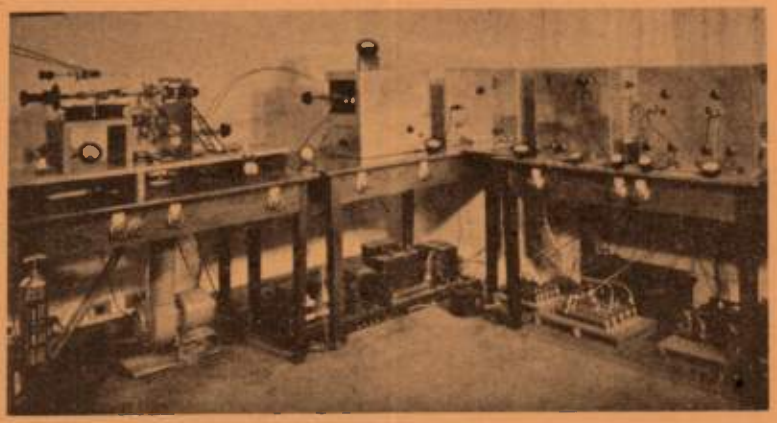
BULLETIN 5015
SEPT. 1, 1946

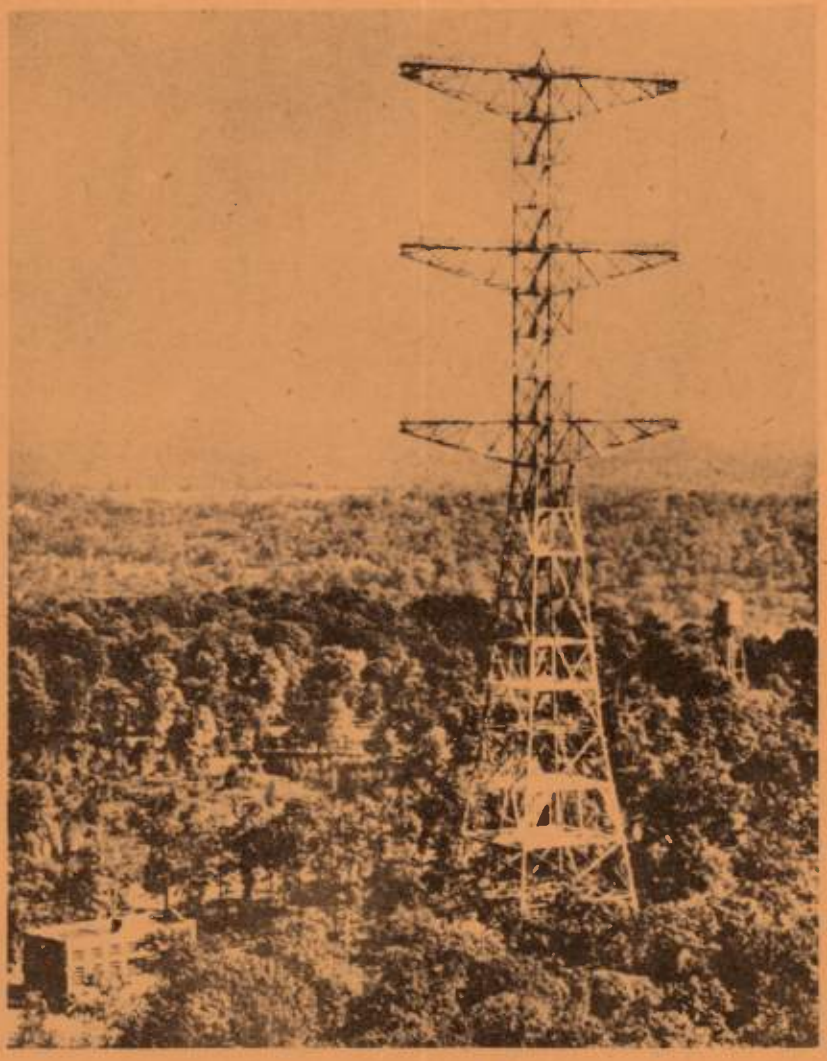
THIS IS FM BY REL

THE PIONEER FM STATIONS

W2XAG YONKERS, N. Y. AND W2XMN ALPINE, N. J.



The tower and a portion of the 117 Mc. F-M Transmitter operated at station W2XAG, Yonkers, N.Y. The apparatus has been in use since November 1935.



An aeroplane view of Major E. H. Armstrong's, 40 KW F-M station W2XMN, Alpine, N.J., equipped with R.E.L. F-M apparatus. The tower is 400 ft. high and has at the present time numerous "turn-stile" antenna systems supported from the cross arms. In service since April, 1938.

REL IN FM

REL built the Armstrong Phase Shift Modulator employed by Station W2XAG in conducting the first public demonstration of Frequency Modulation before a meeting of the IRE on November 6, 1935.

Since that date, 11 years ago, when FM was first publicly unveiled, REL has maintained a fine record as a pioneer manufacturer of FM equipment. As a part of that record, we are the sole manufacturer to have engineered, produced, and installed transmitters in the 50 KW class, on the 42/50 megacycle band. Four stations are, at present, on the air operating successfully at that power and have been continually for a number of years using our equipment.

During the war our entire thought and effort was directed towards the design and production of equipment needed by the Armed Forces. The company's war-time tasks were concluded shortly after V-J Day and then our engineers, who have participated in the development of the FM transmitter art since the beginning, again turned their attention to FM broadcasting problems and have been engaged in designing an extensive line of new FM broadcast transmitters for 88/108 megacycles. All of these transmitters employ the Armstrong Dual Channel Phase Shift method of producing Frequency Modulation. We have found through long experience that there can be no doubt as to the superior worth of this system over any other now known.

It has been, and will continue to be, a company policy to closely follow, step by step, Major Armstrong's inventions and contributions to the art. As a result of pursuing this policy and adding the wealth of our engineering and manufacturing experience, we are able to produce transmitters for the new FM channels that are the finest obtainable today.

TO REL MEANS

UNSURPASSED QUALITY:

REL FM transmitters and associated equipment not only meet all FCC and RMA requirements and proposed standards but exceed them by a considerable margin. Page 4 of this booklet shows how we have approached this problem.

SPECIALIZATION:

The whole effort of our entire organization is directed toward engineering and producing Radio equipment for use in commercial FM broadcasting. This is our sole enterprise. We are engaged in no other activity.

ENGINEERING SUPERVISION:

As a part of our service, an REL engineer will inspect the installation and see that the equipment is properly connected and adjusted, and will instruct the station personnel in the operation and maintenance thereof.

RELIABILITY:

REL stands for Radio Engineering Laboratories, but has always down through the years since 1922, meant RELIABLE ENGINEERING LEADERSHIP!

EQUIPMENT CHECK LIST OF PRESENT REL USERS:

For your convenience, Page 7 of this booklet lists the stations that are presently on the air using REL FM equipment. You will find listed the owners and also the chief engineers concerned.

LEADER AND MOST EXPERIENCED MANUFACTURER:

REL has been building FM equipment for commercial and experimental broadcasting stations since 1935.

FM BROADCAST ENGINEERING CLINIC

Periodically, REL will conduct a one week school period at our plant in New York to which engineers and station owners who use our equipment are invited. Page 5 of this booklet outlines the clinic in detail.

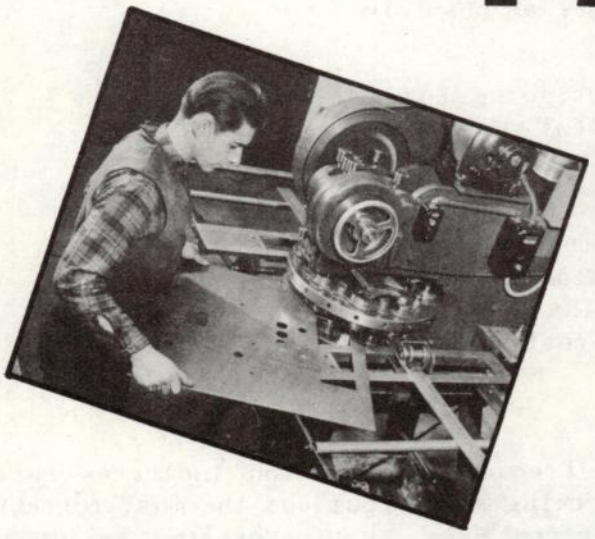
REL PROTECTION PLAN

Our contracts are written to protect the broadcaster in the event that FCC action should cause a change in transmitter power requirements.

SPECIALIZATION

IN

FM



"THE WHOLE EFFORT OF OUR ENTIRE ORGANIZATION IS DIRECTED TOWARD ENGINEERING AND PRODUCING RADIO EQUIPMENT FOR USE IN COMMERCIAL FM BROADCASTING."

BASIC FM DESIGN REQUIREMENTS AS THEY ARE MET BY REL

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From the broadcaster's viewpoint, the major points of interest in the selection of new FM broadcasting equipment are these;

1. It must be designed to meet all FCC requirements in regard to standards of good engineering practice.

2. It is desirable that it meet all of the proposed RMA standards.

3. That it exceed, insofar as possible, every one of the minimum requirements in both cases above.

4. That all this be accomplished in as fool-proof and straightforward a manner as possible.

5. That the mechanical design be such as to permit easy and quick replacement of all components should the need ever arise.

6. That components and mechanical portions of equipment such as cabinets, doors, chassis, and wiring be the best that the state of the art permits without concession to cost.

Past experience by broadcasters in Frequency Modulation indicates quite definitely that these points add up to being able to put out the most reliable signal of the best quality in any given area. FM broadcasting is unique compared to AM broadcasting in that differences in transmission quality can now be heard by the careful listener. This has been borne out by experience in communities with several FM broadcasting stations in operation, from which the listeners could choose.

The engineering of REL equipment has been consumated with all the above important points clearly in mind. The purchaser of REL products may rest assured that any piece of equipment leaving our factory not only will meet the above listed minimum requirements, but in many cases will far exceed them.

REL FREQUENCY MODULATION BROADCAST ENGINEERING CLINIC

In keeping with the high standard of service extended to users of REL equipment we now offer a new and convenient means of keeping engineers abreast of the rapidly advancing developments in the radio art as they apply to FM broadcasting.

The plan is as follows; there will be a one week session periodically at REL to which users of our equipment will be invited. The program will consist of three days of instruction and demonstrations. These will cover elementary and advanced engineering as well as the latest circuits and changes thereto employed in REL equipment. The remaining time will be devoted to a question and answer session and a period has been set aside in which mutual troubles as well as "hints and kinks" can be freely discussed.

The session will be headed by REL personnel, assisted by outstanding engineers in the FM field. The views and thoughts of these guest authorities will tend to broaden the entire aspect of the Clinic.

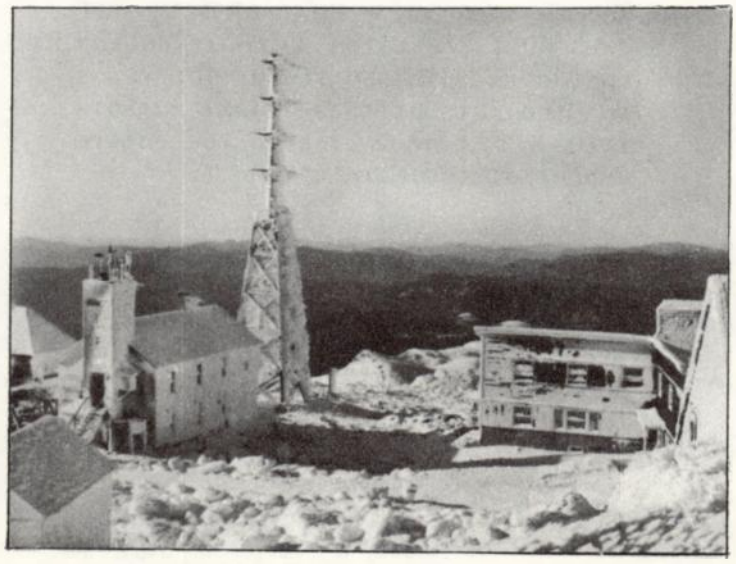
We feel that this service will be of tremendous mutual benefit as it will enable all of us to profit from field as well as factory experience and hence to add to our know-how and to further advance the art.

* * * * * *

PRE-WAR
STATIONS EQUIPPED WITH
REL FM TRANSMITTERS

40 - 50 MC.

STATION	OWNER	POWER	LOCATION
W2XMN	Major E.H. Armstrong	50 KW	Alpine, New Jersey
WENA	The Detroit News	50 KW	Detroit, Michigan
WGTR	Yankee Network	50 KW	Paxton, Mass.
WMFM	The Journal Company	50 KW	Milwaukee, Wisconsin
WMTW	Yankee Network	10 KW	Mt. Washington, New Hampshire.
WFIL-FM	WFIL Broadcasting Company	10 KW	Philadelphia, Pa.
WELD	Radiohio Inc.	10 KW	Columbus, Ohio.
WHFM	Stromberg Carlson Company	3 KW	Rochester, New York
WHEF	WHEC, Inc.	3 KW	Rochester, New York
WNBF-FM	Wylie B. Jones Advertising Agency	3 KW	Binghamton, New York
WNYE	Board of Education City of New York	1 KW	Brooklyn, New York
WQXQ	New York Times	1 KW	New York, New York



View shows WMTW atop Mt. Washington, New Hampshire

POST WAR
STATIONS EQUIPPED WITH
REL FM TRANSMITTERS

88 - 108 MC.

W2XMN WFMN

Route 9W
Alpine, New Jersey

Owned and operated by: Major E.H. Armstrong
Chief Engineer: Perry Osborn
Telephone: Closter 5-1088

WINX W3XO

6th & Eye Streets, NW
Washington, D.C.

Owned and operated by: The Washington Post
Chief Engineer: Ralph Cannon
Telephone: Republic 8000

WDRC-FM

750 Main Street
Hartford, Conn.

Owned and operated by: WDRC, Inc.
Chief Engineer: Italo A. Martino
Telephone: Hartford 7-1186-9

WTIC-FM

26 Grove Street
Hartford, Conn.

Owned and operated by: Travelers Bcstg. Service Corp.
Chief Engineer: H. Taylor.
Telephone: Hartford 2-3181

WENA

4500 Penobscot Bldg.
Detroit 26, Michigan

Owned and operated by: The Detroit News
Chief Engineer: Carl Wesser
Telephone: Cherry 1411

WNBF-FM

Arlington Hotel
Binghamton, New York

Owned and operated by: Wylie B. Jones Advertising Agency
Chief Engineer: Lester Y. Gilbert
Telephone: Binghamton 2-3461

WGTR

Paxton, Mass.

Owned and operated by: Yankee Network 21 Brookline Ave. Boston, Mass.
Chief Engineer: I.E. Robinson
Telephone: Commonwealth 0177

WMIT

Winston Salem, N.C.

Owned and operated by: Gordon Gray
Chief Engineer: Paul Dillon
Telephone: Winston Salem 4141

WIL-FM

Melbourne Hotel
St. Louis, Mo.

Owned and operated by: Missouri Bcstg. Co.
Chief Engineer: Edward Goodbarlet
Telephone: Jefferson 8403

WRCM

Jung Hotel
New Orleans, La.

Owned and operated by: Supreme Bcstg. Co.
Chief Engineer: George A. Mayoral
Telephone: Ca - 6031

WTMJ-FM

Radio City
Milwaukee, Wisconsin

Owned and operated by: The Journal Company
Chief Engineer: Phil Laeser
Telephone: Market 6000

WMTW

Mt. Washington
New Hampshire

Owned and operated by: Yankee Network 21 Brookline Ave. Boston, Mass.
Chief Engineer: I.E. Robinson
Telephone: Commonwealth 0177

WCOY

130 S. Salisbury St.
Raleigh, N.C.

Owned and operated by: Capitol Bcstg. Co.
Chief Engineer: Stanley Brown
Telephone: Raleigh 5411

KTHT

Southern Standard Bldg.
Houston, Texas

Owned and operated by: Texas Star Bcstg. Co.
Chief Engineer: Louis I. Kelly
Telephone: Capitol 6246

WGAL

8 W. King St.
Lancaster, PA.

Owned and operated by: WGAL, Inc.
Chief Engineer: J.E. Mathiot
Telephone: 5252

WMFR

Security Bank Bldg.
High Point, N.C.

Owned and operated by: Radio Station WMFR
Chief Engineer: Gary Davis
Telephone: 4593

RECENT CONTRACTORS FOR
REL FM TRANSMITTERS
88 - 108 MC.

KDPR	Central Louisiana Bcstg. Co. Alexandria, Louisiana	WHAI	John W. Haigis Greenfield, Massachusetts
KWIN	Rogue Valley Broadcasting Co. Ashland, Oregon	WIL-FM	Missouri Bcstg. Co. St. Louis, Missouri
WBBB	Alamance Broadcasting Co. Inc. Burlington, North Carolina	WLEE	Thomas Tinsley Richmond, Virginia
WBT	Southeastern Bcstg. Co. Charlotte, North Carolina	WMFM	The Journal Company Milwaukee, Wisconsin
WCOY	Capitol Broadcasting Co. Inc. Raleigh, North Carolina	WMFR	Radio Station WMFR High Point, North Carolina
*	Capitol Broadcasting Co. Inc. Charlotte, North Carolina	WMTW	Yankee Network Mt. Washington, N.H.
*	Capitol Broadcasting Co. Inc. Greensboro, North Carolina	WNBF-FM	Wylie B. Jones Advert. Agy. Binghamton, New York
WDRC-FM	WDRC, Inc. Hartford, Connecticut	WPAG	Washtenaw Bcstg. Corp. Ann Arbor, Michigan
WENA	The Detroit News Detroit, Michigan	WRCM	Supreme Broadcasting Co. New Orleans, Louisiana
WFAS	Westchester Bcstg. Co. White Plains, New York	WSTP	Piedmont Broadcasting Corp. Salisbury, North Carolina
WGBR	Eastern Carolina Bcstg. Co. Goldsboro, North Carolina	WTIC-FM	Travelers Bcstg. Service Co. Hartford, Connecticut
WGTR	Yankee Network Paxton, Massachusetts	*	The Wyandotte News Herald Wyandotte, Michigan

MUNICIPALITIES AND EDUCATIONAL INSTITUTIONS

City of Cleveland, Ohio
City of Detroit, Michigan
City of Newark, New Jersey
Louisiana State University
University of Wisconsin

* Indicates that call letters have not yet been assigned.

PRICE LIST OF
REL FM BROADCAST EQUIPMENT

TRANSMITTERS

MODEL NO.		PRICES F.O.B. FACTORY L.I.C.
549()-DL	250 watt. Bulletin 5005	$ 4,700.00
518()-DL	1 kw., Bulletin 5006	8,200.00
519()-DL	3 kw., Bulletin 5007	11,800.00
520()-DL	10 kw., Bulletin 5012	21,500.00
521()-DL	50 kw., Bulletin 5011	72,000.00

1. Price includes necessary crystals for any single frequency in the range of 88/108 megacycles, one set of operating and one set of spare tubes.

2. 250 watt and 1 kw transmitters have primary power requirements of 208/230 volts, 60 cycles, 1 phase; 3, 10 and 50 kw. transmitters require, 208/230 volts, 60 cycles 3 phase.

3. If desired, orders for 3, 10, and 50 kw transmitters will be accepted at prices indicated, to be furnished in successive stages as equipment becomes available. 250 watt transmitter is driver for 3 kw, 1 kw transmitter is driver unit for 10 kw, 10 kw is driver unit for 50 kw.

4. All transmitters guaranteed to meet or better FCC requirements for FM broadcast service and applicable RMA standards. All transmitters are covered by REL guarantee against defect in manufacture, materials or workmanship for a period of one year after delivery.

5. Engineering check up of each installation will be made by REL after purchaser has installed, connected and set up the REL equipment ready for operation.

CONSOLES

603	Studio speech input desk console unit, including four pre-amplifiers, two program amplifiers, one monitor amplifier, six	1,250.00

PRICE LIST OF
REL FM BROADCAST EQUIPMENT

CONSOLES (Cont'd.)

MODEL NO.		PRICES F.O.B. FACTORY L.I.C.
	mixers and necessary power supply; capable of handling eight microphones (four simultaneously) two transcription units, six remote lines, two programs simultaneously. Furnished with one set of operating tubes. Bulletin 5009 1. Supplied for operation on 115 volts, 60 cycles, 1 phase. 2. Includes provision for two additional pre-amplifiers at slight additional cost.	
604	Transmitter site operating console desk unit, including one pre-amplifier, one program amplifier, Model 600 Frequency and Modulation Monitor built in, transmitter operating controls, and Model 643 pre-emphasis unit. Furnished with one set of operating tubes. Bulletin 5010 1. Supplied for operation on 115 volts, 60 cycles, 1 phase.	$1,880.00
	MONITORS	
600	FM Frequency and Modulation Monitor in a vertical metal floor stand cabinet.	850.00
600T	FM Frequency and Modulation Monitor in a metal cabinet for table top use.	830.00
600R	FM Frequency and Modulation Monitor, less cabinet for standard relay rack mounting. (Model 600, 600T and 600R; Bulletin 5008) 1. Price includes necessary crystals and factory adjustment to any single frequency in the 88 to 108 megacycle band, one set of operating tubes. 2. Approved by FCC in their letter of June 7th to REL (no approval number required). 3. For operation on 115 volts, 60 cycles, 1 phase.	830.00

PRICE LIST OF
REL FM BROADCAST EQUIPMENT

ACCESSORIES FOR MONITORING EQUIPMENT

MODEL NO.		PRICES F.O.B. FACTORY L.I.C.
600AMP FOR USE WITH MODEL 600	Audio Amplifier with power supply open chassis for mounting on shelf of Model 600, output 10 watts. Includes one set of operating tubes.	$145.00
600AMPR FOR USE WITH MODELS; 600T & 600R	Audio Amplifier with power supply for rack mounting using 19" standard panel, metal dust cover. Output 10 watts. Includes one set of operating tubes. (Model 600AMP and 600AMPR; Bulletin 5008)	160.00

ANTENNAS

642	REL three element turnstile antenna, power gain - 2, less transmission lines. Bulletin 5016	680.00

NOTE: Model 642 Antenna uses open transmission line for feeding. Other turnstile antennas for use in conection with coaxial lines can be supplied as follows.

Special Models

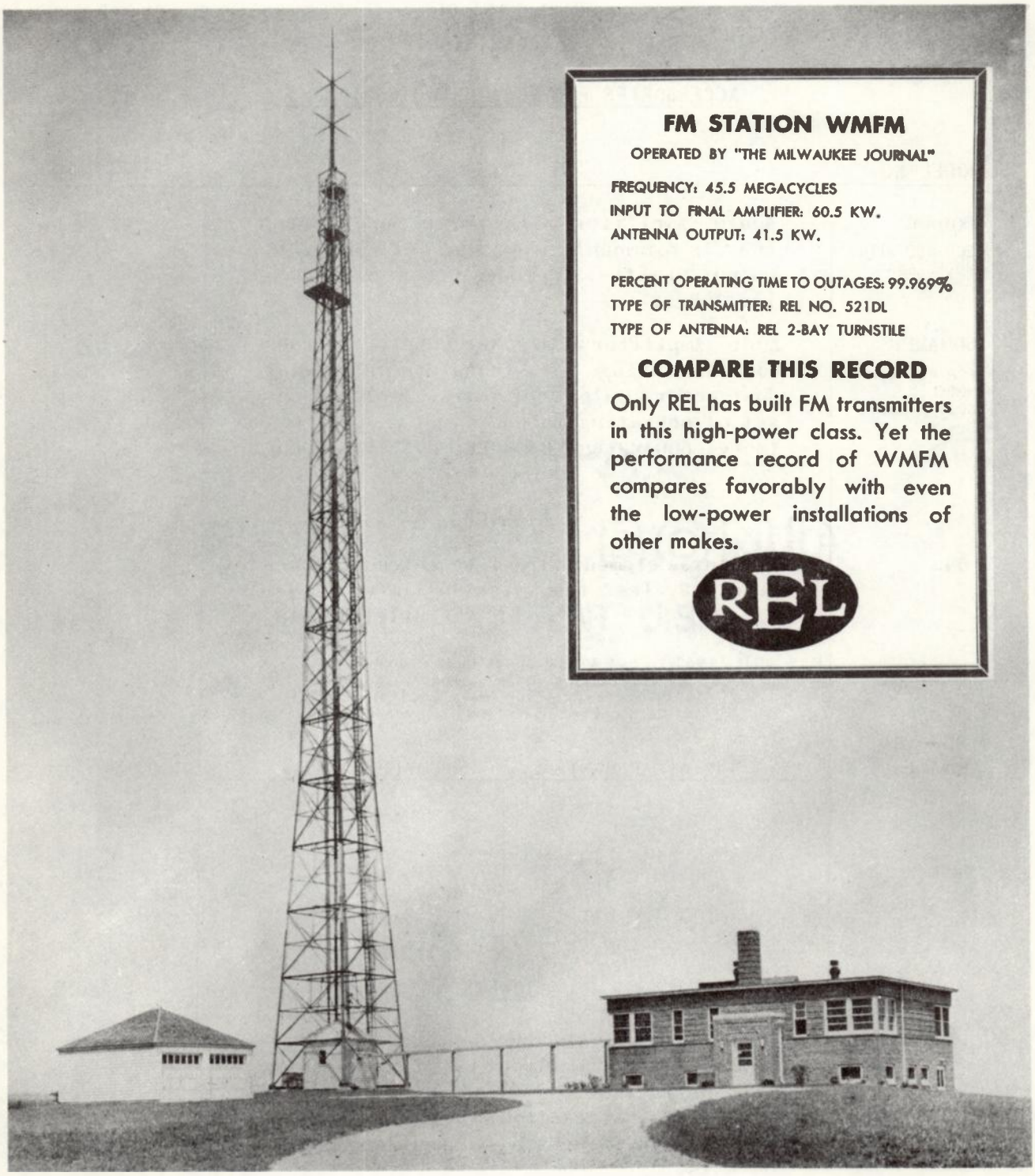
No. of ELEMENTS	POWER GAIN
1.	0.50
2.	1.20
4.	2.50
6.	3.80
8.	5.20

PRICES OF THESE ANTENNAS WILL BE FURNISHED UPON REQUEST.

TOWERS

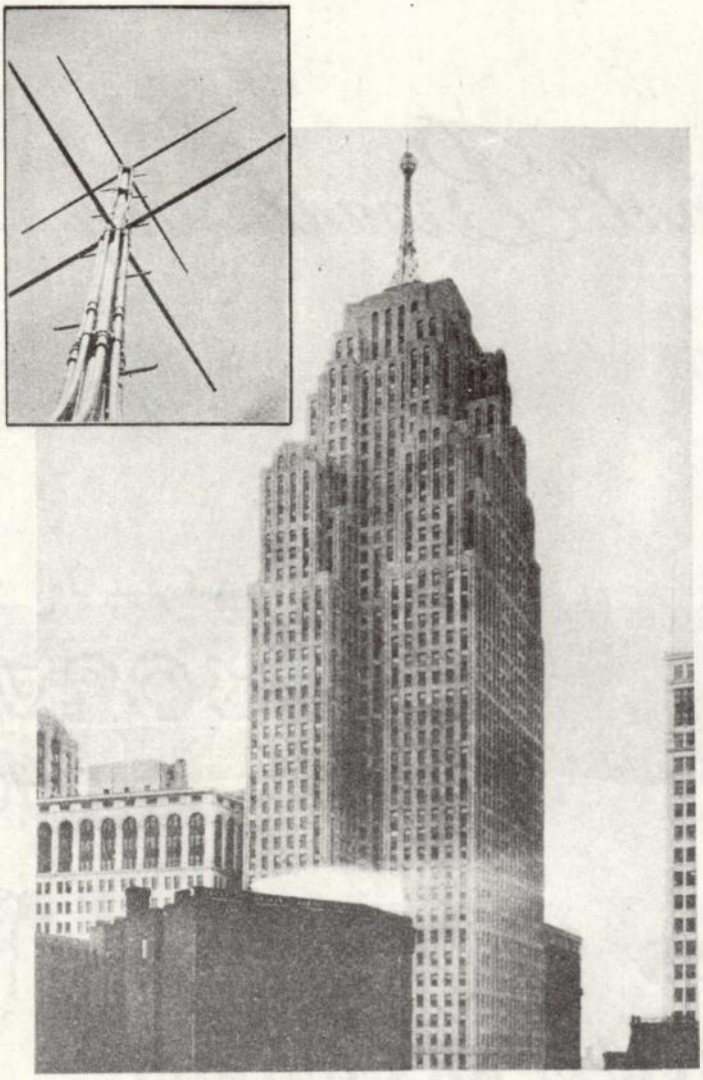
Prices on towers are dependent upon individual requirements of height and type of construction. As these conditions vary for each installation, REL will furnish prices upon request, accompanied with full details.

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE



Station WMFM is under the management of Walter J. Damm, one of the pioneers of FM broadcasting. This transmitter operates in conjunction with *The Milwaukee Journal*'s Radio City which ranks among the finest radio installations in this country.

The demonstrated dependability and efficiency of WMFM and many other REL transmitters definitely establishes the superiority of the Armstrong Phase Shift method of frequency modulation employed in REL transmitters of all power ratings.



HIGH-POWER FM SKYSCRAPER INSTALLATIONS

THE first high-power FM transmitter to be installed atop a skyscraper is the 50-kw. REL model 521 equipment, completed in October, 1941 for the Evening News Association in the Penobscot Building, Detroit — first FM station in Michigan.

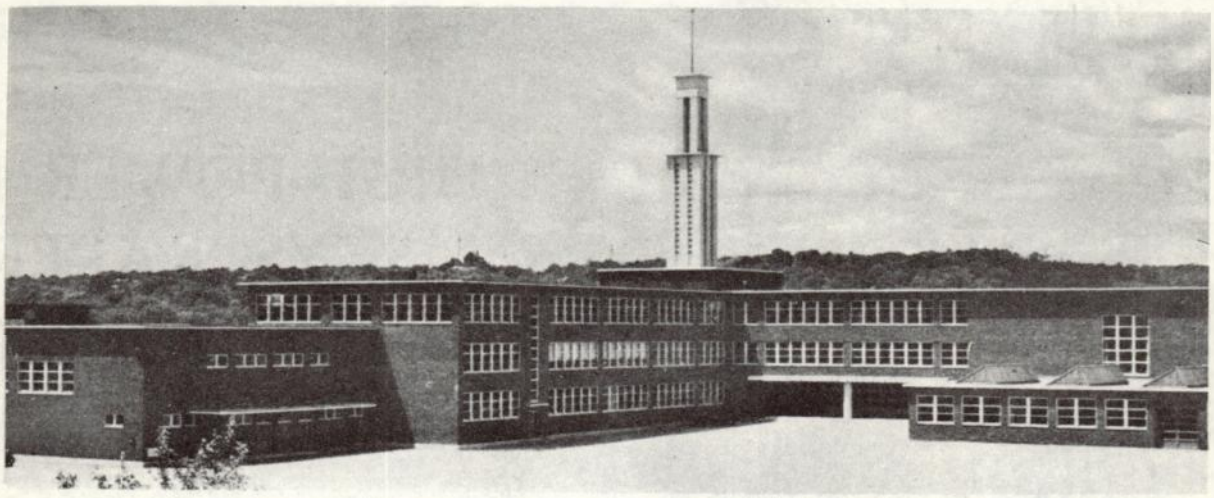
To those who do not have suitable high ground available, and must therefore use a tall building to obtain sufficient antenna height, WENA (formerly W45D) is of special interest.

Primary power equipment is installed in the basement. The 3-kw. REL driver and the 50-kw. REL amplifier, together with the speech and control equipment, are on the 45th floor, where the studios and offices are located. On the 46th floor are the water circulating pumps, filament motor-generator, and gas tanks for the transmission line. Phasing and matching section for the antenna is on the roof. A 2-bay REL turnstile is mounted above the ball at the top of the tower, as the illustrations show.

This is probably the most difficult installation that any manufacturer of radio transmitters has been called upon to make. To REL engineers, it was another opportunity to apply our unequalled background of experience. The highly successful performance of WENA over a period of nearly three years is proof that the job was well done.

Such is the engineering service available to all purchasers of REL Frequency Modulation transmitters and associated equipment.

Educational Broadcasting



FM goes to school!

...but in the role of an Educator!

FM has been chosen as the ideal method for Transmitting Educational Programs. The Federal Communications Commission has assigned special FM Frequencies for the exclusive use of schools and colleges of this country. Boards of Education of large cities have already broadcast, by Frequency Modulation. regularly scheduled educational programs.

REL has been the pioneer in FM Educational Stations, having furnished and equipped WNYE (NYC) and WBOE (Cleveland). This added to our background of numerous successful installations of 1 to 50 KW Commercial FM Stations, has ideally equipped us to serve Educational Groups interested in FM.

REL

RADIO ENGINEERING LABS., INC.

35-54 Thirty-Sixth Street Long Island City 1, N. Y.

REL is presently engaged in the manufacture of a complete line of FM Broadcast Transmitters and associated equipment, as described below:

MODEL NO.	DESCRIPTION	BULLETIN NO.
549()-DL	250 Watt Transmitter	5005
518()-DL	1 KW Transmitter	5006
519()-DL	3 KW Transmitter	5007
520()-DL	10 KW Transmitter	5012
521()-DL	50 KW Transmitter	5011
600	Frequency & Modulation Monitor	5008
603	Studio Speech Console Desk	5009
604	Transmitter Site Speech Console Desk	5010
642	3 Element Turnstile Antenna	Dwg. T-288

REL WILL BE GLAD TO FURNISH ANY OF THE ABOVE BULLETINS ON REQUEST.

REL SALES ENGINEERING OFFICES

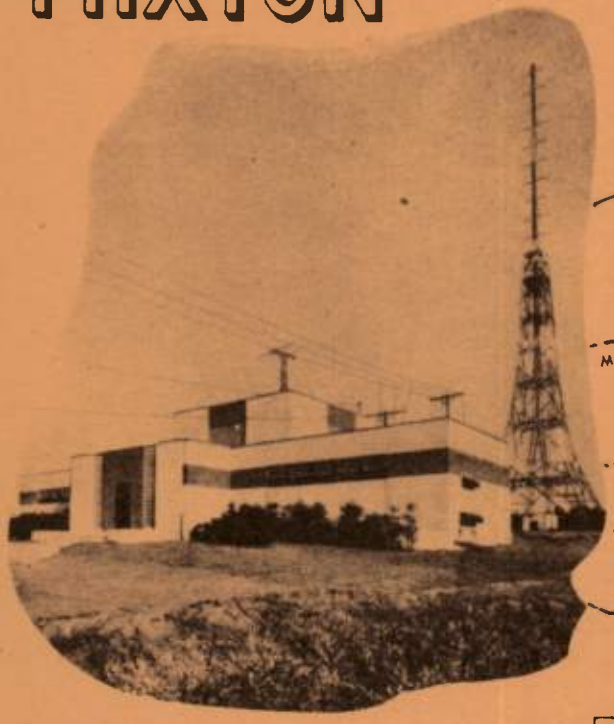
	NAME AND ADDRESS	PERSON	TELEPHONE NO
MIDWEST	REL Equipment Sales, Inc. 612 North Michigan Avenue Chicago 11, Illinois	Ralph B. Ritter Edward F. Classen Russ R. Diethert	Superior 9109
PACIFIC COAST	7422 Melrose Avenue Hollywood 46, California	Norman B. Neely Louis G. MacKenzie	Whitney 1147
MICHIGAN	2040 Grand River Ave. W Detroit, Michigan	M. N. Duffy	Cherry 2270
SOUTH EAST	1008 Wellington Road High Point, N.C.	John F. Bivins David Cauldwell	51409
SOUTH WEST	Jung Hotel New Orleans, La.	Dr. G. A. Mayoral Stanley Ray	Ca. 6031
CANADA	Rogers Majestic, Ltd. 622 Fleet Street West Toronto 2B Ontario, Canada	R. M. Brophy S. G. Paterson	Waverly 1011
EXPORT	Radio Engineering Labs., Inc. 89 Broad Street New York 4, N.Y.	Ad. Auriema V.T. Allen	Bowling Green 9-7751

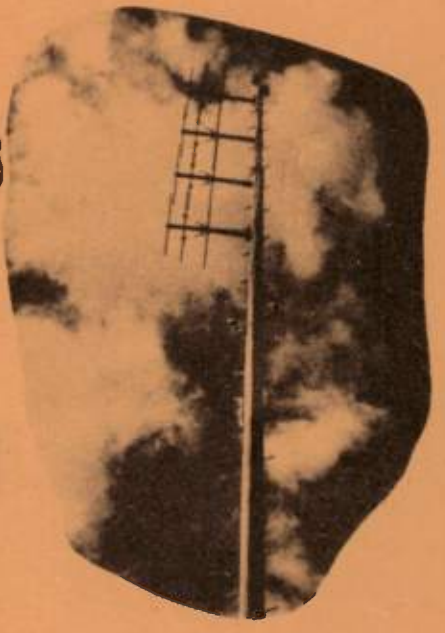
REL

PAXTON

FIRST WITH F.M. RELAY!

(S.T.L.)





BOSTON

F. M. relay operation...offered by others as a possibility...is already an REL accomplishment of proven reliability.

● For five years, the first studio-to-transmitter F. M. relay ever to be installed has been in continuous practical operation by the Yankee Network *without wire connections* between studio and transmitter. Programs originating in Station WEOD, located atop the Buckminster Hotel, Boston, are relayed to Station WGTR 50 kw, also an REL installation in Paxton 43 miles distant, over two hill-ranges and beyond line of sight.

Yes, REL has in back of its organization five years of practical operation—in F. M. relaying, a field generally regarded as one for future development. REL has again established a scientific precedent . . . and continues to energetically and successfully lead the field in radio pioneering!

REL equipment in this installation consists of 250 w., S-T link transmitter operating on 156.75 mc.

PIONEER MANUFACTURERS OF FM TRANSMITTERS EMPLOYING ARMSTRONG PHASE-SHIFT MODULATION

RADIO ENGINEERING LABS., INC.

35-54 Thirty-Sixth Street Long Island City 1, N. Y.