RADIO LORE FOR NOVICE AND EXPERIENCED FAN

European Radio Engineers Seek Efficiency First in Receivers

Balance and Eye Value Have Secondary Place With Foreign Builders.—Compactness Means Little. Expert Describes One Amplifier

BY WENDELL BUCK

Efficiency and results first, then balance and eye value, roughly sums up the attitude of your European radio engineer. First he designs his circuit and lays out the parts of the assembly for sheer and downright efficiency. He builds his receiver and satisfies himself that he has every possible bit of radio efficiency from it. After that, and only then, does he turn his eye to the artistic effect and symmetry of the whole.

A glance at several of the leading European radio magazines, particularly the English, will bring out the point admirably. Here you find the sets spaces freely and openly, with little idea of sacrificing results for compactness.

The wiring is in many cases unpleasant to the eye. Seldom is an attempt made at exact and perfect wiring. Rather, each lead is run according to the geometric axiom: a straight line is the shortest distance between two points. The result is that the European engineer and experimenter is getting a splendid degree of efficiency, and in many cases, taking tube for tube, securing much better results than we Americans.

Our tendency is to design the radio receiver with two principal objectives in mind. Efficiency, yes, but with it a well-balanced, neatly wired, compactly spaced assembly, even though we may have to sacrifice a certain bit of radio frequency transfer, or lose somewhat in our audio frequency step-up.

Only the other day the contrast in American and European methods was brought home quite well in a conversation with a well-known European engineer recently arrived in this country. We were engaged in a free-for-all discussion of radio methods in general and tone quality in particular.

"No doubt," said my European friend, "quality is the prime consideration in radio to-day. Experimenters are buying high quality condensers, better transformers, even though they cost a bit more. Tone quality, I presume, is the paramount issue in radio. One hears it talked about everywhere. One sees comparative curves of transformers. One sees new audio frequency systems and modifications of old systems presented in large numbers. But in the last analysis are not most builders superficial and casual in their methods of getting fine tone quality? How many people are conscientiously and laboriously going down to the details of securing the best possible tone?"

My answer was that I had heard several radio sets, new models this year, that had as fine tone quality as anyone could get or could ask for. His reply was that fundamentally the ear was the best judge of true radio reproduction, and further, that I didn't know radio reproduction at its best because I had never heard it.

He quickly sketched out a rough schematic diagram. Then he presented me with two transformers. The rest of the parts for the amplifier should be of the best available makes.

"This amplifier, worked out with the constants here will give you a new appreciation of tone. Build it!" These were his parting words.

Connected behind one stage of tuned radio frequency and a non-regenerative detector the results vindicated my European friend's argument. When I went down to the details and fine points of securing a better tone, I got it. I thought I had the finest only because I had not taken the pains and trouble to work out the little points which make the big difference in final performance.

Figure 1 shows the schematic wiring diagram of the audio amplifier. Here we find an audio system worked out in detail and designed to give not onlytrue quality, but range and volume as well. For best results, two power tubes should be used: a 112 in the first stage and a 171 in the second or output stage.

The assembly of the amplifier provides for the 171 in the second stage with plate potentials up to 135 volts, with 22½ volts C battery. If you want more volume and reserve power, an output transformer, about 1 to 1 ratio, may be added and plate potentials up to 180 volts applied, with C bias of from 30 to 40 volts. The addition of the output transformer is indicated by the dotted portion of the schematic diagram. For all ordinary purposes, the 171 tube with 135 volts of B battery will do very nicely. However, if you like reserve power and volume, the addition of the output transformer and 45 volts B battery is advised.

Three 1 mfd. filter condensers are used to by-pass the radio frequency current and prevent it from reaching the audio side of the set. An additional, or fifth connection, marked "Earth," is provided on the case of each Ferranti transformer for a grounding connection. The connections for the 1 mfd. condensers (one end indicated as running to the transformer) are shown in the schematic sketch of the circuit.

The parts required are: 2 Ferranti AF3 audio frequency transformers, 3 1mfd. filter condensers, 1 6 ohm rheostat, 1 single jack, 7 binding posts, 2 cushion sockets.

A word or two should be said here about the transformers and the method of connecting them in the assembly. The four markings on the top of the case vary slightly from the standard markings found on American transformers. The marking +HT is the B+ connection as we know it. In connecting bateries to thea mplifier the C minus leads run directly to the terminal marks "Grid Bias" on the transformer. That is, 6 volts negative to the first transformer, and 22½ or 30 to 30 volts to the second, depending on the B voltage used on the 171 tube.

Careful construction of the amplifier, using the filter condensers and Ferranti transformers exactly as shown, will give quality of an exceptional sort. The condensers aid materially in eradicating "background noise" in the speaker, the hissing and frying you hear from so many sets when the set is tuned in but the broadcasting station silent.

As far as actual reproduction goes, *this audio frequency combination gives* remarkable range and definition. Bass notes boom out as they should. Higher frequencies reproduce with extraordinary fidelity.

It should be borne in mind, however, that tone quality is not entirely dependent upon the audio side of the sea. Far from it. Don't use this audio amplifier behind a radio frequency stage and a detector that distort. Needless to say, distorted output will be delivered by the detector tube to the audio frequency amplifier, and, of course, amplified and reproduced by the speaker in distorted form.

A stage of efficient R. F. amplification with a non-regenerative detector following is shown in Figure 2 This can be simply and rather inexpensively constructed for use in combination with the audio amplifier described. Selectivity is variable to meet the requirements of various locations and working conditions. The four-tube set resulting from a combining of the two diagrams, the R. F. stage and detector plus the audio amplifier, is a receiver of exceptional performance. It has the high selectivity demanded in congested broadcasting areas. There is plenty of volume—and the tone quality wins hearty approval from seasoned radio experimenters who have heard many, many sets.

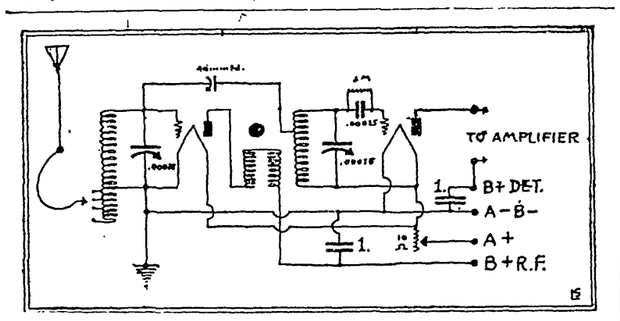


Fig. 1—Wiring Diagram of Receiver to be Used With the Audio Amplifier Described

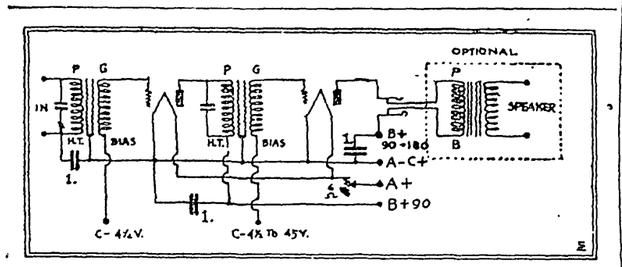


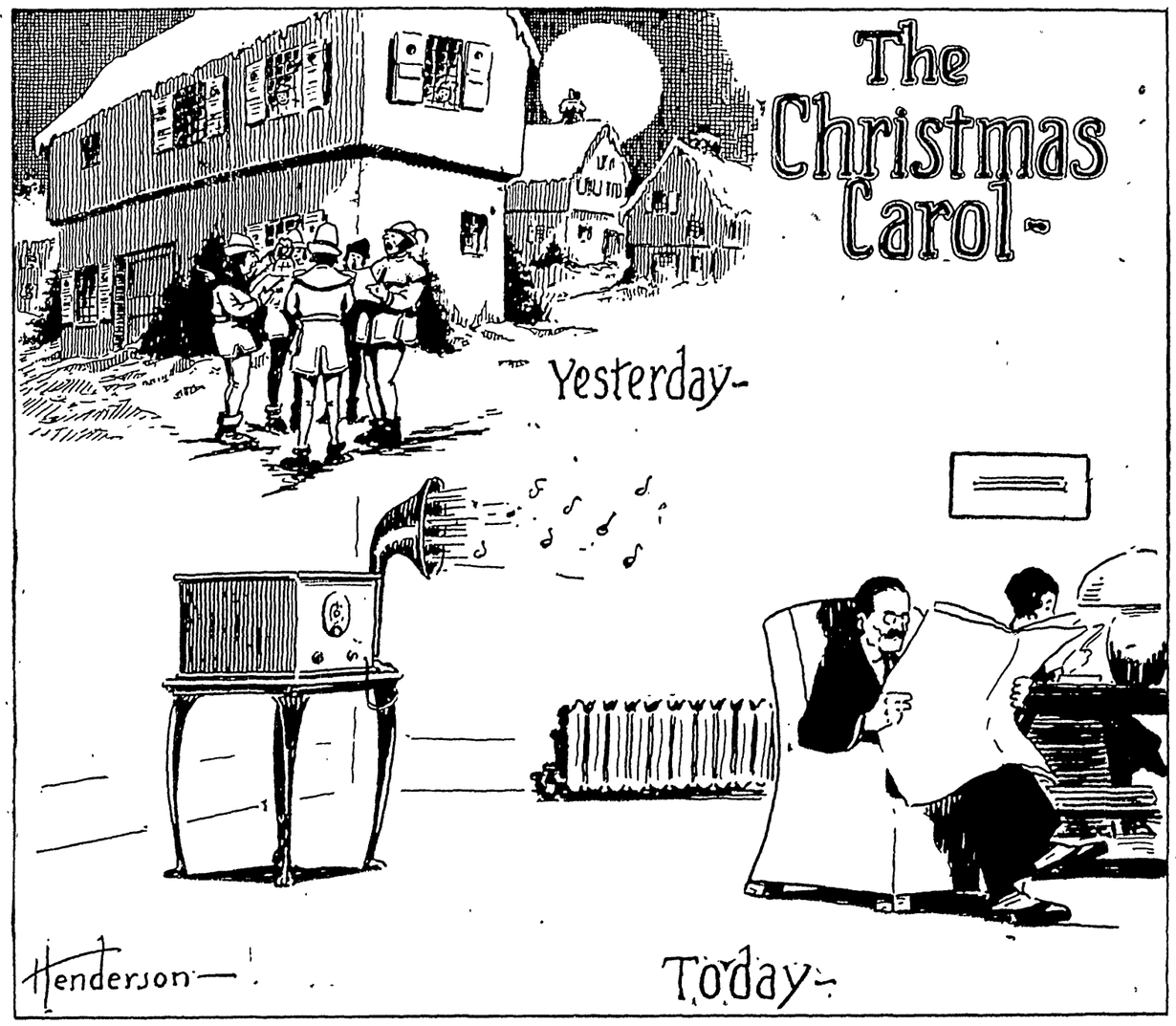
Fig. 2—Wiring Diagram of Model Distortionless Transformer Coupled A. F. Amplifier

TUBE INTELLIGENCE.

Amount of Light Does Not Indicate Sensitivity or Real Condition.

The amount of light a vacuum tube gives off is no indication of its sensitiveness or general condition. The fact that a tube does emit light is entirely an incidental feature of its operation. What is desired in a tube is a flow of little particles of electricity called "electrons," and the easiest way to obtain it is to bury certain kinds of wires in glass bulbs from which the air has been exhausted. The temperature must be quite high in order to make the flow copious, and most wires must be heated white hot by the current from the "A" battery for proper operation. While the incandescent wire, or "filament," as it is correctly called, emits considerable light, this phenomenon has absolutely no connection with the functioning of the tube from the radio standpoint In many of the modern tubes, of both the coated and uncoated variety, little or no light is visible through the glass because of the inner coating of mercury which lines the bulbs. The heaviness of this coating varies considerably, as well, therefore, the amount of light that penetrates through it, so no significance at all can be attached to the brilliance of the illumination.

SHORT CIRCUITS



RADIO PROGRAMMES

WJAR follows its regular schedule to-day with the concert from the Capitol Theatre at 7:20 p. m., and the Atwater Kent hour, presenting Mme. Schumann-Heink, at 9:15 p. m. To-morrow at 10 p. m. the grand opera to be presented will be "Tales of Hoffman." On Tuesday, a musical programme will be given at 8:30 p. m., under the direction of Ivy Hustler Whitehead, soprano. Wednesday at 9:00 p. m. Ex-Governor Charles Dean Kimball will give one of a series of historical talks, under the auspices of the Rhode Island Society of Sons of the American Revolution, and the musical programme at 9:10 p. m. will be by Ulric LaReau, bartitone, and Frank Chadwick, tenor. On Thursday at 7:50 p. m. Captain Charles A. Roberts of the Providence Fire Department will talk on "Christmas Safety." Friday the feature of the day's broadcast will be the City of Providence Christmas Eve Civic Celebration at 8:45 p. m., at which the speakers will be Hon. Joseph H. Gainer, James E. Dunne and Pres. W. H. P. Faunce of Brown University. Music will be rendered by the Providence Festival chorus. Saturday Christmas programmes will be heard at 3 p. m. and 4:30 p. m.

WEAN broadcasts to-day at 10:45 a. m. the Sunday morning service of the Mathewson Street M. E. Church, music at 1 p. m. and an organ recital at 6.30 p. m. Monday the regular schedule will be followed and on Tuesday a Christmas cantata, "The Prince of Peace," will be sung at 8:30 p. m. Wednesday and Friday the station's regular entertainers will be heard. Thursday the special feature will be a Christmas programme given by the Carolyn Bongartz groupe. On Saturday at 11 a. m. services of the Cathedral Church of St. Paul, Boston, will be broadcast, and at 8:25 p. m. the Canadian-American League hockey game will be relayed from Boston.

WDWF will be heard at 4:45 p. m. to-day in its regular Sunday recital.

WSLI broadcasts this morning at 10:45 a. m. services of the First Church of Christ Scientist. Monday and Tuesday the usual orchestral programmes will be followed, and on Wednesday at 8:15 p. m. a piano recital will be given by June Russillio Thursday and Friday the regulaar entertainers will be heard, and Saturday the station will be silent.

WJAR—THE OUTLET COMPANY—485

To-day.

7 20 p. m.—Musical programme by Mal Edward Bowes and the Capitol Theatre Family
9:15 p. m.—Atwater Kent hour, presenting Mme. Schumann-Heink.

Monday.

10.00 a. m.—Housewives' Radio Exchange. A department conducted by Mrs. Wood on all matters of household interest. All questions submitted will be answered by radio.
1 05 p. m.—Studio programme.
1 30 p. m.—Weather report.
8 00 p. m.—The Colonial Launderlers
9 00 p. m.—A. & P. Gypsies.
10:00 p. m.—Grand opera, "Tales of Hoffman"

Tuesday.

1:05 p. m.—Studio programme.
1:30 p. m.—Weather report.
7:00 p. m.—Al Billincoff and his orchestra.
7 50 p. m.—One of a series of safety talks sponsored by the Providence Safety Council.
8 00 p. m.—The Vikings.
8 30 p. m.—Musical programme, direction of Ivy Hustler Whitehead, soprano soloist.
9 00 p. m.—Eveready hour.
10.00 p. m.—Auction bridge game

Wednesday.

10:00 a. m.—Housewives' Radio Exchange. A department conducted by Mrs. Wood on all matters of household interest. All questions submitted will be answered by radio.
1 05 p. m.—Studio programme.
1.30 p. m.—Weather report.
7.30 p. m.—United States Army Band, under the direction of Capt. W. J. Stannard, relayed from Washington, D. C.
8.00 p. m.—Frederick William Wile.
8:15 p. m.—Salon concert.
8:30 p. m.—Davis Saxophone Octet.
9.00 p. m.—Ex-Governor Charles Dean Kimball will give one of the series of historical talks, under the auspices of the Rhode Island Society of Sons of the American Revolution. Subject, "Esek Hopkins, Commander-in-Chief of the Navy, and Stephen Hopkins, Signer of the Declaration of Independence."
9.10 p. m.—Musical programme by Ulric LaReau, baritone, and Frank Chadwick, tenor

Thursday.

1:05 p. m.—Studio programme.
1:30 p. m.—Weather report.
7.50 p. m.—Capt. Charles A. Roberts of the fire prevention bureau of the Providence fire department will talk on "Christmas Safety."
8:00 p. m.—Hubert W. Powers Hudson-Essex Orchestra.
9 00 p. m.—Cilequot Club Eskimos.
10.00 p. m.—Goodrich Zippers, under the direction of Henry Burr

Friday.

10 00 a. m.—Housewives Radio Exchange. A department conducted by Mrs. Wood on all matters of household interest. All questions submitted will be answered by radio.
1:05 p. m.—Studio programme.
1 30 p. m.—Weather report.
8.00 p. m.—"Musik Tawkalog," by Miss Mabel Woolsey.
8.30 p. m.—Musical programme by Julia Fiske and Gladys E. A. Smith.
8:45 p. m.—City of Providence Christmas Eve civic celebration from the Outlet Auditorium. The principal speakers will include Hon. Joseph H. Gainer, Mayor of the city of Providence, James E. Dunne, Mayor-elect of the city of Providence; President W. H. P. Faunce of Brown University. The musical programme by the Providence Festival Chorus, under the direction of John B. Archer.
10:00 p. m.—Whittall's Anglo-Persians.

Saturday.

3:00 p. m.—Christmas programme.
4 00 p. m.—Concert by the South Sea Islanders.
4 30 p. m.—Christmas programme.

WEAN—THE SHEPARD STORES—367

To-day.

10:45 a. m.—Service from the Mathewson Street M. E. Church.
1.00 p. m.—Yoeng's Chinese-American Restaurant orchestra.
6.30 p. m.—Organ recital.

Monday.

11:55 a. m.—Time signals.
12:00 p. m.—Shepard Colonial Concert Orchestra.
12:10 p. m.—Weather report.
12:15 p. m.—Continuation of musical programme.
4 00 p. m.—Musical programme.
4 30 p. m.—Weather report.
6 30 p. m.—WEAN dinner dance.
7 55 p. m.—The Black Iron Shiners.
8:15 p. m.—Metropolitan Theatre studio.
9:15 p. m.—Metropolitan grand orchestra.

Tuesday.

10 00 a. m.—Home service talk by Miss Kathleen Atkinson.
11:55 a. m.—Time signals.
12 00 p. m.—Shepard Colonial Concert Orchestra.
12 10 p. m.—Weather report.
12 15 p. m.—Continuation of musical programme.
4 00 p. m.—Musical programme.
4 30 p. m.—Weather report.
6 30 p. m.—WEAN dinner dance.
8 00 p. m.—Musical programme
8 30 p. m.—Playette, "The Manager."
9.00 p. m.—Prize winning fantasie presented by the Rhodes Orchestra, from Rhodes-on-the-Pawtuxet.

Thursday.

10 00 a. m.—Home service talk by Miss Kathleen Atkinson.
11:55 a. m.—Time signals.
12:00 p. m.—Shepard Colonial concert orchestra.
12:10 p. m.—Weather report.
12 15 p. m.—Continuation of musical programme.
4:00 p. m.—Organ recital, John Fitzpatrick.
4 30 p. m.—Weather report.
6.30 p. m.—WEAN dinner dance, Shepard Colonial dance orchestra.
7 30 p. m.—Musical programme.
8.00 p. m.—Christmas programme by the Carolyn Bongartz group.

Friday.

11 55 a. m.—Time signals.
12:00 p. m.—Shepard Colonial concert orchestra.
12:10 p. m.—Weather report.
12:15 p. m.—Continuation of musical programme
4:00 p. m.—Musical programme.
4:30 p. m.—Weather report.
6:30 p. m.—WEAN dinner dance.
7:00 p. m.—Vesper service from St. John's Episcopal Cathedral.
9:30 p. m.—Even-song service from St. John's Episcopal Cathedral.

WBAL—BALTIMORE—246.

6:30 p. m.—Concert orchestra.
8.00 p. m.—Old English Christmas carols, by the choir of Emmanuel Episcopal Church.

WRBM—CHICAGO—226.

1.30 p. m.—Orchestra.
5:00 p. m.—Orchestra.
9.00 p. m.—"Through India to Bombay."
10:00 p. m.—Salon orchestra.
1.00 a. m.—The Nutty Club.

WBZ—SPRINGFIELD—333.

10:45 a. m.—Services from the South Congregational Church
6.30 p. m.—Organ music by Edith Lang.
7:00 p. m.—Trio.
8:00 p. m.—Concert.
9:00 p. m.—Music.
10:00 p. m.—Concert.
10:15 p. m.—Concert.

WCAE PITTSBURGH—461

9:30 a. m.—Bible class.
11:00 a. m.—Service from Rodef Shalom Synagogue.
2:00 p. m.—Service, Ashbury Methodist Episcopal Church.
3:00 p. m.—Organ recital by Casper P. Koch.
4 00 p. m.—Address by Dr. S Parker Cadman from Bedford Branch of Y. M. C. A.
6.30 p. m.—Concert Orchestra.
7:20 p. m.—Concert by the Capitol Theatre Family.
9:15 p. m.—Atwater Kent hour, presenting Ernestine Schumann-Heink, contralto.
10:15 p. m.—Concert. Howers Gibson, violinist. Elimer Zoller, pianist.

WCAE—PHILADELPHIA—278.

11:00 a. m.—Services from First Unitarian Church.
5:00 p. m.—Recital.
5:15 p. m.—*Church services.*
5.25 p. m.—"And He Shall Turn the Heart" (Malachi), Rev. John W. Stockwell.
5:35 p. m.—Recital, continued.
5:45 p. m.—"The Christmas Heart Breaker," Rev. John W. Stockwell.
6.45 p. m.—Concert orchestra.
7:45 p. m.—Concert orchestra
8:30 p. m.—Tenor.
10:00 p. m.—Orchestra.

WCCO—ST. PAUL—416.

11 50 a. m.—Plymouth Congregational Church.
5:10 p. m.—House of Hope Presbyterian Church.
7:20 p. m.—Second Church of Christ, Scientist.
9.15 p. m.—Atwater Kent hour.
10:15 p. m.—Musical programme.
11.00 p. m.—Organ recital by Hugo Philler Goodwin.

WDRC—NEW HAVEN—268.

11.00 a. m.—Services of the Church of the Redeemer.

WEAF—NEW YORK—492.

2:00 p. m.—Interdenominational church services.
3:00 p. m.—Young People's conference from the Marble Collegiate Church. Address by Dr. Daniel A. Poling, "Fear of the Unknown."
4:00 p. m.—Men's conference in the Bedford Branch, Y. M. C. A., Brooklyn. Address by Dr. S. Parkes Cadman.
5:30 p. m.—Paul Jelenek, pianist.
6:00 p. m.—"Problems of a Mother-in-Law" by Sarah Truax.
6:15 p. m.—Orchestral concert, Giuseppe di Benedetto, tenor.
7:20 p. m.—Musical programme by Major Edward Bowes and the Capitol Theatre Family.
9:15 p. m.—Atwater Kent hour, featuring Mme. Ernestine Schumann-Heink, contralto.
10:15 p. m.—"The Guest of the Shepherds," a Bible story with musical setting.

WEMC—BERRIEN SPRINGS—316.

12:00 m.—Church services.
9.15 p. m.—Lighthouse Choir.

WENR—CHICAGO—266.

3.00 p. m.—Hour of better music.
4:00 p. m.—Classical programme.
10:30 p. m.—Trio.
11:30 p. m.—Orchestra.

WFAA—DALLAS—475.

3:30 p. m.—Farmers' hour, address, music.
7:00 p. m.—Bible class.
8:30 p. m.—Presbyterian Church.
9:30 p. m.—Symphony Orchestra.
12:00 m.—Recital.

WFI—PHILADELPHIA—394.

4:30 p. m.—Chapel service.
7:30 p. m.—Service from Arch Street Presbyterian Church.
9:15 p. m.—Atwater Kent hour. Mme. Ernestine Schumann-Heink, contralto.

WGBS—NEW YORK—316.

4:00 p. m.—"The Little Church Around the Corner."
9.30 p. m.—The Old-Time Minstrels.
10.30 p. m.—*Symphony orchestra.*

WGR—BUFFALO—319.

10:45 p. m.—Service from the Westminster Presbyterian Church.
7:45 p. m.—Service from the Central Presbyterian Church.
9:15 p. m.—Atwater Kent hour.

WGY—SCHENECTADY—379.

11:00 a. m.—Service, All Souls' Church.
3:00 p. m.—Musical programme.
8:00 p. m.—Service of All Souls' Church.
9:00 p. m.—Music.
10.15 p. m.—Concert.

WHAP—NEW YORK—431.

7:15 p. m.—Concert of sacred music.
7:45 p. m.—Selections from the Bible and Science and Health with Key to the Scriptures by Mary Baker Eddy, read by Augusta E. Stetson, C. S. D.
8:45 p. m.—Organ recital, Mary Ray Pinney.

WHAR—ATLANTIC CITY—275.

10:45 a. m.—Service, Chelsea Baptist Church.
2:15 p. m.—Recital.
2:45 p. m.—Sermon by Rev. Walter Bruggeman.
7:45 p. m.—Service, Chelsea Baptist Church.
9:00 p. m.—An hour with the classics.

WHAS—LOUISVILLE—399.

11:00 a. m.—Services of the Broadway Christian Church.
5:30 p. m.—Choral evensong service from Christ Church Cathedral.

WHN—NEW YORK—361.

12:30 p. m.—Organ recital, Marah McCurdy, organist.
4:30 p. m.—News flashes and sport events.
5:00 p. m.—Dance orchestra.
5:30 p. m.—News flashes and sport events.
6:30 p. m.—Orchestra.
10:00 p. m.—Orchestra.
11:00 p. m.—Orchestra.
12:00 p. m.—Orchestra.

WIP—PHILADELPHIA—508.

4.00 p. m.—"Christmas Eve in Bethlehem," lecture by Dr. William T. Ellis.
7.15 p. m.—Service from Holy Trinity Church.
10:00 p. m.—Symphony orchestra.

WJZ—NEW YORK—454.

9:00 a. m.—Children's hour.
11:00 a. m.—Park Avenue Baptist Church service.
3:55 p. m.—Vesper service.
7.00 p. m.—Church carllon.
7:20 p. m.—'Cello quartet.
8:00 p. m.—Concert.
9:00 p. m.—Concert orchestra.
9.45 p. m.—Erva Giles, soprano.
10:00 p. m.—Godfrey Ludlow, violinist.

WKRC—CINCINNATI—422

7:45 p. m.—Walnut Hills Christian Church.
11:00 p. m.—Classical programme.
12:15 p. m.—Orchestra.
1.00 a. m.—Blues and ballads.
1:15 a. m.—Dance programme.

WLW—CINCINNATI—422

9:30 a. m.—Sunday school.
11:00 a. m.—Service from the Seventh Presbyterian Church.
3:00 p. m.—Organ recital by Walter Devaux.
7:30 p. m.—Services of the First Presbyterian Church, Walnut Hills.
8:30 p. m.—"Getting Acquainted with Beethoven."
8:50 p. m.—Orchestra.

WLWL—NEW YORK—384

8:00 p. m.—"What Think Ye of Christ?" Rev. John H. Sullivan, C. S. P. Paulist choir.

WMAK—BUFFALO—266

10.25 p. m.—First Presbyterian Church services
3:00 p. m.—Musicale.
7.30 p. m.—Service, First Church of Christ, Scientist.

WMAC—NEW YORK—341

11:00 a. m.—Christian Science services.
12:15 p. m.—"Gloomchasers."
2:30 p. m.—Concert.
3:30 p. m.—Chinatown Rescue Society services.
5:00 p. m.—Music.
5:30 p. m.—Soloists.
6:00 p. m.—Concert.
7:00 p. m.—Orchestra.
7:30 p. m.—Broadway chat.
8:00 p. m.—Music.
9:00 p. m.—Moment Musicale.
10:00 p. m.—Orchestra.

WOAW—OMAHA—526

10:00 a. m.—Chapel service.
2:30 p. m.—Father Flanagan's Boys' Home period.
7:00 p. m.—Bible study period.
10:00 p. m.—Chapel service.

WOC—DAVENPORT—484

2:00 p. m.—Old folks' musical programme.
7:30 p. m.—Church service, United Presbyterian Church, Monmouth, Ill.
9:15 p. m.—Atwater Kent hour.
11:00 p. m.—Musical programme.

WOR—NEWARK—405

4:30 p. m.—Studio programme.
6:00 p. m.—Studio ensemble.
7:00 p. m.—Quartet.
7:20 p. m.—Gerald Herzman, pianist, and Nicolas Globatcheff, basso.
7:45 p. m.—Concert.

WPG—ATLANTIC CITY—299

3:15 p. m.—Organ recital.
4:15 p. m.—Community.
5:30 p. m.—Concert orchestra.
9:00 p. m.—Last-minute news flashes.
9:15 p. m.—Atwater Kent hour.
10:00 p. m.—Musicale.

WRC—WASHINGTON—469

11:00 a. m.—Church services.
4:00 p. m.—Services from Washington Cathedral.
6:50 p. m.—Vesper concert.
7:20 p. m.—Musical programme from the Capitol Theatre.
8:15 p. m.—Atwater Kent hour.
10:15 p. m.—Concert.

WRNY—NEW YORK—374

11:00 a. m.—St. Matthew Lutheran Church services.
4:00 p. m.—Rose Becker, recital.
4:30 p. m.—Operatic ensemble.
5:00 p. m.—Twilight hour.
7:20 p. m.—Bible class.
7:30 p. m.—Chelsea Methodist Episcopal Church services.

WSAI—CINCINNATI—326

11:00 a. m.—Services from the Presbyterian Church of the Covenant.
3:45 p. m.—Chime concert.
4:00 p. m.—Address by Dr. S. Parkes Cadman.
8:00 p. m.—Sermonette.
9:15 p. m.—Atwater Kent hour.

WSB—ATLANTA—428

10:30 a. m.—Sunday school.
11:04 a. m.—First Presbyterian Church service.
6.00 p. m.—Vesper services from the Church of the Redeemer.
9:00 p. m.—North Avenue Presbyterian Church service.

WTAG—WORCESTER—545

4:00 p. m.—Men's Conference from Bedford Branch, Y. M. C. A., Brooklyn.
7:20 p. m.—Capitol Theatre Family.
9:15 p. m.—Atwater Kent hour.
10:15 p. m.—Daily news bulletin.

WTAM—CLEVELAND—389

11:00 a. m.—Church services.
3:00 p. m.—Musicale.
6:00 p. m.—Orchestra.
7:00 p. m.—Theatre orchestra.
8:00 p. m.—Church services
9:15 p. m.—Atwater Kent hour.
10:15 p. m.—Orchestra.

WWJ—DETROIT—352

10:00 a. m.—Church services from First Presbyterian Church.
3 30 p. m.—Detroit Symphony Orchestra.
7 20 p. m.—Capitol Theatre Family.
9:15 p. m.—Atwater Kent hour.

OUT OF TOWN STATIONS

To-Day

CKAC—MONTREAL—411

2:45 p. m.—Capitol Theatre Symphony.

KDKA—EAST PITTSBURGH—309

11:00 a. m.—Service of the Calvary Episcopal Church.
4.00 p. m.—Organ recital, by Dr. Charles Heinroth
4:45 p. m.—Vesper service of the Shadyside Presbyterian Church, Pittsburgh.
6:30 p. m.—Symphony orchestra.
7:45 p. m.—Service of the East End Christian Church.

KFI—LOS ANGELES—467

1.00 p. m.—Services under the direction of Los Angeles Church Federation.
2.00 p. m.—Temple Baptist Church.
5:45 p. m.—San Francisco Symphony Orchestra, Alfred Hertz, conductor.
6:30 p. m.—KFI special.
9:45 p. m.—Music appreciation chat
10.00 p. m.—Organ recital, Alex Reilly at the console.
11:00 p. m.—Classic hour.
12:00 p. m.—Dance orchestra.
1.00 a. m.—Orchestra.

KFUO—ST. LOUIS—545

4.30 p. m.—Address (German), "Christ, the Promised King."
10.15 p. m.—Address, "The Judge of the World." Music.

KGO—OAKLAND—361

2 00 p. m.—First Methodist Episcopal Church service.
5:40 p. m.—San Francisco Symphony Orchestra.
7.00 p. m.—Vesper service, Grace Cathedral.
8.30 p. m.—Symphony orchestra.
10:55 p. m.—First Methodist Episcopal Church service.
12:00 p. m.—Symphony orchestra.

KMTR—HOLLYWOOD—370

9:30 p. m.—Lella Castberg's half-hour, "How to Stay Young."
10:00 p. m.—Concert orchestra.
11:00 p. m.—Orchestra.

KNX—LOS ANGELES—337

1:00 p. m.—First Presbyterian Church service.
5:00 p. m.—Musical programme.
7:30 p. m.—Half-hour of cinema chit-chat.
9:30 p. m.—First Unitarian Church service.
10:00 p. m.—First Presbyterian Church service.
11.00 p. m.—Concert orchestra.
12.00 p. m.—Feature programme.

KOA—DENVER—322.

1.00 p. m.—Service of St. John's Episcopal Cathedral.

To-day's Programmes in Brief

For the convenience of radio fans, the following hourly schedule of broadcasting to-day is given in brief form, the complete programme being given under the regular listing of announcements. Figures following stations denote wave length.

The hours are based on Eastern Standard Time.

LOCAL STATIONS

10:45—Church, WEAN, 367.
10:45—Church, WLSI, 441.
1:00—Music, WEAN, 367.
4:45—Recital, WDWF, 441.
6:30—Organ, WEAN, 367.
7.20—Concert, WJAR, 485.
9:15—Concert, WJAR, 485.

OUT-OF-TOWN STATIONS

9:00—Children's hour, WJZ, 454.
9:30—Sunday school, WLW, 422.
Bible class, WCAE, 461.
10:00—Chapel, WOAW, 526.
Church, WWJ, 352.
10:25—Church, WMAK, 265.
10:30—Sunday school, WSB, 428.
10:45—Church, WGR, 319.
Church, WBZ, 333.
Church, WHAR, 275.
Church, WGY, 379.
Church, WIP, 508.
10.50—Church, WEEI, 348.
11:00—Church, KDKA, 309.
Church, WCAU, 278.
Church, WJZ, 454.
Church, WLW, 422.
Church, WMCA, 341.
Church, WRC, 469.
Church, WSAI, 326.
Church, WHAS, 399.
Church, WTAM, 389.
Church, WCAE, 461.
Church, WRNY, 374.
Church, WDRC, 268.
Church, WGY, 379
11:50—Church, WCCO, 415.
11:54—Church, WSB, 428.
12:00—Church, WEMC, 316.
12:15—Special, WMCA, 341.
12:30—Organ, WHN, 361.
1:00—Church, KFI, 467.
Church, KOA, 322.
Church, KNX, 337.
1:30—Concert, WRBM, 226.
2:00—Church, KGO, 361.
Church, WEAF, 492.
Concert, WOC, 484.
Church, KOA, 322.
Church, KFI, 467.
Church, WCAE, 461.
2:15—Concert, WHAR, 275.
2:30—Sunday school, WOO, 508.
Concert, WMCA, 341.
Special, WOAW, 526.
2:45—Sermon, WHAR, 275.
Orchestra, CKAC, 411.
3:00—Recital, WLW, 422.
Address, WEAF, 492.
Concert, WGY, 379.
Music, WTAM, 389.
Organ, WCAE, 461.
Music, WMAK, 265.
Music, WENR, 266.
3:15—Organ, WPG, 299.
3:30—Special, WMCA, 341.
Music, WFAA, 476.
Orchestra, WWJ, 352.
3:45—Chimes, WSAI, 326.
3:55—Vespers, WJZ, 454.
4:00—Dr. S. Parkes Cadman, address, WEAF, 492; WTAG, 545; WSAI, 326.
Evensong, WGBS, 316.
Church, WRO, 469.
Organ, KDKA, 309.
Lecture, WIP, 508.
Music, WRNY, 374.
Address, WCAE, 461.
Music, WENR, 266.
4:15—Music, WPG, 299.
4:30—News, WHN, 361.
4:30—Address, KFUO, 545
Music, WRNY, 374
Music, WOR, 405
Chapel, WFI, 394
Organ, WGY, 379
Orchestra, WCX, 516
Orchestra, WSB, 428.
4:45—Vespers, KDKA, 309.
5:00—Orchestra, WBBM, 226.
Music, WCAU, 278.
Orchestra, WHN, 361.
Music, WMCA, 341.
Community chorus, WRNY, 374
Concert, KNX, 337
5:10—Church, WCCO, 415
5:15—Church, WCAU, 278
5:25—Address, WCAU, 278
5:30—Orchestra, WPG, 299.
News, WHN, 361.
Pianist, WEAF, 492
Evensong, WHAS, 399
Soloists, WMCA, 341
5:35—Music, WCAU, 278
5:40—Orchestra, KGO, 361.
5:45—Talk, WCAU, 278.
Orchestra, KFI, 467.
6:00—Concert, WORJ, 405.
Orchestra, WTAM, 389.
Popular music, WMCA, 341.
Sacred music, WSB, 428.
Talk, WEAF, 492.
6:15—Tenor, WEAF, 492.
6:30—Orchestra, WHN, 361.
Concert, WCAE, 461.
Concert, KDKA, 309.
Concert, WBAL, 246.
Organ, WBZ, 333.
6:45—Orchestra, WCAU, 278.
6:50—Vespers, WHC, 469.
7:00—Carillons, WJZ, 454.
Orchestra, WTAM, 389.
Trio, WBZ, 333.
Bible class, WFAA, 476.
Quartet, WOR, 405.
Orchestra, WMCA, 341.
Bible class, WOAW, 526.
Vespers, KOA, 322.
Vespers, KGO, 361.
7:15—Church, WIP, 508.
Concert, WHAP, 431.
7:20—Duo, WOR, 405.
Quartet, WJZ, 454.
Church, WCCO, 416;
Capitol Theatre Family, WTAG, 545; WEAF, 492; WRC, 469; WCAE, 461; WWJ, 352.
Bible hour, WRNY, 374.
7:30—Special, KNX, 337.
Church, WFI, 394.
Chat, WMCA, 341.
Church, WLW, 422.
Church, WOC, 484.
Church, WRNY, 374.
7:45—Orchestra, WCAU, 278.
Bible reading, WHAP, 431.
Church, KDKA, 309.
Church, WHAR, 275.
Church, WGR, 319.
Concert WOR, 405.
Church, WKRC, 325.
7:50—Church, WMAK, 265.
8:00—Church, WTAM, 389.
Concert, WBZ, 333.
Music, WMCA, 341.
Address, WLWL, 384.
Concert, WJZ, 454.
Sermon, WSAI, 326.
Church, WGY, 379.
Carols, WBAL, 246.
Choir, WLWL, 384.
8:30—Music, WLW, 422.
Church, WFAA, 476.
Tenor, WCAU, 278.
8:45—Organ, WHAP, 431.
8:50—Concert, WLW, 422.
9:00—Special, WBZ, 333.
Concert, WHAR, 275.
News, WPG, 299.
Church, WSB, 428.
Music, WMCA, 341.
Music, WGY, 379.
Travelogue, WBBM, 226.
Orchestra, WJZ, 454.
9:15—Atwater Kent hour: WCCO, 415; WEAF, 492; WFI, 394; WOC, 484; WRC, 469; WSAI, 326; WTAG, 545; WGR, 319; WCAE, 461; WTAM, 389; WWJ, 352; Orchestra, WPG, 299.
Choir, WEMC, 316.
9:30—Talk, KMTR, 370.
Orchestra, KGO, 361.
Special, KFI, 467.
Concert, WFAA, 476.
Church, KOA, 322.
Church, KNX, 337.
Minstrels, WGBS, 316.
9:45—Music chat, KFI, 467.
Soprano, WJZ, 454.
10:00—Organ, KFI, 467.
Orchestra, KMTR, 370.
Concert, WBZ, 333.
Orchestra, WBBM, 226.
Church, KNX, 337.
Violinist, WJZ, 454.
Orchestra, WCAU, 278.
Orchestra, WIP, 508.
Orchestra, WHN, 361.
Orchestra, WMCA, 341.
Chapel, WOAW, 526.
Concert, WPG, 299.
10:15—Concert, WCCO, 415.
Bible story, WEAF, 492.
Special, WGY, 379; WRC, 469; Concert, WBZ, 333.
Music, WTAM, 389.
Address, KFUO, 545.
News bulletins, WTAG, 545.
Concert, WCAE, 461.
10:30—Trio, WENR, 266.
Orchestra, WGBS, 316.
10:35—Church, KGO, 361.
11:00—Organ, WCCO, 416.
Concert, KMTR, 370.
Orchestra, KFI, 467.
Concert, WOC, 484.
Music, WKRC, 325.
Orchestra, WHN, 361.
Orchestra, KNX, 337.
11:30—Orchestra, WENR, 266.
12:00—Special, KNX, 337.
Orchestra, WHN, 361.
Concert, KFI, 467.
Concert, KGO, 361.
Orchestra, WFAA, 475.
12:15—Orchestra, WKRC, 325.
1:00—Orchestra, KFI, 467.
Music, WBBM, 226.
Special, WKRC, 325.
1:15—Orchestra, WKRC, 325.

RADIO OBSERVES OCEAN SPANNING

First Transatlantic Signals Effected 25 Years Ago

Marconi Caught English Wireless Station Signals at Newfoundland in December, 1901.—World Refused to Believe Feat.—Used Kites and Balloons

BY LLOYD JACQUET.

Twenty-five years ago the world was told that Marconi had succeeded in spanning the Atlantic by wireless, and the world didn't believe it. Yet the claim was true and eventually the non-believers were forced to acceptance as a new era of communication dawned upon civilization.

On Dec. 12, 1901, Marconi and his assistants, experimenting on top of Signal Hill, at the entrance of St. John's Harbor, in Newfoundland, sent up a kite, to which was attached a wire, called an "aerial," and heard distinctly the first wireless signals ever to be received across the Atlantic ocean.

Between 11:30 a. m. and 2:30 p. m. St. John's time, on that memorable day the telephone headsets with which Marconi and his assistants had provided themselves brought to their ears the series of three dots, at frequent intervals. These dots formed the letter "s" in the Marconi code, and so clearly were they heard by all that there was no longer doubt in Marconi's mind that actual reception of the wireless signals across the ocean had been accomplished.

Marconi's experiments in Newfoundland were ostensibly not for the purpose of establishing communication with England. He went to St. John's at first to select a spot for the erection of a station with which he might carry on communication with the transatlantic liners, 300 miles out at sea, just as they reached the Grand Banks.

He brought with him, besides delicate receiving gear, several balloons and kites, for the purpose of sending up the aerials which he was to use in this work. His theory was at that time that the higher the aerial the greater the receiving distance.

For more than a week Marconi and his assistants worked at installing the station and preparing the antenna systems for the kites. They had had much trouble with the balloon, one of which was carried away in the wind.

Before leaving England, Marconi had made arrangements with the station in Poldhu, Cornwall, then considered a very powerful installation, to transmit signals daily, as soon as the word should be received from him by cable.

The cable was sent on Monday, Dec. 9, 1901. On Wednesday, when he had succeeded sending up a kite for a long period of time, he and his assistants heard what they were convinced to be signals from the Poldhu station in Cornwall. However, as he had equipped the field receiving station with telephone head-sets, which were more sensitive than the recording apparatus usually used for such purposes, no positive evidence could be shown, and he further listened on the following day, Thursday.

T.. time, the series of three dots of the letter "s" were so plainly evident, that Marconi was sure the signals were genuine wireless messages from his Cornwall stations, sent as prearranged with his chief operator.

So carefully had he guarded his intentions from the world that it was quite startled when he made his first simple report to his officials in London by cable, on Saturday night.

So great was the scepticism about his actual results, because of the absence of a recording tape, which was usually used by him for recording purposes, that it took the famous tests he made on board the U. S. Philadelphia, a year later, to prove that such a long distance reception experiment was thoroughly possible.

The Cornwall transmitting station was situated 1700 miles from the experimental receiving installation in Newfoundland.

Marconi was hardly 30 years old when he accomplished the wonderful feat of sending messages through space across the ocean.

This was only one of the steps of his amazing career. Born in Bologna of an English mother and a native Italian father, he early professed a strong liking for things scientific. At 8 years of age, he was already inventing; at 12, the tutor his parents had provided him attempted, it is said, to take away from him a device which he had assembled himself; and even when he reached 16 his only studies were mathematics, chemistry and electricity.

He was only 20 when he began his experiments on telegraphing without wires. Although his parents and his friends looked upon him as a "boy genius," they were startled and frankly incredulous in his wild ideas of projecting messages through mountains, and over lakes. But he succeeded in sending a tiny message from one corner of a large room of the Marconi homestead, to the other. That was his first real success. Then he signaled several yards, then a few hundred, and, finally, more than a mile.

This all happened between 1894 and 1895.

In 1896 he decided to go to England and carry on his experiments in cooperation with W. H. Preece, then chief electrician of the British Postal System and very much interested in the results of the young Italian inventor.

He knew that he could wireless between points on land, and some of his earliest experiments in England were principally concerned with the possibilities of wireless telegraphy between shore and ships at sea.

To Marconi also goes the credit of having been the first one to establish communication between land and a ship in motion. This was done in 1897. His opportunity to prove how useful his newly developed art really could be came in July, 1898, when he wirelessed the results of the Kingston regatta from a shipboard station on the Flying Huntress. The Daily Express was able to print full reports of the yacht race long before the telescopes of land observers could know the news.

Again, on March 28, 1899, Marconi succeeded in establishing the first communication ever held between two countries. He telegraphed messages by wireless from his station in South Foreland, County of Kent, England, to Boulogne, France, for hours at a time. He was then only 26 years old.

The distance was 32 miles, the record up to that time. The greatest previous record had been 18 miles. Thus, Marconi had practically doubled the range of his strange apparatus in less than two years!

But the crowning achievement came with his announcement that December afternoon, 25 years ago, that at last messages had been heard across the Atlantic ocean.

Of course, there were many skeptics. And scientists, engineers, men who really should have known, were frankly doubtful of the accuracy of Marconi's reports on his long-distance receptions from England.

However, all doubt was dispelled following his receiving reports while on board the steamship Philadelphia, on March 2, 1902, when he heard, and had verified by the ship's officers, signals from his powerful Poldhu station, 1551 miles away. This was the greatest distance messages had ever been heard on a ship at sea.

This distance was increased the day after to 2099 miles, and was carefully checked by the navigating officers, on the charts of the voyage, which Marconi kept for conclusive proof. These ship experiments were his most important marine ones, and no doubt did more than anything else to prove the value as an aid to shipping.

His next important trip was on the steamship Campania, in May, 1904, in which he endeavored to keep in communication with both sides of the Atlantic at once. The ship had been equipped with the most powerful installation afloat at that time, and was capable of sending messages for a distance of 150 to 175 miles. His receiving apparatus had been greatly improved and he was able to hear Cornwall station at all times during the voyage very easily.

It was even then a great novelty to receive messages direct from the ship. The following Marconigram, which was sent by Marconi to the Tribune, when the Camania was off Nantucket Lightship coming in from Liverpool, England, inquiring as to his speeess, was one of the first ever dispatched in this manner:

The Tribune, New York:

Thanks for message. Undertook voyage for purpose ascertaining requirements on shipboard for daily news message. Results satisfactory for immediate inauguration.

(Signed) MARCONI.

The daily news service by radio, now a regular service of every ocean liner, no matter where it is at sea, had its inception at this time.

After a quarter century of work, of perfecting, inventing and developing radio, Marconi has just inaugurated the new beam transmitter. The first transatlantic beam was turned on the Canadian receiving station only a month ago. Others will tie-up Great Britain with every one of its colonies, no matter how far away. This is the cumulation of Marconi's visionary dream—the linking up of the British Empire by wireless.

The little shack at St. John's, Newfoundland, where the early receiving station was established, has been dismantled. In fact, all of the old historical places, which saw the first efforts in the establishment of transoceanic communication will soon be forgotten. It is no longer necessary to be on the edge of the sea to receive messages from across the world! The stations are moving inland, near Montreal, nearer the great centres of commercial activity.

Marconi has already contributed much to the world in the wireless field. His 30 years of wireless work have been profitable. The genius which made possible the first communication across the room of his father's mansion, and across the Atlantic, is not dead. No one knows what to expect from Marconi next. He has given us so much that we really ought not to expect any more.

CORRECT VOLTAGE

Amount Indicated by Tube Manufacturer Should Be Used.

The correct filament voltage as called for by the manufacturer should be applied to your tubes. There is no danger of hurting the tube if the voltage is too low, but there is danger when this voltage is too high. It may not burn out the tubes but it will deactivate or paralyze them, which makes one or more of them inoperative.

If you have all good tubes in your set and have one that has been deactivated, if the latter is placed in the set it will be found the tube or tubes will have to be burned much brighter to get anywhere near the same results as when all good tubes are in use. This added brilliancy means the other good tubes are being forced and it will only be a matter of time when they are in as bad condition as the poor tube. This is one bad feature of having all tubes on one rheostat unless a filament voltmeter is part of the set.

Tubes used for radio frequency amplification do not require burning as bright as those used for audio frequency amplification. In the former case they should get the correct filament voltage for best results and this will depend on the wave length the set is adjusted to. The longer wave lengths usually require the ratio frequency tubes to be burned a little brighter.

Cheap voltmeters are not accurate enough for testing and only a high grade voltmeter should be used and one with a scale of from 0 to 8. The higher figures are necessary because in some cases freshly charged storage batteries read seven volts. A voltmeter with such a scale will handle any of the tubes in use to-day. Readings should be taken across the filament terminals of the socket with the tube in the socket.

The Super-Heterodyne

The average super-heterodyne has seven or eight tubes consisting of an oscillator, mixer or first detector, two or three stages of intermediate frequency, second detector and one or two stages of audio.

MAKING SCENERY SOUNDS BIG JOB

Radio Drama's Demands for Atmosphere Are Exacting

Director Must Convey Settings to Listening Audiences Entirely by Sounds.—Many Unique Devices Employed Successfully.—Regular Stage Props Useless

Creating the atmosphere for radio plays and playlets is probably the most difficult job of the ether drama director. Costumes and scenery bother him not. Indeed, it is unnecessary for his players to memorize lines or the usual stage "business." A couple of rehearsals and a little study enable them to read their parts as well as their stage cousins might speak them. But the biggest and most difficult part of the entire producton is the atmosphere, the entrances and exits of the actors. Sound scenery must be developed and operated so effectively that the thousands of fans, listening in all over the country, may follow the play's action not only with understanding but enjoyment.

For example, says the New York Times, the British Broadcasting Company placed a microphone at a busy London street corner and produced these sounds as a background for the lines of the playing cast. There are effects, however, that might be difficult of importation. For example, a forest fire might not always synchronize with a play. At WGY some time ago a most realistic forest fire was created by the use of a plumber's blow torch for the sound of flame and wind and by breaking up matches to simulate the sound of cracking, breaking, burning tree limbs.

Since the listener is unable to see any one enter a scene, the character's presence is generally denoted by the closing of a door or by the lines. For this reason the doors in all the homes of the radio drama characters are apt to be squeaky affairs and the slamming of doors which has won many a boy or girl a corrective word from parents becomes a necessity.

Ten Eyck Clay, director of the WGY players, is a seasoned actor of the stage "prop." He has found that the most difficult problem in the radio drama, demanding most in time and energy, is the production of sound-scenery. Actors readily throw themselves into character and in the radio production it is not necessary to memorize lines. At most two rehearsals of a cast are sufficient for a worthy radio performance.

The scenery, according to Mr. Clay, is another question entirely, for the obvious sound is not always the most suitable to produce a certain effect. Hours and hours are sometimes devoted to devising a fairly accurate sound production. After the "props" necessary to create the sound have been found or built radio rehearsals must be held in co-operation with the radio engineers.

The stage "props" is rarely suitable for radio use, though the wind, and thunder machines of the stage are usually used for the thunder storm effect. In the movies the spectator sees the locomotive, and the supplementary sounds produced in the orchestra pit need not be accurate to emphasize the effect. The picture has registered in the mind of the spectator. On the stage also "prop"-produced noises are often poor imitations of the real thing. The radio microphone is so sensitive that the motion picture theatre or stage props are practically useless. The passing train must sound like a train and not a motorcycle or a tugboat.

One of the most stubborn "sound" problems that Mr. Clay has faced was the production of the sound of a speeding express train. This particular train was supposed to be on a one-track road, where the roadbed was none too smooth and where a flat wheel or two was not considered an offence. The player-director proceeded to make a sound study of railroad trains and after he was satisfied that he had learned all the sounds in their proper sequence he tackled the problem of producing these sounds so faithfully that the listener many miles away would know that he was listening to the passing of a steam engine drawn trains.

A real locomotive bell and a creditable whistle were readily produced. To these were added boards covered with sandpaper which, when rubbed one against the other, produced what may be described as the chug-chug of the engine. A flour sieve helped to define the sharp first sound heard as the engine puffs.

Then came the problems of producing the roar of the passing train and the pounding or bumping of the wheels on uneven track. A metal panel, 5 feet long and an eighth of an inch thick, was decided upon for the roadbed. A couple of youngsters on roller skates speeding over the uneven surface of the sidewalk suggested the rolling stock and a pair of roller skates was utilized as a train. In the first rehearsal, Russell Hoff, chief of the control rooms crew, suggested that a couple of heavy cords be stretched over the metal panel. As the roller skates passed over the panel one couldn't tell the sound from that of a train bumping over uneven rails. The volume of sound was regulated in the control room. The listener first heard the distant whistle and the muffled roar and each second the control room crew built up the volume until the heavy train veritably thundered past the little country railway station. An added effect, familiar to those who live near passing trains, was the rattling of window glass. Five people were required to produce the train effect, one to whistle, one to chug, one to operate the roller skates, one to make windows rattle, another to sound the bell and the sixth, the control room operator, to control the sound volume.

The best recipe for a fast train, then, is: Two short pieces of wood covered with sandpaper, a flour sieve, a pair of roller skates, a metal panel, a whistle, a bell and two pieces of heavy cord.

WIRING TIPS

Keep Wires Between Grid Posts of Tube Sockets and Related Parts Free.

The only important wires which must be kept short and free of all others are those running directly from the grid posts of the tube sockets to related instruments. It is advisable, but not so urgently essential, to keep the grid connections on the audio amplifiers short. However, if they do take a few twists or lie across some other wires they will not seriously affect the operation of the receiver, as similarly mistreated wires in the radio-frequency magnifiers are certain to do. All the other wires in a set, including the filament returns, the "A," "B" and "C" battery and rheostat and switch leads, may be bunched together into one cable without harming the outfit in the slightest. There is no need at all for stiff busbar and carefully separated connections; insulated solid or flexible No. 18 wire is just as good and can be handled much more easily.

VALUE OF INDOOR AERIAL.

An attic is the best place for an indoor aerial. This type is just as good a year after it is erected as it was the day it was put up. There is no danger of it blowing over or falling off the roof. Due to its not coming in contact with nature's elements, it can be small wire because there is no strain on it and it does not corrode. With the indoor aerial that is properly erected the results are the same on rainy nights as on dry nights.

WIRES FOR AERIALS

When in doubt as to what kind of wire to use for an aerial, it will depend on where the aerial is to be erected. For an indoor one, not exposed to the weather, any kind of copper wire will answer the purpose. Even wire as small as No. 30 can be used and it may be along the moulding, out of sight. For an outdoor aerial, it should be strong and not less than No. 14, or stranded wire. The small wire would soon deteriorate.

POLARITY OF PHONES.

All good telephones have a colored cord to designate polarity. They will give louder signals when connected properly. The red or brown tip (the regular cord has a red or brown strand in it) should go to the positive from the "B" battery and the other cord to the other contact. The majority of sets are marked plus on the loud speaker terminals.

1927 RECEIVERS WILL COST MORE

Early Models Indicate Increase in Price, Weight and Tubes

General Advance Shows Radio Completely "Sold" to Public. Sets Now Reach as High as $5000.—Average Price for New Year Set at $184

BY LLOYD JACQUET.

Radio sets designed and built for the 1927 radio season weigh more and are larger than those offered for sale to the public during the 1926 season. The price is greater than last year's model and the number of tubes is on the increase. All of this information was gathered from an analysis made from more than 200 representative and diversified sets, which have just been exhibited at the many radio shows by leading manufacturers throughout the country.

By taking all of the averages of dimensions, weight, prices, number of controls, number of radio and audio tubes and other facts about these sets it was possible to "build" the average radio set for 1927.

Actually, the average set measures 28 inches in length, 17 inches in height and 20 inches in width. It is much larger than the 1926 model, which was, according to figures gathered and made public by Radio Retailing last season, only 11 by 10 by 24. Thus the modern radio set is growing.

There has been a gain, or rather considerable increase, in weight. Whereas the 1926 average set weighed but 23 pounds, the new 1927 model reaches 61 pounds. This is easily explained, since a great deal more metal in transformers, chassis, panels, shields and elsewhere has been introduced in the construction of the modern radio receiver.

As to the analysis of the number of tubes, the indications are that a greater number are included in the 1927 type of set. Last year the number was five. This year the figures give an average of a little more than 5½ tubes a set. Of course, the "half" tube is largely an indication that there are more six, seven and eight tube outfits and fewer one, two and three tube sets than previously. Inasmuch as the fraction is over the half, it would probably be correct to assume that the average number of tubes for 1927 set is six.

These tubes are divided into radio frequency and audio frequency tubes, each set needing besides, a detector tube. The findings are rather interesting in that they show a tendency to increase both the radio and audio stages of amplification, but in uneven proportions.

The number of controls seemed to decrease with the increase in prices. They numbered at least three in the $30 to $80 group, and were reduced to two in the $100 to $400 group, and average between the increase, as the average tube value a set of radio-amplifier tubes is nearly 10 per cent. larger than the increase in audio tubes. Curiously enough, the survey does not show the tendency of quite a few manufacturers to include the extra "power" stage in the audio-frequency end of the receivers now being sold.

This compares as follows with the 1926 set: Radio-frequency amplification, two tubes; single detector tube; audio frequency, two tubes; total, five tubes.

Practically the only thing which remains unchanged in the 1926 and 1927 average set is the matter of controls, or knobs and dials. Our 1927 average set shows two main dials for tuning and two or three smaller knobs for rheostats and switches. There has been somewhat of a change, however, in the design of these controls. While many sets still make use of the dials, the tendency is decidedly towards the flush type of "window" control by means of a small knob only.

More of the 1927 sets have calibrated dials, with illuminated scales, and wave lengths are indicated, instead of numbers, in a number of cases. These are small refinements which merely show how the appearance of the sets has changed over a period of a year.

It is in the matter of the price that the greatest surprise comes, however. Last year's survey showed that a set would cost, on the average, about $80. Very evidently, the radio public has had a great deal more money to spend on radio, or has become completely "sold" on it, as to-day there are sets that sell for as much as $5000.

Our average 1927 set has a sale price of $184. This is practically $100 more than the 1926 model.

Unquestionably, the radio buyer is getting more for his money than he did last year. In this great advance in price, it must be considered that a great number of sets have fine cabinets, with elaborate woodwork, which naturally add a considerable amount to the price of the instrument.

While the average 1927 set is still in the "table type" class, it is competing fiercely with the console model. It is, in fact, the console which has brought up its average price to such a high level, because there are sets listed on the 1927 list which reach down to $9.75, a price never before attained in tube sets, and consoles costing $500 or more.

It must be remembered too that a great deal of workmanship is necessary in the new chassis type of construction, which has been adopted by quite a few of the 1927 set manufacturers. Shielding has added to the cost, as has the introduction one and two in the high price sets. The higher priced sets had a large number of loop equipments and were naturally housed in beautiful cabinets, which added considerably to the average price, as finally calculated for the average set.

Greater care, too, has been exercised in the design and finish of each individual part entering into the assembly of the final set. There are innovations in variable condensers, radial tuning dials with "gang" combinations, and single control possibilities, which require exquisite workmanship for smooth operation.

Almost every set is equipped with a vernier type of tuning control. Sensing no doubt the necessity for a large degree of selectivity in the radio sets of the year, anticipating the chaotic condition of the air, the average set is quite selective. Tuned radio frequency circuits are still the most popular, with the use of power stages in the audio end growing into favor.

Practically every 1927 set will work on an aerial and ground, but there are quite a few—enough to mention them—which operate from a loop, and aerial and ground.

With very few exceptions, the tube sockets were designed to receive the standard five-volt tubes. A few sets have been designed for both the five and three-volt tubes.

Not many have a built-in loud speaker. The speakers are more common as an integral part of the set when the entire installation is housed in a console.

The single control set, which seemed to be so popular among the manufacturers a year or so ago, has practically been abandoned. To-day, the sets have arrangements which can be made into single control, but which allow of dual tuning, if necessary.

Altogether, the average set of 1927 is a superior set. It is more selective, has better quality, and is easier to tune and take care of than any of its predecessors. It represents a stabler value, and shows very definitely that radio manufacturers have learned how to make a good, substantial, permanent product, which will not have to be radically changed from year to year, as has been the custom since broadcasting began.

SIR OLIVER HAS HOWL-PROOF SET

English Scientist Presents Own Invention to Public

Sir Oliver Lodge is again in the limelight, this time through his invention of a new radio receiver which he claims is howl proof. He has named it the "N" circuit and declares that if it were universally adopted there would be an end to the oscillation nuisance. The receiver was presented to the English public at the beginning of the present radio season.

"In designing the receiver which has now become known as the N circuit my object was first to provide a wireless set that would not oscillate or cause interference with neighboring sets (and this is very necessary if we are all to enjoy the broadcasting, just as traffic control on the roads is necessary if we are to have safety); secondly, to provide a set which would be perfectly simple to operate and yet would receive programmes from the local stations as well as the distant stations," said Sir Oliver Lodge, in a recent article in the New York Times.

"If the 'N' circuit were universally adopted there would be an end to the oscillation nuisance."

From this short statement it will be seen that the scientist's prime object has been to eliminate the "blooper." Regenerative circuits because of their excellent amplification have always been popular, but their use has been coupled with the "howling" nuisance.

The fundamental principle of the "N" circuit is the employment of a single connection between the antenna and detector tube. It is nothing more or less than a closed oscillating circuit. The antenna circuit itself need not be a tuned circuit, but can be of the aperiodic type, and is heavily damped. The "N" circuit has a very low resistance, so that comparatively high voltages can be generated by small voltage impulses.

Sir Oliver Lodge maintains that for good quality of reproduction there should not be more than one tuned circuit, as, if two tuned circuits be employed, there is a great liability to distortion owing to heterodyning between the circuits.

In the "N" circuit the coil is made of a fairly high inductance value and the capacity of the condenser small. Owing to the much greater length of the antenna system, and to its damping, it is impossible for radiation from the antenna to occur.

The ground is also connected to the plate of the detector tube, and there is a small resistance between the grid and th filament circuit.

Vagrant Waves of Interest to Fans

Dry "B" batteries are renewed more than any other parts of a set.

Lessons in English are now broadcast from a radio station in Tokio, Japan.

Some interference can be tuned out by using small variable condensers and large coils.

It is much better to build your own set than to try and improve on a manufactured one.

The operating costs of broadcasting stations in New York city run to nearly $3,000,000 a year.

Wireless telephone equipment is to be installed on 36 express trains in Germany, where telephone subscribers throughout the country will be able to get into prompt communication with relatives and friends travelling on any one of the trains.

As a rule, loud speakers are not amplifiers, and they require a strong signal to work them.

There are from two to 50 persons employed on various broadcasting stations in the United States.

A long outdoor aerial picks up more energy than a short one, but most any kind will get locals.

Sulphate forms on the plates of a storage battery when it has run down and not been charged.

The effect of the fixed condenser in series with the lead-in is the same as shortening the antenna.

St. Paul, Minn., is the first city to introduce radio service in the homes over the regular telephone wires.

Denmark has 70,000 receiving sets. There are 48,000 in Copenhagen, nearly half of which are tube sets.

The radio industry in the United States now employs 300,000 persons in 1200 plants and 40,000 dealers' stores.

Radio broadcasting of propaganda or political speeches is forbidden in England. This rule even prevents broadcasting of the King's speech at the opening of Parliament.

Broadcasting for the prevention of crime and detection of criminals is soon to be employed extensively in Cleveland, O. Small sets with headphones are to be installed on every squad car and motorcycle.

The first and only time Thomas A. Edison, the inventor, ever spoke over the radio was in Atlantic City, N. J. All he said was: "I have never spoken over the radio before—good night!" He once announced that he would never speak via the air.

Radio messages frequently travel from a broadcasting station to a receiving set over two entirely separate paths. One path is along the surface of the ground. The other path is through the high levels of the air, 50 or 100 miles above the earth.

For advertising on the air, broadcasting stations in New York city ask $400 an hour; Boston, $250; Philadelphia, $200; Pittsburgh, $200; Detroit, $200; Minneapolis, $250; St. Louis, $250, and Chicago, $350. To broadcast over a chain of 16 stations it costs $3350 an hour, but subject to certain discounts.

If a condenser is placed in parallel with a coil, the wave length is increased. If placed in series with the coil, the wave length is reduced.

Soft tubes should be mounted on soft rubber sponges.

A large condenser requires more care in tuning than a small one does.

A good set should always get good results, while a cheap set may and may not.

High, strong winds cause aerials to tighten and break unless properly fastened.

Connecting the primary and secondary together and grounding them will sometimes help reception.

A piece of dry rope makes an excellent emergency insulator for an aerial until a regular insulator can be installed.

It is possible to receive local stations without an aerial by merely changing the ground wire over to the regular aerial binding post.

Successful tests have been made of two-way radio telephone communication on freight trains for the exchange of messages between conductor or brakeman in the caboose and the engineer or fireman on the engine. The train was made up of 100 cars.

If possible, avoid running the lead-in through the basement.

Every school in Atlanta, Ga., is equipped with a receiving set. The entire equipment is worth $13,000.

A "C" battery replaced every six months not only keeps the "B" battery hills down, but gives clear reproduction.

Radio is to be used for the transmission of orders for movements of trains in the yards of the St. Paul Union Depot, in St. Paul, Minn.

Good tube sockets are made from good insulating material and contain high-grade springs, which are so constructed that a tube fits snugly.

Never try to charge a battery in a few hours. A slow charge will give better results, and it is not advisable to exceed a 5-ampere charging rate.

A variable condenser is placed in the set to vary the wave length of the various circuits so as to adjust or tune them to resonance with the incoming radio wave.