

RADIO FREE EUROPE'S Broadcast Operation

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Part One
RFE Installations
in Germany

This article, we believe, will be of interest to broadcasters not only because Radio Free Europe has been in the headlines recently but also because American personnel supervise the operation of this king-size radio system. Broadcasters who have toured the RFE installations in Europe have found them just as interesting as we did on our trip some months ago. At that time we met quite a few broadcast engineers from the U. S. A. who are in key supervisory positions for the RFE in Portugal and Germany. These engineers and their families were quite enthusiastic about their experiences outside the States.

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Radio Free Europe was organized in December 1949, to broadcast to the Communist-dominated satellites in Central and Eastern Europe. From transmitters in Germany and Portugal, RFE beams news, information, commentary and a variety of other programs to Poland, Czechoslovakia, Hungary, Bulgaria and Rumania. For twenty hours a day, programs are transmitted to all major groups within these countries. Political, economic and spiritual issues are stressed, with the primary purpose of giving the true facts about events in the listeners' own country and the free world. Twenty-two powerful transmitters and an extensive radio relay system are employed to accomplish this goal. Sources of information for the news programs include a huge monitoring system for listening in on Iron Curtain stations, a staff of correspondents and a group of evaluators. A staff of devoted, locally well-known exiles write the programs and act as talent and announcers to give vitality and validity to the Voice of Freedom broadcasts. The management of RFE, and supervision of technical operations, is American.

Appropriately enough, on July 4, 1950, in the woods of Lampertheim, near Frankfurt, Germany, the Voice of Freedom was born. At that time the National Committee for a Free Europe, organized by a group of public-spirited American citizens, first started beaming local language programs to peoples in the satellite countries. With the support of contributions from interested Americans to the Crusade for Freedom, a mobile RCA 7500-watt transmitter, studio and supporting facilities housed in several trailer vans had been procured. In 1951 five additional high-power radio transmitters were added at fixed locations in Germany. Then the mobile transmitter



Schubertova and Sasek, Czechoslovak broadcasters for RFE, produce "In the Mood", a cultural program of music and poetry.

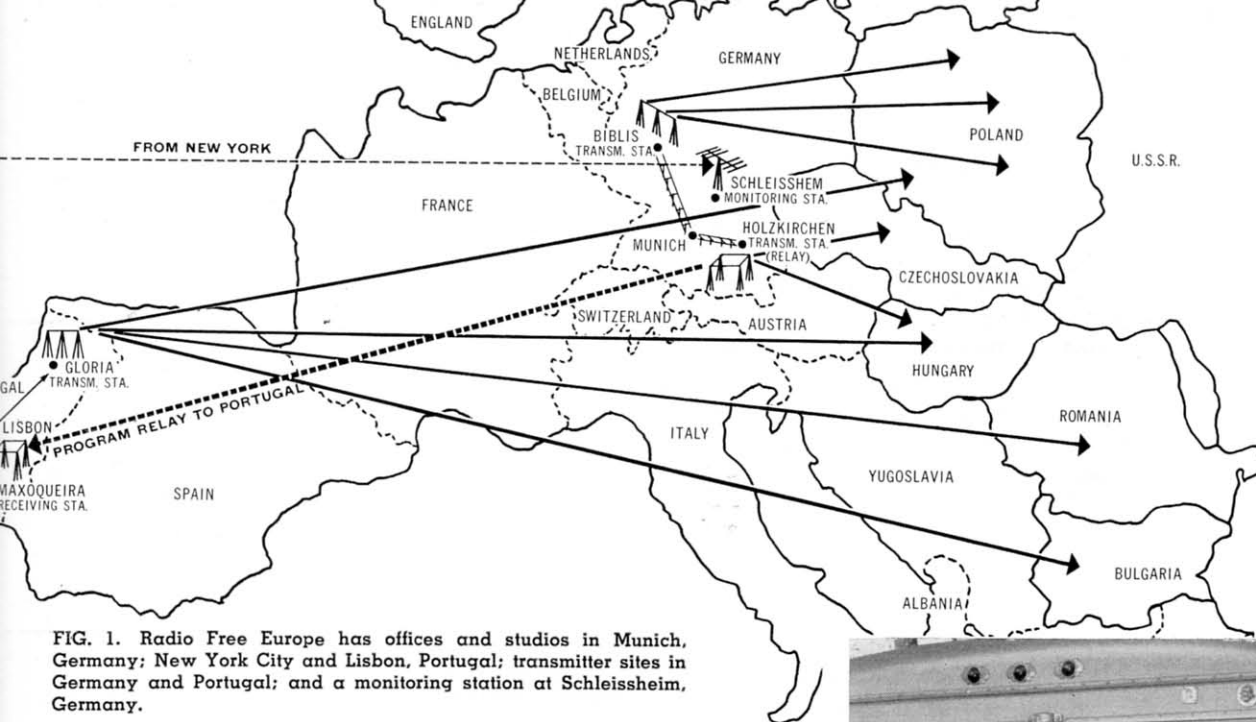


FIG. 1. Radio Free Europe has offices and studios in Munich, Germany; New York City and Lisbon, Portugal; transmitter sites in Germany and Portugal; and a monitoring station at Schleissheim, Germany.

was transported to Portugal, where it became the first transmitter at what is now one of the largest transmitting plants in the world.

New York Headquarters

New York City is the news center and administrative headquarters for the RFE operation. Under Mr. W. J. Convery Egan, Director of RFE, an executive staff heads programming, policy, information, administration, engineering and supporting activities. Controls for all phases of the operation reside here.

Facilities at New York include several studios for program preparation, since about 10 per cent of programs originate here. All programs are produced in the languages of the target countries. This material goes to RFE in Europe via Press Wireless or is put on tape and flown over. The programs coming out of New York are primarily international commentaries and news, plus some music and entertainment programs.

Under Mr. Claude M. Harris, Director of Engineering, technical policy is determined, plans are drawn up, and equipment and maintenance supplies are purchased. Also, together with the Munich office, studies are made of monitoring reports, sunspot activity and ionospheric conditions in order to select the best frequencies for use in the transmitting schedules, which are revised periodically.

Two 2-way radio teletype channels are in use Monday through Saturday via Press Wireless for six hours daily to send news, scripts, and program material from New York to Munich. In the other direction, operational data, monitoring information, and scripts are transmitted. In addition there is an international teletype circuit via RCA Communications for sending administrative messages.

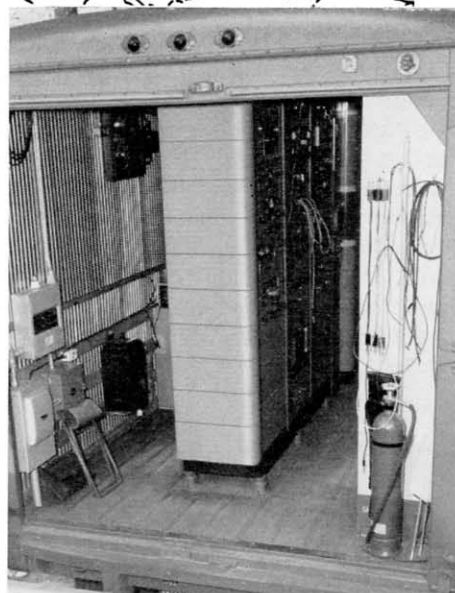


FIG. 2. Close-up of transmitter unit of original RFE radio station procured from RCA which is installed in seven tractor-trailer units.

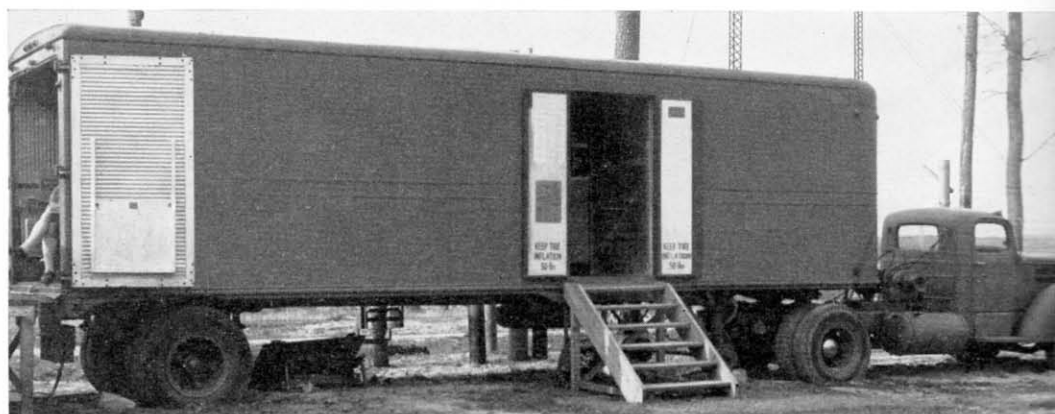


FIG. 3. Original RFE transmitter in the woods of Lampertheim, near Frankfurt, Germany. Here the "voice of freedom" was born on July 4, 1950.



FIG. 4. Original RFE radio studio and control room on wheels, in Germany. It occupied one tractor of the seven-tractor broadcast station.



W. J. Convery Egan, Director of Radio Free Europe.



Claude M. Harris, Director of Engineering for Radio Free Europe.



Russell E. Geiger, Assistant Director of Engineering for Radio Free Europe.

Developing the Program Format

The Mission

RFE is private initiative and enterprise applied to fighting Communism, and in doing so, protecting the security and liberty of the United States. Many learned during the war that the most potent force is spiritual; that the appeal to men's minds produces a dedication which surmounts every trial and test until victory is won. To toughen, strengthen and fortify such dedication to the cause of freedom—without inciting violence or bloodshed—is the mission of Radio Free Europe.

The Technique

In order to carry out a program of such scope, RFE realized that a new approach, utilizing original techniques, should be adopted for its strategic target area centered between the great land mass of the Soviet Union and Western Europe. In a short time, experimentation proved that RFE could most effectively deliver its message if it spoke with the voice and authority of freedom-loving exiles who had escaped from behind the Iron Curtain. Therefore, RFE developed what is, in

effect, a network of stations: The Voice of Free Czechoslovakia, Free Hungary, Free Poland, Free Rumania and Free Bulgaria.

Programs cover a range of subjects equal to any domestic radio station. Special programs are designed for youth, workers, intellectuals, farmers, women, scientists, military men and even Communists. Of primary importance is RFE's practice of providing truthful news and information for its listeners. News and information that is suppressed or delayed by the regimes is broadcast daily by RFE, so that the people may know the unvarnished truth. The Voice of Free Poland becomes, in effect, the *true* Radio Warsaw when RFE's Polish staff speaks to their listeners as friends and fellow countrymen.

News and Information Service

RFE maintains a staff of correspondents wherever news may first become available. In Munich, this steady stream of information is evaluated by trained analysts. Communist newspapers and periodicals from the target countries are studied

daily, and RFE monitoring sections listen day and night to at least 35 Communist stations in the satellites and the Soviet Union. To further bulwark news coverage, the RFE Central Newsroom operates on a round-the-clock, seven-day-a-week basis, feeding 250,000 words of Western and satellite news each day to the language desks.

Evaluation and Research

An Evaluation and Research Section compiles a great storehouse of information, on which Programming depends for most of its material. There is a total staff of some 100 persons, engaged in the Evaluation and in the Research and Library subsections.

The first source of material is the sixteen field offices of RFE, some situated close to the Iron Curtain, like the Austrian and the Berlin bureaus, others at more remote places specially suited for the collection of first-hand information from visitors of satellite countries such as the ports of Hamburg and Istanbul and some in greater or lesser capitals like London, Paris or Stockholm. It is these field offices which provide the live contacts with the popula-

HOW RFE PROGRAMS ARE CREATED

- I. INFORMATION REPORTS
From 15 RFE Bureaus
- II. MONITORING of Regime
Radio Stations and Soviet
and Satellite News Services
- III. NEWS From Wire Services
- IV. NEWSPAPERS, Books and
Magazines



FIG. 5. First-hand report from Czechoslovakia. RFE reporter (right) interviews escapee while his story is recorded on tape for broadcast. Refugees and travelers from behind the Iron Curtain are interviewed regularly.

tion of "captive nations." Reports reach RFE to the tune of something like 1200 a month.

The Evaluators work patiently through the reports, checking them line-by-line against their accumulated knowledge. Apart from factual checks, every Evaluator has to lead a double life—a physical one in Munich, an imaginative one in his own captive country, so that he can instinctively spot anything which is at variance with the picture he has—and keeps fresh through his work—of the country from which the refugee, or visitor, has come. The factual information at his disposal is enormous. Hungarian Evaluation, for example, with a staff today of two evaluators and three researchers, has built up a registry of 56,000 individual or biographic cards, and 20,000 "collective cards," which give a detailed breakdown of individual factories, kolkhozes, Party units and so forth, from the top down to the smallest cell.

RFE Monitoring

The Monitoring Section constitutes the ears of RFE's Program Desks. By listening to the home transmissions of radio stations

behind the Iron Curtain—that is, the broadcasts which the Communist regimes beam to their own people—RFE gleans a great deal of information about the internal situation of the satellite countries, the propaganda tactics of the Communists and, by reading between the lines, the reaction of the people.

It is one of the wonders of modern engineering skill that so many of the self-revealing local broadcasts are heard, because in most cases the Iron Curtain stations are not concerned with reaching beyond their own borders—whereas American equipment and techniques have enabled RFE to "pull in" stations from great distances. This is of great importance because the local flavor of these broadcasts spell something to the exiles who are working in Munich formulating the Free World's answer to them.

At present 35 Curtain stations are monitored regularly, 4 to 6 others on a spot basis. In the course of a week 12 languages will be used. The daily intake by aural monitoring reaches 50,000 words and on some heavy days the total monitoring intake (including news services, monitored mechanically) is more than 200,000 words.

Program Schedules

Sufficient programs are prepared for 21 hours of daily broadcasting to Poland, Czechoslovakia, Hungary, and a lesser amount to Bulgaria and Rumania. A typical program day runs from 4:55 a.m. to 12:20 a.m. the following day, a total of 19 hours and 25 minutes. When developments make it necessary or desirable, RFE extends this broadcast schedule and has even run for 24 hours round-the-clock for days at a time. Newscasts are made on-the-hour for ten minutes. Most programs other than news are put on tape prior to broadcasting. At midnight each day a "saturation" effect is achieved by beaming all transmitters on one target.

From Germany and Portugal programs are beamed behind the Iron Curtain by 22 transmitters. During the entire broadcast day all programs are on several frequencies. For example, in Poland a listener can get RFE on eight different channels, seven in Hungary and seven in Czechoslovakia. This makes the task of jamming by the Communists difficult, very expensive and quite impossible to achieve. The opposition uses 1200 jammers in attempting to counteract the RFE broadcasts.



FIG. 6. Information received is carefully processed by staff of evaluation experts, translators, etc. Writer-producer-talent teams transform this source material into 184 hours of original programs weekly.



FIG. 7. The program fare consists of newscasts, political commentaries, group programs, and feature programs. Illustrated here in a Munich studio is a Hungarian newscaster.

**Broadcast over
22 transmitters
in Germany
and Portugal**

RFE Technical Facilities

Radio Free Europe's physical facilities are scattered over the European map in order to take best possible advantage of differences in propagation paths and conditions. In order to conform to the known short-wave listening habits of the satellite audience, it is considered necessary to broadcast on the 49, 41, 31, 25, 19, 16 and 13 meter bands. With locations in Germany and Portugal, it is possible to present a good signal to most of the target areas on nearly all of the above bands at one time. The listener is thereby assured of a good signal level on each of the short-wave bands capable of propagating a signal.

Antenna Systems

With five specific well-defined target areas to cover, RFE has designed and constructed antenna systems which radiate maximum power at the required horizontal and vertical angles and with optimum conical beam width, thereby insuring the delivery of high-intensity signal levels throughout the target areas. The power

gain of the short-wave antennas varies from 10 times for those relative wide-angle systems located near the target areas to 56 times for those narrow-angle systems located more than 1200 miles from the target areas. Both horizontal broadside curtains and high-gain rhombic antennas are used.

Most of the high-gain curtain antennas are designed for use on two adjacent broadcast bands and many are slewed electrically through twenty degrees azimuthal range so that any target area can be effectively covered with a radiation system tailored to the requirement. In order to achieve maximum flexibility, extensive antenna switching systems have been installed so that transmitters can be directed to any target area.

Frequency Allocations

Propagation experts in New York and Munich study and determine the choice of frequencies for best accomplishing objectives. A schedule of proposed frequency

TECHNICAL FLOW CHART FOR A TYPICAL



FIG. 8. RFE American producer listens as staff talent brings a play, "The Voice of the Turtle," to life at Munich studios. Program is tape-recorded in Production Studio and on day of scheduled broadcast, tape is delivered to Air-shift Studio for the specific language to be used.



FIG. 9. Newscasters give latest news live every hour on the hour to countries behind the Iron Curtain. . . . Newscasts, and other topical programs, are done live from speakers' rooms (announce booths) adjoining the control room in the airshift studios.

assignments is worked up in Munich and New York for use in Germany and Portugal. After agreement is reached, the schedule becomes effective for a period generally ranging from two weeks to one month.

Relay Transmitters

In the U. S. A., most radio stations are linked together by commercially available program lines, however, in Europe there are no program lines from Germany to Portugal. Therefore, RFE had to devise a system whereby its programs could be relayed by radio. In Germany, six 10,000 watt transmitters were installed which beam programs to Portugal, where they are picked up on triple-diversity receivers and then broadcast to the target countries. In order to obtain the best results over the relay, in case of either jamming or poor propagation conditions, program material is sent over two basic trunk circuits. In other words, the six relay transmitters are split up into two groups of three, each

of which acts as a communication trunk line for relay material. At the receiving terminal the best transmission of the three is selected for broadcast or recording. As many as 84 frequency changes are requested and made per day on these six transmitters in order to maintain the best reception conditions.

Technical Effectiveness

One of the first questions that a thoughtful person asks is, "How effective is RFE? Are they being heard through the jamming?" Let us say that of course RFE encounters jamming on some of the broadcasts, but the natural laws of propagation, plus careful system planning and operation by the RFE engineering staff, prevent the opposition from being wholly successful.

RFE maintains three separate monitor receiving sites, each of which makes two readings per hour on each of the target transmitters throughout the 20-hour broadcast day. Berlin reports on Polish and

Czech transmissions, Vienna on Czech and Hungarian programs, while Istanbul monitors RFE Hungarian, Rumanian and Bulgarian broadcasts. The reception results of each individual station are put into graphic form, which shows at a glance the daily intelligibility of each transmitter over a two-week period.

These reception data are also put into still another form. Each of the hourly readings of all radio stations of each language network are put onto an IBM punch card. From these individual cards an average is made for an entire monthly period, as an example the report summary might read as follows: Of all eight Polish transmitters as monitored in Berlin, the listener could hear the RFE Polish language program at any time of the day or night on one or more frequencies, with an intelligibility and signal strength of "fair" to "good" 92 per cent of the time. Over a period of years it has been found that the average of all language services varies in effectiveness between 85 and 100 per cent.

BROADCAST



FIG. 10. Master control at Munich Studios feeds program signals to transmitters for target countries. (This unit was designed and built by RFE engineers.)

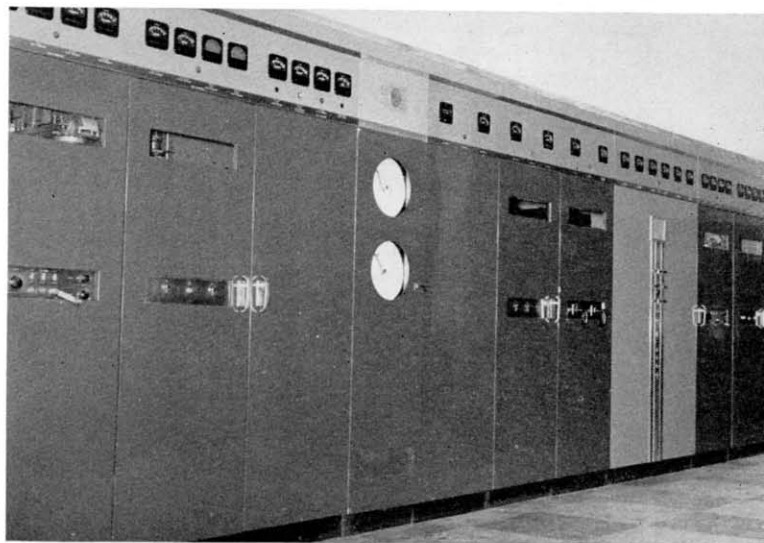


FIG. 11. At transmitter center in Germany nine broadcast transmitters are used. Shown here is part of two RCA 50-kw transmitters used in this area.

FIG. 12. At the transmitter center in Portugal 13 broadcast transmitters are used to beam programs to target countries. Shown here is the main transmitter hall housing eight RCA 50-kw transmitters.





FIG. 13. RFE installation in Munich, which houses 21 studios and 20 control rooms besides monitoring, engineering, programming and administrative facilities. Broadcasts emanate here for Czechoslovakia, Hungary, Poland, Rumania and Bulgaria.

RFE Operations in Munich

In the English Garden section of Munich are located the European headquarters of Radio Free Europe. Here the great bulk of the programs are prepared, while other programs are produced in New York. Here also operations are co-ordinated with Portugal. The RFE headquarters building in Munich houses administration offices, studios, program and monitoring facilities.

The radio equipment for monitoring, relaying and transmitting are located at Schleissheim, Holzkirchen and Biblis, respectively. Schleissheim, some seven miles from Munich headquarters, is the primary listening post of RFE. Here are located the antenna system and sensitive receivers for prying behind the Iron Curtain into centers such as Prague, Warsaw, Sofia and Bucharest. Holzkirchen, 17 miles from Munich, is the home base of the relay system connecting Germany and Portugal, to co-ordinate broadcasts of the same program, via short-wave and medium-wave transmitters in Germany and short-wave transmitters in Portugal. Here is located the 135-kw medium-wave transmitter which broadcasts to nearby Czechoslovakia. Biblis, 200 miles from Munich, is the location of eight powerful transmitters

that beam broadcasts from Germany directly to the target areas.

Technical Monitoring

Monitoring operations at Munich are divided into two phases: Technical and Content. Technical monitoring is an engineering function while Content monitoring is a programming function. The International Shortwave bands of 49, 41, 31, 25, 19, 16 and 13 meters are monitored. Under Mr. Vincent J. Skee, Manager of Technical Operations, a master control room receives all signals from Schleissheim and distributes them to the various content monitoring rooms. In a technical monitoring control room are receivers used by the technical monitor operators engaged in their tasks. Charts are issued at regular intervals showing who is on the air, when, and at what frequency. Sources monitored include BBC, VOA, Armed Forces Network, Western as well as Iron Curtain stations. From these charts "open" frequencies and times are revealed which help provide data for future scheduling of transmitter frequencies. Thus, the technical monitors uncover the open slots into which RFE can insert programs for broadcast to target areas.

Content Monitoring

A typical content monitoring area consists of two rooms equipped with recorders and typewriters as well as the listening facilities. Audio comes from master control into a distribution box at which the content monitor can premonitor the various signals before selecting one for recording.



FIG. 14. Cardinal Spellman is one of the distinguished visitors who annually make pilgrimage to Munich and appear as guest speakers to the radio audience, encouraging both the RFE staff and the audience behind the Iron Curtain.

The content monitor is primarily an editor in a specific language. He is an eavesdropper on what the Communist regime is putting out for local consumption. The information is typed and immediately forwarded to the policy room for use in preparing programs.

Programming

The information gathered by the content monitor enables the political advisory staff to prepare effective programs such as "The Other Side of the Coin." This program refutes the statements put out for local consumption by satellite governments, showing how untruthful they are when compared to official news agency statements. Refugee personnel are the key figures in the program preparation. Around them revolves the successful application of the Freedom Crusade principle. They are usually well-known figures in their own countries and thus establish themselves as reliable commentators. There are 28 of these people at Munich and another 20 or so at the Schleissheim monitoring center specializing in program work for their respective countries.

Munich Studios

There are a total of 21 studios and 21 control rooms in Munich. The studios divide into two general types: Air-shift studios and production studios. The air-shift studios are the "live" studios. (There is one for each language. Air-shift studios connect directly to the transmitter and relay stations through master control room.) Production studios are used for

preparation of the programs—editing of tapes and general preparation work prior to putting the program on the air via the air-shift studio.

There are six air-shift studios in Munich, each of which consists of three rooms: Two speakers' rooms (announce booths) with a control room in between. Each speaking studio is furnished with a table, chair, and Type 77-D or 44BX Microphone. Besides the air-shift studios for each of the four main languages there are two for use in feeding relay programs to Portugal. In addition there is one large studio employed for round-table discussions by large groups, audience participation shows, and larger productions. This houses several booms with Types 44 and 77 microphones as well as the desk mikes.

Twelve production studios are in use at Munich. These are complete with tape recorder-players and editing equipment. Each language group has two production studios at its disposal, leaving two additional ones for special and emergency use.

Program Personalities

It is here in Munich that important personalities from the U. S. A. and all over the world pay frequent visits to studios of the RFE to lend their aid. Leading figures from the entertainment world, important businessmen, government and religious leaders are guest speakers on many occasions. Their appearances before the microphone give additional hope to the imprisoned peoples and incidentally encourage RFE personnel.



FIG. 16. Technical monitoring at Munich.

FIG. 15. Content monitoring at Munich.

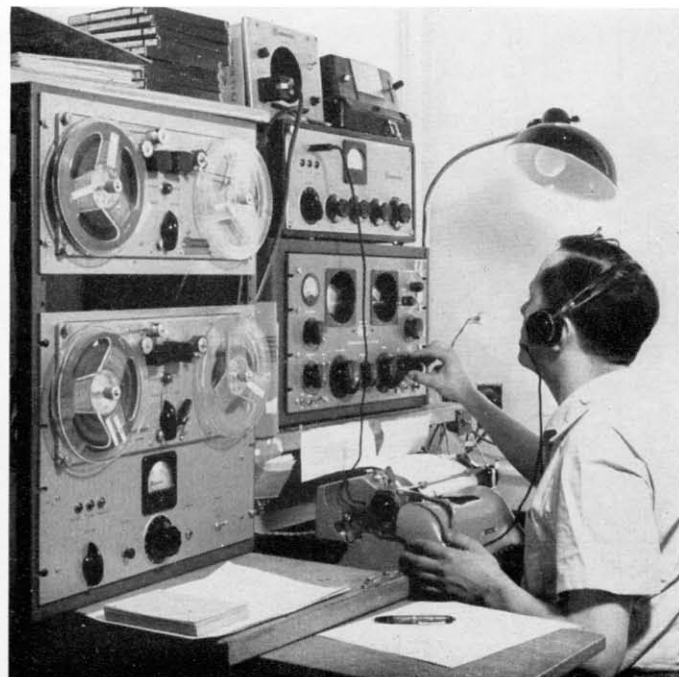


FIG. 17. (Right) George Graveson, Chief Engineer, and (left) Vincent J. Skee, Manager of Technical Operations in Master Control Room at Munich.



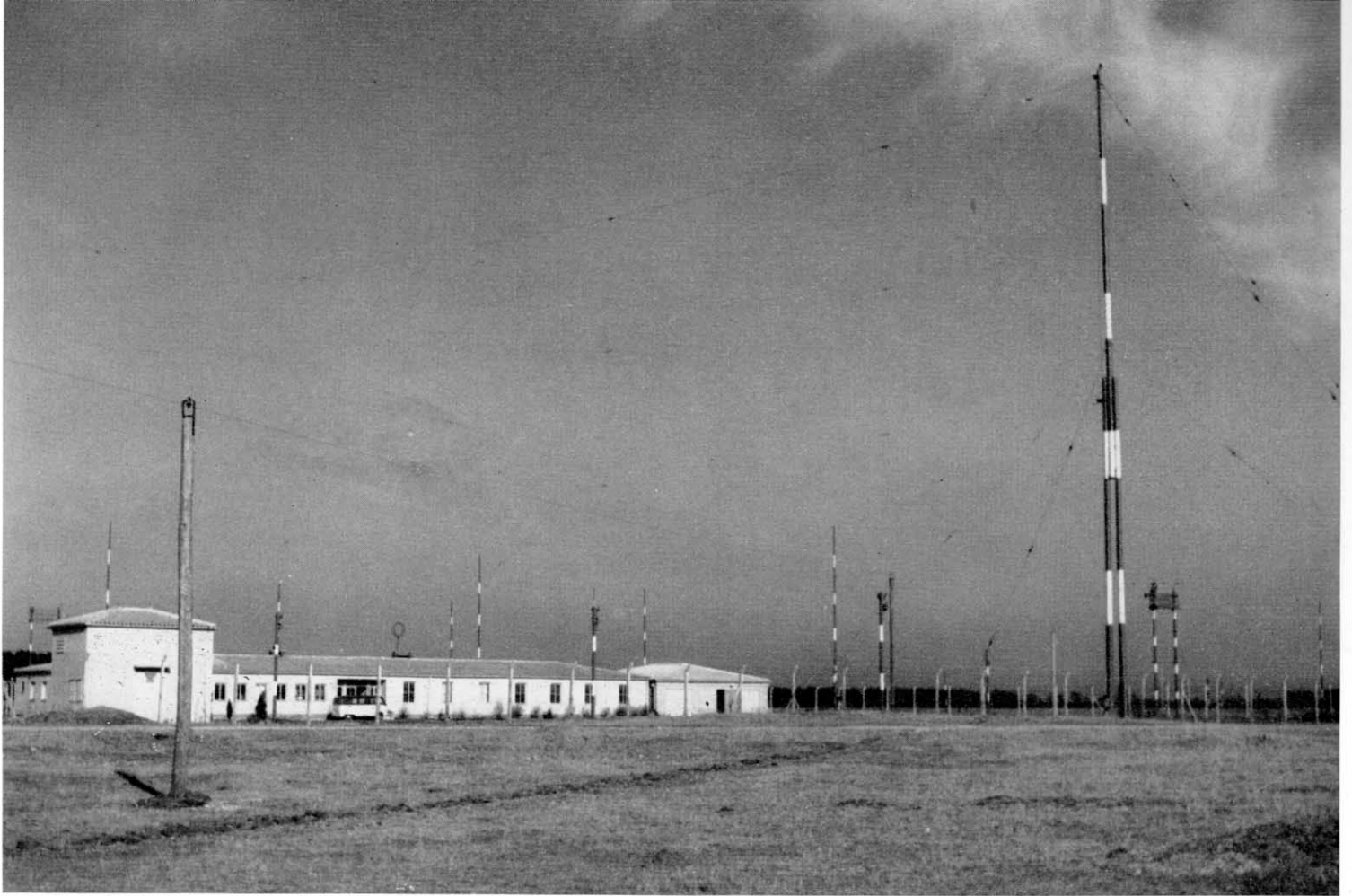
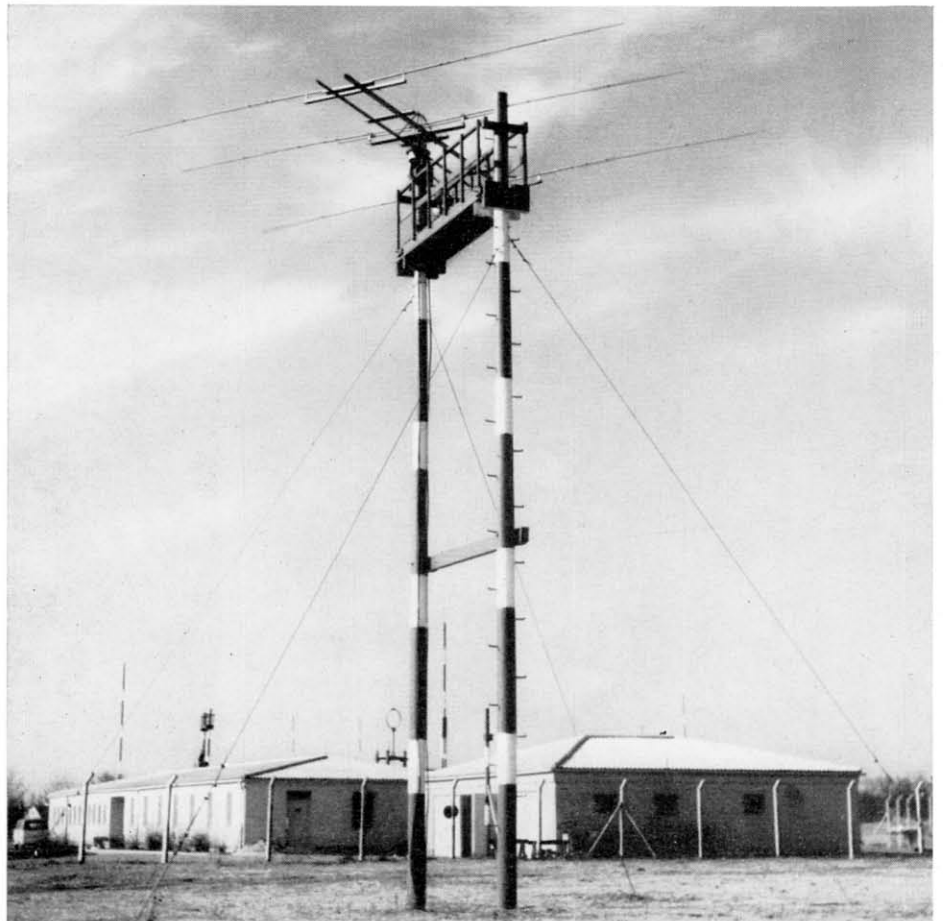


FIG. 18. Schleissheim monitoring station installation, seven miles from Munich. Signals are fed from here to Munich via telephone lines.

FIG. 19. Rotatable-beam antenna at Schleissheim is one of many types employed to extract signals of local Iron Curtain stations from the ether.



Schleissheim Monitoring Station

The Schleissheim monitoring station is the "ears" of RFE! From this installation comes the raw material from which RFE programs are produced. Receiving engineers and information department monitors turn their dials and from the ether pluck the signals of the Communist broadcasts, reconstructing on printed pages the output of the Communist press and radio.

First, they listen to and record the domestic version broadcast for home consumption from satellite stations like Radio Prague, Radio Budapest, Radio Sofia, or Radio Warsaw. Then, from satellite news agencies, they tune in on propaganda meant for Western ears. Lastly, to keep things on an even keel, up-to-the-minute news is received from the U. S. A.

The receiver station staff and the content monitors supply RFE newsmen and program staffs with all versions, and by comparison they discover the big lies of Communism and answer them with facts. Some of the material is delivered to the news and program departments in the form of typewritten copy prepared by content monitors from recorded satellite broadcasts. Much of the rest of it starts as Morse, Hellschreiber or teletype signals sorted and sifted out of the crowded ether, refined into usable form by radiomen and finally sent down the telephone lines from the Schleissheim to Munich to appear in printed form on teleprinters in the newsroom.

Interference Problems

Listening to Communist transmitters poses a big problem since many of the stations are low-powered, designed for local

broadcasting and are usually located several hundred miles away. Nearby principal terminals of Voice of America and the U. S. Armed Forces also pose selectivity and crosstalk problems. Loop antennas have been used with some success, but these are not so good at night because of sky-wave interference. Two-tower vertical directional arrays have been erected to cope with the problem. In addition, another site at Mooseburg, some 30 miles from Schleissheim, is used to get around interference problems.

Typical Monitor Booth

The equipment in a typical monitor booth consists of a communications receiver that can be tuned by the operator for his convenience. Also, a two-position switch is available to switch antennas. The operator is usually a trained journalist in a specific language. He has available a tape recorder and a typewriter equipped for typing his specific language. His output is turned over to the desk chief at Munich. Extracts in English of the main highlights are sent to American policy people in Munich for their guidance in the conferences wherein the political addresses are prepared.

Technical Operations

Fifty communications receivers are used for the listening post at Schleissheim. Programs are received from the New York desk of RFE via Press Wireless, using triple diversity receivers and rhombic antennas. These programs are all "voice." Teletype plays a big part in the monitoring operations and each year some 1500

miles of tape are used and some 75 million words are copied from the various news agencies.

Telephone lines are used to connect Schleissheim with Munich so that the master switching center can monitor all incoming and outgoing lines. The Munich center also has intercom with all language monitoring booths and remote receiving sites.

Personnel

Mr. F. Sherwood, who was Asst. Chief Engineer of WHEC, Rochester, N. Y., is in charge of engineering at Schleissheim, with 45 technical people. Under Mr. Harold Peters, who has charge of program monitoring at Schleissheim, are 22 monitoring people. In addition there are various other building workers and a security force.

Antenna Systems

Programs transmitted by commercial radio from New York City are received at Schleissheim on a triple-diversity system using standard communications receivers and rhombic antenna systems. For monitoring the stations in satellite countries numerous antennas are used, including long-wave, open-V, and Yagi with appropriate commercial receivers.

There are a number of rhombic antenna systems in use. One is headed towards Warsaw and Moscow, two towards the U. S. A. and a fourth towards Lisbon. Three others are reversible rhombics for coverage of either Istanbul or the U. S. A. In addition there are two Beverage antennas, a cross-loop and goniometer arrangement, and several inverted rhombics.

FIG. 20. Monitoring is by four methods: Direct-Voice, radio teletype, Hellschreiber, and Morse code. Here is an operator receiving Morse code and transcribing it on a teletype perforating machine.



FIG. 21. Typical output of a Hellschreiber recorder. This is being fed from an RCA Communications receiver. The monitoring output at Schleissheim is fed to Munich via telephone lines.



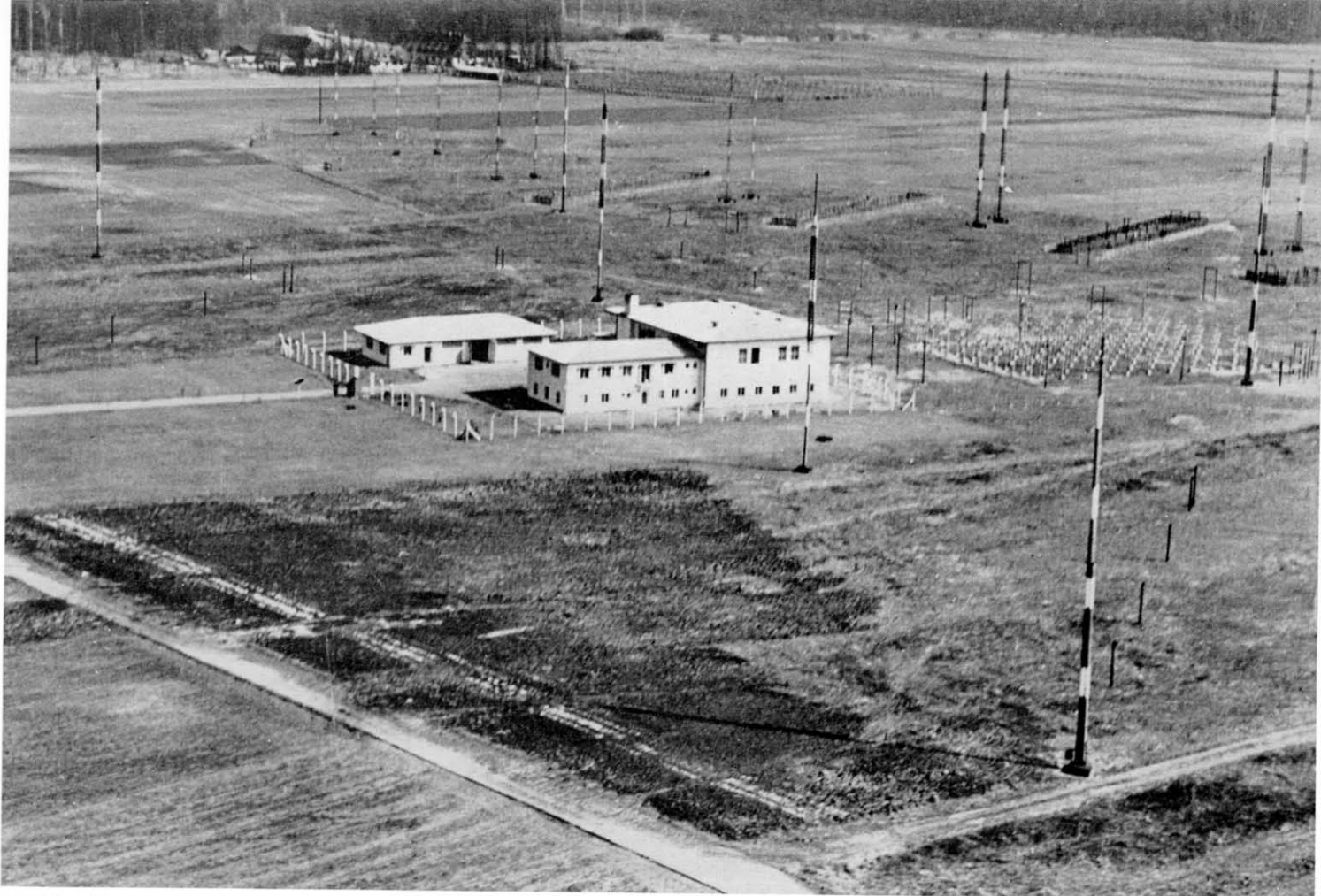


FIG. 22. RFE transmitting plant at Biblis, Germany, some 200 miles northwest of Munich. Eight transmitters are located here—the center of the RFE radio barrage projecting the voice of freedom to countries behind the Iron Curtain.

Biblis Transmitting Center

Near this small town, some 200 miles northwest of Munich and about 50 miles south of Frankfurt, lies an abandoned airstrip which is now the home of eight transmitters scattering messages of hope behind the Iron Curtain. There are four 10-kw, one 20-kw and three 50-kw transmitters, which operate on the international short-wave bands. The control room panel was designed and built by RFE engineers to accommodate five incoming lines, and additional miscellaneous inputs as needed, to the eight transmitters. Incoming lines carry program connections from the Munich studios, connect to the Deutsche Post, and also provide emergency connections to the studios. In addition, stand-by tape recorders are available in case of program failure to provide music for broadcasts in each of the languages. A 14-channel, tape recorder monitors all incoming lines, plus transmitter outputs and time signals, to keep a permanent record of all operations.

Central Oscillators

All crystal oscillators for the transmitters are installed in central racks for ease of frequency change and frequency control. These crystal units are not the ones originally supplied with the transmitters, be-

cause RFE engineers have found it more appropriate to employ one uniform type of their own design. These crystals are high stability units in thermostatically controlled ovens and are all ground to the same correlation factor. Included in the master bank are three variable frequency oscillators which are used temporarily whenever a new frequency is assigned (until new crystals are ground). An electronic counter is used for measuring and checking crystal frequency output.

Power Supply

Commercial power comes in at 20,000 volts and is brought down to 380 and 460 volts for operation of the transmitters and other equipment. Some 750-kw is required to operate the transmitters at Biblis. Commercial reliability is high so no emergency power unit is required. A small battery system is provided for emergency lighting should it ever become necessary.

Antenna Switching System

This is a 9-by-12 universal-type of crossbar system built by RFE engineers and works at 600 ohms. The design went through several small model changes and

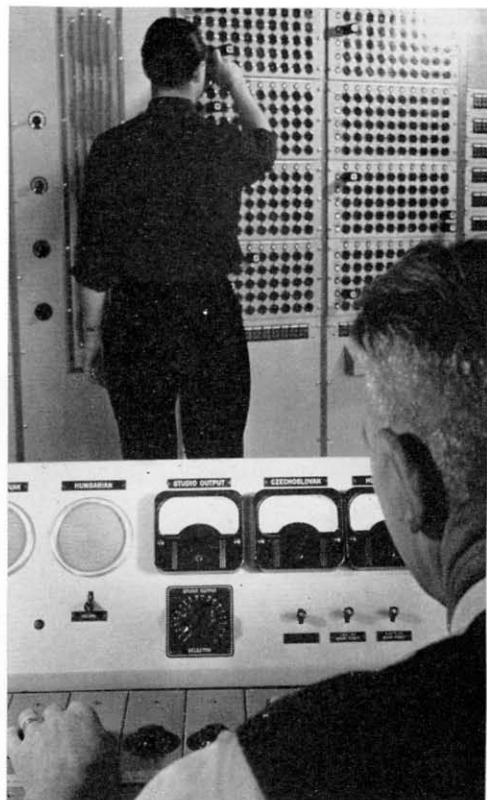


FIG. 23. Master control for feeding programs to Biblis transmitting plant. This control was designed and built by RFE engineers.

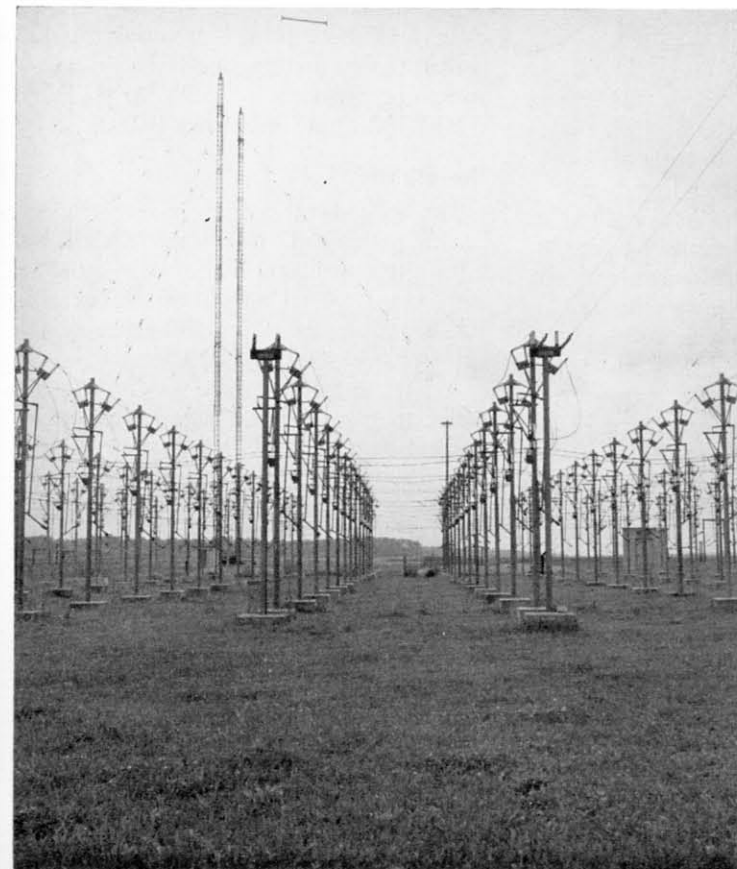
has been so stable and effective that it attracts wide interest throughout Europe. The same design is employed for the transmitters at Portugal. It is truly universal, connecting any of 9 transmitters to any of 12 antennas, and will handle 50-kw of power per switch.

Antenna Systems

Rhombic and curtain antennas are used. The curtain antennas consist of one, two or four elements with a tuned parasitic reflector associated with each element. High gain and control of directivity are characteristic. These are determined by choice of operating parameters and physical dimensions of radiating elements. Each individual element consists of a driven antenna operating as a dipole.

To achieve high performance of the curtain, the parasitic reflectors are adjusted for proper phase and magnitude of current in the reflecting element and the input tuned for proper impedance. Basically these antennas are broad-band systems, each being designed to cover two adjacent international broadcasting bands. Separate sets of tuning stub and switch arrangements make it possible to make the change-over quickly.

FIG. 25. Antenna switching system at Biblis employing 9-by-13 crossbar built and designed by RFE engineers.



Experimental work has been going on with diplexers—working two transmitters on different frequencies into the same antenna. This work or experimentation as related to RFE's requirements has been proved in the lab at Munich under direction of Mr. Perry Esten using scaled model antennas on UHF frequencies. Actual testing in the field proved the theory and the diplexer has been placed into operation with satisfactory results.

Personnel at Biblis

There are some 50 persons employed in the transmitting plant at Biblis under the direction of Mr. Fred Parry. Of these 16 are actually engaged in transmitter operations and maintenance. The remainder are drivers, cooks, accountants, draftsmen, machinists, clerical, etc. There are three 8-hour shifts daily—working round-the-clock 7 days a week—since the transmitters are always in broadcast operation or for maintenance.

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EDITOR'S NOTE: *Part II, the concluding part of this article, will appear in our next issue, and will be devoted to RFE Installations in Portugal.*

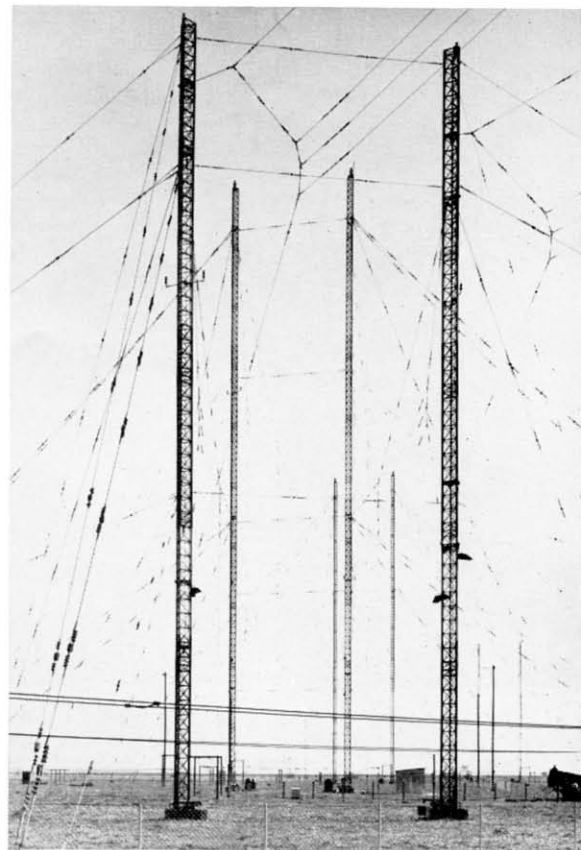


FIG. 24. Typical curtain antenna system used at Biblis transmitting center.

FIG. 26. Fred Parry, engineer in charge, shown at 50-kw RCA transmitter in Biblis, Germany; transmitting plant of RFE.

