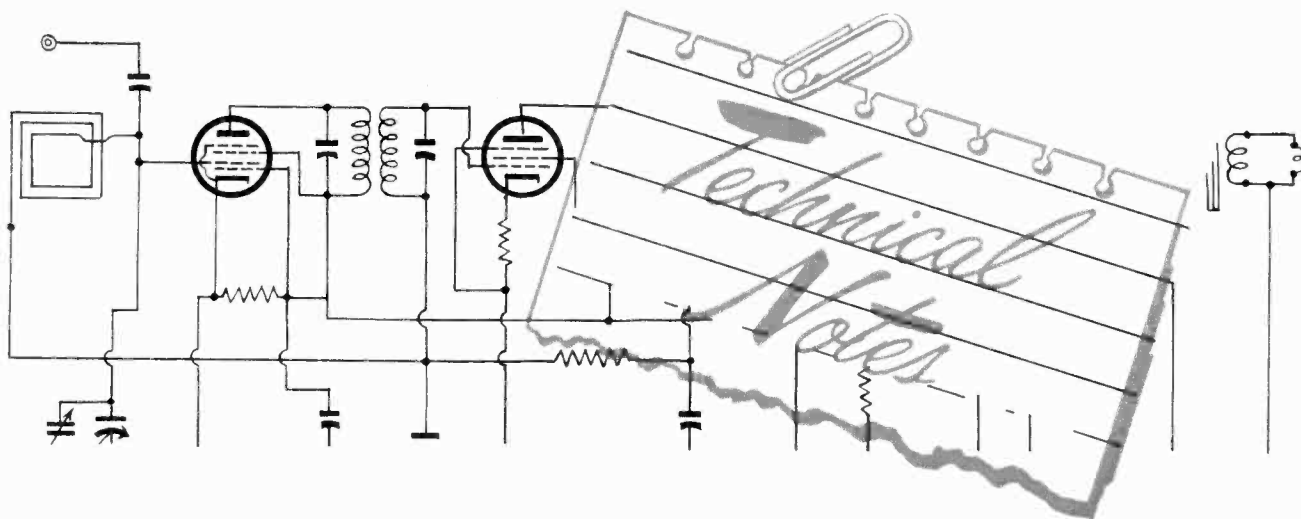
Sponsors of so-called "right-to-work" legislation are still trying to distort statements by Samuel Gompers and Franklin D. Roosevelt to make it appear that the pioneering labor leader and the New Deal President were opposed to the union shop, the National Council for Industrial Peace has charged.

The same distortions were used during the 1958 election campaign and have popped up again in Oklahoma, where the National "Right-to-Work" Committee has been trying—without success—to enact a compulsory open-shop law.

Two years ago, AFL-CIO President George Meany denounced as a "tawdry device" the lifting of a Gompers quotation dealing with the principle of "voluntarism" from a speech on the relationship among unions affiliated with the former AFL. Meany pointed out that Gompers "devoted his life to establishment of the union shop for the welfare and protection of working people everywhere."

Mrs. Eleanor Roosevelt, co-chairman of the Council for Industrial Peace, called the allegation "a shameful fraud on the public." She said:

"A check of my husband's papers, in his library at Hyde Park, will show that no tortured phrase or out of context quote can substantiate such an allegation . . . the American public understands well that Franklin Delano Roosevelt would never have supported such a reactionary doctrine."



Echoes in Space

Two space and communications engineers say a technological skeleton left over from the steam locomotive era is haunting the space age and is causing controversy in discussions of how communication satellites should be floated.

The question concerns "time delay" or echo effect—a question answered nearly four decades ago in ground communication. The two engineers—R. P. Haviland of the General Electric Company's Missiles and Space Vehicles Department, Philadelphia, and A. J. Vadasz of GE's Communication Products Department, Lynchburg, Va.—say the problem has been virtually rediscovered in research under way on relay satellites capable of handling world-wide long-distance traffic.

A joint technical paper by the two engineers was presented recently at the Fifth National Symposium on Global Communications in Chicago. Delivered by Vadasz, the paper indicated that the echo phenomenon will be a powerful consideration in any common user satellite relay telecommunications system designed for the future.

The echo problem will exist, Vadasz said, where satellites are used in duplex telephony—or simultaneous two-way conversation over voice circuits. Due to the time necessary for a voice to travel to its destination and back to the person who is speaking, the returning message causes a perceivable echo. This may compel a speaker to talk at a slower rate, stutter, or to stop completely.

In wire line communications on earth, this problem was ironed out by echo suppressors as early as 1922. With the echo-suppressing technique, the voice line was attenuated in one direction while the lines carried speech in the opposite direction.

In space communications, Vadasz said, fewer satellites are needed for relay purposes when the orbit is at higher altitudes. However, he added, the height at which the satellite orbits has a direct effect on the degree

to which an echo is perceptible. The higher the altitude, the longer the distance the signal travels, the larger the time delay and the greater the echo.

Thus, a relay system orbited at 19,000 nautical miles may require only three space vehicles but would be affected tremendously by the echo problem. A system orbited at 6,000 miles would take more satellites—about 10 in all—but at this altitude the time delay would be less, though not eliminated.

General Electric has proposed a 10-satellite, 6,000-mile relay concept to the Federal Communications Commission. The primary purpose of the system would be to provide world-wide interconnecting facilities for existing national telecommunications networks.

While space scientists are intensifying their research in the world of satellites, new efforts are also being made to resolve newly-encountered phenomena in terrestrial communications.

Another GE engineer, William H. Gentry, Jr., discussed a 690-mile multi-channel communications system in use by the Air Force in the Arctic using over-the-horizon tropospheric scatter techniques. Gentry outlined characteristics of frequency selective fading and differential path delay observed in long scatter paths that are not found in other types of communications and said the industry will need more complex diversity combiner designs in the future to overcome phase and amplitude differences.

Weather Service Radio

Zenith Sales Corporation has announced the new Royal 790 Super-Navigator, a 3-band all-transistor portable radio designed for use by boat owners, fliers, farmers, and all others needing frequent, detailed weather news, plus advance warnings of weather dangerous to life or property.

For safety purposes, the receiver is also engineered to serve either the boatman or private plane pilot as a

self-powered, emergency navigation instrument for homing and cross-bearing orientation on standard broadcast stations, LF range stations and Coast Guard beacons. It has particular value for the instrument-rated pilot in case of two-way radio failure, Zenith states, since it will permit navigation to VFR conditions off airways or, with some practice, permit complete low frequency let-downs by range or ADF techniques.

Highly sensitive and selective, the Super-Navigator provides long-range reception of standard broadcasts on the 540 to 1600 kc band, Federal Aviation Agency and Canadian weather-navigation stations and radio beacons on the long wave (150 to 400 kc) band, plus marine weather stations, ship-to-shore and ship-to-ship communications, time signals broadcast on 2.5 and 5.0 mc from the Bureau of Standards station, WWV, Beltsville, Md., and regular and emergency Civil Air Patrol and amateur broadcasts on the 2 to 5.0 mc short wave band.

Directional characteristics of the Super-Navigator make it possible for yachtsmen to locate the position of boats reporting a good fishing location on the ship-to-shore channel.

Working the radio's 150 to 400 kc LW band, the set owner will be able to get at frequent intervals around the clock "the finest weather service on the air" from a network of several hundred FAA weather-navigation stations. Unlike weather information from standard broadcast stations, FAA weather bulletins give weather conditions recorded within the hour at the reporting stations and up to 14 other stations from 100 to 300 miles away. From time to time as needed, they also report advisories of dangerous weather, including location and movement of squall lines, areas of thunderstorm activity, tornados, etc.

Up until a year ago, these weather navigation stations maintained a regular schedule of broadcasts at 15 minutes after the hour and before the hour during every 24 hour period.

Currently, the FAA is implementing a program in which a total of 87 of these stations will be converted to higher power, and will transmit continuous taped weather broadcasts that you can tune in any time of day or night. Tapes are changed every hour, and oftener if changing weather conditions dictate. They supply a weather summary of frontal and air mass movements for the general area, forecasts for twelve to twenty-four hours ahead, plus specific weather conditions at 10 or 12 stations within the broadcast area. Information includes wind direction and velocity, tem-

TECHNICIANS

Bonus Assignments in Alaska

You are needed to maintain a vital communications system in Alaska. To qualify, you should have experience in the following fields:

ELECTRONICS

At least two years experience in the maintenance and repair of radio communications, microwave, tropospheric scatter, teletype and associated carrier equipment.

COMMUNICATIONS

At least three years experience in the maintenance and repair of cross-bar central office and PBX equipment.

Address inquiries and application to
Marvin R. Weatherly, Bus. Rep.
Local Union No. 1547
414 Denali Street
Anchorage, Alaska

perature, precipitation, visibility and barometric pressure.

As of July 1, 50 stations from Maine to California have been converted to this transcribed service and are described by pilots as "electronic weather bureaus." The total is expected to jump to 86 by the end of 1961.

Compact and weighing only 5 lbs., 6 ozs., complete with batteries, the Super-Navigator carries as easily as many cameras, and fits into close quarters of even the smallest boat or plane.

The radio's tuned RF stage with 3-gang condenser, plus a new Zenith-exclusive IF ceramic filter, assure superior selectivity and sensitivity. A 4-inch Alnico 5 speaker and push pull audio with 500 milliwatts of undistorted power output, give superb tone quality and adequate volume in most boats, planes and automobiles. An earphone attachment, either miniature or standard size, is optional at extra cost for private listening.

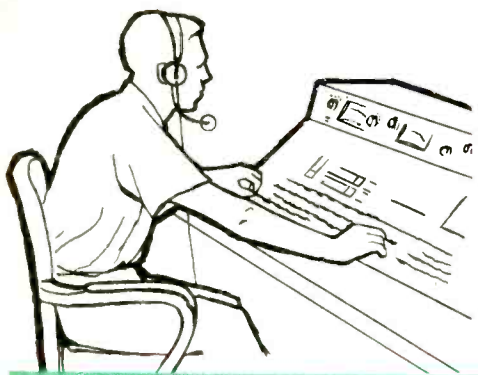
Power source of the receiver is 6 "C" type flashlight batteries that provide up to 300 hours of service before a fresh set of batteries is needed, Zenith stated. The radio's case is genuine top grain cowhide in a licorice black color.

Manufacturer's suggested retail price of the Super-Navigator radio in the U. S. is \$99.95, less batteries.

The 1961 RADIO, TV AND RECORDING DIVISION PROGRESS MEETING

MINNEAPOLIS, MINNESOTA—AUGUST 15, 16, AND 17

Your local union should have representatives at this annual gathering.



STATION BREAKS

Washington's EVT

The Greater Washington, D. C. Educational Television Association, Inc., has awarded General Electric Company a contract to equip its new UHF non-commercial station.

In announcing the broadcast equipment order placed with G-E, Mrs. Edmund D. Campbell, GWETA president, said Channel 26 will begin telecasting October 2 from studios in Arlington's Yorktown High School.

Initially, the station will be equipped with a 12,000-watt UHF transmitter and a five-bay antenna at the former Arlington tower site of WTTG, Channel 5, Washington.

Studio equipment will include three Vidicon camera channels—two for live telecasting and one for film. In addition, G-E will supply two 16 mm film projectors and a slide projector, audio control equipment, switcher, test equipment and monitors.

These telecasting facilities will represent the first phase of construction in a five-year program described by Mrs. Campbell for attaining a "final" type of studio.

Future plans, the GWETA president continued, include a second production center in a different location in the Washington Metropolitan area. This would mean greater convenience for persons participating in the educational programs.

A mobile unit also is included in ultimate plans for the GWETA station. Mrs. Campbell noted that this would mean even more convenience of location and would allow greatly expanded and improved programming.

In addition, she said, the station would be able to broadcast special events of historic significance as well as high school athletic academic contests and competitions. This type of activity will be a tremendous impetus to the sale of converters for home sets so that GWETA's programs can be received at home as well as in the classroom.

Getting a sufficient number of viewers to equip their home sets with these converters is one of the major hurdles facing the association in its efforts to realize maximum benefit from the station.

When Channel 26 goes on the air in October, it will

offer four hours of telecasting for school children each day. In addition, there will be at least one adult program each week.

Initially, the adult series—covering such areas as foreign affairs, safety, childhood education, etc.—will be received in the schools at night for the benefit of those who have not converted their home sets.

The programming for school children the first year will be directed mainly at the elementary level with one junior high course. Also, the new television station will provide in-service training for teachers.

Discussing the coming of educational television to the Washington area, Mrs. Campbell said this instruction method can spread the effect of the superior teacher while providing concrete assistance for the poorer teacher.

Japanese Exports Up

The electronic industry in Japan reached new peaks of production, profit and export during 1960 and, among other items, will build about ten million transistor radios in 1961—most of them for export.

LAST LAUGH



"Now tell me Congressman, doesn't it make sense... by punishing ALL union officers you're sure of getting that .01% who are corrupt."

Technician-Engineer

ALEXANDER BROWDY
1962 S STEARNS DR
LOS ANGELES 34 CALIF
45 BN