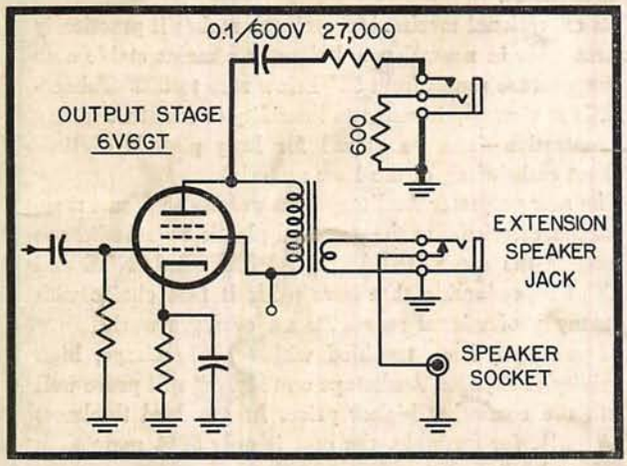
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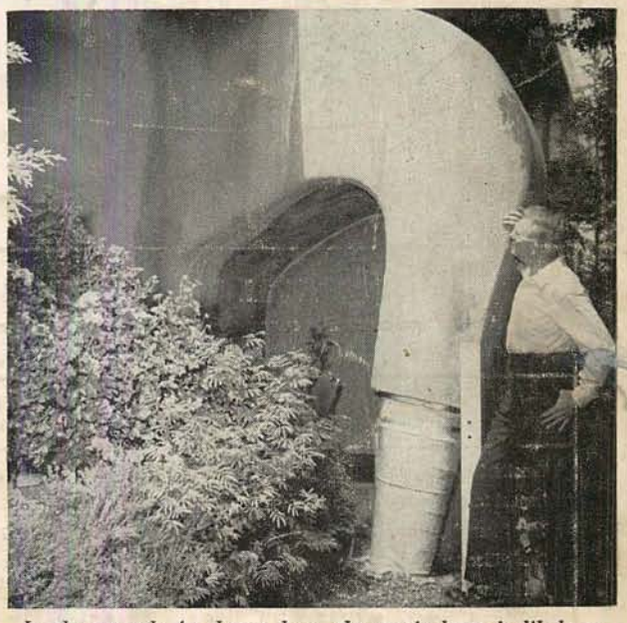
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This simple modification to a tape recorder will usually result in improved quality on playback through your hi-fi amplifier and speaker system. Read "At Home with Audio," page 28.



In the crusade for better bass, the music lover is likely to end up with a large exponential horn. If there isn't room for it in the house, why not build it outside? See page 17.

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"Mylar" polyester film compared to ordinary plastic base material (cellulose acetate)

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Tensile Strength, psi	25,000	25,000	25,000	11,000
Impact Strength, kg-cm	90	170	200	10
Tear Strength, grams	22	35	75	5
Break Elongation, %	80	95	105	20
Softening Point, °F	464-473	464-473	464-473	149-230
Moisture Absorption, % (at 100% RH)	0.3	0.3	0.3	9.0
Bending Modulus, psi	500,000	500,000	500,000	350,000
Flex Life, cycles at 0° F	20,000	—	—	500

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ENGINEERING MUSIC SOUND REPRODUCTION

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AUDIO PATENTS

RICHARD H. DORF*

ONE OF THE BIG FACTORS which can contribute to electronic organ sound, especially in homes and small halls, is artificial reverberation. It is also useful in improving liveness of musical recordings of any sort when used in moderation. One common method of providing reverberation is the echo chamber, a room with very hard walls, with a microphone at one end and a speaker at the other. Results are often good, but providing a room especially for this purpose is not always possible. Another method is to use a mechanical spring system such as the Hammond people provide in one of their tone cabinets (see the writer's book, "Electronic Musical Instruments," advertised elsewhere in this issue). The spring system, however, is not easily adjustable and it runs into troubles with resonance.

There are also two tape-recorder methods. One, most easily used with ordinary machines, provides that the signal is fed into the recording head. The playback head output, which comes a fraction of a second later, is then fed back to the record head, with the result that any sound travels through this time-delayed loop until the accumulative losses allow it to fade out. With a very linear tape system this method gives good results, but in practice the range of adjustment of loop gain between just under unity (unity gain or more would cause oscillation) and that at which reverberation effect becomes negligible is extremely small. This adjustment fixes the reverberation time by controlling the signal loss on each trip through the loop. In addition, the slightest frequency nonlinearity anywhere causes great emphasis of the peak frequency after a few trips through the loop, and other distortions are emphasized in the same way.

The most satisfactory method is to have a single recording head followed by a large number of playback heads. Then the signals from the playback heads (which are commoned into a single amplifier output channel) are repetitions of the input signal at spaced time intervals. The repetition effect of echoes is present and none of the feedback-loop troubles are encountered. The system must still have high quality, however, and the expense of the playback heads (which are more critical in construction than recording heads) is considerable.

James R. Ambrose shows in his Patent 2,674,660, assigned to RCA, how to cut in half the number of playback heads required for a particular reverberation machine. *Figure* 1 is a mechanical view of the setup showing that there is first an erase head, then two record heads, each of which records on half the width of the tape. Following this group comes the playback heads, five of them as shown here. Note that the record heads are rather widely spaced with respect to the spacing of the playback heads, and that the smaller spacing is not a submultiple of the larger. Now, when the material applied to the record heads (simultaneously but not necessarily at the same level) passes the playback heads, there will be ten repetitions of the signal even though there are only five reproducers, since each playback head covers the full track.

Figure 2 shows the electrical setup in block form. The erase head, of course, operates normally and simply clears the tape. The record heads are fed the signal, with provision for varying the level of the left one. Each playback head has its own preamplifier, all feeding to a common output amplifier through separate level controls which can be set for a gradual fadeout.

There is in addition a feedback channel by which the output of one of the playback heads can be reintroduced into the input circuit to provide some measure of the feedback type of reverberation in combination with the multiple-head method. In a complete system thre is also a direct path from input to output without going through the tape machine, so that reverberation may be controlled by apportioning the signal going through the two paths.

From the Horse's Mouth

One type of communication which finds the greatest welcome in our mailbag is the letter of sound advice from patent attorneys. We feel that most people who work with audio (and electronics in general) sooner or later hit on some idea which they think may warrant patent proceedings. It then becomes all-important that the patent laws and legal practices and precedents furnish maximum protection to the inventor—and this they cannot do unless the inventor knows about them. Since we are not ourselves a patent attorney (interesting use of the singular and plural in the editorial "we") these utterances directly from the horse's mouth deserve passing along to you.

A short time ago we published a description of the Coulter transformerless amplifier, with a comment on how short was the processing time of the British patent office compared to that of the American. Mr. I. Irving Silverman of the Chicago patent law firm of Silverman & Mullin has sent us an explanation of this discrepancy. His letter was sparked by the fact that he

(*Continued on page 6*)

* *Audio Consultant, 225 W. 84th St., New York 24, N. Y.*

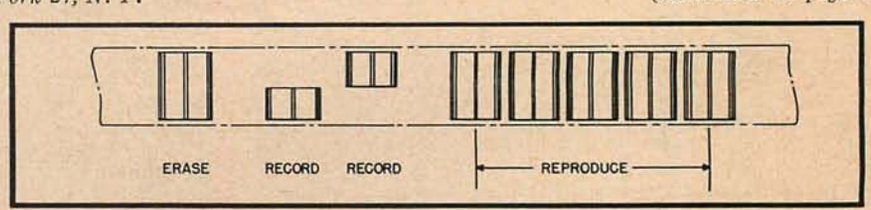


Fig. 1

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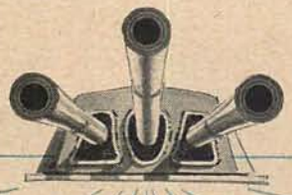
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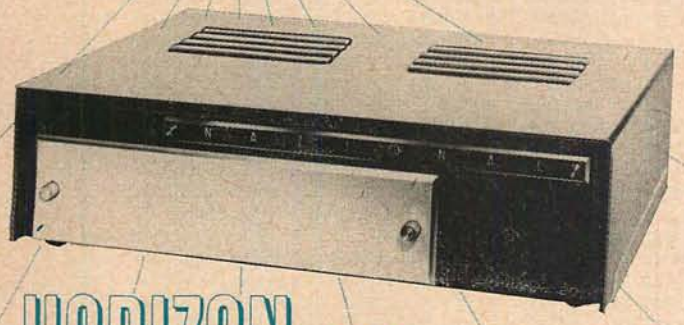
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The HORIZON 20 is a 20-watt amplifier with a total harmonic distortion of less than .3% and total intermodulation distortion of less than 1% at full rated output. Frequency response is ±.1 db 20 cps to 20 kcs.; ±1 db 10 cps to 100 kcs. Power response at rated output is ±.15 db, 20 cps to 20 kcs. Hum and noise is 80 db below rated output.





HORIZON *10*

10-WATT AMPLIFIER $79.95 (SIZE: 14½" x 4")

Incorporating the revolutionary new unity-coupled circuit in a 10-watt amplifier design, the HORIZON 10 offers performance never before achieved at such a moderate price!

The built-in preamp-control unit offers a choice of 3 inputs, 3 record equalization curves, a loudness control and separate bass and treble controls.

Harmonic distortion is less than .5%; intermodulation distortion, less than 2% at rated output. Frequency response is ±1 db, 20 cps to 20 kcs.; power response, ±2 db, 20 cps to 20 kcs. Hum and noise are better than 70 db below rated output on high-level input, better than 50 db on low level input.

HORIZON *5*

PREAMPLIFIER-CONTROL UNIT $49.95

The HORIZON 5 achieves a new high in frequency response (±1 db, 20 cps to 100 kcs) and voltage output (up to 10 volts) — a new low in distortion (less than .2% harmonic, .3% intermodulation)!

Four inputs, 7 record equalization curves, a loudness-volume control and bass and treble controls are provided.

Entire unit slips quickly, easily into either the tuner or 20-watt amplifier.

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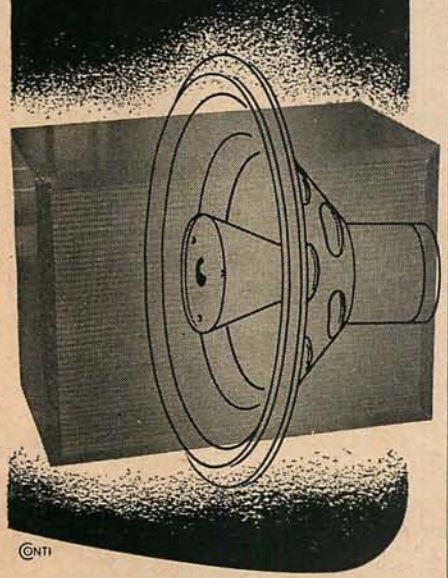
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PATENTS

(*from page 2*)

is the attorney who handled the later stages of both the British and U. S. Coulter applications.

The time difference is due to the differences in the patent laws of the two countries. For one thing, the American rules call for a reply to an examiner's letter within 6 months, whereas in Britain the time for reply is decreased to shorter and shorter periods for succeeding replies.

Perhaps more important is that in England the patent term (16 years) begins from the date of filing the application, while in the U. S. the term (17 years) does not commence until the issuance of the patent certificate, which takes place at the termination of all Patent Office action. Thus it is obviously advantageous for the applicant in America to stretch out the period between filing and granting, since during the application period a large amount of protection exists without shortening the total period during which the invention belongs exclusively to the inventor. In Britain, however, it is to the inventor's advantage to proceed as quickly as possible, since the 16-year period begins running out on the day of filing while until the certificate is granted there is not maximum protection.

Both offices, Mr. Silverman comments, are overworked, and both have extremely high-caliber examiners (high-calib*re*, we assume, in Britain).

Mr. Silverman also enters the lists on behalf of his best recommendation on foolproof recording of date of conception. He feels that the ideal system for anyone engaged in work which might result in invention is to keep bound notebooks in ink, with numbered pages—in the form of a continuing business record. All experiments, conversations, diagrams, etc., should be entered in it in ink and any disclosures of inventive matter should be witnessed by an individual (or several) who understand it thoroughly and so state. Such a record book carries great weight in court and in addition (our own comment) is worth its weight in gold in enabling its owner to recall all that has been done on the job. It is our own practice to keep such a book for each consulting assignment as a legal and business protection to the client.

One more fact Mr. Silverman points out, which too many people forget. To obtain legal protection in the form of a patent, application must be made within one year after publication, sale, or public use. Mere recording of the conception, as we have discussed it above and previously, is *not enough*. Formal application for a patent must be made within one year or all patent rights are surrendered.

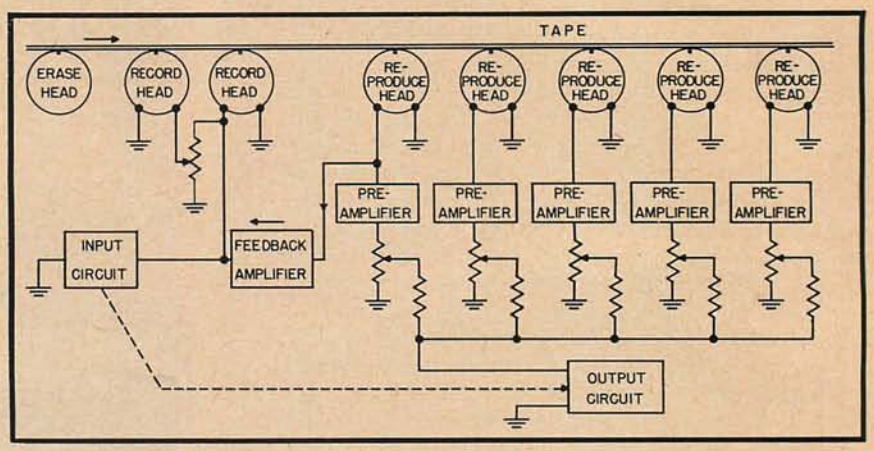


Fig. 2

COMING EVENTS

July 8–12—The British Institution of Radio Engineers, 3rd post-war convention, University of Oxford, England. For further information, write The Secretary, B. I. R. E., 9 Bedford Square, London, W. C. 1.

July 19–30—Transistors and their applications, special summer program offered at Massachusetts Institute of Technology. Details and application blanks may be obtained from the Summer Session Office, Room 7-103, M. I. T., Cambridge 39, Mass.

Aug. 25–27—Western Electronic Show and Convention. Ambassador Hotel, Los Angeles, Calif.

Aug 27–29.—Dixie Audio Festival, Henry Grady Hotel, Atlanta, Ga. Open to public 28–29, 1:00 p.m. to 10:00 p.m.

Sept. 30, Oct. 1–2—1954 High-Fidelity Show, International Sight and Sound Exposition. Palmer House, Chicago, Ill.

Oct. 4–6—National Electronics Conference, Hotel Sherman, Chicago. Papers are solicited on all electronics subjects, and the program chairman would appreciate sugestions for titles and authors of suitable papers. Write George E. Anner, Elec. Engrg. Dept., University of Illinois, Urbana, Ill.

Oct. 13–17—1954 Annual Convention, Audio Engineering Society. Hotel New Yorker, New York City.

Oct. 14–17—The Audio Fair, Hotel New Yorker, New York City.

Nov. 18–19—Sixth Annual Electronics Conference sponsored by the Kansas City Section of the I.R.E., Hotel President, Kansas City, Mo.

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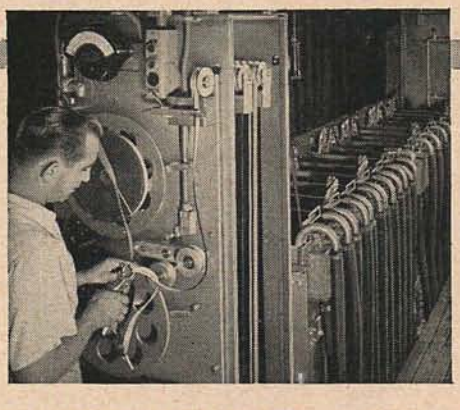
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LETTERS

Transformerless, not Errorless

SIR:

. . . In the schematic of the article on the transformerless amplifier in the June issue, the polarity of the 40/150 decoupling capacitor in the cathode of the 6SN7 is reversed. In the parts list, three 6082's are required, not six. The balance pot *need* not be wirewound, although that is desirable; ordinary 2-watt controls are satisfactory.

In subsequent experimentation with this amplifier on various speakers, I have found the .01-μf, 16-ohm correction network most universally applicable. The single 0.5-μf capacitor is particularly poor. It can add more instability than it can remove. Inasmuch as this was treated as a choice, I doubt if any great harm can arise from the lack of this new fragment of knowledge. . . .

DOUGLAS P. DICKIE, JR.,
1725 Gower St.,
Hollywood 28, Calif.

De-emphasis in FM Tuners

SIR:

Burstein gives a somewhat inaccurate picture of de-emphasis in an FM tuner in his June article. He assumes that the discriminator is a zero-impedance generator and neglects Miller effect and the over-all response of the tuner. Further, the impression is given that almost any RC product equalling 75 μsec is suitable. In the interest of the a.c./d.c. ratio of the load viewed by the discriminator, it is desirable to have R as large as possible. The capacitance can almost be made up of the Miller effect of the following stage. (*But not if it is a cathode follower,* ED.)

The article does provoke interest in the de-emphasis question however, and since a signal generator with variable FM is not at the disposal of most of us, perhaps an FM station could be prevailed upon to provide a frequency run at the end of the broadcast day. Then we could sit back and plot the curve with a VTVM across the tuner.

CHARLES L. BENSON,
5959 La Tijera Blvd.,
Los Angeles 56, Calif.

Bass-Reflex Nomograph

SIR:

Sodaro quotes a formula by Helmholtz as a basis for his nomograph in the May issue. In many reference books, however, this is quoted as

$$f = \frac{c}{2\pi}\sqrt{\frac{S}{L'V_o}}$$

and includes L', the acoustic length of the neck.

Of course, one can design a cavity on the basis of an area of the port alone, since Massa's 45-deg. correction curve for the length of the neck shows that a cavity will possess an acoustic neck in any case, even if its physical equivalent is missing. But it is a well known fact that for the greatest efficiency of a tuned circuit, the ratio of L/C must be maximum; thus the use of a neck is advisable.

Neglecting the vibration coefficient of an ordinary cavity, an improvement of 100 per cent may be achieved by a choice of an optimum length for the neck.

Even under the best conditions, Mr. Sodaro's cavity will give only two peaks in the bass (1 speaker, 1 cavity), while a properly designed cavity can be suitably overcoupled with the speaker, thus giving three peaks in the bass, with better bass reproduction.

JOHN KASON,
76 Chatsworth Road,
London, N. W. 2, England.

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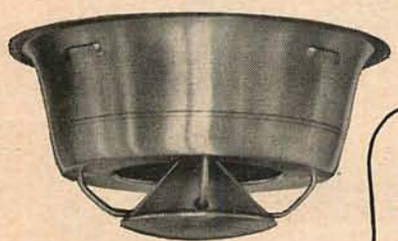


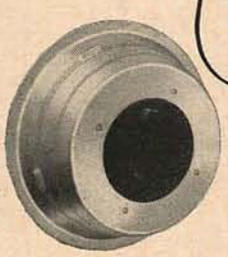
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NEW LITERATURE

● **United Transformer Company,** 150 Varick St., New York 13, N. Y., in its new 1954 Catalog A lists the firm's complete line of transformers, reactors, filters, and specialized electronic assemblies. In addition to illustrations and complete technical data, the book contains complete price information on all listings. Catalog A should be in the library of every professional audio engineer. Copy will be mailed without charge on request.

● **Shure Brothers, Inc.,** 225 W. Huron St., Chicago 10, Ill., gives complete replacement information for most home-model tape-recorder heads in a new chart recently made available to dealers and servicemen. Listed are the exact Shure replacements for manufacturers' original equipment. Illustrations of the various types of recording heads, dimensions, and technical data are included. Copy will be mailed on request.

● **Engineering Products Division, Radio Corporation of America,** Camden 2, N. J., is now distributing to radio and TV stations a comprehensive new catalog of RCA broadcast audio equipment. Requests for copy should ask for Form 2J8930, and must be made on broadcast station letterheads.

● **Radio Receptor Company,** 251 W. 19th St., New York 11, N. Y., along with describing and illustrating literally hundreds of types of selenium rectifiers, includes a large amount of practical technical information in Bulletin No. 177. The 24-page catalog is fully illustrated with voltage curves, circuitry, and product applications. Among the rectifiers discussed are those for use with magnetic amplifiers, hermetically-sealed and high-temperature types, as well as imbedded stacks. This is a truly worthwhile publication which belongs in the files of all engineers who have problems in rectification. Request for copy should be directed to the Sales Department.

● **Texas Instruments Incorporated,** 6000 Lemmon Ave., Dallas 9, Tex., announces descriptive literature on the first commercially-available silicon transistors. Silicon transistors offer high power output and greater independence of ambient temperatures than their germanium counterparts. Current amplification factor is essentially independent of temperature change up to 150° C. Bulletins covering three types of silicon transistors now in production will be mailed on request.

● **The R. T. Bozak Co.,** 114 Manhattan St., Stamford, Conn., illustrates and describes the complete line of Bozak speakers and enclosures in a new six-page folder which will be mailed on request. The introductory statement includes some interesting conclusions on speaker design.

● **Sylvania Electric Products Inc.,** 1740 Broadway, New York 19, N. Y., is now introducing a new 42-page booklet titled "Industrial Uses for Germanium Crystals." Sylvania plant engineers, industrial engineers, and consultants have tested and screened the many applications the booklet describes. Four main chapters cover: relays and relay applications; timing circuits; power supply uses, and applications in industrial instrumentation. The booklet is priced at twenty-five cents and may be obtained by writing direct to Sylvania at the address shown above.

● **Technology Instrument Corporation,** 531 Main St., Acton, Mass., will mail on request Laboratory Report No. 10 titled "A Laboratory Power Amplifier With Negligible Distortion and Phase Shift Compensation." Written by Charles E. Stone, the report places particular emphasis on phase characteristics, output voltage, flexibility, and linear operation.

● **Triad Transformer Corporation,** 4055 Redwood Ave., Venice, Calif., introduces four new high-fidelity amplifier kits in Catalog TR-54. Kits cover the power range from 10 to 40 watts, and include a new preamplifier which incorporates a record equalizer as well as a newly-designed tone-control system. The catalog contains photographs, performance specifications, wiring diagrams, and prices. Copy will be supplied on written request.

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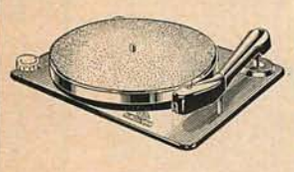
has the "MAGIC WAND" plus every other feature you have ever wanted in an automatic record changer.

In the MIRACORD XA-100 you find a three-speed automatic changer where every component is held to the closest tolerances of high precision—where wow and rumble are eliminated. The results achieved provide everything the most exacting *individual could wish for.*

The MIRACORD XA-100 comes complete with the "Magic Wand" and single play spindles. An automatic record spindle for 45 rpm is available as an accessory. Every unit is shipped completely assembled with leads and plugs attached ready for operation. The MIRACORD XA-100 is superbly finished in rich burgundy with surf-white trim.

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- Simple control-at-a-glance through four push-buttons: Start, Pause, Filter and Repeat.
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- Built in filter to suppress surface noise of old records.
- Continuous record repeat if desired.
- Adjustable mechanism to pre-set pause between records.
- Simple thumb screw adjustment compensates for cartridge weight (No tools necessary).
- Specially engineered four pole motor insures rumble-free operation.
- White rubber matted turntable.
- Silent automatic shutoff.
- Constant speed guaranteed whether one or ten records are on the turntable—insures correct pitch—eliminates wow.
- Record capacity: 8 12" records or 10 10" records (or a corresponding mixture of both) or 10 7" records.
- Ball bearing suspension of turntable.
- The plug-in head has been specially designed to accommodate your choice of cartridge.
- By inverting the single play spindle the same record will repeat continuously.
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START: This button starts the mechanism. It also enables you at any time to change to the next record.

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REPEAT: Push this button to repeat the record being played.

PAUSE: Now you can automatically select a "pause" time between records of from five seconds to five minutes! The selection setting appears at a window directly above the push button. "Pausamatic" is a unique MIRACORD XA-100 feature. Here is your choice of pause lengths (in seconds) between records:

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RPM	0	1	2	3	4
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Harmonic Distortion . . . less than 0.5% at rated output, less than 0.3% at 10 watts.
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• AUDIO AUDITIES

SAUL J. WHITE

Too Much Music

HOW LONG CAN WE STAND good music? While I recognize that ours is an art enjoyed by longhairs and serious-minded laymen, and that most of us soon revolt at hours of repetitious popular music, yet I wonder how long we can take a symphonic program, enjoyable as it may first seem.

In music, there is such a thing as "too much of a good thing." From my own personal experience I could not live in a background of music for more than two hours without seeking some surcease. The continued assault on my eardrums results in a vague discomfort as, in spite of an intellectual responsiveness, some malignity asserts itself with gathering force.

I can stack up a program of highly pleasurable music while in a mood of extreme patience, relaxation, and goodwill. I will place the best selections for the latter portion of my intended program. I will have no other objective but that of giving myself over to the enjoyment of the music, but I find that after a distressingly short time I will tire of it. An aural weariness sets in. After less than two hours, my favorite selections no longer hold the usual interest. At first it is subconscious, later it is conscious irritation.

Whoever said, "Music never runs dry . . . never leaves an ache," never lived in the electronic age wherein it is possible to have our brain bombarded for hours with good music, thrilling music, loud music. While our intellect recognizes music as an embodiment of great human achievement, as art that imparts significant reactions within us, yet nevertheless the nervous system recognizes it only as another type of stimulation on a sensitive and overworked organ. Mechanically, music is a stimulation of the hearing system no different than the stimulation produced by noise or dissonance. Evolution, education and culture have given music special pleasurable significance, but anatomically it remains only a vibration beating itself on our eardrums. Certain organs, muscles, fibres are put to work, absorbing and dissipating energy, and like any other organ it cannot be overworked without evidence of distress appearing.

Even as background music not requiring our acute attention, even if we build a psychological wall against it, we still suffer under the never-ending assault on our ears. The ear membrane, per se, rattles on and on. Like a light flashing into our eyes, or like the pricking of a pin on our skin, it will in time wear our nervous system thin. It does this through sheer exhaustion of the organ involved.

I cannot recall any instance where nature places animals with sensitive hearing in a habitat of perpetual noise, such as the region of a waterfall, or pounding surf.

Like drugs, massage, and various therapies, music can aid the physically and mentally sick when administered in limited doses. But let it run on and on, uncontrolled, and it can become a serious detriment to health. In fact, to some it can become a dangerous thing, it may contribute to real nerve sickness. It will disturb the appetite and digestion. According to a Dr. Walter A. Cannon, who has reported on this subject, it is entirely capable of completely halting the normal rhythms of the stomach. There are hypersensitive individuals who are afflicted by a psychoallergy to music. I have read where such persons after being exposed for a short time to particular music will be tossed into a fury. Others are placed in a state of lethargy, and some individuals even faint. While I know AUDIO's readers do not possess a sensitivity of this order, it nevertheless is only a matter of degree and quantity. Some normal persons can take it for two hours, others for four, perhaps some for twenty-four, but sooner or later it will get all of us.

Mystery writer, Agatha Christie bases one of her novels, The Seven Taylors, on the mysterious death of a thief found in the belfry of a church without any visible signs of violence or injury. Subsequent autopsy revealed that death was due to a brain hemorrhage. But from what cause? Sound! Yes, the tolling of the bells, while the thief was trapped in the belfry, resulted in an agonizing end.

Employment Register

Personnel may be listed here at no charge to industry or to members of the Audio Engineering Society. For insertion in this column, brief announcements should be sent to Chairman, Employment Register Committee, P. O. Box 629, Mineola, N. Y. before the fifth of the month preceding the date of issue.

★ **Positions Open** • **Positions Wanted**

★ **Audio Engineer.** Must be capable of designing high-grade audio amplifiers and associated equipment. Midwest location. Should be of stable character. Proven ability more important than degree. Salary commensurate with ability. Box 701, Audio.

★ **Electronics Technician:** Well versed in operation, maintenance, and servicing of high-quality professional tape recorders wanted by major recording company. Only qualified technicians with previous experience in the field need apply. Give full experience with details of duties performed, background, and salary expected. All communications held confidential. Reply Box 702, AUDIO.

• **Audio and Transducer Engineer:** M.S. in Physics, 13 years' experience, last 5 years in acoustics, physics of moving parts, speech and hearing. Presently Senior Engineer in medium-size company. Interested in administrative or supervisory capacity in or near New York City. Robert Brown, 7 Granger Place, Rochester 7, N. Y.

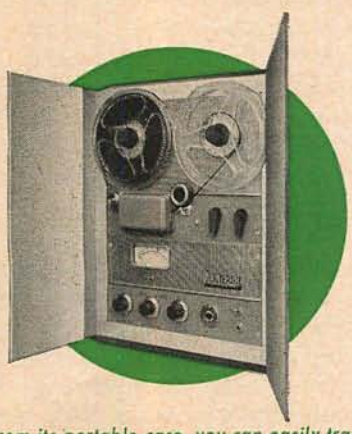
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EDITOR'S REPORT

DOES "GOOD MUSIC" PAY?

MUSIC LOVERS and audiofans are continually asking for more "good music" and are usually told that it is not economically possible for the broadcaster to run a station with "good music" as the main item on the program. But we have just recently read that WQXR has started work on its new 50,000-watt transmitter, which will replace the present 10,000-watt unit. And in addition to placing WQXR in the category of most powerful stations"—even now a fairly limited group—this will give it the unique distinction of being the only 50-kw station specializing in the broadcast of classical music and news. The new transmitter will triple the strength of WQXR's signal all over Greater New York, northern New Jersey, the southern half of Connecticut, and the New York Counties of Westchester, Putnam, and Dutchess, as well as all over Long Island.

It is well known, of course, that WQXR is the station of *The New York Times*, which undoubtedly contributes considerably to the support of the station. But it is also well known that there appears to be very little time on WQXR that is not sponsored. And it is also well known that it costs money to erect a 50-kw transmitter, and still more money goes into its operation over the years than did for the operation of the 10-kw station. All of this money has to come from somewhere—and the most likely suspect is the sponsor.

We must conclude, therefore, with the opinion that a station *can* be programmed with "good music" and still be financially successful—as several enterprising station managers are proving all over the country.

We put the words "good music" in quotes because most everyone who speaks of classical music also calls it "good music." And while it appears that most audiofans lean toward classical or semi-classical music, we do not feel that only classical or semi-classical music can be "good." One has only to attend a big jam session to see that there are different grades of Dixieland, swing, bop, or jazz—and to see also that those who do attend jam sessions get just as much enjoyment—even more, perhaps—as the lover of serious music. But for our background music, classical and semi-classical music is far better suited than are most "popular" forms of music.

Getting back to WQXR, this is one example of what follows from an interest in high fidelity. Originally started as an experimental station by John V. L. Hogan, the programming was largely from his favorite classical phonograph records, and listeners expressed their approval of the music. The station has continued that policy since becoming a commercial radio station, and its power increased from the original 1000 watts to 5000 in 1940, to 10,000 in 1941, and now is on the way to 50,000. Elliott M. Sanger, v.p. and general manager, was with Hogan way back in '36, and he has made the classical-music policy a good one for the New York area.

All of this reference to 50 kw is, of course, for the AM station. WQXR also operates an FM station, and the serious audiofan would normally do his listening on FM. One reader—Dr. Leon J. Ginsburg, Los Angeles—comments that he cannot find any radio log of the programs being broadcast by the FM stations in his locality. He phoned stations, newspapers, talked to audio men, and found that all agreed that "when John Q. Public pays off his TV set, he'll begin to notice FM; and only then will broadcasters and publishers take note. Hi-fi is too expensive for John Q. Public now." Actually it isn't too expensive, if JQP has the desire for music. Listing the complete programs of a music station does take up a lot of space, and many of the FM stations have solved that problem by publishing their own monthly program guide which lists every selection. WQXR has over 60,000 subscribers to their guide, at one dollar per year; the municipal station WNYC has over 30,000 at twenty cents per year—their guide comes out every other month, and costs are largely covered by, we imagine, the city's public relations funds. A commercial station, applying the same principles of business as it does to time selling, can make space sales in its program support the cost of production—and probably come out a little ahead. Note: Suggested new business—plan programs for a hypothetical radio station, publish program guide, and sell planned program and guide to stations all over the country.

SINGLE-ENDED PUSH-PULL?

As practically everyone has noticed, the UTC MLF amplifier seems to have introduced a new design—what with a plate that is not connected to the output transformer. There are two errors here—one in the manufacturer's original drawing, and the other in our office in not checking to see if the circuit would work. A line should be added from the lower 5881 plate to the lead from the primary of the output transformer to the 0.1-meg resistor, together with the two dots which indicate a connection. A dot should also be added to the crossing above the upper 5881, and two others at the cathode leads of the two 6AU6's. All of this refers to Fig. 10, page 38, in the June issue. Tch, tch, tch.

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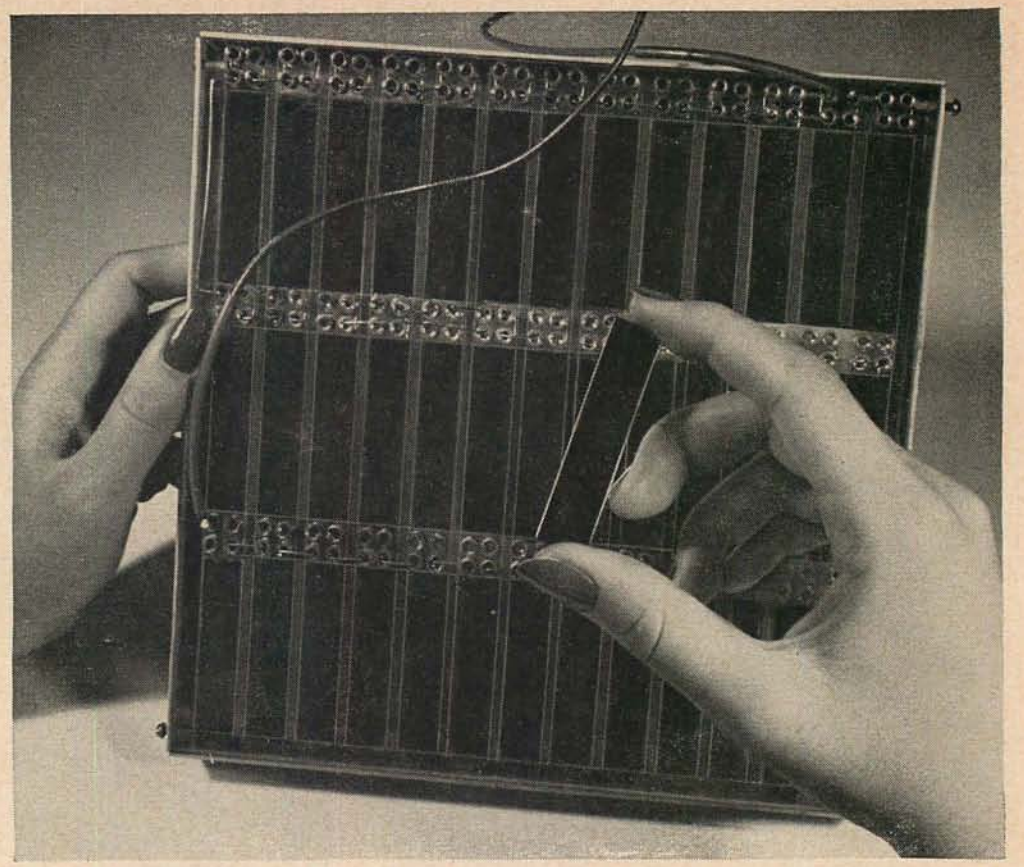
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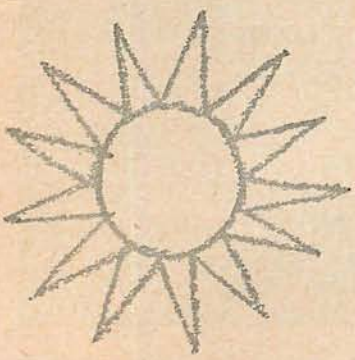
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The Bell Solar Battery. A square yard of the small silicon wafers turns sunshine into 50 watts of electricity. The battery's 6% efficiency approaches that of gasoline and steam engines and will be increased. Theoretically the battery will never wear out. It is still in the early experimental stage.



Bell Solar Battery

Bell Laboratories scientists have created the Bell Solar Battery. It marks a big step forward in converting the sun's energy directly and efficiently into usable amounts of electricity. It is made of highly purified silicon, which comes from sand, one of the commonest materials on earth.

The battery grew out of the same long-range research at Bell Laboratories that created the transistor—a pea-sized amplifier originally made of the semiconductor germanium. Research into semiconductors pointed to silicon as a solar energy converter. Transistor-inspired techniques developed a silicon wafer with unique properties.

The silicon wafers can turn sunlight into electricity to operate low-power mobile telephones, and charge storage batteries in remote places for rural telephone service. These are but two of the many applications foreseen for telephony.

Thus, again fundamental research at Bell Telephone Laboratories paves the way for still better low-cost telephone service.



Inventors of the Bell Solar Battery, left to right, G. L. Pearson, D. M. Chapin and C. S. Fuller – checking silicon wafers on which a layer of boron less than 1/10,000 of an inch thick has been deposited. The boron forms a "p-n junction" in the silicon. Action of light on junction excites current flow.

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The Concrete Monster

JAMES FERGUSON*

It could only happen in California—an exponential horn built into the side of a house! It's a neat job and must sound fine. We envy his originality—as well as his apparent disregard for domestic relations.

ONE OF THE MOST IMPORTANT links in the audio chain, and often the weakest, is the speaker system, especially the speaker enclosure or baffle. Radio and audio magazines devote frequent articles to them. Many preface the test by saying that the exponential horn is the best and most efficient method of transferring acoustical energy from the cone or driver to the free air in a room. Its high efficiency reduces distortion by not requiring so high a setting of the volume control for a given sound level, and smaller excursions of the voice coil keep it in the linear portion of its travel.

The articles say that the mid-range and high frequencies offer no space problems for horns, but when it comes to the low bass the horn's mammoth size (a length of some 16 feet and mouth diameter of 10 feet) necessary to reproduce properly organ pedal notes and other bass down to 30 cps or lower simply rule it out. The little woman would not tolerate such a monster in the living room, even if the hi-fi bug would. So the articles offer you something less bulky which sounds less well at the bass end. When you compromise on size, you often compromise on quality.

After considering this knotty problem for some time and building several enclosures which promised "big bass" performance in moderate size spaces, I still was not satisfied. So I decided to build an exponential horn outside the house, and merely let it poke its mouth into the room. And for the benefit of the many perfectionists who read this magazine, the following is a brief outline of the system I have constructed.

I used three speakers, all exponential-horn-loaded, and two dividing networks crossing over at 200 and 3,500 cps. The "listening-room" is a combination living- and dining-room (*Fig.* 1), 31 feet long and 18 feet wide, narrowing to 12 feet in the dining section. Looking from the living-section into the dining-section, the cabinet containing the mid-range horn and four-in-a-row high-frequency horns, *Fig.* 2, is located in the right corner under a window.

This cabinet is shaped like a cube 2 feet square and 27 inches high, with the projecting corner sliced off diagonally so that its face is 21 inches wide. The lower 20 inches is occupied by the mid-range horn and back-of-cone air chamber which surrounds it. It has a throat area of 50 square inches which doubles every 6 inches of horn length, being 400 square inches at the mouth. It is driven by a 12-inch Wharfedale speaker which has a porous cloth cone suspension. The four-cell high-frequency horn (each horn with 4-inch-square mouth and 10-inch length) is located in the upper part of the cabinet with room for planters on each side. It is powered by a Stephens P-15 high-frequency driver.

The sound from the big bass horn enters the room in the upper left corner of *Fig.* 1 through an opening 4 feet wide and 5 feet high, *Fig.* 3, with its top at the ceiling. The angle of ceiling and walls forms the last 5 or 6 feet of the horn's length, and its effective mouth diameter at this point is approximately 10 feet. The large opening has in no way detracted from the room's appearance inasmuch as the grill cloth covers not only the opening, but the rest of the wall above a dado and over to the corner window. The opening fills the space to

* *11900 Westminster Place, Los Angeles 34, Calif.*



Fig. 1. The author's dining room, which is part of the living room. Midrange and treble speakers are in the small cabinet beneath the window at the right, while the horn opens into the wall at upper left.

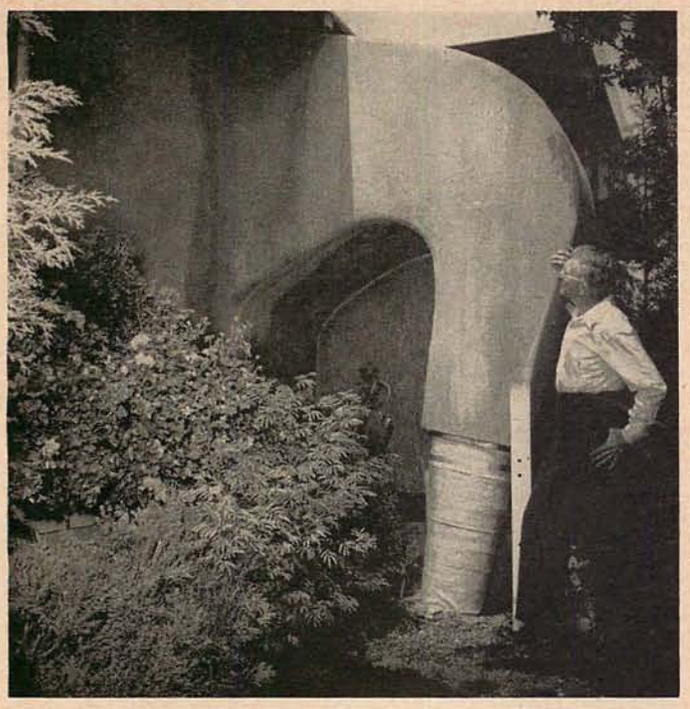


Fig. 2. Closeup of the mid- and high-frequency speaker section in the corner cabinet.

Fig. 3. Mouth of the low-frequency horn opens into the listening area through a grille-cloth-covered port approximately 48 by 60 in.



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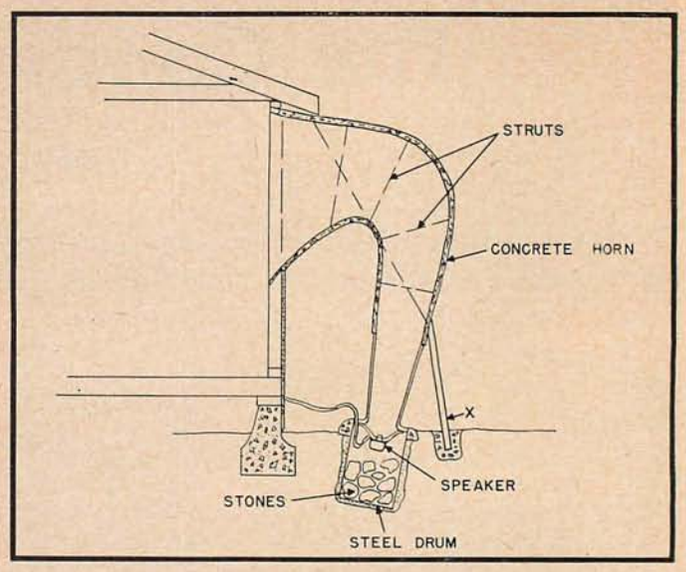


Fig. 4 (left). The author with his externally located exponential horn. Wonder what the neighbors think it is. Fig. 5 (right). Cross section of horn structure with relation to the dining room wall. "X" indicates the 2 × 2 × ¼ angle irons embedded in concrete blocks to support the structure.

the left of the mirror shown in the picture. An uninformed visitor would never suspect the presence of the horn's mouth from inside the room.

The distance of a few feet that separates the bass and mid-range treble horn gives a spatial effect to orchestras which is very pleasing, if not third-dimensional.

The Horn

Now for the big horn and air chamber (which is not built of wood, but of steel and concrete) illustrated in *Figs.* 4 and 5. The speaker, a 15-inch Stephens 103LX "woofer" with low-resonance cone, is mounted underground in a 55-gallon steel drum—the type that has a removable head—and is sealed with a gasket and ring clamp. The speaker is mounted on a ¾-in. plywood ring which is fastened to the underside of the metal drumhead. In addition, a second wood ring of smaller diameter was used to fill in the space between the mounting board and the head, due to the curvature of the head.

A 10-inch circular hole was cut in the metal head, and ½ inch was turned up for a flange to receive the first section of the horn. That made the opening 11 inches in diameter and the hole in the wooden rings was tapered from this size to 13 inches next to the speaker. The air-tight cavity of the drum serves to balance the impedance of the back side of the cone to the horn-loaded front side. It also prevents the sound of the back-wave from being radiated to the neighbors.

Incidentally, the sound from the entire horn outside the house is hardly audible from a few feet distance, even when it is delivering considerable volume in the house.

The drum was partially filled with large stones to reduce its volume to approximately 4½ cubic feet. The stones break up the space into several small cavities of varying sizes and shapes, producing a distributed resonance, rather than one large peak, as would be the case with one large cylindrical cavity.

The horn starts from the drumhead at ground level and emerges into the opening in the wall, making about a 95-degree turn, and having an actual mean length of about 11 feet (though its effective length, including the mouth formed by the walls and ceiling, is over 16 feet). The first 3 feet, forming the throat, was made of 22-gauge galvanized steel in two sections. It was coated on the outside with asbestos-filled pitch or asphalt, and wrapped with a solid layer of binder twine. Then it was given another coat of pitch and wound spirally with a 6 inch strip of water-proof crepe paper as shown in *Fig.* 4. This provides excellent damping of spurious vibrations in the metal walls. The metal portion of the horn telescopes into the next, concrete, part for removal of the speaker.

The concrete horn proper was made as follows, built up as shown in *Fig.* 6. Quarter-inch round iron bars were bent to form the corners, then square frames made of the same material were placed along the length of the frames at about 2-foot intervals and tied together with wire where they intersected. Not shown are some extra rods which were added in the broad parts of the frame; these rods were spaced about 12 inches apart in each direction. Also not shown are some diagonal bracings of ⅜-inch rods. The frame was next covered with heavy-gauge galvanized metal lath, which was secured to the frame with "hairpins" of 18-gauge galvanized wire, spaced about 10 inches apart and twisted.

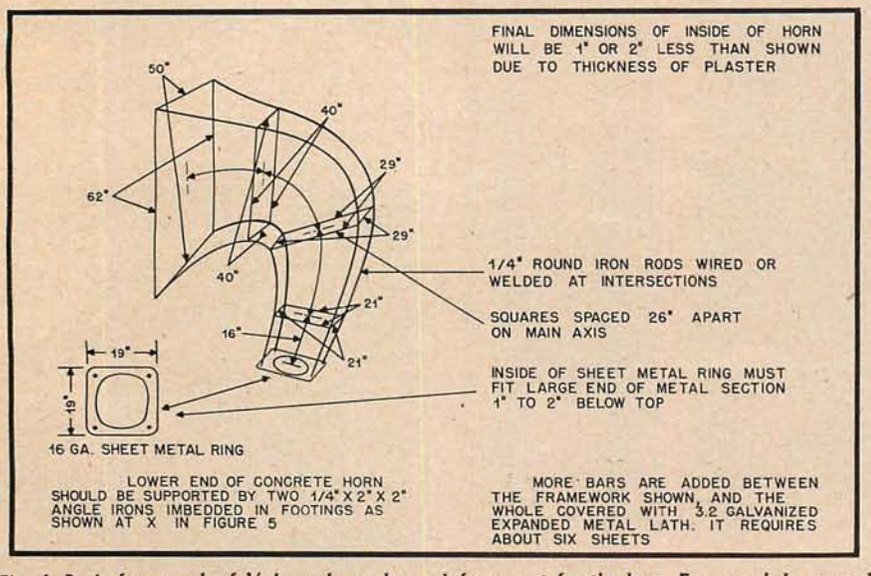


Fig. 6. Basic framework of ¼-in. rods used as reinforcement for the horn. Framework is covered with metal lath before cementing.

(Continued on page 51)

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Pickup Loading and its Effect on Frequency Response

W. A. FITZMAURICE* and W. JOSEPH**

If you notice a difference in quality when you move your phono equipment ten feet or so from the amplifier, do not be surprised—there's a good reason for it. The authors explain why and tell how to avoid it.

IN HOME AUDIO installations employing magnetic pickups, the cartridge is usually located somewhat remote from the preamplifier by distances ranging upward from one foot. Because of the capacitance associated with the interconnecting cables, the question is raised as to the effect of this shunt capacitive loading on the response of the cartridge. In addition, there seems to be considerable doubt as to the exact effect of resistive loadings as recommended by various sources.

To answer these questions the authors carried out an investigation to determine the response of variable reluctance cartridges under varying conditions of loading.

The measuring arrangement used is shown in *Fig.* 1. The output of an audio oscillator was connected in series with an inductance of 520 millihenrys and a resistance of 340 ohms. This simulates the General Electric variable reluctance cartridge, type RPX-040, RPX-041, or RPX-050. Various combinations of C shunt and R shunt were used. The shunt capacitance consisted of mica capacitors, the input capacitance of the Ballantine Model 300 a.c. voltmeter, and stray wiring capacitance. The audio oscillator output was maintained constant at all frequencies at 0.01 volts.

The results obtained were plotted and are shown in the curves of *Fig.* 2. It will be noted that the effect of shunt capacitance is quite marked when the shunt resistance is in the neighborhood of 50,000 ohms or greater With no load resistor (infinite R_s), pronounced resonant peaks are obtained for all values of C_s measured. With C_s of only 140 μμf, a 15-db peak is encountered at about 16,000 cps. Such peaks tend to accentuate noise and produce "dirty" highs.

The damping effect of R_s (decreased Q), may be seen by the reduction of a 19-db peak at 7500 cps with C_s of 540 μμf and R_s of infinity, to a 3-db peak with the same C_s and R_s of 50,000 ohms. With C_s of 40 μμf and 140 μμf and R_s of 50,000 ohms, the resonant effect holds the response level to approximately 10,000 cps. The "water fall" drop thereafter is a characteristic of the effect of resonance.

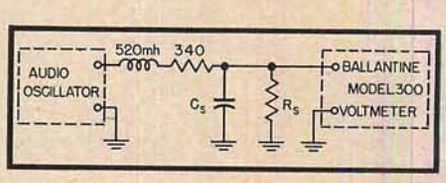


Fig. 1. Equipment set-up for measuring cartridge response.

As R_s is decreased, the effect of C_s becomes progressively less, and drooping response is obtained. With R_s of 15,000 ohms, the response is down 3 db at 5000 cps and 8 db at 10,000 cps. With R_s of 5000 ohms, the response is down 3 db at 1500 cps and down 8 db at 4000 cps, independent of all values of C_s used.

Below resonance, the performance characteristics may be analyzed by referring to to *Fig.* 1 and noting that the output of the audio oscillator (equivalent to the internally generated voltage of the cartridge) is impressed across a voltage divider consisting of L, R, and the parallel combination of R_s and C_s, all in series. The output is taken across the parallel combination of R_s and C_s. Since the impedance of L increases and the impedance of C_s decreases with an increase in frequency, a voltage divider exists whose output is a function of, and decreases with, an increase in frequency.

The data given applies specifically only to the cartridge simulated. However, from Table 1 listing the impedance of the more popular types of variable reluctance cartridges, it can be seen that the same problem exists to some extent in all cases.

A survey of the types of cable commonly employed shows the minimum capacitance per foot of high-grade rubber microphone cable to be about 40 μμf. and for the smaller phono cables, about 60 μμf. Coaxial cables are available with capacitance per foot as low as 13 μμf. Of course, there is always the foot or so of high-capacitance phono cable incorporated in the record player arm to be contended with.

Cathode Follower Helps

When cable capacitance is added to the input capacitance of the preamplifier, it is unusual to find C_s lower than 100 μμf. From the foregoing it may be seen that with such capacitance it is possible to obtain very satisfactory response from the cartridge up to 10,000 cps, and de-emphasis may also be provided to compensate for today's recording practices. This, however, means very careful juggling of C_s and R_s and requires measuring equipment not available to most experimenters. In addition, it is often desirable to incorporate variable de-emphasis networks into the system with the preamplifier remotely located from the record player with a consequent introduction of a C_s of 500 μμf or more.

With these factors in mind, the authors believe that higher quality installations should incorporate a cathode follower immediately adjacent to the cartridge.

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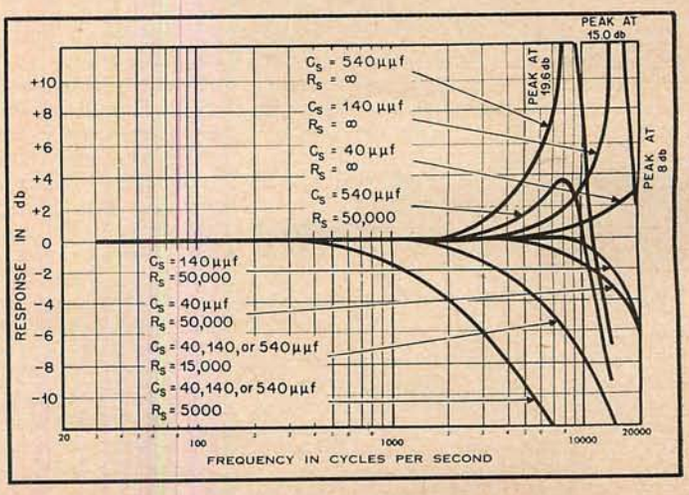


Fig. 2. Curve showing change in cartridge response with change in load resistance.

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Figure 1

The Allen Electronic Organ*

RICHARD H. DORF**

An electronic musical instrument built to specifications on order in the same manner as are most pipe organs.

THE ALLEN ELECTRIC ORGAN, made by the Allen Organ Co., Inc., Macungie, Pa., is simple in principle, yet it is one of the most interesting, both because Allen organs are among the largest electronic instruments manufactured today and they are among the closest analogies to the pipe organ in certain respects.

A pipe organ consists of several ranks of pipes, each with a distinctive tone color. Where the number of separate ranks is limited by space or cost, controls on the console make it possible for the organist to employ the various ranks on more than one console and to employ each rank in more than one register. The organ is unlike other instruments (except possibly the piano, harpsichord, etc.) in that each note of each tone quality is created by a separate "instrument" or pipe which can be voiced to have an appropriate volume level and harmonic content.

The Allen organ at its best and most elaborate does exactly this. It can have a separate vacuum-tube oscillator for each tone quality, so that the oscillators are simply substitutes for pipes, one by one. In such an instrument, playing a single note with, say, three stops pulled will cause three separate oscillators to sound. Not only does the hearer receive the desirable sound of separately voiced "pipes" in such a case; the fact that the oscillators are not "locked" or synchonized gives a chorus or choir effect which cannot be obtained when all notes are in locked phase relationship.

In practice, few Allen organs employ this possibility to its greatest degree; several qualities are ordinarily obtained from a single oscillator, because it would be extremely expensive to provide a complete rank of oscillators for each stop, to say nothing of the tremendous primary power requirement. However, the practice is employed in greater or less degree throughout the Allen line. This is possible because there is no such thing as a standard model, though the lower-priced organs are standardized in some degree and a home entertainment model with no alterations possible has just been introduced. Organs are sold by Allen on an individual design basis in the same manner as pipe organs, where the builder visits the location, discusses requirements with the organist and others, and then all come to an agreement on the specification. The number of stops, manuals, couplers, and so on thus varies from organ to organ.

Figure 1 shows the console of one of the larger Allen organs, costing, as is often the case, several times the price of any other American electronic organ because of its greater resources and complexity. This model is played like and sounds very similar to a unified pipe organ of fair size. *Figure* 2 shows in contrast one of the smallest Allen models, a two-manual organ with a small number of stops and couplers, a single swell shoe, a two-octave pedal clavier, and no combination "pistons." An organ such as this latter may have a single rank of oscillators for each manual, each oscillator having two to four tone-color filters, and some unification couplers to add flexibility by making the oscillators available at 16-, 4-, and possibly 2-foot pitches in addition to the 8-foot unison. Such an instrument, except for its lack of chorus effect on a single manual, is equivalent to a pipe organ with a number of ranks equal to the number of filters associated with each note plus unification and duplexing.

*From the book, "Electronic Musical Instruments," to be published later this month by Radio Magazines, Inc. See advertisement, page 42.

** *Audio Consultant, 255 W. 84th St., New York 24, N. Y.*

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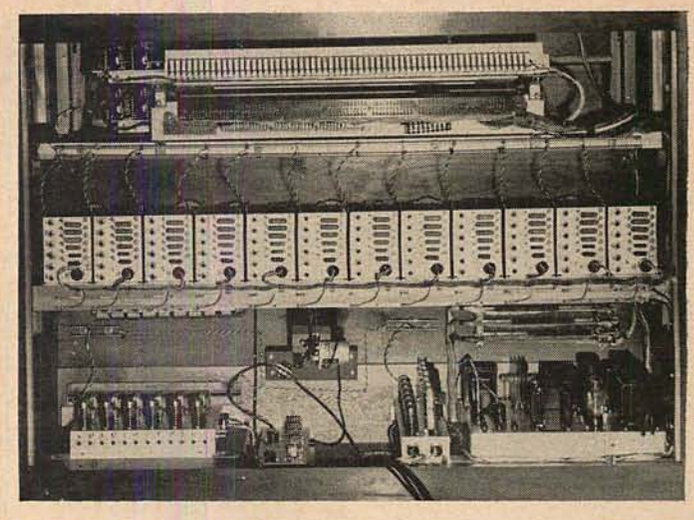


Fig. 2 (left). Console used with one of the smallest organs. Fig. 4 (right). Rear view of the Allen models with self-contained generators. Note the capacitators affixed to terminals on the back of each of the twelve generator chassis.

Tone Generation

Figure 3 is a schematic diagram of an oscillator-filter circuit found in typical Allen organs. There is one such circuit for each note of each manual and for each pedal. One triode of a 6SN7 is used for each note, so that a single tube takes care of two notes.

The oscillator itself is a Hartley circuit with plate grounded through the power-supply filter capacitor (not shown). Output is taken from the junction of the grid-bias network C_8-R_8 and the tuned circuit L_1-C_1-C_2-C_3. Two of these capacitors are within the chassis, while the third is connected across a pair of thumbnut terminals on the front panel of the chassis. These capacitors can be seen in *Fig.* 4, which is a rear view of an Allen model with self-contained generators. The oscillator is tunable over a range of about a semitone with R_6, but if it gets out of tune by more than a semitone, the outside capacitor must be replaced to bring frequency back within the tunable range. A tuning kit is made available to service personnel which contains a variety of capacitors for this purpose.

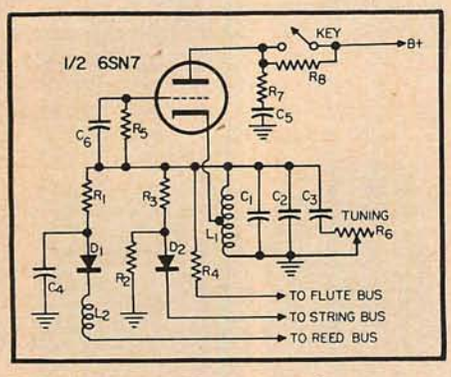


Fig. 3. Oscillator-filter circuit for one note. A basically similar circuit is employed for each note of each manual and the pedal clavier.

The narrow tuning range is due to the desire to avoid variable capacitors, since they contribute to instability on account of temperature and moisture changes. The range of adjustment made possibly by R_6 is kept low to avoid reducing the Q of the tuned circuit too much. The oscillator is inherently extremely stable, however, and in the normal location yearly tuning usually suffices. The tuning inductor L_1 is a universal-wound air-core coil, an unusual practice in audio which makes for very high Q.

The oscillators are normally nonoperative, though a small plate voltage is maintained, current passing through large-resistance R_8, to increase emissive life. When a key is pressed B-plus voltage is applied to the plate. R_7 and C_5 make up a time-constant network which cause the plate voltage to build up in a finite time interval rather than instantly, so that the oscillator output increases gradually from zero, giving a soft tone envelope to imitate the gradual speech of pipes. The decay envelope is also gradual because of the time taken by C_5 to discharge.

The oscillator output is a sine wave before modification by the filter circuits. The sine wave, attenuated as desired by R_4, is connected to a flute bus, to which the outputs of all other oscillators in the same rank are also connected.

The sine-wave tone is also passed through R_3 and copper-oxide diode D_2. The diode rectifies the sine wave, producing a half-sine-wave, which is rich in harmonics. This simulates string tone and it is passed to a string bus, which, like the flute bus, is common to all oscillators in the rank.

A third attenuating resistor R_1 and distorting diode D_1 is used to produce a reed tone. The reed tone is also rich in harmonics but it has a pronounced formant in a particular part of the spectrum in which harmonics are prominent. This formant is produced by C_4 and L_2, one each of which is provided for every note.

The reader may now see the idea behind the Allen scheme of tone production and begin to relate it to those in other electronic organs. In the Baldwin, all generated tones are rich in harmonics and all are passed through a single filter. In the Connsonata each generated tone is available both pure and with harmonics and, again, a single filter produces each tone color. In both of these

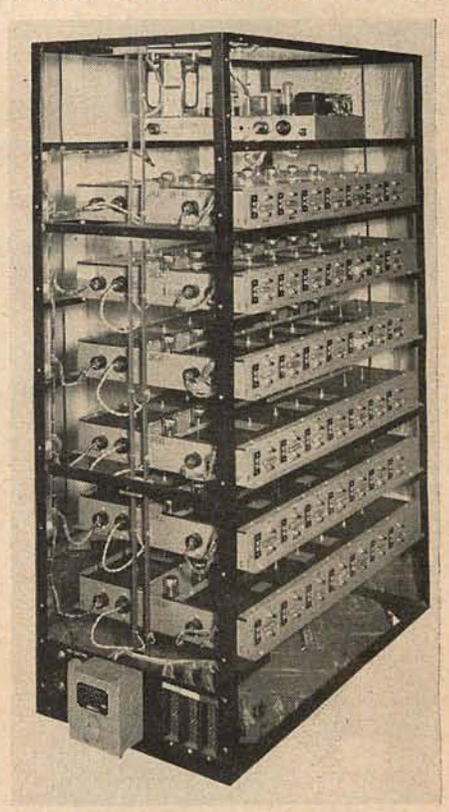


Fig. 5. External generator rack employed with some of the larger Allen models. Each of the six chassis shown carries seven octaves of two adjacent tones, or a total of 85 notes. (Eight octaves of the C tone are provided to include the top C of the scale.)

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cases the single filter attenuates or emphasizes fundamentals as well as harmonics. If, for example, it is a string-type filter which emphasizes upper harmonics, it also attenuates lower notes so that notes at the lower registers are not so strong as a whole as those above. This is what actually happens in an orchestral instrument, but in a pipe organ each pipe can be voiced so that its total loudness is appropriate and is properly related to the rest of the scale, while its harmonic structure is still controlled to give the desired tone color.

In the Allen a similar procedure is made possible by the inclusion of individual filters for each note. Using a string tone again as an example, if the note concerned is a low one and the necessary prominent harmonic structure makes the total loudness wrong for smooth scaling, R_3 (*Fig.* 3) is simply selected for the correct total output of that note in that tone color. This is even more important with strong-formant qualities such as reed, where the tuned filter may cause notes with fundamentals far removed from the formant frequency to be weak. R_1 can simply be adjusted for the correct level, and it will vary from note to note. While the procedure employed in the other instruments results in a very acceptable compromise, therefore, and is, in engineerese, more "elegant," the Allen scheme is more closely analogous to pipe-organ construction. It is consequently, of course, a great deal more expensive and space-consuming. And to provide the wide range of tone colors obtained in the Baldwin, for instance, by the Allen method would be so expensive and bulky as to be almost impractical.

While some Allen models do have the electronism contained within the console, most employ separate racks connected to the console by cables. Such a rack is shown in *Fig.* 5, containing six generator chassis, each generating seven octaves of two notes, for a total of 85 notes, including the extra top C. A power supply and tone changer (see below) is at the top of the rack. This particular rack contains the generator for one rank for the great manual. An organ with minimum specification would have another similar rack for the swell and pedal generators. More elaborate organs have several such racks for each manual containing an equal number of ranks of generators. Different ranks will have, of course, different output filters and busses, though all filters are built on the same lines—diode plus tuned circuit, simple resistance, or high- and/or low-pass filters. The "stopped" qualities, incidentally, are produced by employing two diodes in parallel and in polarity oposition. These qualities, required for clarinet, stopped diapason, stopped or doppel flute, and other woodwinds, are characterized by a symmetrical waveshape containing almost exclusively odd harmonics. This is the same effect produced in the Baldwin by the out-phaser circuit. *Figure* 6 shows the underside of one of the generator chassis used in the racks.

The Registration System

The registration system of the Allen —the method by which the player can select the desired tone colors, pitch registers, and intermanual couplings— is found in the tone-changer chassis (plural) and key-contact couplers.

Keep in mind that each rank of generators supplies output from as many signal busses as there are types of filters. The rank of which one oscillator is illustrated in *Fig.* 3, for instance, has three busses—string, flute, and reed— and therefore three outputs, each taken from one bus. The string bus is connected on the tone-changer chassis to a preamplifier such as that diagrammed in *Fig.* 7. The reed bus is connected to another similar preamplifier, and the flute bus is connected to a third, similar except that the input is direct instead of transformer-coupled. The transformer primaries have a very low impedance, perhaps 5 ohms, while the grid resistor used with the flute preamplifier is 0.25 meg.

The input to each preamplifier is controlled by a potentiometer so that a certain amount of voicing is possible to adjust to the characteristics of the auditorium. The outputs of the preamplifiers go to relay contacts on the tone-changer chassis. These relays are controlled from the console with the stop tablets. The tabs close relays in various combinations to channel selected mixtures of the basic tone qualities to the power amplifier. Resistors are used between preamplifiers and certain relay contacts so that mixtures can contain the components at various levels. A tone-changer chassis appears in *Fig.* 8.

A typical small Allen organ may therefore have, with the three basic ranks of generators and with three tone qualities available from each, the approximate equivalent of a pipe organ with nine ranks of pipes. This is, of course, a very small organ, but the maker feels that the equivalent of a few ranks, with the ranks voiced in the same way as organ pipes and the organ provided with sufficient coupling facilities, is preferable to the much larger array of tonal qualities obtainable by systems like the Baldwin and Connsonata which do not allow such voicing. There is no doubt (and the writer has confirmed this personally) that the Allen organ does give a very fine scale. Whether this advantage is preferable to the greater range of individual colors obtainable in the other instruments is a matter of personal taste.

An additional factor to be considered is the pitch registration inherent in the simpler Allen instruments (and also in the Connsonata). *Figure* 9 is a photograph of one end of a playing manual and the organ-type coupler arrangement. In speaking of this, let us, for clarity, decide that the horizontal direction is the player's right-left, while vertical is from front to rear of the instrument.

In the coupler system there is a vertical rod for each key, and each carries B-plus voltage. Associated with each rod and key is a vertical series of 11 upstanding spring-wire contacts. There may be more or less than 11 in any particular organ. Each contact in, say, the first horizontal row is wired to the plate of the oscillator corresponding to the pitch denoted by the associated key. All contacts in this first horizontal row pass through small holes in a horizontal strip of nonconducting material, the right end of which is connected to the actuator of a solenoid relay. When the relay is energized, the entire nonconducting strip moves somewhat to the right, bending the entire first horizontal row of contacts to the right and bringing each one close to (but not touching) the vertical bar which carries B-plus. When a key is pressed, a lever rotates this bar (which is not round in cross-section but more or less flat) so that it moves toward the contacts. Because the contacts in the first horizontal row have been pulled close to the bars, pressing any key will make the bar associated with that key contact one of the first-row spring contacts. Thus, pressing any key will energize the oscillator of pitch corresponding to that key and the 8-foot register will sound.

The second horizontal row of contacts may be wired to the plates of the oscilla-

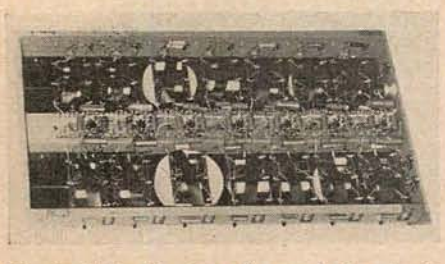


Fig. 6. Underside view of one of the chassis shown in Fig. 5.

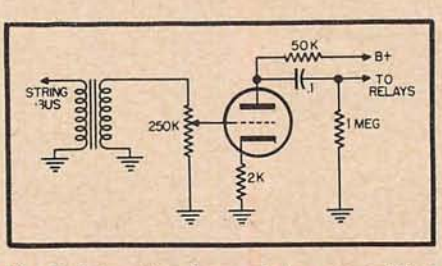


Fig. 7. Schematic of one of the preamplifiers used in the Allen organ.

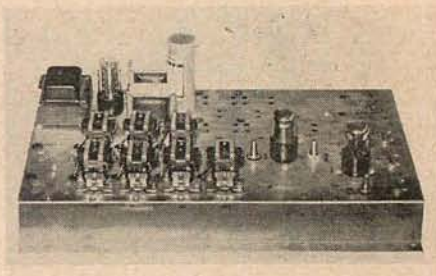


Fig. 8. A tone-changer chassis. The relays are actuated by the tabs, and act to provide different tone qualities as indicated by the stop tabs actuated.

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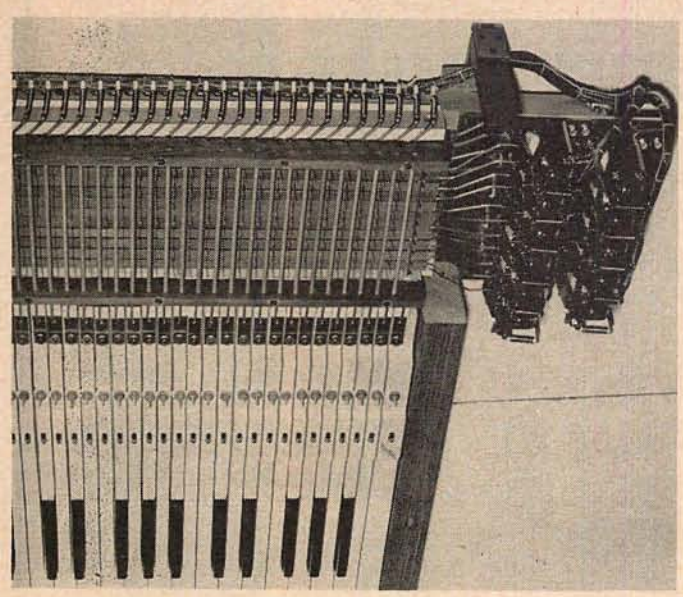


Fig. 9. One end of a playing manual, showing the mechanism used to couple various tone qualities and registers. Relay-type actuators at right move contact strips as required.

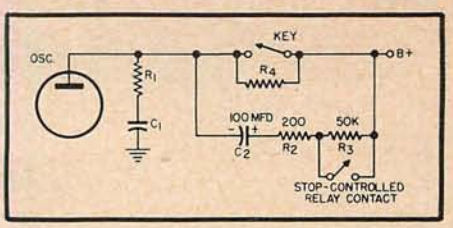


Fig. 10. Circuit used to provide percussive attack for stops such as celesta, harp, bells, and so on.

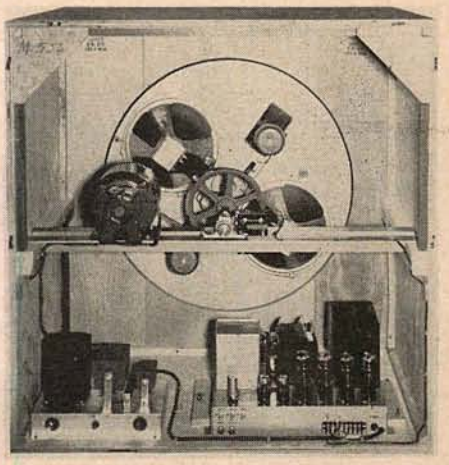


Fig. 11. The Allen Gyrophonic Projector—a device which introduces a vibrato by mechanico-acoustic means.

tors an octave higher than the associated keys. When the second solenoid is actuated, these second-row contacts are pulled close to the bars, and pressing a key will sound the oscillator an octave higher. The third horizontal row of contacts may be connected to oscillators an octave lower than the keys for 16-foot pitch, and so on. By this means any desired coupling may be had, so that the tone qualities selected by the stop tablets may be played in the 16-, 5 1/3-, 4, 2 2/3-, 2-, 1 3/5-, 1 1/3-, and 1-foot registers. Depending on the number of contact wires and solenoid-actuated strips, intermanual coupling is also possible, so that pressing a key on one manual may energize the oscillators of another manual in any of several pitch registers.

This process of unification and duplexing is probably essential to any organ with few ranks of pipes or oscillators in this case. Organ authorities differ to some extent as to whether it is a desirable feature. As a practical matter, note that it is not possible, for example, to set up a combination on one manual consisting of a string stop at 8-foot pitch plus a very soft flute at 4-foot. In an instrument of the Allen type, all voices will sound at all pitches which are coupled in, so that pulling a string and flute will result in both voices at both 8- and 4-foot pitches.

The limitations discussed above and the necessity for extensive use of unification for flexibility exist to a much lesser degree, of course, in the more elaborate versions of the Allen organ. The company sometimes makes models selling at tens of thousands of dollars which contain respectable numbers of ranks of oscillators, different ranks giving different tone colors and pitch registers. Extra ranks are also sometimes added, tuned slightly sharp, to give the beating celeste effect. If enough ranks are used, (and enough separated speakers) both quality and musical integrity closely resemble their pipe-organ counterparts. In theory there is little to limit the closeness of resemblance to the finest organs, provided enough generators are used and correctly voiced. Of course, certain pipe-organ qualities are almost unattainable: the partly percussive attack of a few stops and the random unsteadiness of pitch which contributes so much to the vibrancy of organ tone and which caused a famous authority to say, "No good pipe organ is ever quite in tune."

One other voice is of interest, the harp effect. This is a purely electronic circuit capable of imitating the percussive tones included in some organs—celesta, harp, bells, etc. The circuitry is shown in *Fig.* 10. The oscillator is one of the regular ones used for other tones. An additional time-constant circuit is connected between plate and B-plus, including C_2, R_2, and R_3. A relay contact (one per key) across R_3 is normally open, so that the additional circuit is not effective because of the large value of R_3. When the relay is closed (harp effect in operation), and the playing key is closed, plate voltage is applied to the oscillator tube with no more delay than usual because the key almost directly shorts C_2 and discharges it very quickly. This is the percussive attack. When the key is opened, a very long time is required for C_2 to charge up to the voltage equal to the difference between the supply voltage on its positive plate and the low plate voltage at its negative end. During the discharge period, therefore, it allows tube plate voltage to die away very gradually, so that the very slow decay characteristic of harp-type tones is produced. The harp circuit is practical because of the extreme frequency stability of the oscillators over a wide range of plate voltage. The circuits which differentiate among the various types of percussive tone are simply diode-R-C filters similar to those used to obtain other tone qualities at the oscillator outputs.

Gyrophonic Projector

An interesting method is used in all Allen organs to obtain vibrato and also some semblance of chorus effect over and above what is caused by the use of more than one generator string. This is the Gyrophonic Projector shown in *Fig.* 11.

In the unit shown, two bass and two treble speakers are mounted on a circular piece of wood. The entire assembly is mounted on a shaft and caused to rotate by belt drive from a d.c. motor energized by a dry-rectifier supply which can be seen in the lower left corner of the enclosure. The power amplifier is at right. The amplifier and speakers are connected by a pair of slip rings, each having two sturdy brushes.

When the speaker assembly rotates at vibrato speed, the hearer receives the effect of phase changes because of the doppler effect caused by changes in distance between his ears and the source. The vibrato is very pleasing, though whether it is superior to the usual type caused by frequency shift of the oscillators is open to question.

A more profound and important effect of the Gyrophonic system is that when vibrato is not desired the speakers are rotated at a very slow rate. This gives a constant slow phase-change effect which, while not really identifiable, gives a wandering, slightly varying effect to the tone which is very similar to what is obtained with more ranks of separate tone generators in a pipe organ and also gives a slight indefiniteness of pitch such as might be caused by the random variations of a pipe-organ air supply. The slowly moving speakers tend to mitigate the "electronic" sound which otherwise results from perfect, motionless sound-source tuning, and are a distinct contribution to organ-like tone. Tablets on the console enable the organist is vary the speed of rotation for fast and slow vibrato or the slow nonvibrato effect.

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Security Sound System

ALAN P. CHESNEY*

Special electronic intercom system gives warning of disturbances in prisons, mental hospitals and other corrective institutions

THE PRESS HAS RECENTLY CARRIED many stories of breaks, riots, and other types of disturbances occurring in prisons, reformatories, mental hospitals, and other similar institutions in various parts of the country. The disturbances might not have occurred had they been under continuous observation so that controls could be effected before developing to the outbreak stage, but it is impossible to have operating personnel in all critical areas at all times.

This article describes a special electronic inter-communication system known by the descriptive title of "Security Sound System," which has been developed to observe institutional control problems. Because of lack of information the public usually knows of activities in institutions only as the result of press reports of spectacular disturbances, such as riots, breaks, and so on, or through following the case of some notorious person who has been brought into confinement. While this article is for purposes of describing a system that has proven effective as a warning and control device in some institutions, its description will follow a general discussion of institutional operation, organization, and problems to give the reader some background information. While the Security Sound System may be applicable to other than corrective institutions and mental hospitals, only these will be considered.

Prisons and penitentiaries are classified as "maximum security" if the institution is surrounded by a reasonably insurmountable wall which is protected by guard towers manned 24 hours a day and equipped with searchlights, machine guns, and other arms capable of controlling approach to both sides of the wall. The second classification is "medium security" where the wall is replaced by a high fence usually of chain-link type surmounted by barbed wire and also protected by guard towers. The third classification is "minimum security," which usually does not have guard towers and may be only partially fenced and may or may not be patrolled.

Mental hospitals are generally constructed along the lines of a minimum security institution in which restrictive windows and locked doors are adequate protection.

Penal institutions are usually manned by guards in each principal corridor or stationed at the intersection of corridors. They are stationed to observe the barred fronts or doors of cells which may be arranged on a single floor on both sides of the corridor, in tiers of two or three for greater security, or arranged in what is commonly called a "cell block" consisting of cells in tiers in a center structure surrounded by a wide corridor and the outer walls of the main building. Frequently steel balconies are mounted high on the outer walls so that a patrolling guard can walk the length of the corridor and look across into all cells to keep every prisoner under observation. These guards are usually armed with repeating shot guns or sub-machine guns, and sometimes with gas guns.

Youth Corrective Institutions usually consist of several separate buildings known as "cottages" containing two major rooms, one a dormitory equipped with single cots of the army type, the other a day room equipped with tables and chairs or benches. Each cottage will house from 30 to 50 "boys" under the control of a "supervisor" who is locked in with them. Obviously, the supervisor is unarmed since the presence of any kind of arms, even a club, would be an invitation to his being overpowered and his weapon used against him as well as in a break. One cottage is usually equipped with cell blocks for incorrigibles or other bad actors who need isolation. It is patrolled in much the same manner as is a prison.

Mental hospitals vary considerably in types of construction and operation since many types of patients are cared for there. The most usual ward arrangement will consist of either a large open room equipped with individual beds, or rows of small rooms along a corridor each containing a single bed and toilet facilities. At one end of the corridor overlooking the area will be an attendant station which may consist of a glass-walled room projecting into the corridors to give unobstructed view in each direction necessary. Attendants usually work in pairs or groups in order to give self protection against attack by patients in a criminal-type mental ward.

Some hospitals are also equipped with a cell block wing for patients classified as insane with criminal tendencies. It might be mentioned here that there is a type of person who is highly dangerous and who has pleaded in court, "Not Guilty (of murder) by Reason of Insanity." In many states the court has no alternative but to commit the individual to a mental institution for observation to determine his sanity. In these cases it is sometimes found that the insanity was of very short duration. When it is determined that the individual is no longer insane, he is returned to court for trial on his crime.

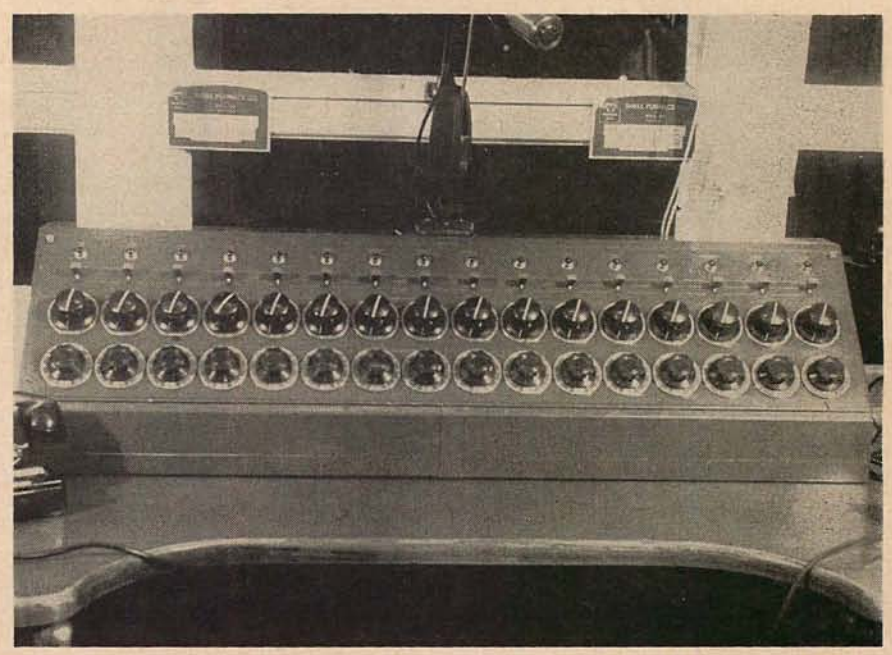


Fig. 1. Control console for the first installation of a Security Sound System in a California institution.

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As may be presumed from the foregoing discussion, an individual seeking to make a break will generally attack his guard. This might be simply to render the guard ineffective, to obtain his keys, to liberate others for aid, or to gain time and give vent to resentment. On this basis the Security Sound System, described herein, was designed for the primary purpose of giving protection to the operating personnel. No signal system can of itself hold back prisoners—only alert men can be effective in controlling other men—but a suitably designed system can be a potent aid in warning and control.

Pilot System

The initial system installed in a California institution was designed along the lines indicated by consideration of factors such as those mentioned. Microphones were installed in the day rooms and dormitories of the cottages in a Youth Authority School for Boys. Microphones were so located that the area immediately adjacent to the desk or station of the supervisor was under observation. After necessary amplification the sound was transmitted over telephone lines to the main control room which, in this case, was the main gate house manned twenty-four hours a day. Sixteen such lines were brought into the control room and appeared on a control console, shown in *Fig.* 1, similar to a broadcast studio control console. Each circuit appeared on a mixing potentiometer. The output of the sixteen pots was combined and fed into the main amplifier and the monitor speaker on the ceiling above the desk. Through this arrangement it was possible for the guard to listen simultaneously to all sixteen cottages. It might be mentioned that in the cottages the day room and the dormitory are not both occupied at the same time.

A special amplifier was designed with one to be bridged on each incoming line at the control room. This amplifier contained two stages of audio amplification, a thyratron, and the necessary relays. The gain control for this amplifier was mounted near the mixing pot on the control panel and is known as a sensitivity control. This amplifier, shown in schematic form in *Fig.* 2 has been labeled a "Circuit Identification Amplifier" and will be spoken of hereafter as a *CIA* amplifier. The design of the amplifier is such as to make it sensitive to signals of loudness varying from a whisper to a gun shot. The threshold of operation of the amplifier is adjusted by the sensitivity control. This control is set so that ambient noise levels in the area of the microphone, which are heard on the monitor speaker at the control room, do not operate the thyratron and relays. At this setting a steep-wavefront sound, such as produced by a scream, a falling chair, or a similar disturbance, will "fire" the thyratron which operates to light a lamp associated with the control unit of this channel, thus identifying the channel and the source of the sound.

It may be desirable on occasion for a supervisor or attendant to call for aid without letting out a cry, which would of course arouse all of the persons under his custody. This was arranged for by providing a pushbutton, the operation of which would light the same indicator lamp at the control room. This alarm circuit was further developed to have, in addition, other protective features to be discussed later.

The pilot installation has been in service for nearly two years and, while of a relatively high cost, has paid for itself more than once in the saving of other costs of supervision and control. It has been effective in giving fire alarms, warning of breaks, calls for assistance in preventing attempts at suicide, and has effectively prevented many major fights, riots, and breaks from the buildings. An interesting personnel reaction to the system is that upon its installation it was looked upon by the supervisors as an administrative attempt to "snoop" upon them in the cottages and was dubbed a "snoop system." This feeling soon gave way to a distinct co-operative attitude when the supervisors found that they were actually being given aid and security through the use of the system.

The Security Sound System actually consists of two separate systems having only one circuit point in common. The pickup or monitor section brings sound from the several areas under observations to the control room loud-speaker and the talk-back section delivers instructions by microphone. The program section transmits program material from tuner, records, or tape, to one, several, or all pickup areas. The point in common is the key on the control panel which is arranged for certain interlocking functions.

Since the several channels are identical to the point of their combination at the control panel mixing network, only one channel of the pickup section will be described.

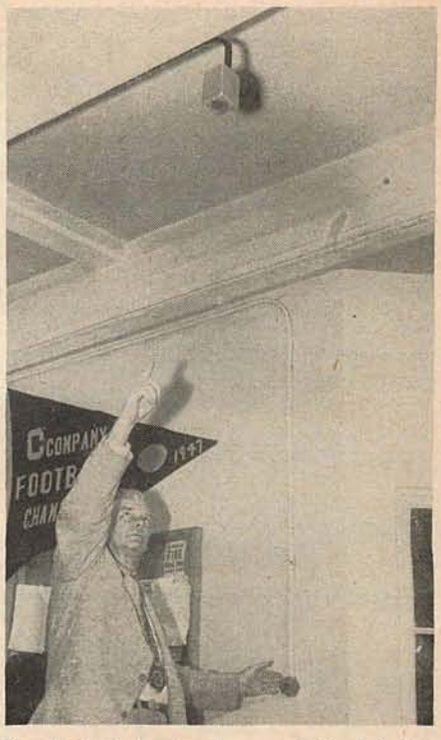


Fig. 3. Typical microphone and signal button mounting located in one of the day rooms.

Microphones selected for use in the pickup areas are of the cylindrically cased dynamic type having excellent transmission characteristics. This microphone was chosen because of its rugged design which would resist mechanical abuse and its small size which permitted it to be enclosed in a deep Condulet, as shown in *Fig.* 3. All wiring was run in

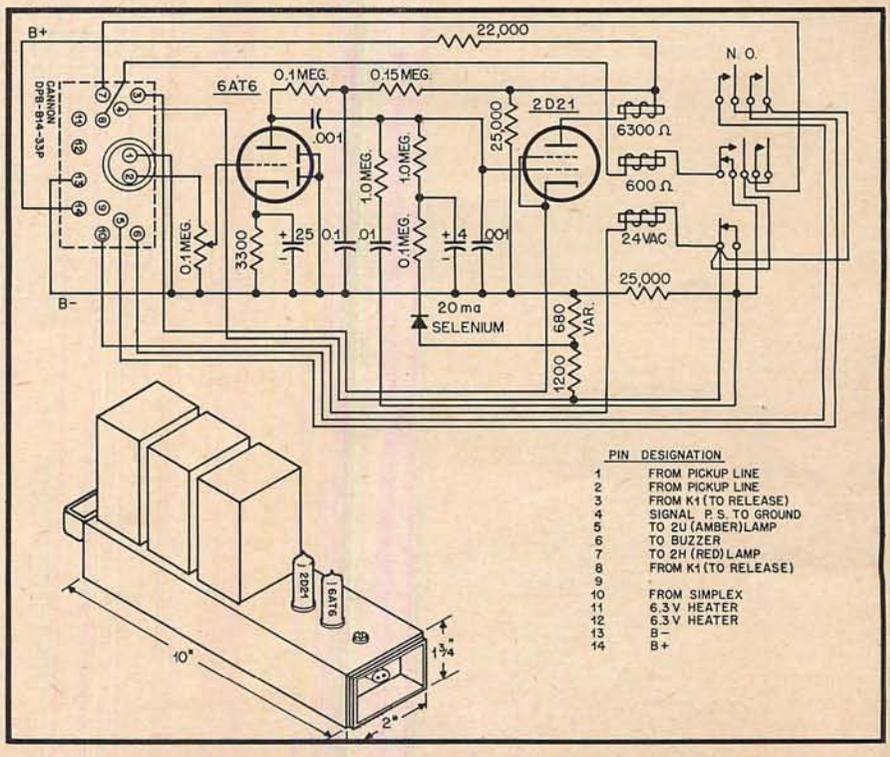


Fig. 2. Schematic and general appearance of one of the Channel Identification Amplifiers.

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rigid conduit and cast fittings. The Condulet which houses the microphone has a number of holes drilled in the end adjacent to the diaphragm end of the microphone. The cast cover is attached with Allen-head screws. Every effort is made to keep the equipment operative in the face of severe mechanical abuses. A microphone has been known to withstand being repeatedly struck by a chair used as a club.

The microphone feeds a preamplifier followed by a gain control and a booster amplifier. The output of a booster amplifier leads into a 1-to-1 ratio line-isolating transformer, the line side of which is center-tapped for line simplexing purposes. The gain control is adjusted to produce a maximum level of +8 VU on the telephone line. The steel housing enclosing the preamplifier and booster amplifier also encloses a speaker amplifier for the talk-back section as well as power supply and signal transformer for the simplexed alarm circuits. The amplifiers have been standardized as plug-in units of a type in common use in the broadcast industry. The preamplifier and booster amplifier are identical. The chassis carry Cannon DPB-type plugs to permit the quick replacement of the amplifier with a spare in the event of failure from any cause. They have a gain of 40 db each and output power of +18 dbm with less than 0.5 per cent total harmonic distortion over the range of 50 to 15,000 cps. They have a signal-to-noise ratio of more than 80 db and a frequency characteristic flat within 2 db over-all from 50 to 15,000 cps. Input and output impedances are 150 ohms, standard throughout the system. The amplifiers are equipped with pushbuttons to permit reading the cathode current of each tube on a test meter for a quick check on performance.

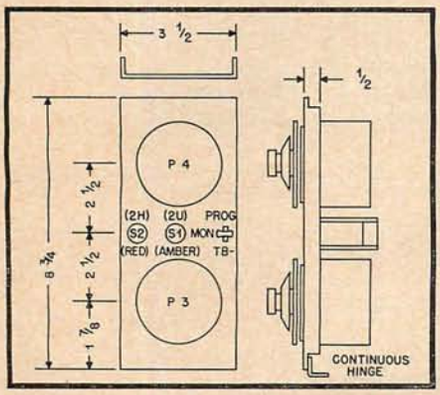


Fig. 4. Arrangement of mixer pots, signal lights, and the key switch for a single channel unit of the control console.

Other types of amplifiers have been tried and have not proven economically suitable in view of the high cost of maintenance and slow servicing involved. A 24- to 48-volt secondary of a bell-ringing transformer mounted in the amplifier enclosure is connected, one side to ground, the other side to one or more normally closed contact pushbuttons in series, thence to the center tap of the line winding of the line-isolation transformer. This simplexing of the alarm circuit is completed by a similar transformer at the control room end in which the center tap of the line winding is connected to a back contact-type relay in the CIA amplifier, thence to ground. The resulting closed circuit does not produce any hum on the pickup line because of the excellent balance of the two transformers. The depression of a pushbutton, the blowing of a fuse, the malicious killing of the a.c. supply line, or cutting of output line wires, will interrupt the signal current over the line resulting in the release of an alarm relay in the CIA amplifier and the lighting of the channel identification lamp on the proper control panel apparatus unit. This simple feature has proven of considerable value.

Since the first installation was made, the control unit has been standardized in a 3½ by 8¾ in. panel on which is mounted the sensitivity control at the top, the mixing pot at the bottom with the signal lamp and control key in the center. Its layout is shown in *Fig.* 4.

System Functions

Reference to the transmission system block schematic, *Fig.* 5, will show the circuit relationships in the apparatus control units which are the dashed-line enclosures at the right. Channel 1 has the transmission path from C_2 through K_1 shown by a heavy line. K_1 (the control key) is in its normal or center position for this function. In Channel 2 the path through the key is indicated for the talk-back function. In this position the key is held down in a non-locking position. Only in this position is the pickup line interrupted. The third, or locking, position of the key, is shown in Channel 3, starting at the left side of Network 3 and passing from the right side of K_1 to the lower right output from the key. In this locking (program) position, the pickup circuit remains operative so that while program material may be transmitted to the loud speaker in the pickup-area, the program and any

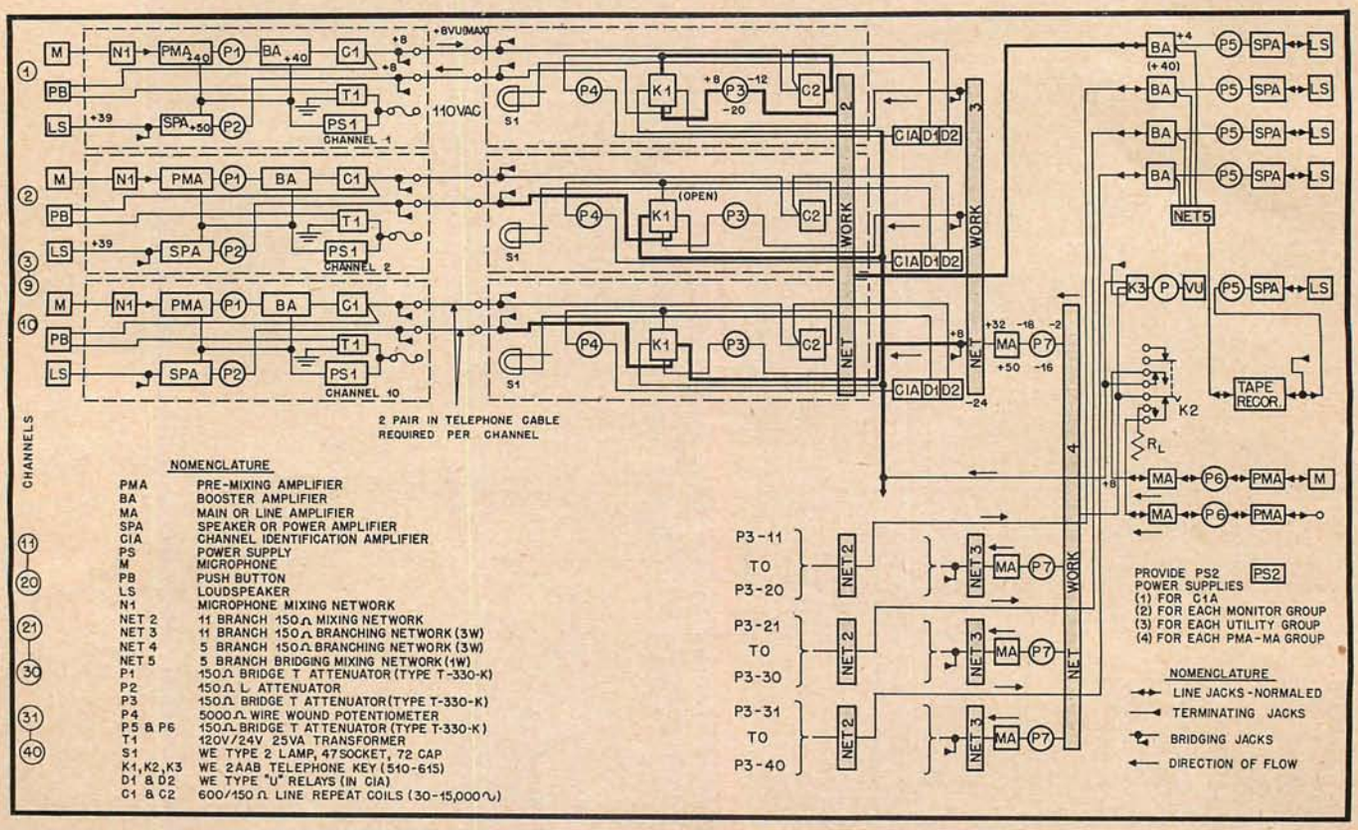


Fig. 5. Block schematic of complete Security Sound System. Channels 1, 2, and 3 have three different modes of operation shown in heavy lines.

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other sounds originating in the area are transmitted back to the control room monitor speaker. This does not produce a feed-back condition as might be supposed but has proven to be a very valuable device in the observation of pickup-area activities since it is usually assumed by the occupants of the area that they cannot be heard while program material is being received.

The lower left output of K_1 feeds through P_3 which is a bridged-T attenuator of the type commonly used in broadcast consoles. This is a 150-ohm device feeding into Network 2, an impedance-matching mixing network, the output of which feeds the necessary booster and speaker amplifiers in the control room. This circuit procedure has been followed because of its proven transmission effectiveness in broadcast equipment.

The booster amplifier in the control room is identical to the unit at the pickup point. The line amplifiers shown as *MA* in *Fig.* 5 and the monitor speaker amplifiers shown as *SPA* are identical units and are assembled on individual plug-in chassis of slightly larger dimensions than the preamplifier-booster amplifier. They have a gain of 50 db with less than 1 per cent r.m.s. harmonic distortion at 8 watts output over a range of 30 to 15,000 cps. Their signal to noise ratio is greater than 60 db and input and output impedance is 150 ohms. At this point it is to be observed that the power supplies at all pickup points and for control room amplifiers are also plug-in units. They have the same structural features as the line amplifiers mentioned above. Standardizing on two types of amplifiers and one type of power supply throughout the entire system has made possible a minimum of spare equipment for emergencies and a simplicity of servicing by non-technical personnel.

If a circuit goes dead, it is only necessary to replace amplifiers with spare units to restore it to operation. Apparatus removed from service is checked by technical personnel and becomes available as a replacement unit for the next emergency.

Talk-Back and Program Section

A microphone of the same type as employed at pickup-areas is used in the control room. It feeds into a preamplifier, main gain control and line amplifier delivering +8 VU through normalled contacts in a master key to a bus common to all control-unit keys. Since only one control unit will normally be operated to the talk-back position at a time, no transmission mismatch will result. For general announcements the control unit keys are operated to the "program" rather than to the "talk-back" position and the master key is operated, substituting the program Network 3 for the common bus to preserve good transmission characteristics.

As mentioned previously, the speaker amplifier *SPA* in the pickup-area is a plug-in unit with 8 watts maximum output. It is connected to one or two loud speakers located in corridors where sound may be heard in a number of cells, in day rooms and dormitories, or in attendant offices depending upon the method of operation of the particular institution. The loud speakers are medium-quality 8-in. permanent-magnet units enclosed in boxes recessed into walls or ceilings in new institutions. In existing buildings the speakers are mounted in sloping-faced cabinets made of 5/8-in. plywood with the speaker opening covered by a protective grille. The loudspeakers employed in the control room are high-quality, high-efficiency units since it is desirable to observe as wide a frequency range of picked-up sound as is possible. This has proven a wise choice in that even the high pitched squeal of iron bars vibrating under the sawing effect of dirt-impregnated yarn has been heard.

Transmission Characteristics

The pickup system has been designed to provide an over-all frequency range in excess of 50 to 15,000 cps with harmonic distortion not to exceed 2 per cent and a system signal-to-noise ratio of better than 60 db. Since pairs in telephone cable distribution plant are used for transmission in both the pickup and talk-back directions, signal levels have been limited to those commonly employed for program channels as standard telephone company practice.

Mixing and branching networks have been calculated to present minimum transmission losses with best transmission efficiency.

Three sources of program material are provided and are optional at each institution. They consist of a rack-mounted AM-FM tuner of high quality, a three-speed turntable of the best quality commercially obtainable equipped with reluctance type pickup and equalizers, and a high-quality tape recorder which is also rack-mounted. The recorder is also arranged through a simple delay circuit to start shortly after an alarm signal is received. This recorder is bridged across the control-room amplifier equipment to record any disturbance occurring throughout the protected portion of the institution. The delay feature is disadvantageous in that it does not permit recording the initial period of the disturbance, but this was not found to be undesirable since the recorder would not get into operation for an appreciable period of time and would miss the initial impact in any case. By retarding its start several seconds a great deal of wear and tear due to false alarms has been eliminated. The operation of the tape recorder provides a record of all of the events associated with a disturbance and makes possible a review of the incidents after the disturbance is over. This review will disclose supplementary problems that occurred in the disturbance, errors in handling the disturbance, and many other details which may be corrected in the future. The tape recorder may also be used for the recording of general announcements, instructions or program material which can be recorded and edited for later release or under specific conditions.

A jack bay is provided in the control room cabinet to permit some circuit flexibility and testing.

Operation

There are no controls accessible in the pick-up area to anyone except servicing personnel. The main control panel located in the control room is manned by personnel assigned to supervise movements of either operating or confined persons, a guard, or in larger institutions a trained technician. Several systems are in the process of installation in California at the time of writing. They range from eight pickup circuits to forty pickup circuits per system. Since the usual large broadcast station studio console has a maximum of eight mixer circuits which are not all used simultaneously, it may be observed that forty channels under continuous simultaneous use presents some operating problems. In order to assist the operator in maintaining the normal mixer pot settings required for individual channel ambient noise conditions, an index device is employed. This device is a circular lucite disk, with a single radial engraved red line, placed underneath the skirt of the regular knob. With the red line of this disk indexing the average ambient setting it is then possible to raise the gain of that particular channel to give special attention to disturbances or problems occurring on that channel. The mixer knob may then be readily returned to the indexed setting.

Ambient conditions change at different times of the day and a chart can be prepared to show the average levels at different times of the day to guide the operator in consistent operation. Obviously, system gain will be reduced during daytime activity hours and raised considerably during night hours when confined personnel are sleeping. A similar indicator is used under the skirt of the knob of the sensitivity controls. The volume indicator is provided to monitor talk-back or program circuits as desired.

Voltage regulating transformers are supplied at institutions which, because of their remoteness from urban areas, have power-line voltage fluctuations which produce a number of problems.

False Alarms

False alarms represent a large percentage of the signals that come in. They are not, however, the bugaboo that was expected. Observation has indicated that the slamming of a door, the scraping of a chair across the floor and an occasional whistle and similar normal noises will occur. The levels of these noises will generally be above the ambient setting of the sensitivity control. The lamp signal for the channel is extinguished by momentarily pressing the channel control key to the talk-back position. It has been found that a thousand false alarms are of no consequence if one real emergency can be observed at the instant it

(*Continued on page 50*)

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at home with AUDIO

LEWIS C. STONE

Some thoughts about the tape recorder—which is apparently here to stay—and methods of using it in a comprehensive home music system.

THERE IS, BY INFERENCE, a legend inscribed on the chassis of your main audio amplifier which can be responsible for a certain facility in introducing a tape recorder into your hi-fi system. That legend is neither declamatory nor exclamatory, but stimulating in the sense that it could encourage an expansiveness in our own capacity to bring yet another facet of re-created sound into your life.

In a word, the legend should be INPUT—but isn't. Instead it is a variety of terms, any or all of which are "input" such as are marked over plug-in receptacles for tape, television, radio, crystal or magnetic pickups. These appear engraved or in decal on the skirt plate of the chassis upon which are mounted the accoutrements of your "department of amplification." In words of more than one syllable, the input insignia on your power amplifier are the opposite numbers of the output indications on many (in fact, most) latter day tape recorder panels.

In this season's crop especially, tape recorders incorporate external amplifier and external speaker outputs as well as microphone and radio phono inputs. The latter inscribe electronically the sound picked up from radio tuner or phonograph records; the former play it back through the speaker in your own audio system, *after* it has been made to lift up its voice by a thorough indocrination in the laws of expansion and intensification as they are demonstrated through the power amplifier. It is in the latter that both volume and range are enlarged upon and magnified, much as a photo enlarger might bring out and make clearly visible any detail inherent in a small photo negative. But detail there must be, else its lack will sorely be magnified by the enlarger. So it is with hi-fi audio; the good signal is brought up to be better, the poor signal also is brought up, but for worse. 'Tis in the nature of high-fidelity instrumentation to accommodate good or bad signal, impartially, but with what partisan results!



Fig. 2. Inputs on the face of this tape recorder handle microphone, radio, and phonograph. Output marked *External Speaker* feeds to amplifier input marked *Tape* in Fig. 1.



Fig. 1. In this "switchboard of home entertainment, six input sockets give your audio system extreme flexibility, accommodating Pickering pickup in *Mag-1*, GE and Audax in *Mag-2*, crystal in *Xtal;* in addition, there are radio, television, and tape recorder inputs.

Why a Tape Recorder?

With the tape recorder, the opinion is widely held, the family can express itself to the outside world by "output" of home life events and occasions. It can be said, if the amplifier is the heart of the home audio system, that the tape recorder is as the brain. It does have the facility (we almost said "faculty") of total recall. Naturally, for it plays back what is there, recorded at will by its operator.

The tape recorder also has the facility of total amnesia. For the operator can plow-in (by electromagnetic erasure) the lush tonal crop of a ninth symphony by a Beethoven, and on the very same stretch of magnetic tape surface inscribe in its stead a nine-day wonder top-hit pop tune. And in turn, this can be chuted down the amnesia sluice-way and replaced with that new-born babe's new-found voice, or the babble of a children's birthday party. Also, perhaps with the aid of a Cousino loop (see NEW PRODUCTS, March, 1954), the at-home review of school lessons, mathematics coaching, diction and language training—and just plain for-the-fun-of-it tape-ups of the odd, the vagrant, the poignant moments that occasionally and unexpectedly occur in the most humdrum family life.

And what recording device, other than precisely the tape recorder, has as much the equivalent of (shall we say) "sentiency"? In its electronic way, it is superior in amnesiability to the normal human brain, which as we all know is a kind of palimpsest of bagatelles and fragments, today's notions overlaying those of yesterday, with never a cancellation, our analysts tell us.

The tape recorder can be all things to all people. To each every machine brings many uses, whether it be as a school teacher or student; hi-fi addict purely, preoccupied with concerts and disc recording; or a "gagster and prankster"

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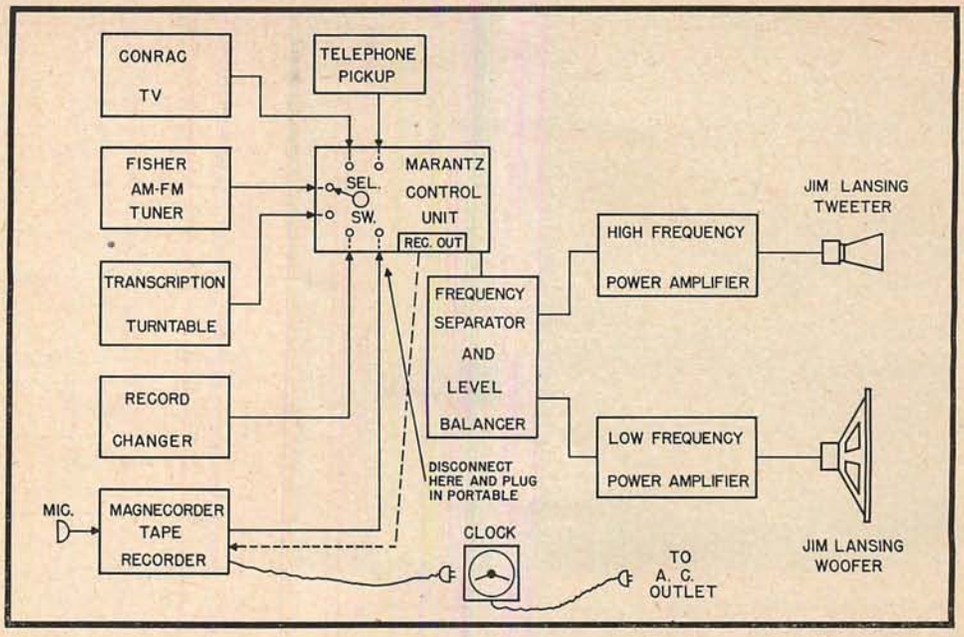


Fig. 3. The audio system that grew. This is the plan for a specific home installation, but any other combination of makes and types of equipment could be connected together in a similar manner to give great operating flexibility and a wide variety of audio services.

playing back covert tape-takes of conversations and harangues inane to the point of nonsense (if nothing worse) by the very unwittingness of the participants. And to every user are available accessories that operate to record "absentee' programs, and others, of which more later.

Now what are the "terms" one must exact from a tape recorder to achieve the desired end results? You have very likely left a hole in your present audio system in anticipation of getting one. You have your choice of all-purpose portables with one head for erase-record-playback; and more complex ones with as many as five heads to permit in addition to the standard functions, playback of a delayed broadcast whilst recording an incoming program on the same tape, with operation on either single or dual track. Also, you can savor tape recording and playback speeds from 3¾ inches per second through 7½ and up to 15 inches per second, with correspondingly higher fidelity playback sound.

Your amplifier has its complement of input connections, similar to those shown in *Fig.* 1, for example. If you choose one of the moderately priced portable varieties of tape recorder, with its own speaker built in, you can shunt the playback sound through your power amplifier into the main hi-fi speaker. You do this when you "feed" the output of the tape recorder (marked EXT SPKR in the companion photograph, *Fig.* 2) to the input of your amplifier (marked TAPE) and thereby bypass (if you like) the smaller speaker that comes as original equipment with the tape recorder. You will then hear the results of your recording efforts on more of a hi-fi plane through your audio system.



Fig. 4. Family tree of this audio system shows a blue-blood streak in quality of components. In addition, there is a portable tape recorder worked by an automatic timer to facilitate home review of school work, using tape pre-recorded from text books and special assignments.

Other Voices

Just as soon as you have gotten your new tape recorder within range of your 30- to 15,000-cps audio system, the temptation may be stronger than you can resist to "play broadcast" with yourself. To rush an impression—but quick—onto those reels you will talk, hum, sing, whistle and strike other odd tonal attitudes before the stock mike. You will hold it before the speaker cabinet (to which are hooked up your tuner and record player—earlier members of the audio fraternity you have organized in your home) to pick up a fancied radio program or two, with the unavoidable trimmings of external noise alighting gratuitously upon the sensitive magnetic tape, for such is the fate of recordings made via the non-selective microphone cum loud-speaker. And lo! you play it back, and all of everything comes back, even to the scraping of that chair as you slid along on it to get the mike closer (but not too close) to the broadcast sounds emanating from the speaker.

This is "fidelity" with a vengeance; neither is it exactly hi, nor quite properly low. It is what might be called the consequences of a "casual pickup of programmage"—to coin a situation by fabricating a phrase.

To get beyond this first fever of tape record-itis may take

THE DETAILS OF THE SYSTEM

Identification of the units of the all-out comprehensive home audio system with tape recorder, shown in Figure 4 at left:

Tape recorder is two-speed Magnecord, Model PT6-VAH, 7-inch reels.

Speakers are Jim Lansing: Model 130-A woofer; Model 175-DLH tweeter; with crossover network N-1200.

Record turntable is Rek-O-Kut T-12, 3-speed, manual; with Gray 108-B viscous damped tone arm. GE Magnetic cartridge. Power amplifier is 30-watt McIntosh A-116, extended range; preamplifier delivers 4 volts, full-range equalization; powered from main amplifier.

Microphone is Electro-Voice Model 630.

Tuner is Fisher, Model 50-R, FM-AM.

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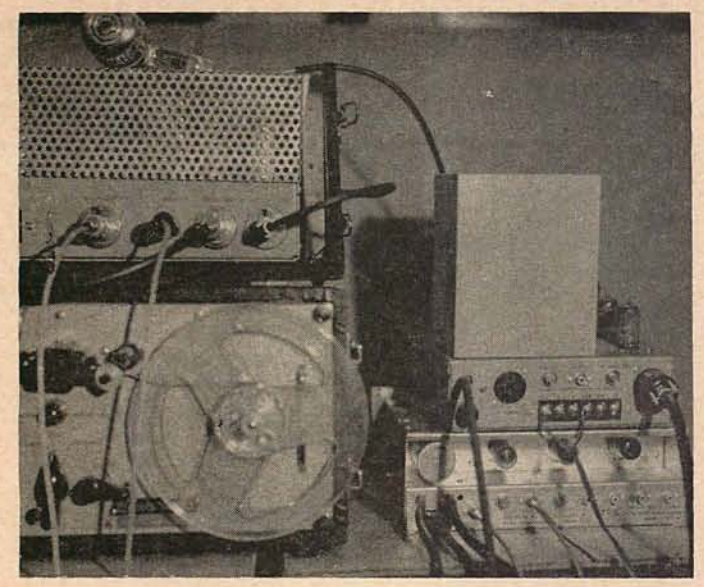


Fig. 5. Top left is the rear panel of a tape recorder amplifier, carrying plug-ins of cables connecting to power and preamplifiers at right. See text for details.

a bit more of time than less. But then—then are you most apt to be ready at least to apply sound to tape with an increasing selectivity. And with better results, too; because you have also been going through a process of learning technique and, as well, the possibilities and limitations of what you are by now calling your "new medium of self-expression."

You may prefer to hold on to the "first edition" reel of tape (see above) as a documentary of your first moments with this delightful additive to your audio system, loath to begin economizing on tape at the expense of erasing *that* particular one and re-using it for something less memorable and unique. And when the initial incandescence wanes, you can then proceed with greater circumspection and your choices are more likely to stay with you as enduring "selections" in your growing library of self-recorded tapes.

A library this, which could conceivably greatly enrich you not alone on a musical plane, but as well your store of knowledge through direct experiences with the live recording of events and circumstances in current history; politics, economics, business, the sciences, music, religious services, the humanities, theatre—to mention a many of the greater mass of learning—all of it, possibly, taking the clear voice of original authority after authority as each clarifies his special subject for, semmingly, you alone.

Enchanted with the medium's possibilities, you may even take the trouble to speculate on what it might mean to us—the nation's morale (if invention were not such a lazy drab, you said)—if we could today summon up Lincoln's voice, or Washington's. Which is but one of many a similar query that need be asked but once, to open out all the stops on the prospect that may lie ahead for those of us who today take the trouble wittingly to stop time in its flight, and to imprint on magnetic tape the imperishable thoughts of perishable, mortal minds and voices as they throw off for us the luminous energy of great idea, invention, discovery.

It is quite possible to garner up such a collection of "originals" by those who seek communion with the great men of our time. We don't know for certain who of the living well-knowns will stand great in the years to come; but not all the dead well-knowns are great, nor are the greats all among the dead.

If we are eclectic enough in our choice, if we "play the field" for suspected enduring greats among our contemporaries, then the ear of future generations may at will pick up the voices of those who have grown in stature with the passing years—voices beamed from a real of tape of your bequeathing and holding (almost imperishably, by today's tape standards) the gist, the nut, the substance, of the cultures of our own day. On a more personal level we can, by the same token, reach out to our descendants, leaving for them a heritage of "family albums" built with the vocal chords of infant and grandparent; offering no less presence than, say, a Kodachrome picture, and with greater impact—by a number of light years greater, it may be.

Family Entrance

On a "per diem" level, we have a communication from reader Carroll (Lond Island) along the lines of family experiences with the tape recorder as a part of the home audio system. Recording requirements have reached a point where they now embrace participation by the entire family, especially a son in college, a daughter in high school. Both of them have learned their subjects better by having learned to use the tape recorder as their personal educational tool, at father's urging, himself a knowledgeable audio-ist.

Such uses have meant the development of an audio system that at first glance may appear to be on the elaborate side. (Block diagram, *Fig.* 3). But remember that the communication we report here describes a process of expansion over several years. We are told that the system grew, organically—sprouting now this and now that accessory or major addition—as more of the tape recorder's capacities could be brought to serve a family growing in numbers *and* in perception. This audio system now represents final choices in tuner, preamplifier, power amplifier, 3-speed record turntable and automatic changer, speakers, two tape recorders (one an early Brush single-speed portable).

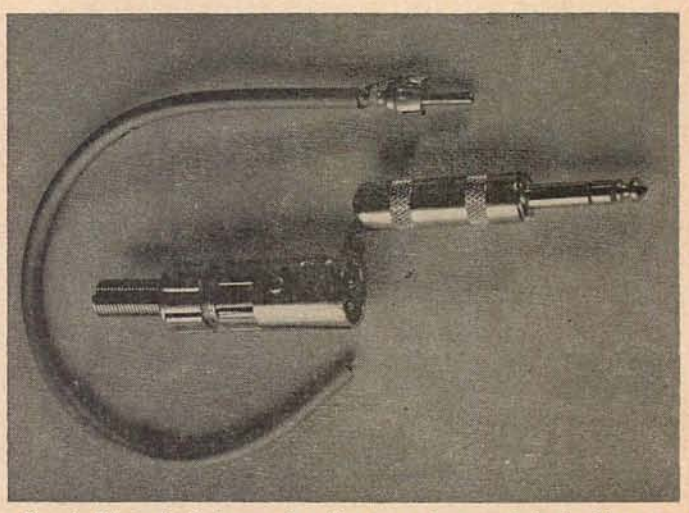


Fig. 6. Three basic types of cable connectors used in hooking up components of audio systems. Structural details and internal wire connections are shown in Fig. 7.

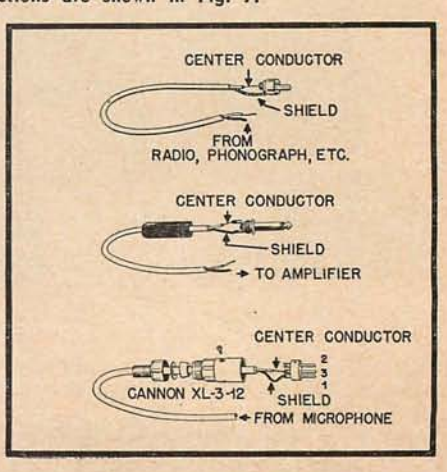


Fig. 7. Details of the three common types of connectors used in home and professional equipment.

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The "Hitch Parade"

For a comprehensive, sort of photographic 3-dimensional block diagram of the entire ensemble, we managed to take a shot while a similar audio system was on a pre-installation bench test. As many interconnections are shown as were possible, without strangling the units to confusion and invisibility in a net of nooses, loops, and coils of zipcords and shielded cables. (*Fig.* 4) Description of the components shown appears later in the article.

All the tape recorder-amplifier hook ups you will ever need to deal with are shown in a close-up of the essential areas of output and input and their designations on tape-recorder amplifier, outside preamplifier, and outside power amplifier (*Fig.* 5). Not shown is the hook up to speakers. But it is understood, is it not, that all roads lead to the speaker voice coil, once the leads from the tape recorder go where they should on the preamplifier; from there another set of hook ups do business with the main amplifier, which in turn encourages the speakers to have their say. Since the speakers are already connected to the amplifier which also carries the input from the tuner, there is no need to show it too, at this point.

Since, in short, the audio system is already set up in its working clothes to take the tape recorder and its train of electronic impulses unto its db-watt-ohm caparasoned formulary—all you need to do is spell out the linkages of the hookups shown in said *Fig.* 5. There you can see for yourself that, of the three basic types of circuit connectors (shown photographically in *Fig.* 6 and with companion structural drawings in *Fig.* 7) these details: That, for instance, jack to input #1 on the preamplifier unit is served by the pin type plug shown at the top in *Fig.* 6. This connector's lead goes to the 600-ohm output where it is shown on the back panel of the tape recorder as in *Fig.* 5, and where a three-prong plug, shown on the left in *Fig.* 6, is required. Also necessary is a connection from the auxiliary output (or detector output, if there be one), using the pin plug, to the BRIDGE input on the recorder, where a telephone plug is demanded.

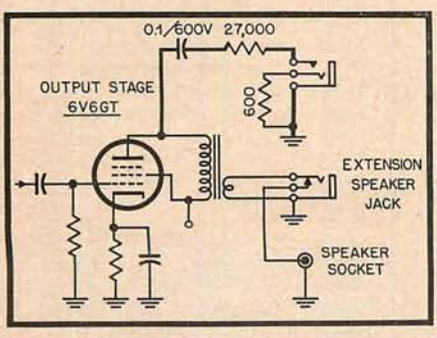


Fig. 8. Recommended method of connecting the output of a tape recorder amplifier to the input of a typical hi-fi amplifier. This method eliminates the output transformer in the recorder and usually gives better quality.

With this particular equiment, power is fed to the pre-amplifier by a cable with an octal plug on the main amplifier end, connecting the other end to the preamplifier, seen in *Fig.* 5. Also visible there is the plug-in of a.c. power line from amplifier into a.c. plug on the preamplifier; and the a.c. power lead from the preamplifier which should connect into the a.c. house outlet. Zipcord runs from power amplifier to crossover network, to woofer, to tweeter (which units are shown in the over-all photo of the system, *Fig.* 4).

The Tape is Not Red . . .

Complex mechanism? The tape recorder is, rather—with a veneer of simplified mechanico-electronic controls. In addition to voluminous circuitry, an appreciation of its structure will perhaps be yours if you take time out to study the underside of your own controllable memory device. The works, as you will see, are replete with carefully engineered small parts, ranging from suitable brakes to solenoids; motor, capstan, switch, flywheel, clutch, spring—all are there—not to mention the record-playback head, erase heads, input and output receptacles, etc.

Among the portable types that have come to our notice, we have room in this month's communication for only one: the Revere Model T-10. This 2-speed recorder is submitted as having a frequency range of 60 to 15,000 cps, plus or minus 3 db at 7½ inch tape speed; and plus or minus 3 db from 80 to 8,000 cps at half the speed. Wow and flutter are a barely perceptible 0.3 per cent. You will just about be able to hear a tolerable 0.5 per cent flutter, although in top grade professional tape consoles this could be a low 0.1 or even less.

Distortion on the T-10 is said by Carl W. Claras, head of sound engineering at Revere, to be 0.65 per cent at normal levels; the reproducer head delivers about .001 volts at the frequency of maximum voltage. The signal-to-noise ratio is 50 db from 3-per-cent distortion point. In order for the instrument to have such a ratio, the relative input noise of the amplifier (which delivers 5½ watts) must be less than 5 microvolts.

And when it comes to equalization, you may be surprised to learn that a tape recorder amplifier (original equipment, that is) is different from any other. The frequency response from a magnetic tape head is anything *but* flat; with a curve that looks like a mole-hill, the low end falling off slowly, the highs dropping off very rapidly. This deficiency in the head must be offset in the amplifier by making *its* response the inverted curve of the tape head response.

So there are problems peculiar to the packaged recorder, whose design is such that it is most convenient to drive the head, in recording, from the output stage. As a result the input signal must be kept as clean as possible with negative feedback.

If a good hi-fi amplifier is introduced, it can be driven from the 3.2-ohm extension speaker jack, connected to the phono of hi-level input of a hi-fi amplifier which has, of course, the advantage of more than several watts of clean output and is, naturally, superior in speaker damping. Recommended for cases where a 600-ohm line is used and the 3.2 ohm output of the recorder may load it down, is inclusion of the circuit of *Fig.* 8. This should give a rise of 1 db at the low end.

Another model, T-11 is in the works. (*Fig.* 9). This consists of a 10-inch tape transport and amplifier only, designed for custom installation, what with the build-in of that 600-ohm output for connection to hi-fi power amplifiers.

More on tape recorders and the several basic variations of hook up to hi-fi home audio systems will appear in future. And, as always, what our readers may have to say on the subject is welcome for possible publication in "at home with AUDIO".

Credits

Material helpful in the preparation of this month's study on the place of the tape recorder in the home audio system is acknowledged with thanks to the following firms in alphabetical order

Ampex Electric Corp., Amplifier Corp. of America, Beam Instruments Corp., Bell Sound Systems, Berlant Associates (Concertone), Electro-Voice, Inc., Harvey Radio Co., Pentron Corp., Presto Recording Corp., Revere Camera Co., Three Dimension Co. (TDC), University Loudspeakers, Inc.

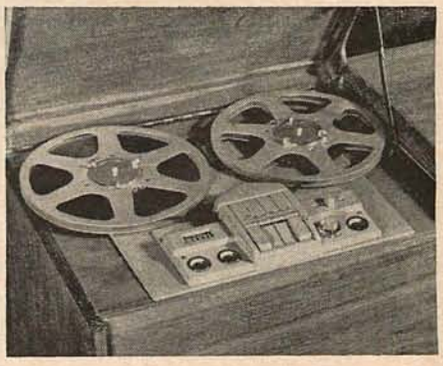


Fig. 9. New model of home-type recorder made by Revere, the T-11. Note the 10-in. reels, which make the unit suitable for long-period recording, such as a full symphony, opera, or —possibly—a sporting event or a lecture. This model consists of tape transport and amplifier only, being designed to be integrated into the home system.

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Building Your Own Hi-Fi Furniture *

IRVING GREENE** and JAMES R. RADCLIFFE***

In three parts—Part 3. Concluding this series on the tricks and short cuts in the construction of cabinets for home music systems. In this article the authors cover fastening methods, plywood edge camouflage, and hinges.

THE SCREW—FACTS AND FIGURES

No other fastening device is as effective as the screw in creating a secure, solid bond between two pieces of wood. The types of screws used in cabinet work fall into two classes —the wood screw and the machine screw. The latter is used exclusively for mounting loudspeakers and securing draw pulls and knobs. It is also used to secure the chassis tuner or amplifier chassis to the shelf.

Wood screws are available with round, flat, or oval heads. The round head is used in cabinets only for special work while the flat and oval heads are used extensively. The diameter of the wood screw is designated by number, as #8, #10, #12 etc. The larger the number, the thicker the diameter of the screw. Thus a 1½ × 10 screw would be 1½ in. long by 3/16 in. in diameter. Incidently, the number 10 screw is the most widely used for ¾-in. work which most frequently applies to the backs of loudspeaker enclosures. The best method of inserting a screw into the work is to drill a pilot hole (slightly less than the diameter of the screw). This makes it easier to drive the screw and prevents the head from twisting off. After a pilot hole is drilled, countersink the hole to form a V-shaped contour, so the head of the screw will be flush with the surface of the wood. Screws holding the backs of speaker cabinets should be spaced closely together. Every 4 to 6 inches is not too close, but never further apart than 8 inches. The job is a simple one if an automatic screw driver or a brace and screw-bit is used since the screws are quite long and a regulation screwdriver can prove to be somewhat tiring.

Mounting a loudspeaker to a baffle board should never be done with wood screws. The proper type of fastener is the flat-head machine screw or carriage bolt with lock washer and nut. One other alternative fastener is the "T" nut and round or hex head machine screw and lock washer. The use of a lock washer is most important because of vibration. Nuts should be twisted as tight as possible over the lock washer making a semi-permanent bond. For this reason, wood screws are undesirable for use to mount the loudspeaker. There have been cases where a speaker has dropped to the bottom of the enclosure after the wood screws worked loose. The speaker should be mounted as snugly to the baffle board as is possible.



Fig. 2. Three typical bail pulls commonly used on traditional styles of furniture. (Courtesy National Lock Co., Rockford, Ill.)

Camouflage

Exposed screw heads can be covered up with one of the many types of wood fillers and putties on the market. Some are available in colors to match woods such as mahogany, oak, and so on. The pre-drilled hole should be countersunk with a tool that makes a V just a bit larger than the screw head so there is ample space to place putty or filler over the screw head. Then, using a putty knife (spatula) apply the the mixture, pressing it in firmly at first and then building it up to the surface. After it has hardened, it should be sanded smooth prior to applying the final finish to the surface.

A somewhat more complicated method of camouflage is to cut a wood plug or dowel the size of the screw head and

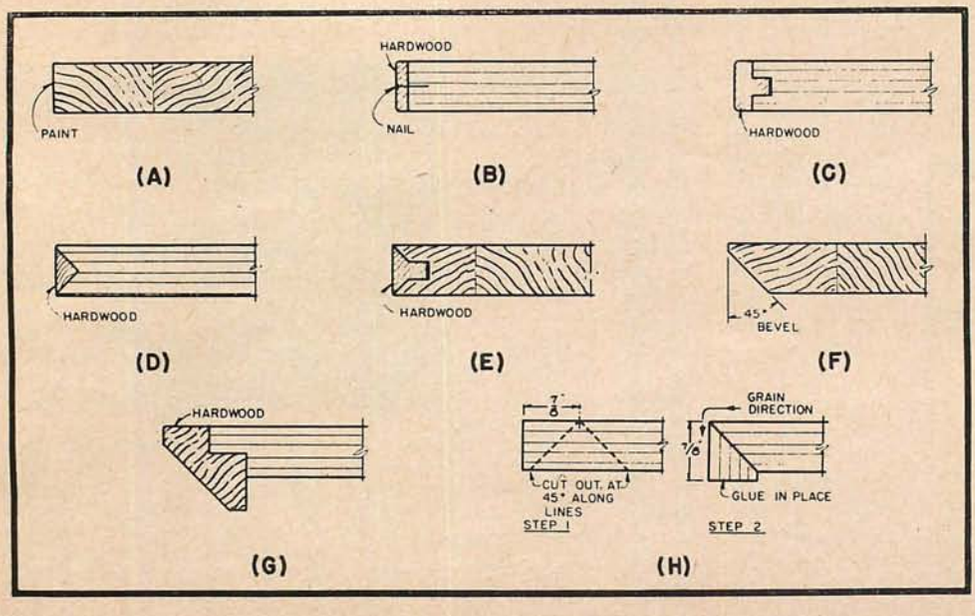


Fig. 1. Plywood edge treatment shown in detail. (A) is the simplest, with the wood being sanded thoroughly and painted to match the face veneer. (B) shows a hardwood strip glued and nailed to the edge, sanded before finishing. (C), (D), and (E) show three methods of gluing hardwood strips along the edges. All three require the use of power tools. (F) serves two purposes—it achieves a bevel motif for decorative purposes and it simulates a greater over-all thickness of the top. (G) gives a similar effect, but permits increasing the apparent thickness as much as desired. (H) is tricky, and involves the cutting of a 90-deg. V groove almost through the wood; after steaming, the end piece can be bent over and glued. The grain pattern thus continues over the edge of the panel.

* Excerpted from the book "The High Fidelity Handbook" by Irving Greene and James R. Radcliffe, to be published in the fall of 1954 by Crown Publishers, Inc.

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after the hole has been pre-drilled, a larger hole must be drilled deep enough to insert the plug and wide enough to pass the diameter of the screw head. The plug is then inserted and adhered with glue. It is best to make the plug a little high and then sand it down flush with the surface. For a custom surface finish it is best to cut the wood plug from matching wood. The dowel can be used where the surface is to be painted or lacquered a solid color.

Perhaps the best way to camouflage exposed screw heads

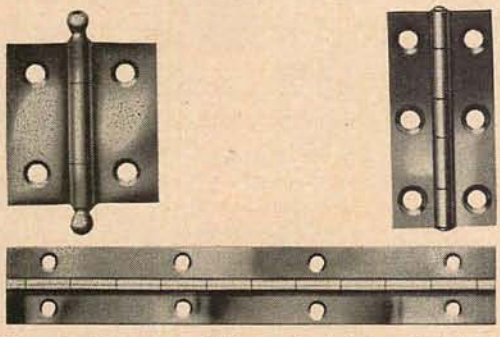


Fig. 3. (Upper). Two types of hinges. At left is a ball tip loose pin butt, and at right is a similar hinge less the ball tips. Fig. 4 (lower). Continuous or piano hinge which is available in lengths up to 72 in. and from 1 1/16 to 2 in. wide when opened out.

is not to have any. This is done by inserting the screws from the underside of the joint through a screw block.

Edge Grain Treatments

A problem peculiar only to plywood has always been what to do with the visible end-grain. The answers can be readily seen in *Fig.* 1. Here are outlined all of the principal methods that have been used by cabinet craftsmen for many years. They range from the simplest treatment of painting the edge to the addition of a hardwood edge strip. The determining factors of which method you will use depend largely upon the tools and equipment you have to work with and the amount of time and bother you wish to take.

A smart and decorative means of concealing end-grain is to use a wood that is in contrast to the rest of the cabinet, or a solid wood lacquered in ebony or dark green can be fitted to a natural finished cabinet along the top and bottom edges carrying this motif to the inside surfaces of the cabinet. Contrast adds interest and style to a furniture piece if done sparingly and in good taste. If you wish to use matching wood to treat the end-grain, be sure to select a wood type that is available in solid wood. For instance, trying to find solid wood strips to match Rosewood or Avodire is like trying to buy a pair of snowshoes in Florida. However, if you may fall heir to a nice length of "rare" Rosewood or Avodire, the edge grain can be concealed by the method shown at H in *Fig.* 1. Here the edge is wrapped around from the basic top or side piece itself.

Methods of attaching the edge pieces vary. A simple finish nail or a combination of nails and glue may be used. This applies especially to edge pieces which are rabbetted into place.

Furniture Hardware

The hardware used for music system cabinets serves two purposes. First, it is a means of function . . . to open and close doors, lids, pull drawers and sliding doors. Second, it is a means of enhancing the decorative appearance of the unit, adding just the proper touch to eliminate the plainness and drabness of a large mass of solid wood. In this light, the style and design of the hardware determines the period style of the furniture. The same cabinet can very well be *traditional* with oval bail pulls and *modern* with smart, square satin brass pulls. Typical pulls are shown in *Fig.* 2.

Hinges

The familiar butt hinge, *Fig.* 3, is still the most popular. They are classified in a dual-dimension for size. For instance, a 1½ in. wide hinge is 1½ in. wide when open full, thus it is for use with two pieces of ¾ in. plywood. The second dimension indicates the height of the hinge. For cabinet work, brass plated butts are used. For the precision fitting of a door to its frame, the hinges should be *mortised* into the mating pieces of wood. To do this, enough layers of wood are removed (1/16 in. or less in addition to the exact dimensions of the butt) so the butt thickness fits flush with the wood surface. This is done with a hammer and wood chisel. The average cabinet door should have two hinges. One is located a few inches from the top and the other a corresponding distance from the bottom. The hinges are first installed into the door (this can be done on the work bench). It is then positioned into the door frame opening by wedging

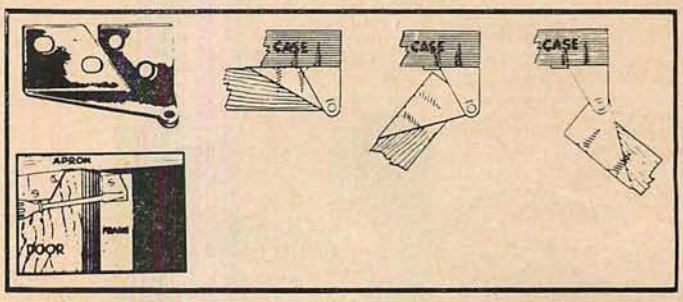


Fig. 5. Non-mortising type of semi-concealed hinge. Note the manner in which this hinge is installed. At the right the door is shown in closed, half-open, and fully-open positions.

it up from the bottom. Then mark the frame sides with the outline of the hinge body and screw hole positions. After mortising the shape of the hinge, pre-drill the screw holes slightly under-sized. With a butt type hinge, the hinge pin is always exposed when the door is in the closed position. This seems to be the one drawback of this hinge. It is most important to have perfect alignment between bottom and top hinges, else the door will bind when closing.

The continuous or piano hinge, *Fig.* 4, can be used for the full height of the door. It is a most popular hinge for lift-lids and full width split doors. This hinge presents no alignment problems as does the butt hinge. The brass or chrome

(Continued on page 51)

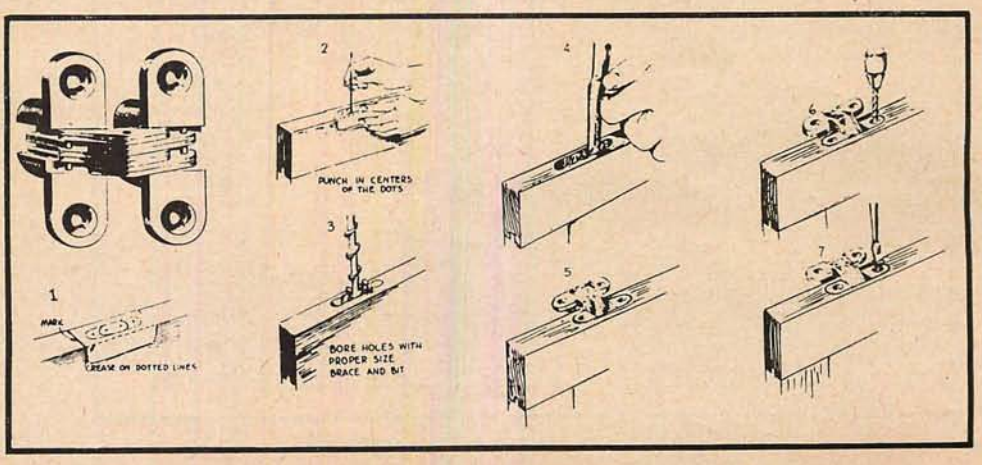


Fig. 6. The fully-concealed Soss hinge. Method of installation is shown in drawings 1 to 7. Soss hinges come with a guiding template, shown at 1, which is used to scribe the centers for holes. Fairly difficult to install, but the finished appearance is well worth it. (Courtesy Soss Mfg. Co., Detroit, Mich.)

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Equipment Report

Leak TL/10 Amplifier—University "Companion" Loudspeaker—Ampex "600" Tape Recorder

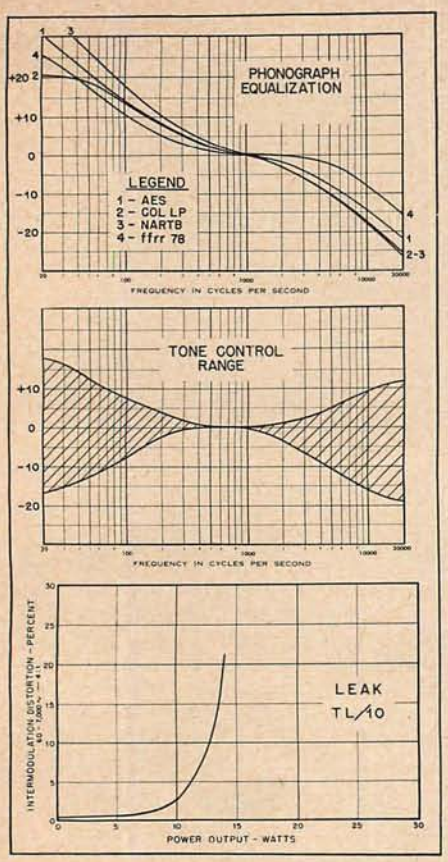
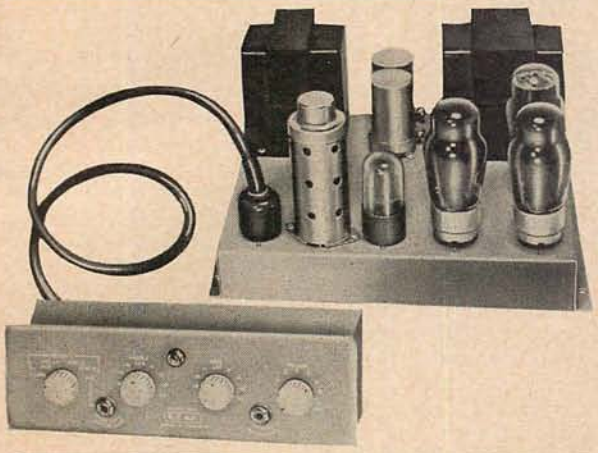


Fig. 1. (left, above). Performance data for the Leak TL/10 amplifier.
Fig. 2. (left). The Leak amplifier with the control unit.



OFFERING MANY of the advantages of the earlier TL/12 amplifier, the new Leak TL/10 brings quality in reproduction to the lower-priced field, yet retains many of the features which made its bigger brother a favorite with British users for both home and professional uses.

Direct comparison between the two amplifiers will show that the TL/10 uses continuously variable tone controls instead of tap switches, that it does not incorporate the Vari-slope feature—a low-pass filter with controllable rate of cutoff—and that it uses KT-61's in place of the larger KT-66's. From the standpoint of performance, however, there is not a great difference: the TL/10 has an output of 10 watts at 2.5 per cent IM distortion whereas the TL/12 has an output of about 14 watts at the same distortion figure.

The TL/10 has obviously been designed with the American market in mind, for while the TL/12 had the typically gentle tone-control curves usually found in British-made amplifiers, the ranges in the TL/10 are more in keeping with American demands. One feature of the new amplifier is the addition of two jacks on the front panel of the control unit to permit connecting a tape recorder into the circuit with a minimum of effort, and with the assurance that performance will not be affected.

Circuit Description

The amplifier is equipped with two regular inputs—pickup and tuner—and with a panel-mounted jack for connection to a tape recorder. Both of the regular inputs are equipped with separate level controls, which is particularly desirable in the case of the tuner input because at full gain setting of the volume control, a signal of 17 mv. at the input will give a 1-watt output, and most tuners are designed to provide outputs ranging from 1 to 2 volts.

All inputs pass through both of the stages in the control unit—both tubes being EF-86's. which are essentially the same as the Z-729 previously reported in these pages (See "Preamp with Presence," Jan. 1954). Frequency-selective feedback around the first stage provides the equalization necessary for phonograph reproduction, and four curves are available—AES, COL-LP, NARTB, and ffrr-78—as shown in the upper section of *Fig.* 1. A two-terminal strip on the rear allows for the addition of another resistor to permit matching any usual type of phonograph pickup. Flat feedback is used for the tape and tuner inputs, which are also fed to the first stage grid. Response at these inputs is within ±0.5 db from 20 to 20,000 cps.

The tone control circuit is essentially the same as the Baxendall arrangement, and provides boost at the frequency extremes before beginning to affect the ranges adjacent to the inflection points. In effect, the response at intermediate settings of the controls may be approximated by sliding the shaded areas of the curves in the center section of *Fig.* 1 to the right or left. In usual American practice, movement of the tone controls affects the response adjacent to the inflection points to some degree with even the slightest change, a practice which gives rise to some "tubbiness" in speech because there is considerable boost at 200 cps, for example, when boost at the lower lows is required. The same effect obtains in the high frequencies, and often gives too much boost at the middle highs when only the upper highs are in need of correction. *Figure* 3 shows the schematic for the control unit, and it will be noted that the output signal available at the tape recorder jack is not affected by the volume control. Thus it is possible to adjust the volume in the monitor loudspeaker at will or to turn it off altogether without affecting the signal fed to the recorder. Tone control adjustments, however, do affect the signal being fed out, which is desirable because it is often advisable to make frequency correction to programs being recorded. A socket is provided to permit feeding plate

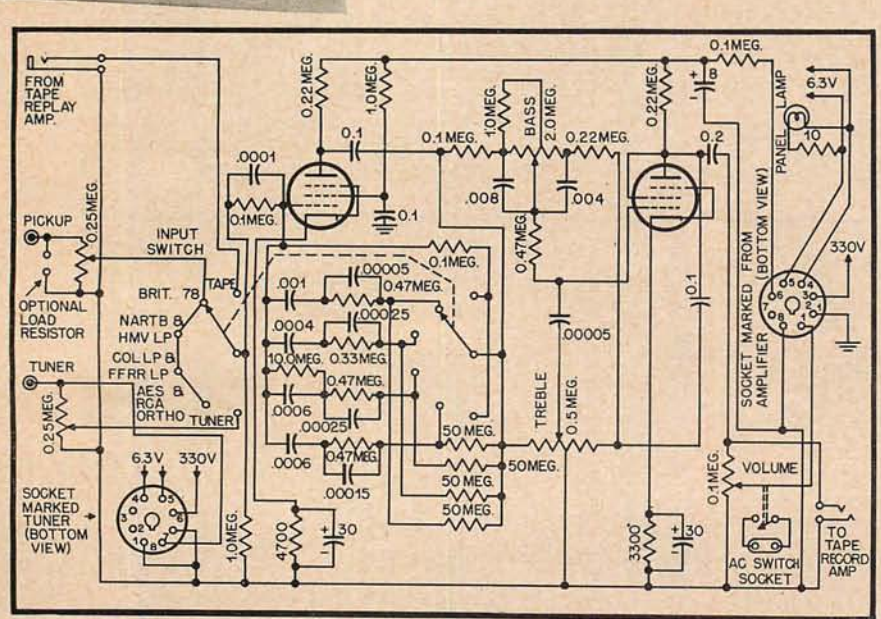


Fig. 3. Schematic of the preamplifier-control unit.

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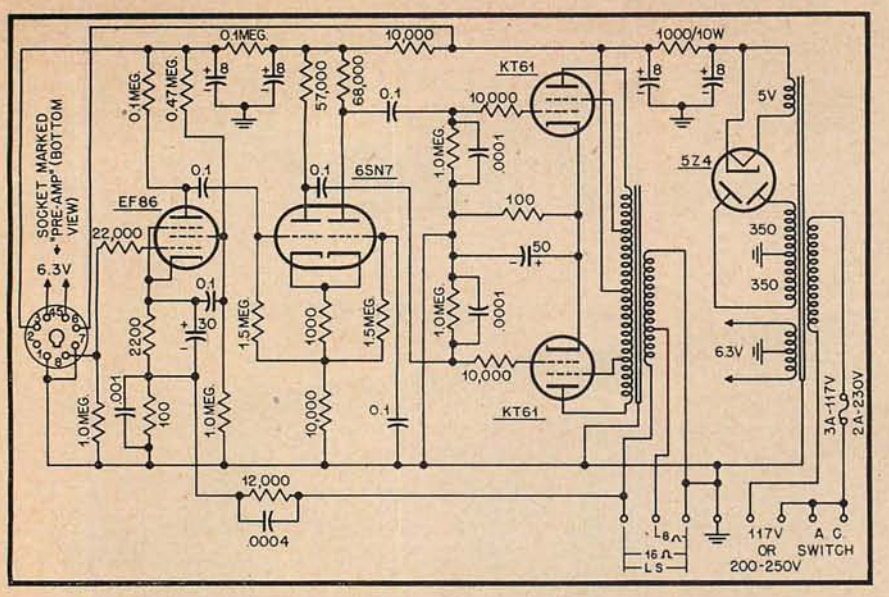


Fig. 4. Schematic of the Leak TL/10 power amplifier.

and heater power to an external tuner which may not have its own supply.

The power amplifier follows quite closely the design of the TL/12, but uses KT-61's which are similar to the American 6V6, although somewhat more linear and having greater power sensitivity. The first stage is a pentode, with feedback from the output transformer secondary fed to the cathode. The second stage is the phase splitter, using the "long-tailed pair" circuit arrangement. The output stage is connected in the Ultra-Linear manner, and 8- and 16-ohm outputs are available; 4-ohm speakers can be accommodated by making a simple change on the transformer terminal panel. Four other changes can be made to permit the use of 6L6's or KT-66's, but no particular advantage is offered in using the larger tubes with the supply voltages available. The amplifier is fused, and a receptacle is provided for phonograph motor connection. The complete schematic is shown in *Fig.* 4.

The TL/10 is neat and compact, and is easy to install. As usual in Leak amplifiers, the workmanship is impeccable—a feature which may only be appreciated in case any component ever has to be replaced. But if amplifiers were installed so that everyone could see under the chasis, many more of them would be built like the Leak products.

One-watt output from the power amplifier is obtained at full volume-control setting from an input of .017 volts at the tuner and tape inputs, and from .0027 volts at the phono input. At full volume-control setting, hum and noise is 46 db below 1 watt from phono input, and with the volume control off, maximum hum and noise is 72 db below 1 watt. These figures correspond to 56 and 82 db respectively below full output—as most amplifiers are rated to give a higher numerical value. However, a 50-watt amplifier will usually not be played in the home any louder than a 10-watt amplifier, so a figure related to some fixed value of power output is more indicative of actual performance.

UNIVERSITY "COMPANION" LOUDSPEAKER

Combining into one modern and attractive piece of furniture a small two-way loudspeaker system and an electric clock equipped to turn on and off any electrical device at a pre-set time, the new University Companion can serve many requirements for the home system. The unit, shown in *Fig.* 5, consists of an 8-inch Diffusicone and a model 4401 tweeter system with an electrical crossover network and a level-adjusting control for the high-frequency unit. The low-frequency cone is relatively heavy and is capable of large low-frequency excursions without acoustic breakup; it is augmented with the additional radiating diffusing rings which distribute the mid-range frequencies. The tweeter consists of a driver unit employing a lightweight phenolic diaphragm and a wide angle horn which provides good high-frequency distribution. The grilles covering the speakers are of expanded aluminum, gold finished, and are acoustically adequate in addition to being attractive and capable of resisting exploring little fingers.



Fig. 5. The new University "Companion" loudspeaker.

The Sessions electric clock is wired to a receptacle on the back of the unit, and by means of a switch on the front can be set to turn on or off any appliance or other electrical unit such as a radio or recorder at any time within twelve hours after it is set.

The Companion is designed to mount on a bookshelf or table, or—with the optionally available wrought iron legs—to stand by itself as a piece of furniture. Because of its small size, it is considered especially suitable as a second speaker—in a bedroom or patio, for example—where the additional advantage of the clock would be appreciated. For such a purpose, this reporter would have preferred that the front panel control were connected as an over-all level control rather than as a means of adjusting the relative balance between the two units, since it is—in our opinion—more desirable to adjust a loudspeaker for optimum quality of reproduction in a given location and then leave it with that adjustment, making all other tone adjustments at the amplifier itself. However, it is probable that any user could readily make that change in wiring if he desired.

Living with the Companion for several days results in the opinion that it is capable of clean reproduction and that its frequency response is adequate for most applications, considering that the very-low frequencies are not present when compared directly with a full-size three-way system, as would be expected. It is a handsome piece of equipment, and does not engender listening fatigue on the part of its auditors—which is important with any loudspeaker.

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AMPEX "600" TAPE RECORDER

Occasionally referred to in Ampex' own literature as a "portable"—possibly because it is in a case with handles on it, which is the definition used by many—the new model 600 still remains a true Ampex, only in a smaller size. It is available in a handsome luggage case, but is also to be offered in chassis form alone for those who will want to build an Ampex into their home systems.

The 600 can, by anybody's standards, be called a professional machine, for it is performance that rates a product, not size. And the new 600 certainly performs like a professional. Reproduction from a standard Ampex alignment and frequency tape, #5563, shows output to be within ± 1 db from 50 to 10,000 cps and recording from the output of an oscillator and playing back from the tape shows a response which varies not more than 2 db from the 1000-cps level from 24 to 12,000 cps, and down only 4 db at 15,000 cps.

The recorder in its carrying case weighs only 26 lbs, and the case carries the power cord, and two 7-in. reels. The 600 consists of two chassis—one the tape transport unit, and the other the amplifier. Molded rubber hold-down knobs keep the reels in place, and are easy to use and very effective. The recorder is assembled onto a die-cast panel, and is of rugged construciton. It uses a single motor, with belt drive to the operating mechanism, and the reel spindles are shifted slightly to contact the rubber driving rollers for the various operating modes. The unit will operate either vertically or horizontally.

The amplifier unit consists of two separate amplifiers—the record section, and the playback section. In the former—as will be seen from the schematic, *Fig.* 7—the low-level input feeds into the first stage, with the line-level input being fed to the volume control in the grid circuit of the second stage. Two separate controls permit mixing of the two inputs. While normally arranged for use with high-impedance microphones, the chassis is provided with a punching and suitable wiring to permit the installation of an input transformer so as to accommodate low-impedance microphones—the additional transformer being available as an accessory. The first three stages of amplification are followed by two additional stages which introduce the frequency correction required for the recording operation, the monitor circuit being tapped off ahead of any frequency-correction circuits.

Since the recorder has three heads—erase, record, and playback—one can monitor the actual recording while it is being made, as with most professional machines. This requires a separate playback amplifier—consisting of two stages with the low-frequency boost necessary for tape playback. A switch permits selection of INPUT or TAPE to feed the monitor circuit, which consists of another amplifier stage and a cathode follower. The VU meter is connected across the output of the cathode follower, and monitoring phones are fed from the same point, using a 10,000-ohm isolating resistor. No panel control is provided for the playback circuit, but internal controls permit adjustment of playback level to match that of the input circuit so that the monitor and meter can be switched from INPUT to TAPE with no change. The bias and erase oscillator operates at approximately 54 kc; power consumption is 75 watts when recording; rewind and fast-forward time is 85 seconds for a 1200-ft. reel. At the LINE INPUT jack, a signal of 0.26 volts at 1000 cps will give 100 per cent modulation; the monitor output for the same signal is 1.4 volts into an open circuit.

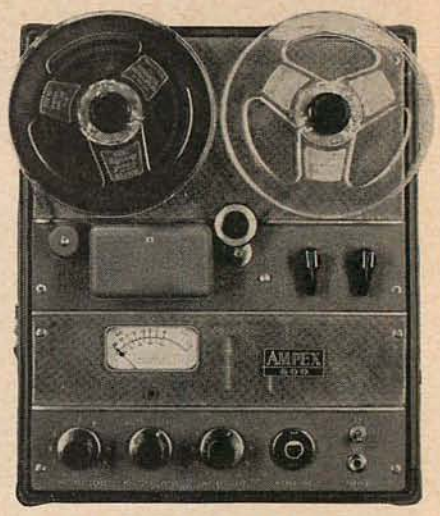


Fig. 6. The Ampex 600 Tape Recorder.

Aside from its more obvious professional uses, this machine would be a welcome addition to any home system where quality is of paramount consideration. The "detector" output of any good tuner could feed the line input satisfactorily, and results would certainly please the most critical user.

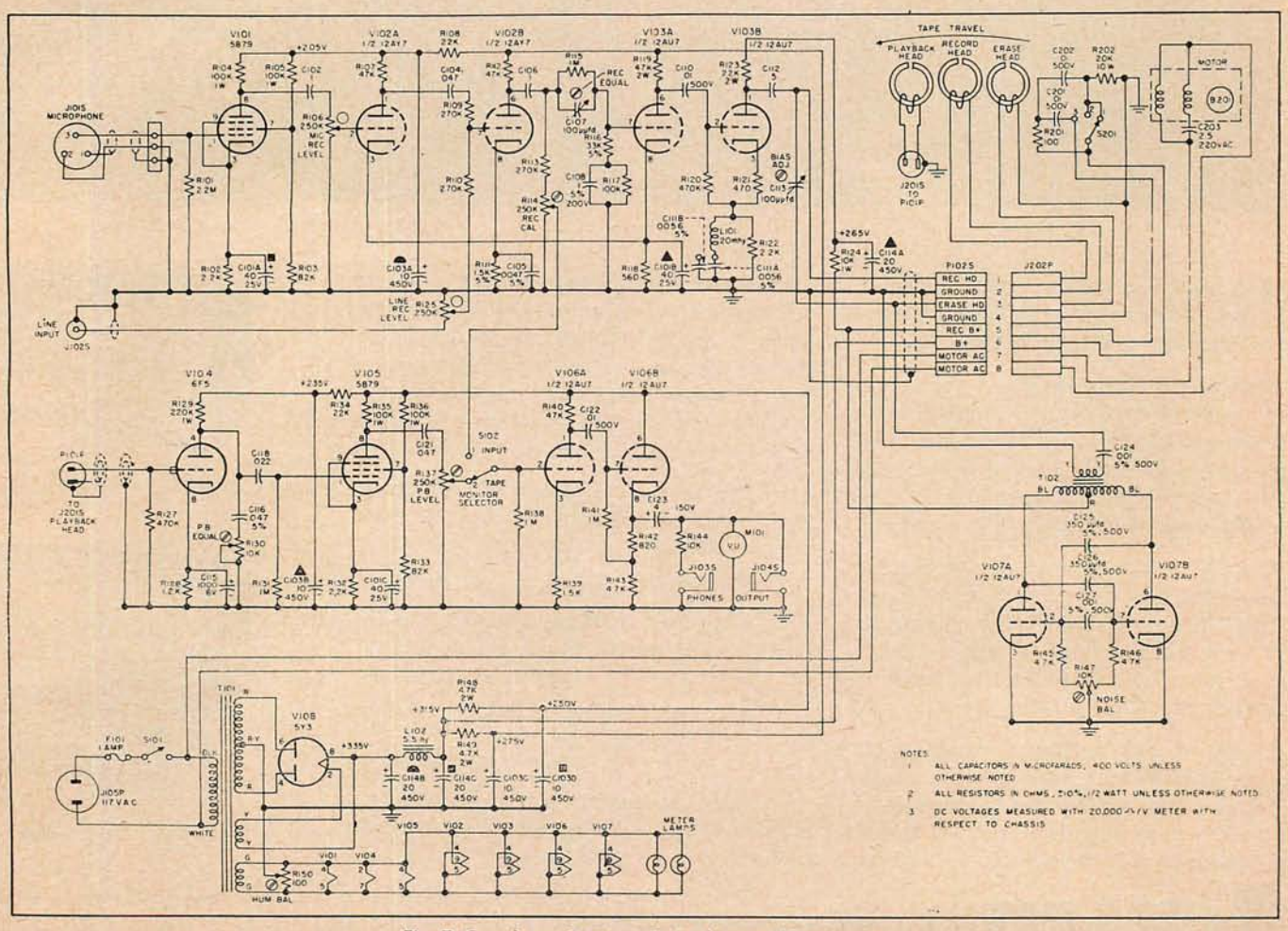


Fig. 7. Complete schematic of the Ampex 600 recorder.

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AUDIO ETC.

Edward Tatnall Canby

THE AUDIO YEAR

AUDIO progress follows more or less the fiscal year, like the theatre and the music seasons. July is between the end of the old season and the beginning of the new and this seems a good time for a look back.

The Season 1953–54 has surely been in many senses THE year of years. This was the period in which, after what already seems a vast period of incubation—a Seven Year Drought—the rains came, the seeds sprouted and like Jack's beanstalk or its U.S. alternative, the fabled cornstalk that hit the sky and produced ears that had to be dragged by tractors and corn grains as big as bushel baskets, Audio joyfully blew up with the biggest bang you've ever heard. A hi-fi bang, too, and no questions asked. (Please read the review of Tchaikowsky's Nutcracker on another page in this connection.)

If this department were exclusively concerned with Sales Expansion and Business Opportunity, I should surely at the present stage be launching a giant carnival of triumph with champagne on the house for all comers. I don't know who has made the profits, but I do know that for every manufactured item launched in any earlier year there must have been ten or twenty or fifty this year. When a business indulges in a huge expansion there is ordinarily a good reason for it, or people think there is, anyhow. Audio must have looked pretty good to a whale of a lot of enterprising individualists this last year, and I don't see yet the slightest signs of a slowdown. So, taking on my professorial role of Audio Plugger from Way Back, I offer my felicitations to all concerned and my Best Wishes for an ever Bigger and Better Future.

Not Wetblanketism . . .

. . . And having got that off my chest, I continue with somewhat less enthusiasm. It is admittedly a tough job to put aside the all-embracing fact of Expansion for a look at other facets of this year. Maybe it's a waste of time; for who is really going to care what happened as long as business is big and everybody's reasonably happy? Also —I have a certain feeling that any qualification of the present universal joy from this direction may be interpreted as wetblanketism. Don't be a spoil-sport, Canby!

Don't intend to. Every silver lining has a cloud, after all, or it wouldn't be a silver lining. (Well, *that* wasn't so good, but let it pass.) There isn't anything more destructive than destructive criticism, negativism, I am the first to say. There I happily agree with any and all of the publicity departments whose duty it is to paint the Audio sky bright blue and chrome plate the clouds, if any. But unlike some, I take it as occasionally constructive to point out the less-than-perfect, if only to give a bit of 3-D perspective. Otherwise how are we to know where we are in the welter of superlatives? Advertising or no, grammatically and practically it is impossible to have something "better" without having something thereby less good. You can't have a High without a Low or a North without a South. So, then, what is the perspective for last season?

Tail-Chasing

First, I'd say this was the Season of Unoriginality. Perhaps a nicer word would be Consolidation. While in the business area Audio has been expanding, in the design and engineering area it has been, so to speak, taking profits. Cashing in on the developmental progress of those dim distant Seven Years of relative silence. Development goes on, of course. Future bombshells are even now forming in the laboratories and test benches, without the slightest doubt. But that is for later. This year we have been exploiting the past, in two major respects.

First in sheer volume; for every amplifier of yesteryear there are a dozen this year. Name any other area of the Audio field (except, perhaps records, which hit the big expansion some time ago) and you will find an almost monotonous multiplication of "sensational new models" which are in fact competitive with others already on the scene. Some areas have burgeoned faster than others, notably the small speaker system field. But the pattern is ever so clear wherever you look this year, if you've been watching stores, catalogues and Fairs. The competitive aspect, indeed, is unabashedly out in front, calculated, intentional and persistent. Nobody's going to let anybody else get away with too big a hunk of the present bonanza.

Ethics in this sort of competition are hard to define and I, for one, am never quite sure when I ought to feel that something is an outright "steal" and when merely a legitimate and straightforward bid to get in on a good thing. I wouldn't attempt to suggest rules, for there aren't any except the pragmatic ones of success, failure, or prestige, and anybody with sense knows enough to leave a very safe margin between himself and the nearest law. This isn't a matter of law. Yet even so, strictly from my own point of view (of which this column is a reflection) I have frankly often been quite annoyed and even sort of disgusted at the way in which design features, inner and outer, decorative, practical, fundamental, have been systematically "borrowed" in every direction during this last year.

Calculated unoriginality! If one eight-inch enclosure goes over well, such as the original R-J, from 'way back, then everybody gets out a similar box for which he crows lustily and heartily. Not a steal at all, just a Calculated Similarity.

(*Continued on page 52*)

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EDWARD TATNALL CANBY*

OUT IN FRONT

* WC **Ravel: Daphnis and Chloe Suites #1 and #2; Alborada del Gracioso.** French Net. Radio Orch., Chorale Marcel Briclot, Cluytens.

Angel 35054

A winning combination of the many factors that make a fine recording makes this disc, for my ears, rate as a new forward mark in the advance of the recording art.

More and more we are realizing that the successful "hi-fi record" must hit the jackpot in a whole series of precise areas of technical and musical skills; plain engineering won't do it, nor will fine performance, nor can even a consummate mike trickery make a top quality disc, if other elements are lacking. This is such an "all-around" disc, outstanding in each of the necessary respects.

Low surface noise and extremely low distortion even in the loudest portions are necessary foundations, reflecting a maximum engineering success. Careful space planning so that inner groove trouble is minimized (variable groove spacing is used) helps too, and there is no trouble with those difficult last loud passages that so often end up our more spectacular music. (Many a fine disc has foundered on this score.)

Add to this the matter of mike technique. Here we have one of the finest illustrations yet of that rather special illusion of presence, immediacy, perspective, that we are now calling "hi-fi sound." The immediacy and clarity of this orchestral texture is breathtaking and yet (with the exception of a very loud tambourine that is too close for musical comfort) the musical effect is not seriously exaggerated—the music comes through musically undistorted.

We've been rapidly realizing the last few years that, whether via one mike or many, the maximum effectiveness for recorded sound depends on what is essentially a sort of audible trickery, a kind of illusion that has its own values decidedly unlike those of the much-touted "concert hall sound." The peculiar combination of simultaneous nearness and distance that makes for a good recorded effect is a law unto itself. Whatever way it is achieved, it is essentially unlike any "concert hall" musical balance, nor will a "concert hall" sound ever be literally effective via the recorded medium. In orchestral music, as here, we get the most out of the musical intention via a kind of inside-the-orchestra perspective which brings an astonishing closeness of detail within the over-all audible framework of big liveness that holds the whole mass together for the ear. The more you listen to it the more strikingly unlike a concert sound it is —yet this is the technique that does the job best for Ravel's music, on records.

There is still more in this record that is intriguing. The most immediately noticeable quality is a seemingly extraordinary dynamic range. I'm not even sure that on a VU meter it would rate as remarkable but I know that I set the volume at the beginning of Side 1 at what seemed a reasonable loudness for the fairly quiet passage I heard and a few moments later was almost blown out of the room by the first full fortissimo, which was much louder than I had expected. Again and again this music drops down in volume—then down and down some more without hitting the "mud," upsetting that unconscious mental balance of expectation that we all develop as part of our listening habits. Again and again as a climax approaches the intensity goes up—and up some more. So remarkable is this effect that it is actually difficult to find a proper volume setting for the whole disc without quite a bit of experimenting.

Howcome? Perhaps the good surfaces allow an extra-low bottom level, perhaps the volume peaks are actually louder than usual, though I know that they are not overcut. Technical perfection may have allowed for an actual increase of dynamic range. But I have a strong feeling that there is more to it than this. It is in part a musical phenomenon.

Don't forget that Ravel was the greatest master of orchestral climax we've had. And remember that this sort of thing is a matter of psychology—for music is a medium of emotional communication and depends on far more than mere mechanical volume change for its climaxes—else how could we have enjoyed orchestral music these many years via records and broadcasts of limited dynamic range. Color, the changing overtone content of instruments playing at greater and greater tension, the intensifying effect of rising pitch, plus the subtleties of good performance, phrasing, rhythmic pace, all lead us to experience a sense of climax, even without volume change. Nobody could beat Ravel in these respects.

Here we have, moreover, a masterful interpretation of Ravel of unusual force, under Cluytens, which is enough to account for a lot of the impact of this performance. When to that is added a recording technique that transfers to the recorded medium very nearly the full impact of Ravel's remarkable scoring—in terms of recording techniques that are unique to recording itself—then you have a killer-diller of a disc. Climactic music, climactic performance and superb mike technique plus high technical standards of processing—there is the combination that makes this the Best Yet.

KEY	
*	Outstanding recorded sound for the type of material.
b	Heavy bass end—low turnover, European-type
B	Big bass; heavy percussion, fine transients
c	Close-to miking in good liveness
d	Distant, over-all miking, good liveness and presence
D	Recorded with deadish acoustics
m	Small-groove 78, extended play
o	Fine string recording
S	From older 78 rpm recordings
w	Wide dynamic range

* d **Debussy: Fifteen Piano Pieces.** Gieseking. **Angel 35026**

* d **Debussy: Pour le Piano. Images I and II. Estampes.** Gieseking. **Angel 35065**

* d **Debussy: Preludes, Book I.** Gieseking.

Angel 35066

Here is a similar superiority in another medium, the piano. I vote these the most effective piano records I have ever heard. Again there is the combination of advanced engineering, superb microphoning—an unusually important factor in piano recording—and top-ranking performance, with one of the world's really great pianists. Again there is a remarkable transferal of the musical values, in the music itself and in the performance, to the special recorded medium. This is not a recording of a piano concert but an optimum recording for recording's sake of the piano sound.

The piano is still the toughest instrument there is to record. Long ago we realized that mere technical perfection in the recording chain is no guarantee of a good piano sound. I've heard numerous piano records made with the most elaborate technical care that nevertheless were travesties of the piano as a musician expects to hear it. Conversely, an uncomfortable number of extremely elderly 78-rpm discs, notably the early Schnabel Beethoven Sonata records, still hold up as outstanding examples of recorded piano sound in spite of their age. Piano recording requires a very special musico-technical skill that is still rare even today.

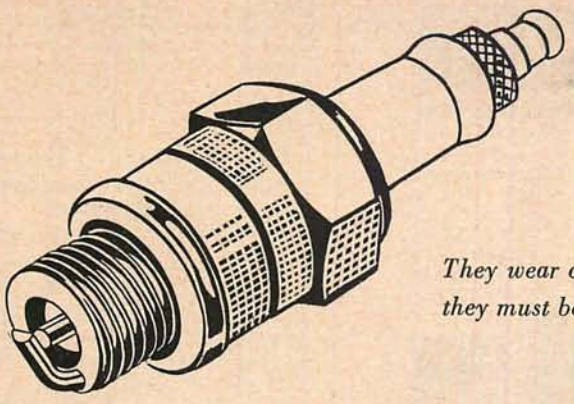
The Gieseking piano sound here is, considering these difficulties, astonishingly natural. The bass sounds huge but never muffled, boomy or soggy. The higher tones are sharp and bell-like without undue thump (from too-close miking), no "buzzing," entirely without those annoying loud resonances that are often heard at some pitches. In the strongest forte sections—which in the Gieseking-Debussy combination are musically overwhelming —there is not a trace of distortion, though as in all loud piano music the transient effects will tax your entire reproducing system from stylus to loudspeaker. The piano is recorded in a warm liveness, seemingly at a little distance, an effect that allows for an extraordinarily life-like sound of remarkable solidity. High volume levels can be used without auditory unpleasantness. (But the proof that these are top ranking records is in the fact that even at low volume the sense of powerful sound comes through. Some records you are always trying to turn up louder. Not these.)

Because these records depend on much more than hi-fi technical perfection for their effect, I predict that their excellence will show up even on the smallest and cheapest home machines. Oddly enough a true hi-fi record—hi-fi in the total musical-technical sense—is always a good bet for small machines, where it will outperform lesser discs as easily as it does on the fanciest equipment.

The interpretations by Gieseking are "out of this world"—the kind of sheer genius-playing that makes overwhelming sense to any listener, the untrained even more strikingly than the trained one. If you're not a Debussy specialist, I suggest trying these in the order listed. The Fifteen Pieces are mostly unfamiliar early works of a simple and melodious type wonderfully easy to listen to.

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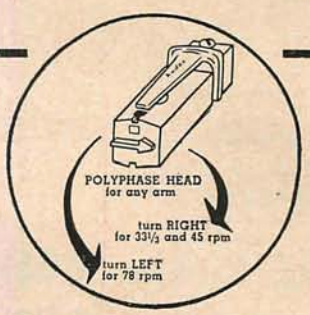
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Flux Density	17,000 gauss nominal
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Among them is a little known item that will perhaps startle you as the original of the popular tune "Reverie." The Pour le Piano record has bigger and more famous Debussy items, on a larger scale; the Preludes are the difficult, dissonant and dryish music of Debussy's late period, with a few familiar and well known exceptions.

✲ S Mendelssohn: Symphony #3 ("Scotch"); #5 ("Reformation"). N. Y. Philharmonic, Mitropoulos.

Col. ML 4864

To the "Out in Front" category I add this disc, as a model of a somewhat different sort—the emphasis here is upon musical performance, a most unusual one, given a solid, dependable recording that does not attract attention to itself, yet conveys the musical sense admirably.

To older music listeners it may be somewhat of a surprise to realize that the Romantic music of the 19th century—from Beethoven right up to Tchaikowsky and Grieg—is beginning to be a lost art in performance. We live in a hard, ugly time, our lives seldom contain that relatively simple idealism and elegance that was so natural a century ago. Our younger players and conductors of music no longer are able to follow the old gracious tradition of music making that even twenty years or so back seemed to most of us to be at the very center of our "classical" world. Today, Romantic music is played to extremes—it is overplayed, with too much violence and tension or too much sugar, or it is underplayed in a sort of apologetic manner, a "modernization," especially in composers of bombast like Liszt, that misses the whole idea of the original.

That is the background for the extraordinary persuasiveness of Mitropoulos' Mendelssohn—for Mendelssohn, the most straightforward of the Romantics, is now almost the most difficult to play convincingly. Just play the first two or three minutes of the "Scotch" Symphony here, listen to the sweetly agonized strings, the melting, passionate but dignified atmosphere, and you'll begin to understand what we have too often been missing of late in this sort of music.

The recording is technically hi-fi, but it is not of the more spectacular kind—music comes first. Yet notice how beautifully the string choir is projected. Too often in our desire for maximum presence and hi-fi striking power we have falsified string tone by too-close recording that emphasizes uneven ensemble among the individual instruments, brings out harsh tonal qualities that were never intended. This record does not have quite the startling presence and "realism" of the Angel Ravel disc above—but this, again, is a different sort of music altogether. Columbia is surely due praise for its wise moderation in this and other similar recordings of primarily musical interest.

BIRD SONGS ON DISCS

American Bird Songs, vol. 2. LP edition.
ᵐ **The Mockingbird Sings** (10" 78 rpm)
ᵐ **Western Bird Songs** (10" 78 rpm)
(Cornell University Records, 128 Roberts Pl., Ithaca N. Y.)

The well known Cornell bird song collectors are finally getting into the swing of LP and the newer close-grooved 78-rpm records. Cornell converted from disc and film to tape recording early in the game, but their records have continued as expensive and bulky 78's. The first volume of American Bird Songs was a sensation in its time, pre-LP and pre-tape; the second volume from all-tape originals was issued recently on fancy plastic 78's—five in a big album at an unconscionable price. After a first flyer in LP at long last about a year ago, Cornell has finally reissued Volume 2 on a single LP, a far more useful and economical format which as far as I can tell is identical with the 78-rpm album even to the identification of the old 78 sides! A long-awaited event, and about time. (Volume 1 was made from technically inferior disc originals and no doubt will have to be re-done in part for LP.)

The two ten-inch records here are perhaps a better value than you might at first think. They take advantage of present cutting techniques to cram an "extended play" on each side; I haven't timed them but I'd guess that there is considerably more than the old 12-inch length on each of these. A good compromise for subjects that can use less extended treatment than a full LP, easier to use than a 45 EP, with better quality. The Mockingbird disc combines a reissue of the scarce 78 rpm plastic put out some years back by the Mass.

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Audubon Society with new recordings of another bird singing in Florida. Western Bird Songs gives extended samples of ten songs heard exclusively by Westerners, to balance off the Eastern orientation of the other records.

Why bird songs? I can only tell you that not only do they record beautifully, given tape and the ornithological know-how, but the sounds are, like much "real" music, catchy, and before you know it you will get interested in the birds themselves as you hear them outdoors. The records do a remarkable job, after a few playings, of impressing the songs on your memory for later sudden recognition in the field. Just yesterday, in a canoe in southern New Jersey, I heard at least a dozen calls I immediately recognized, to my pleasure. Of course I couldn't remember the names of any of the blasted things, but that really didn't matter—it was the recognition that counted!

The Cornell technique is improving, both in the technical perfection of the recordings (a tricky business all the way along) and in the presentation on records. The birds now sing continuously, one song joined to the next, with commentary "over" the songs, thereby avoiding the unpleasant fading in and out that was formerly the practice. The dry but friendly comment of Prof. A. A. Allen makes an excellent impression, unaffected and businesslike.

Songbirds of America in Color, Sound and Story. (booklet and record). A Soundbook: Book-Record, Inc. 680 5th Av., New York. (LP or 45EP)

This is a logical extension of the Cornell activities, for the two-man team that has built up the Cornell bird song collection includes P. P. Kellogg, electrical and sound engineer, as well as Prof. of Ornithology, and Prof. Allen (above) who is a long-time bird photographer, one of the leaders in the field. This slick-cardboard plastic-bound booklet is clearly oriented towards children and school teachers and some details, especially the memory phrases ("If I could see one I would seize one and would squeeze one till it squirts") you may find a bit icky—the whole has that faintly moralistic tone so beloved by our schoolteachers. But the pictures are stunning, one for each bird, the accompanying descriptions as to size, habits, range, are excellent—and best of all is the new combination of ear and eye, as one listens to the record which is keyed to the booklet's sequence. (Available in LP or 45 EP; comments as in the other records are by Prof. Allen, but with more schoolchild stuff here and the rather uncomfortable memory phrases which he has been persuaded to repeat out loud.) A wealth of supplementary information on birds, flyways, ornithological classifications, with more photographs, rounds out a good 30 pages—there is even a bibliography, a section on photographing birds and on attracting them with bird houses etc. A good beginning in the new sound-and-sight field. 24 common birds are covered.

Suggestion: If this Soundbook goes over well, a more serious, comprehensive and condensed bird Soundbook with many more birds, adult comment and a minimum of pretty extras should do wonderfully among the thousands of people who now buy bird atlases and the like for serious hobby-study.

BIG NOISE

[d] **Wagner: Tannhauser; Overture and Venusberg Music. Tristan & Isolde; Prelude, Liebestod.** Philharmonia Orch., Kletzki.
Angel 35059

[c] **Wagner: Tannhauser; Overture and Venusberg Music. Lohengrin; Prelude Act III, Excs. from Walkure, Meistersinger.** Phila. Orch., Ormandy.
Columbia ML 4865

Here are two new collections of Wagnerian war horse material in hi-fi dress, and oddly enough in this case it is Angel who promotes the more conservative sound, Columbia the more spectacular. Both are reasonably good, solid readings, neither one outstandingly fresh. Of the two the Columbia under Ormandy shows up the best musically; the long experience of this orchestra with such music, going back to the days of Stokowsky and the Symphonic Syntheses (remember?) tells heavily in the greater sense of showmanship and dramatic detail. Kletski and the English Philharmonia play smoothly but with less drama; those long-drawn-out climaxes, the great musical hills and valleys of Wagnerian expression, lack sufficient drive to maintain their shape and the music often seems to meander.

From an engineering standpoint, the Columbia-Philadelphia recording is a real hi-fi job with sharp brass, loud triangle and tambourine. (Too loud for my ear—Wagner uses them persistently with hardly a pause throughout the middle part of the Tannhaüser music, sounding here like an officeful of telephones ringing madly!) Also the inevitable sharp, edgy strings that seem to go with this kind of recording. Dramatic as sound and in general more effective than the Angel sound, but the price is paid in the hard, rough uneven string effect, individual violins showing through the tonal fabric.

The Angel recorded sound for the same music (Tannhaüser) is more distant, flatter in perspective, less immediately impressive, but also truer to the music. Take your choice.

[cB] **Tchaikowsky: The Nutcracker: Complete Ballet.** Minneapolis Symphony, Dorati.
Mercury OL-2-101 (2)

This elaborate and beautifully presented album, two factory-sealed records in a candy-stripe book printed in lovely colors with elaborate line art work by Maas, pages of background material on the ballet, photos of various stagings—will no doubt go down in hi-fi history for one single recorded passage lasting a fraction of a second. The sound is a gunshot, real and honest-to-goodness (it was called for in the original score) and by golly, it sounds like one, with no skimping. A technical tour de force, if a brief one! One third into side 2.

The rest of the recording is most decidedly in the super-hi-fi category. It presents a spectacular sound, enormous rolling drums, sharp brasses and triangles, edgy strings. As a musican I question the musical balance a bit, but I admit the effec-

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tiveness of the distortion, if it can be called that. The record is a percussion triumph, the percussion sounds (even the double bass) dominating the entire ensemble with astonishingly clean transients. Other parts of the orchestra are not as effective, the strings have that tell-tale edgy, close-up sound that seems always to be associated with the more sensational hi-fi effects, a string tone that from a musician's point of view is not very desirable; but this is a price most of us will pay in exchange for the fine sound of the other instrumental choirs. For my own taste I'd say that the single mike was placed closer to the orchestra as a whole than the optimum position for over-all ensemble. Closer placing brings out the solos, sharpens the colors and the general hi-fi impact, but deadens the over-all liveness balance. Matter of taste.

The complete Nutcracker score is enormously longer than the relatively tiny Nutcracker Suite that we have all known forever and anon. You'll be amazed at how much unfamiliar music intervenes between the occasional familiar items. Much of it is first rate Tchaikowsky though as might be guessed there are moments of padding. The Dorati performance is exact, precise, dynamic and hard—not bad for the music in this case. The Dorati touch is apt to be hard to the point of unmusicality, but ballet music of this sort is his forte and the results are very acceptable here.

[d] **Stravinsky: Le Sacre du Printemps.** Pittsburgh Symphony, Steinberg.

Capitol P8254

An interesting comparison here with the Mercury-Dorati version mentioned last month which was recorded with much the same type of sound as the Nutcracker reviewed above. The mike technique is quite startlingly different between the two, yet both are easily within acceptable bounds. Capitol's Sacre is taken from a fair distance, the orchestra immersed in a big-hall liveness; there is little or no effect of close-up accentuation. Mercury's is so close that after the Capitol it sounds for a moment like a glorified chamber work, the hall reverberation only faintly heard in comparison with the very near instruments. Try the first loud passage, somewhat under an inch into side 1 on both. An excellent way to study the possibilities for variation in microphone placement.

I prefer Steinberg's musical treatment to Dorati's which, as I suggested last month, is a relentless, driving, hard performance. Hard music, yes—but not quite that rigid, as Steinberg proves. (A third recording, from London, has not reached me.)

[D] **Brahms: Violin Concerto.** Julian Olevsky; Nat. Symphony Orch., Mitchell.

Westminster WL 5273

[D] **Creston; Symphonies # 2, #3.** Nat. Symphony Orch., Mitchell.

Westminster WL 5272

Westminster comes to the U.S. (Washington, D.C.) for a new orchestral series after a challenging musical tour during the last years through the major capitals of Europe. The National Symphony has been strictly minor league and is, under its new conductor Howard Mitchell, shall we say on the mend, towards better things. Though the ultra-well-known Brahms Concerto might seem a rash opener for the series, considering that there are a round dozen LP versions, studded with great names, this version has good points. There is a quiet sincerity and unaffectedness about the slow movement in particular that is wholly pleasant to hear, and young Olevsky's playing, rather thin and uneven in tone, is nevertheless pleasingly musical and unprepossessing.

But—with such formidable competition—it's only accurate to suggest that weaknesses are pretty often audible. The orchestra, lovely in the slow movement, is tubby and relatively fussy in the outer faster movements; the lift, the long line is missing. There are minute but noticeable weaknesses of ensemble, too, in the face of the competition.

When you come down to it, the conclusion is hard to avoid that Westminster lays itself wide open with this sort of music, which is best left to the big orchestras and the great performing names. You never can be sure, of course, but the odds are against a compelling recorded performance with this sort of group. Westminster has deliberately gone after the big repertory works during the last year or so and in spite of a noble job of recording and much good music making, I can't feel that musically the move has been successful. This is big-time territory.

The two Creston works are in a fairly easily digested modern idiom not too far removed from

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the fancier sort of film music that most of us are now well accustomed to. There is plenty of melody, rather obvious and a bit heavy, the music in general has a thick and heavy orchestral texture. Though some critics have found these works of great importance, I'll have to decline to go that far, though they certainly are highly competent and skillfully written orchestral essays.

In both Westminster discs the National Symphony is recorded with a more than usually dead sound, rather intimate and almost with a chamber music effect. No stunts in microphoning and the over-all balance is excellent.

[b] **Tchaikowsky: Symphony #4.** Hague Philharmonic, Van Otterloo.

Epic LC 3029

A good recording but still with an odd sound that implies, as it has in earlier Epics, that something is wrong somewhere in the way of equalization. This one, for instance, has again the thick, tubby bass I've noticed before; it responds excellently to a change from 500-cps to 300-cps turnover on my amplifier. Could the European-style bass end somehow have been incorporated here? I confess I don't know how, but there it is. The high end is extended enough but there is a certain nasal quality to it that I can't define, which is not good.

Recording acoustics here favor close strings, distant woodwind and brass; the perspective is not overly dramatic and the strings sound overworked. Performance is—for Tchaikowsky—on the phlegmatic side.

All of which adds up to a very so-so mark, and I only mention the whole because this, after all, comes from one of the biggest electrical and electronic companies in the world.

ODDITIES

[*] **The Asuma Kabuki Musicians.**

Columbia ML 4925

A hi-fi recording of the famed Japanese group who played for the touring Kabuki dancers that have recently been making a sensation here. Put this, along with Shan-Kar and the Balinese Gamelin recordings, as a top ranking addition to the exotic sound department. It's fun just for the wierd sounds—but if you are serious you'll be fascinated at this complex display of an involved musical art almost wholly removed from the language of our own Western musical tradition. Some of it is composed, too, though not exactly in the sense that we would mean by that word; arranged would be a better term. The rest, evidently is traditional.

Vienna Choir Boys.

Columbia ML 4873

Whether it's a Strauss waltz or a heavenly Schubert, there's something in this album to make you gush with emotion. Capitol had an LP of these singers which seems to have been withdrawn; this will help to replace it. The combination of the Austrian musical sweetness with the wonderful high sounds of boys' voices is unbeatable.

[*] [d] **Fiedler's 25th.** Boston Pops Orch., Fiedler.

RCA Victor LM 1790

For a good decade I've continued to be agreeably puzzled at a strange phenomenon—the RCA recordings of the Boston Pops have consistently had a better sound than the RCA recordings of the Boston Symphony—the same group. Indeed, the Pops records ranked collectively as RCA's very best in the 78 days. This superb recording is the apotheosis of the Pops, with all of the best in both musical verve and flamboyant excellence of recorded sound.

A remarkable effect it is, too—unlike any other. The Pops sounds a bit like the Army Band playing in some huge and glorious stadium; the cymbals crash and the brass glitters in a distant but wholly alive manner and the strings are nothing short of perfection. A long-familiar sound on records, brought technically up to date, and the lively music, a characteristic Boston mixture including many an old favorite (the Mosquito Dance, where the mosquito is slapped at the end, is one), will keep you happy for many playings. Bravo, Fiedler!

[*] **Harp Music, vol. 2 (Modern); vol. 3 (18th c.).** Nicanor Zabaleta.

Esoteric ES 523, 524

Zabaleta is to the harp what Segovia is to the guitar. This is no recording of soft background stuff—you'll find that elsewhere. Instead, here are original works composed for harp in two periods that are wholly atypical of the harp stuff we usually hear. On the 18th century disc the sonata by Carl Phillip Emmanuel Bach is a gem and worth the whole record, the Beethoven Variations are unmistakably him. (The rest is lesser stuff, pleasant but not important.) On the modern disc the Hindemith sonata is unexpected and novel in sound and the Prelude by Prokofieff is interesting, too—that gives you an idea of what sort of disc this is. Some of the other modern stuff is not so hot.

Lovely recording and the man is a genius at the harp, no doubt about it.

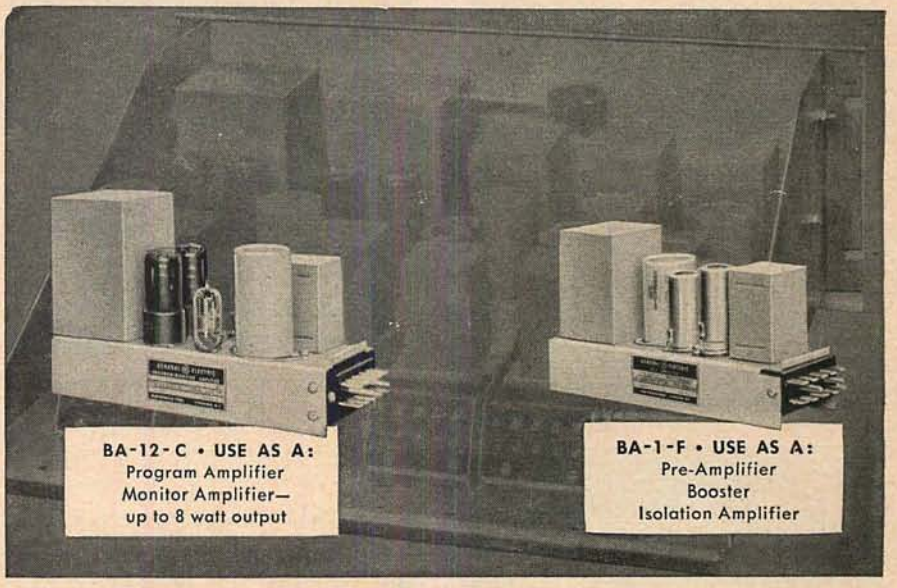
[o] **Thomson-Stein: Four Saints in Three Acts.** Solos, Chorus Orch., Thomson.

RCA Victor LCT 1139

This is surely the finest living proof, this music, that "modern" doesn't necessarily mean "dissonant"—nor is simple music necessarily uninteresting. The amazing text of Gertrude Stein is set to music that at first will sound to you like a harmony exercise, or a series of pieces of hymns, all tonic and dominant triads without a trace of dissonance. But this is true simplicity, which hides a subtlety that grows on you as the lively opera with its superbly meaningful gibberish ("A pigeon on the grass, alas") moves vividly onward. The cast is all-negro, in part the original cast of the 1927 premiere, and within seconds of the beginning you know that these people are fervently pro-Stein and pro-Thomson. Their singing is superb and full of persuasiveness.

The plain fact is that Stein's writing was put together very much in the manner of music itself, with constant repetition for emphasis combined, as in music, with variation and development of repeated ideas. Thus when Stein is set to music she suddenly makes a new kind of sense, in terms of the musical kind of structure. Fun, and enlightening, too.

The recording is as recent as 1947 and though RCA classes it in its reissue category the sound is plenty adequate for enjoyment, with good tonal range and quality. The words are unusually clear.



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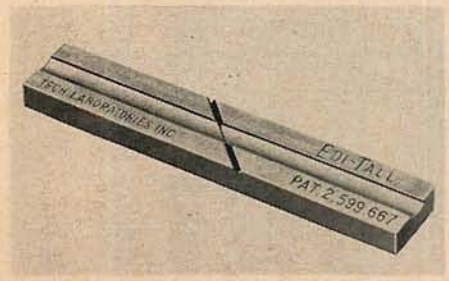
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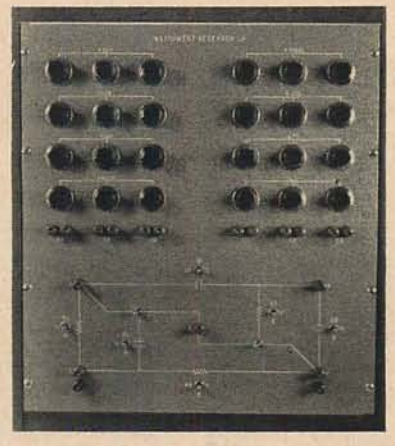
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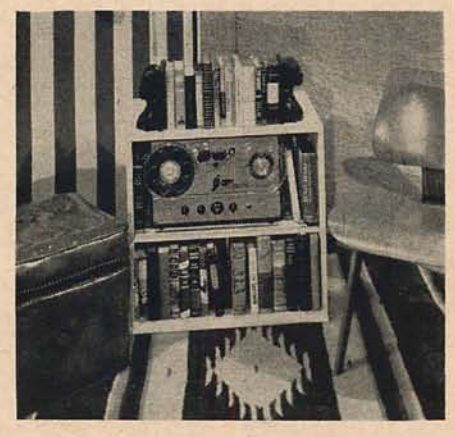
does a job virtually as competent as that performed by its larger counterpart, and is considerably more convenient for home use. It is made of precision-machined Duraluminum. For further information write Tech Laboratories, Inc., 2 E. Edsall, Palisades Park, N. J.

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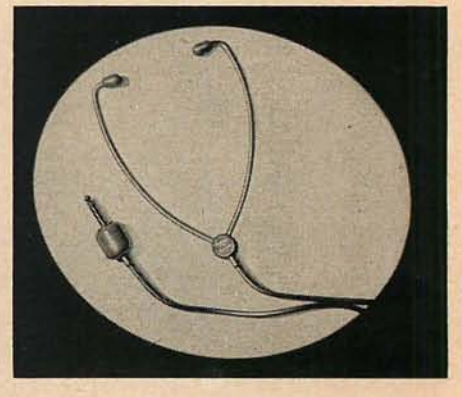
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• **Stephens 12-Inch Coaxial Speaker.** In the new Stephens Model 122AX speaker, a unique method is used in loading the high-frequency diaphragm by means of a pair of exponential concentric horns. A 2-in. voice coil operates the woofer diaphragm



through a fully-enclosed magnet structure using 1½ lbs. of Alnico V, providing faithful response down to 40 cps. Coupled through a 5000-cps high-pass filter network are a Dural diaphragm and a 1-in. voice coil giving smooth response to 18,000 cps. Copper voice coils are used to approach the ideal ratio of conductor mass to that of the moving system. Power capacity is 20 watts. Impedance is 12 ohms. Stephens Manufacturing Corporation, 8538 Warner Blvd., Culver City, Calif.

• **Light Weight Headset.** With frequency range covering both speech and music, the Dynaset weighs but 1.25 ounces and is equipped with a dynamic speaker unit only three-quarters of an inch in diameter. It is well-suited for use with dictating equipment, monitoring, and other similar applications. Under-the-chin styling makes the unit especially suitable for use by

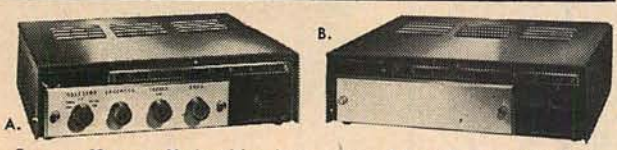


women, eliminating hair muss and head band fatigue. Sensitivity is 105 db above 0.000204 dyne/sq. cm. for one milliwatt power input, and frequency response is from 50 to 8000 cps. For literature and price information write Dept. KP, Telex, Inc., Telex Park, St. Paul, Minn.

• **Preamplifier-Tone Control Unit.** With controls in "L" (level) position, frequency range of the new Hartley audio control system is 20 to 50,000 cps. Distortion content is less than 0.1 per cent. Bass and treble controls are continuously variable, and permit up to 36 db boost at 40 cps, and 13 db boost and 16 db attenuation at 10,000 cps. Cathode-follower output permits long leads to power amplifier without frequency discrimination. Input selector

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For over 40 years, National has been a byword in radio communications ...famous as makers of outstanding equipment for professionals, radio hams, armed forces and other government agencies. This experience and 'know-how' has now been applied to the development of a complete line of high quality audio units embodying the most advanced design elements and performance features.

(D) CRITERION *AM-FM Tuner*

Completely independent AM and FM sections, each with its own tuning and level controls. Permits simultaneous AM and FM reception for binaural listening of same program or to enable different programs to be fed to different points, or recording one while listening to another.

Exclusive 'Mutamatic' FM tuning eliminates between-stations noise and hiss. **Other FM features include:** 0.5 μV sensitivity for 20 db quieting . . better than 60 db image rejection . . . 4-section tuning capacitor for maximum selectivity . . . less than 0.5% audio distortion with modulation up to 125% . . . cathode follower output: 2 volts at 600 ohms. **Other AM features include:** 10 μV sensitivity for 10 db signal-to-noise ratio . . image ratio better than 60 db . . . less than 1% audio distortion . . . cathode follower output: 2 volts at 600 ohms.

A recorder output provides a constant 1 volt level independent of gain control setting. Cabinet measures 16½ x 7¾". By removing decorative face plate, space is provided for recessing and flush-mounting the Horizon 5 preamplifier-control unit (as illustrated).

Complete with tubes *(less preamplifier)* **$169.95**

(C) HORIZON 5 *Preamplifier—Control Unit*

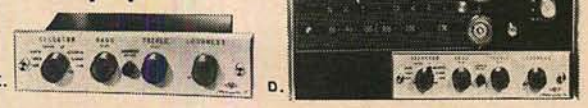
An unusually flexible, high quality unit with 3 inputs for tuner, TV, phono, tape, or other program sources, and providing 7 phono equalization positions. Each input has gain set adjustment. Independent, continuously variable bass and treble tone controls permit boost or attenuation from + 25db to −15db at 30 cycles, and from + 12db to −25db at 10,000 cycles. Has Loudness Control with on/off switch. In 'off' position it acts as conventional Volume Control.

In flat position, frequency response extends from 20 to 20,000 cycles ±.25db, and to 100,000 cycles ±1db. Harmonic Distortion: less than .2% at 1.5 volts, and less than .6% at 10 volts output. Intermodulation Distortion: less than .3% at 1.5 volts, and less than 1.5% at 10 volts output (400cps and 7kc mixed 4/1). Output impedance: 3000 ohms permits up to 50 feet of cable without frequency discrimination.

Horizon 5 may be panel-mounted or recessed in Criterion Tuner or Horizon 20 Amplifier.

Complete with tubes **$49.95**

The NEW NATIONAL *Horizon Line*
of High Fidelity Equipment



(A) HORIZON 10 *10 Watt Amplifier*

A complete, self-contained power amplifier with phono equalizer, bass and treble, and loudness controls. Has 2 high-level inputs for tuner, tape, etc., and phono input with compensation selector for A.E.S., Ortho, and Foreign records. Tone controls are continuously variable over a range from + 11db to −10db at 10,000 cycles, and to + 15db at 30 cycles.

Frequency response: 20 to 20,000 cycles ±1db. Power response: 20 to 20,000 cycles ±2db. Distortion: less than .5% harmonic, and less than 2% intermodulation, at 10 watts.

Employs new 'Unity Coupling' circuit as described in Horizon 20 Amplifier.

Complete with tubes *(less preamplifier)* **$79.95**

(B) HORIZON 20 *20 Watt Amplifier*

The Horizon 20 embodies a major design innovation called 'Unity Coupling'. By this means, the output transformer is no longer relied upon for distortion cancellation between the output tubes, as is the case in normal push-pull circuits. The transformer serves simply as an impedance matching component. In this way, transformer distortion is reduced to a minimum.

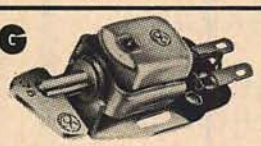
Other features of the Horizon 20 include: Frequency response from 20 to 20,000 cycles ±.1db and from 10 to 100,000 cycles ±1db. Power response at 20 watts from 20 to 20,000 cycles ±.15db and from 10 to 60,000 cycles ±1db. Harmonic distortion is less than .3% at rated 20 watt output, and .6% at 25 watts. Intermodulation distortion is not more than 1% at 20 watts (400cps and 7kc mixed 4/1).

Output taps are provided for matching to either 8 or 16 ohm speaker system. By removing decorative face plate, space is provided for recessing and flush mounting the Horizon 5 preamplifier-control unit.

Complete with tubes *(less preamplifier)* **$84.95**

All National Horizon High Fidelity Units Employ Printed Circuitry

New PICKERING
TURN-OVER CARTRIDGE
Model 260DS with Diamond and Sapphire Styli



Following the enthusiastic acceptance of the Model 260DD Dual Diamond Cartridge, Pickering now announces the Model 260DS with Sapphire stylus for standard and Diamond for microgroove. Both cartridges are otherwise identical.

Response is smooth and clean from 20 to 20,000 cycles. Lower moving mass and higher compliance provides excellent tracking at low stylus pressure, and good transient response. These and other design features result in lower harmonic and intermodulation distortion. The Model 260DS fits most pickup arms and operates directly into conventional low-level preamp inputs.

Model 260DS— Diamond-Sapphire **$48.00**
Model 260DD — Dual Diamond **60.00**

New ELECTRO-VOICE Model 666
Super-Cardioid Dynamic Microphone



A wide-range, unidirectional microphone with a single moving element and featuring unusually high front-to-back discrimination. Frequency response is uniform from 50 to 13,000 cycles. The output impedance is 50 ohms with internal provision for easily adjusting to 150 or 250 ohms. Output is −57 db (Ref. 0 db = 1 mw/10 dynes/cm2).

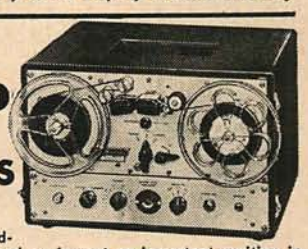
The Model 666 is ideal for TV, radio, recording and other applications calling for high quality, and can be used with boom, floor and table stands, and other microphone mounts. Weighs only 11 ozs.

Complete with Stand Coupler and 20-ft., 2-conductor cable with Cannon UA-3-11 connector **$147.00**

Model 366 — Boom Shock-Mount **24.00**
Model 420 — Table Stand **12.00**

NOTE: Prices Net, F.O.B., N.Y.C. Subject to change without notice.

New MAGNECORD *Portable* TAPE RECORDERS



Model M-30 Precision built to standards which have gained for Magnecord equipment an important position in the professional field, the Model M-30 has been priced within reach of the high fidelity enthusiast, the musician, and others concerned with high quality recording. Frequency response at 7½"/sec. extends from 50 to over 10,000 cycles ±2 db, and at 3¾"/sec. from 50 to 5000 cycles ±2 db. An oversize, 4-pole motor is employed for excellent speed regulation. An eye tube permits control of recording level.

Two inputs are provided for recording from high impedance microphone, and from phonograph, radio tuner, or other high level source. The output is high impedance, and can be fed into any conventional high quality amplifier. A monitoring jack permits the use of earphones or external VU meter. Uses tape reels up to 7", dual-track (full-width track optional). Weight: 35 lbs.

Supplied with AC cord, 7" take-up reel, and maroon leatherette-covered case measuring 17¾x11¼x13¼" **$299.00**

Model M-33 The model M-33 is identical in all respects to the Model M-30, except that it is provided with a built-in amplifier and loudspeaker. The M-33 is also provided with an output connection for playback through an external amplifier system.

Supplied as the Model M-30 plus a high quality ceramic microphone **$329.00**

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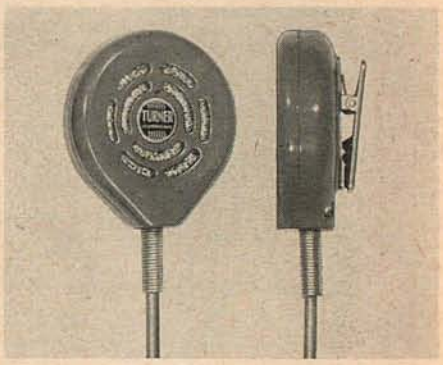
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switch affords four positions for various program sources. The unit contains two tubes, a 6AV6 and a 12AX7, which derive power from the main amplifier. The sturdy metal cabinet is finished in bronze hammerloid. Dimensions are 11 × 3 × 3 ins. Complete information is available from H. A. Hartley Co., Inc., 521 E. 162nd St., Bronx 51, N. Y.



• **Lapel Microphone.** Weighing but one ounce exclusive of cord, the new Turner Type L-100 crystal Lapel Microphone offers remarkable performance considering its exceptionally low price. Frequency response is 50 to 10,000 cps and output level is 50 db below 1 volt/dyne/sq. cm. Pickup pattern is essentially non-directional. The



unit is cased in light gray plastic. An adjustable rubber-padded clip permits the microphone to be clipped anywhere, with the cable always hanging downward and the microphone in a vertical position. Full information may be obtained by writing The Turner Company, 909 17th St., N.E., Cedar Rapids, Iowa.

• **Stromberg-Carlson 8-Inch Speaker.** Frequency response of 50 to 13,000 cps and power handling capacity of 10 watts are among the characteristics of the new Model RF-460 8-inch high-fidelity speaker recently introduced by Stromberg-Carlson Company, Sound Equipment Division, Rochester 21, N. Y. Full bass response is realized when the RF-460 is used in a



closed-back cabinet with internal volume of 1.7 cubic feet or larger. Constructional features include an aluminum voice-coil form to eliminate humidity and temperature variations, prevent warping and buckling, and to provide increased power-handling capacity. Flux density is 13,000 gauss and input impedance is eight ohms.

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TOPS IN HI-FI POPS

ROBERT SYLVESTER

IT PROBABLY ISN'T too much to say that the recording business was launched by comedy. If memory serves and history doesn't correct it, Sam Bernard's *Cohen On The Telephone* was the first phonograph hit recording. The vaudeville monologists and comedy singers—Van and Schenck, Sophie Tucker, Bert Williams et al—were among the earliest record stars. And then, after World War I, comedy virtually disappeared from the turntables. The varied musical arts dominated the recording field.

Once in a blue moon a comedy surprise would come along as an overnight hit. The best remembered are the discs made by the blackface team, Moran and Mack, called "The Two Black Crows." But even this temporary comic revival was not truly a recording original. Moran and Mack were a howling hit on an early radio broadcast and were subsequently recorded by Victor.

The only consistent comedian on records in recent years has been Spike Jones, but Jones actually offers comedy music and musical burlesques rather than pure comedy. There has been, of course, a long parade of novelty songs and comedy tunes and ditties which lay claim to a few belly laughs. But comedy as straight comedy has been neglected and ignored until very recently.

It now is in the throes of a renaissance and, according to the record shops, is doing pretty well for itself. Coral Records, in fact, not only boast two hit discs but also can claim discovery of a couple of hitherto unknown funny fellows.

The best of these is an unsung nightclub comedian named Buddy Hackett. Hackett has done two sides (78) for Coral from his cafe routines. Of these, the best is his imitation of a Chinese waiter trying to order a "family dinner" for six Americans who can't make up their minds. Hackett's routine is original and bright—i.e.: "all Americans look alike" and "lookee that blondie woman; built like brick wall of China." The reverse side of *The Chinese Dinner* offers Hackett on how to lose weight by taking a frightening series of pills.

Coral also offers a comedian named Eddie Lawrence with two sides of a song monologue called "Old, Old Vienna" (78) which has some yok lines. It is Lawrence's contention, for instance, that the only reason Vienna had all those great composers is that they were born there and couldn't help being Viennese. He is convinced that all Viennese would rather be in Las Vegas.

Perhaps the most successful and by all odds the most valuable of the new comedy recordings is the Victor 12-inch (LP) production called *The Old Curiosity Shop*. This consists of a series of selections from famed and long gone stars of yesteryear and includes songs as well as talk. But the comedy highlights are well worth having since they include De Wolf Hopper himself doing his immortal *Casey at The Bat*, as well as routines by Fanny Brice, Will Rogers, and other early comic entertainers whose recordings are now collectors' items.

This *Old Curiosity Shop* is nicely balanced and has a truly nostalgic and historical quality. It's a great record to play either while your alone or when the party starts to drag and needs a little unusual entertainment to pick it up again.

The aforementioned indefatiguable Spike Jones has a new Victor disc (on both 78 and 45) which was, probably, inevitable. It is Maestro Jones and his boys burlesquing the new wunderkind who calls himself Liberace. The Jones bit is aptly titled *I'm In The Mood For Love* and takes Liberace apart with loud abandon.

Jackie Gleason, the television comedian whose moony and mellow cornet-and-strings records continue to be best sellers, has also collected some of his comedy routines and songs for Capitol (33) under the title *Away We go*. It's typical Gleason who, like all other comedians, is funnier when seen than merely heard.

Victor Borge, another musi-comedian who has been doing his one-man show on Broadway all season, and is a veteran recording star, has put several of his *Comedy In Music* routines on a 12-inch Columbia LP. Borge fans probably won't want to miss this one.

While not new, Victor's recording of the late, fabulous Florence Foster Jenkins is still selling and is already a collector's item. Miss Jenkins was a happily misguided society matron who probably sang worse than anyone in the world, delighted in proving it, and frequently sold out concert halls to people who preferred to hear her attempt an aria than hear Lily Pons really sing one. The Jenkins recordings are now collected on an 8-inch Victor LP. You can find one if you're willing to shop around a bit.

A new recording firm called Audio Archives makes its bow with a 12-inch LP novelty titled *If I'm Elected*. This is basically excerpts from campaign speeches by various men who have run for—and often been elected to—national office. It has the voices of several dead Presidents and also some unintentional comedy by same. Other comedy is nicely interpolated from the political humors of Will Rogers and Irvin S. Cobb. The overall narration is by actor John Carradine.

There is, of course, a mine of great comedy which very probably will never be released. These are the acts, patter and sketches done by our foremost comics for the V-discs which were beamed to military forces during the war. Every graduate GI must remember these star-laden recorded shows. Countless albums could be gleaned from them today and issued commercially. But there is little chance of such an achievement.

The royalty payments would be extremely complicated, clearances would be well-nigh impossible, and nobody seems to know what became of the original V-Disc masters anyway. The best guess is that they were destroyed under agreement with the artists and their parent recording companies.

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PICKUP LOADING

(*from page 19*)

The simple cathode follower shown in *Fig.* 3 was set up and tested. The effectiveness of this arrangement is brought out by the response curves of *Fig.* 4. Even with a C_s of 2500 μμf, a negligible effect on high-frequency response is noted. The effect of various values of coupling capacitors, C_c, on the low frequency response was explored. A C_c of 0.05 μf with an R_k of 5000 or 10,000 ohms produces a droop of only 1 db at 20 cps.

A 0.2-meg R_s was employed to eliminate any resonant effect arising from phono arm cable capacitance as represented by C_s of 40 μμf.

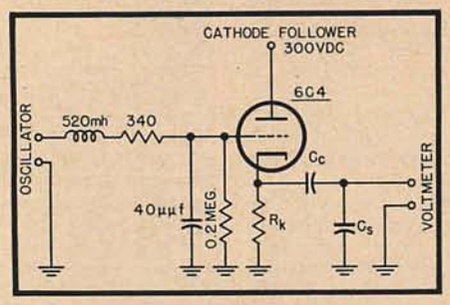


Fig. 3. Equipment set-up for measuring cartridge response when feeding a cathode follower.

When operating with 300 volts on the plate and a 5000-ohm, ½-watt cathode resistor, a 6C4 draws 3.5 ma. Virtually the same results may be obtained with (½) 12AU7, (½) 6SN7, 6J5 or numerous other triodes. Different values of plate voltage have little effect on the results. As careful attention must be paid to the filtering of the cathode follower B+ supply voltage as for a preamplifier.

When a follower is employed, it is recommended that de-emphasis be accomplished after the output of the follower. An excellent example of such a system may be seen in an article by P. W. St. George and B. B. Drisko entitled "A Versatile Preamplifier" in the first Audio Anthology.

TABLE 1

Manufacturer	Cartridge Model	Approx. L mh	Approx. R ohms
General Electric	All home types	520	340
Audak	L-6	750	600
Pickering	120	165	600
	140		
	260	130	750

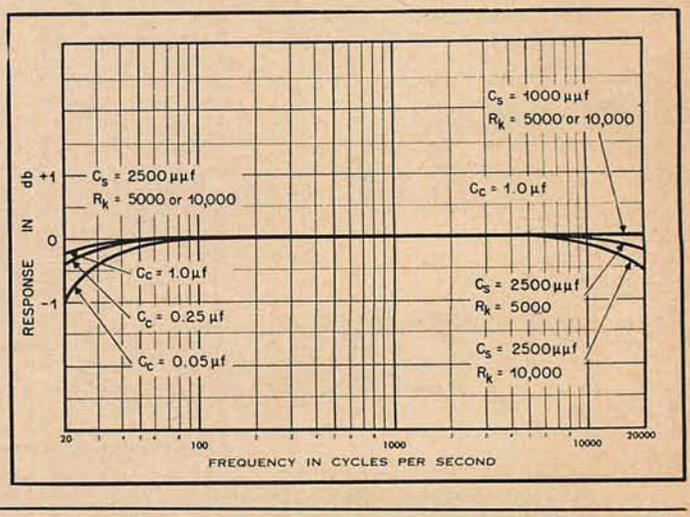


Fig. 4. Curve showing change in cartridge response with change in a load isolated by a cathode follower.

SECURITY SOUND SYSTEM

(*from page 27*)

occurs. Even in a large institution, voices of individuals become identifiable as also do individual rooms by their own peculiar acoustic conditions.

Reliability Is Imperative

Experience has shown that there is no compromise with quality in the design of a Security Sound System. Operating personnel come to rely on it as a device to protect their lives and insure their safety. Failures in good equipment are rare and a regular servicing program will usually eliminate tube failures and other troubles before they occur. The use of cheap or inferior equipment is to be avoided since the system had better not exist than be unreliable. With the completion of a new installation of the system in each institution, much more is being learned about operation and performance.

In the pilot installation so much good and so little bad has been discovered about the Security Sound System that it has been proven that such a system can be highly effective in any of the types of institutions mentioned.

The writer designed the basic system about three years ago and has not applied for patents for the reason that the system should be in the public domain and thus be available for better protection in institutions of confinement.

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CONCRETE MONSTER

(*from page 18*)

Next, the opening was made in the wall by removing the stucco from the outside and lath and plaster from the inside, exposing two studs passing through the opening. One was removed for the length of the opening for easy access during construction, and the other "air-stream" shaped and left in place.

(I must confess here that I was reluctant to tell my wife of my intention to cut a barn-door size hole in her dining-room wall, so I maneuvered her into an over-night visit to her daughter in a nearby city. When she returned home, the deed was done and it was too late for her to object. It seems that many wives don't share their husbands' enthusiasm for hi-fi.)

The frame, or cage, was supported in place and a coat of cement mortar (composed of one part plastic cement and three parts sand—to which was added a water-proofing and hardening compound, such as Anti-hydro, Sealcrete, etc.) was trowelled onto the metal lath. After this had set for 48 hours, more coats were trowelled on the inside and outside until a thickness of 2 inches or more had been built up. Each coat was scratched or roughened so the next would adhere firmly, and the last outside coat was "floated" with a sponge-rubber float. The inside was trowelled smooth. A metal ring was used at the small end of the frame, which acted as a screed[1] for plastering, and to make a neat ending for the concrete portion of the horn.

The horn has an expansion rate which doubles in cross-sectional area every 27 inches of horn length, beginning with the 11-inch circular opening in the drum-head. The sheet-metal section, *Fig. 7*, makes a transition from round at the small end to square (with rounded corners) at the beginning of the concrete part. After the concrete had thoroughly dried out, the inside was coated with a sealer and then with gloss lacquer to make the surface more reflective.

The opening into the room was covered with closely woven white nylon cloth about 1 inch back of the grill cloth (or at the stud line), and which was used to prevent a "dark look" at the opening. It doesn't seem to make any difference in the sound. An open-mesh drapery material was used for the grill cloth.

I drive the speaker system with a home-built ultra-linear amplifier, using a Fisher audio control, with phono, tape recorder, and an AM-FM tuner as sound sources. TV sound comes from a 630-type television set.

And how does it sound? Well, in previous articles on speakers and enclosures, the superlatives have been pretty well used up, but I've been listening quite a while and this is the best I have heard yet on the low end. The highs are good, too. •

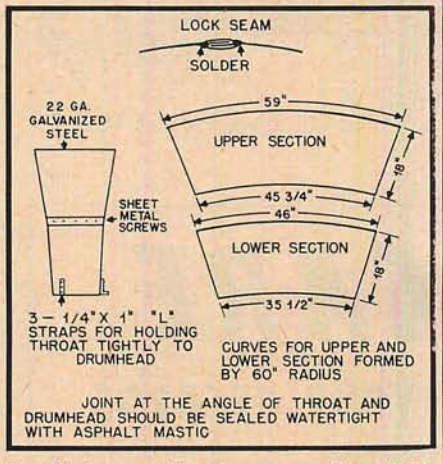


Fig. 7. Patterns for the construction of the telescoping throat end of the exponential horn.

[1] Screed: A strip used to gauge the thickness of the plastering.

BUILDING YOUR OWN HI-FI FURNITURE

(*from page 33*)

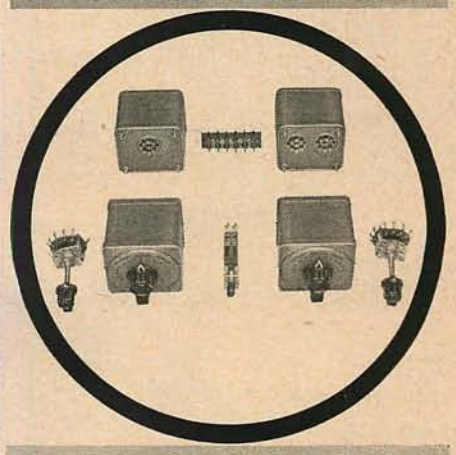
finish of this type of hinge adds to the decorative appearance of the cabinet and the exposed hinge pin is not objectional as in the case of other hinges. Another popular hinge for hi-fi cabinets is the concealed hinge, *Fig.* 5. They are almost invisible and have an offset hinge point which in most cases permits the door to be swung back. These are installed on the top and bottom of the door as opposed to the sides.

The completely invisible hinge joint is made possible with the Soss hinge, *Fig.* 6. The two halves of the hinge are mortised into the edges of the mating pieces. This mortise is either drilled with a brace and bit or with a chisel and a brace and bit, depending on the type of Soss hinge used. This type of hinge is best used with lumber core plywood and an accurate mortise should be cut to prevent binding.

To eliminate the need for mortising to install the hinge, there is available a number of non-mortising type cabinet hinges. One type is the very thin butt hinge which is similar to the butts shown in *Fig.* 3 but reduced to less than a single thickness so no mortise is required.

As with practically any trade, there are many "tricks" that save time and give a professional appearance to the completed cabinet. Common sense, carefully applied, should be adequate for the person who builds a cabinet only occasionally. If much work is to be done, it is suggested that a reference work on cabinetry be studied—both to save time and to ensure a better job.

SIMPLIFY CUSTOM INSTALLATION



The 4200 Sound Effects Filter and 4201 Program Equalizer are now available in component form, as illustrated, for the custom builder.

In addition to the flexibility of installation, all the features and characteristics of the standard models are retained.

The high and low sections of either model may be obtained separately. Complete wiring instructions included.

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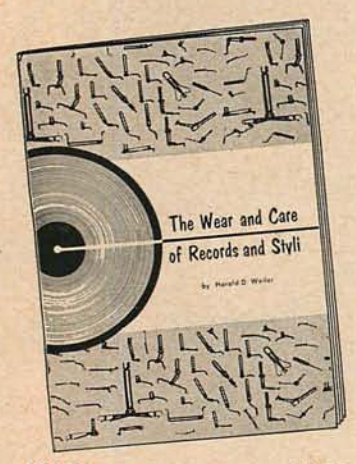
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AUDIO ETC.

(*from page 39*)

This goes on and on. If among these happy proliferations there appears one model with a certain very good looking decorative metal ring around the speaker grille that attracts both a lot of eyes and a lot of dollars, then quick like a flash everybody has metal rings around their speaker grilles. Different of course, but not *very* different, and the percentage of difference has been rather remarkably consistent this year—as consistent, for example, as the sizes of the numerous eight-inch speaker enclosures themselves: about half of them measure alike within an inch or so each way. Calculated Similarity.

Now don't get me wrong. This, as I say, is the age-old way of the business world. Everybody does it and always has. But don't forget that somebody, somewhere, some time, must stop chasing somebody else's tail around in a circle and strike out for new fields. The guy who does that, alas, isn't always the one who cashes in. But this too is an old business story. Thank the Lord we still have among us those idealistic optimists who *think* they can get somewhere with a new idea—otherwise we'd all end up like the dragonfly, who (I've always been told) will eat his own tail if you feed it to him, until he dies of indigestion. In this Year of Consolidation, tail-chasing is our favorite sport.

Progress, Too

Fortunately, tail chasing has its good points too. I mentioned two aspects of our present consolidation, the first being this rampaging Calculated Similarity, or to put it another way, the phenomenon of mutual bandwagon-climbing. The second aspect is just as clear, but a lot more constructive. Out of this sort of close competition inevitably comes a quiet and steady refining of existing ideas, procedures, equipment, standards. That, during this last year, has been very much to the good.

Even though generally speaking there has been little of radically new interest (with some exceptions, notably the new wide range ceramic pickup development, described here in an earlier month) there has been undeniably throughout the true Audio field a gratifying clarification of detail, a simplifying, an upgrading of performance standards.

Amplifiers, for example, have not only multiplied tremendously. Constant revision and experiment has improved everything about the breed from the ease with which they can be mounted in cabinetry and the simplicity of control settings all the way to higher basic tolerances for distortion, hum and so on.

Aside from what I'm sure would be a generally admitted enhancement of performance (I'm not so sure about durability) I'd suggest that the most noticeable amplifier progress has been due just to this sort of ceaseless competitive polishing-up. Physically this year's models have been more adaptable to a greater variety of audio installations, better looking, easier to feel and easier to read. Inputs and outputs and switching are both more versatile and generally simpler as well. (Some of the older models were paragons of utter confusion in their outward facilities!) The marked trend towards fixed-position equalization, to supplement the standard bass and treble controls, is a good one because records during this year have at last begun to approach a reasonable uniformity of recording curve and the problem of equalization is bound to

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get simpler. To separate record equalization from tone control (for taste, room sound, etc.) has always been desirable and that seems to be the trend.

Among the low priced tape recorders, to mention just one more of the many areas in which this constructive consolidation has been seen during the year, you'll note a similar kind of progress. Nothing sensationally new, but in two particular respects the trend is to the good. First, the inherently clumsy mechanism of tape transport has been further simplified, (notably in the loading and unloading of tape) along familiar lines. Who will forget the original Soundmirror of *circa* 1947, a pioneer and grandaddy of millions of younger models but a holy terror in operation, with push-button controls almost guaranteed to go haywire! No reflection on the maker; he was doing wonders for his time, and who could do better, at that stage?

More important, there has been a significant widening of frequency response at all the home tape speeds in many new recorders launched this last year (and there will be more of it in the new season to come) which has basically altered the home tape picture in a vital economic sense. More sound quality, more "fi" for the same tape dollar; or longer tape play with no loss in quality. Next year's tape picture in the home will undoubtedly reflect some radical results of these changes, in the much wider sale of pre-recorded tape, to take advantage of more and better machines now in homes.

The implications of a widening of frequency response were taken up in this space all of four years ago, when the then new Ampex 400 was the first tape recorder and player to do the trick. Owners of back copies of Æ may be interested in looking over the forecasts in those articles in the light of what's now about to happen in the home tape field. (Æ, August and September, 1950)

Table Hi-Fi and Craft Parts

Enough—for there's no reason to go further in this over-all evaluation of an Audio year. But one major aspect of that year has yet to be considered. It was suggested above when I spoke of the "true Audio field."

What about the overwhelming explosion of "high fidelity" in the commercial one-piece phonograph field—the nationwide publicity that has carried the home table model machine and the semi-pro separate-unit rig together forward in one tornado of happy expansion?

We all know that a number of distraught gentlemen in the Audio profession have been sweating out an impossible task lately, that of defining High Fidelity and related terminology in the light of this year's upheaval. I am very glad I'm not one of them. I have my own problems.

I'm contemplating a book revision, of the tome I wrote a couple of years back, in which page after page of comparison between "the ordinary home phonograph" and "high fidelity equipment" has now been reduced to so much jargon. For is there any home phonograph that doesn't now boast loudly of high fidelity? (If not, then it's Full Fidelity, or other Calculated Similarity.) That once useful term has now gone completely nuts and I doubt if we'll ever be able to bring it back to practical usefulness. I've got to find some other way of talking about equipment and, so help me, I haven't figured it out yet. When I do, we'll have a new edition of my book!

How do I feel about this year's wholesale invasion of "hi-fi" by the big commercial advertisers? I went into that pretty thoroughly last November in the first Audio Etc. (Æ, Nov. 1953, p. 34) and nothing has happened to alter the general outlook since, except of course the continued proliferation of dozens of new "hi-fi" machines, Calculated Similarities to compete with the triumphant Columbia 360 table phonograph which got there first.

Yes, admittedly there has been a general improvement in home phonograph quality, even if we ignore the huge ad claims. It reflects a much belated modernization that has at last brought a measure of wide range response, an improvement in amplifier and tone control design and a gesture, at least, in the direction of speaker enclosure design. Whether *we* call the result High Fidelity is now of singularly little importance—the big ads call it that anyway, and they aren't going to be stopped.

But, granted quite a lot of improvement, even granted that the better new machines might concievably be called hi-fi on a rational basis (rating, as the AES has been considering it, the better systems as super-hi-fi and ultra-hi-fi)—even so, I do not think that the home machine has even begun to touch the advantages that still belong to the separate-unit, craft-type of equipment that used to have a monopoly on the term High Fidelity. In spite of all this year's publicity-enforced excitement, I honestly do not feel that things have changed much—except linguistically.

I am as much in favor of separate-unit craft audio equipment, for the home, as I ever was and I have no intention of changing my point of view when it comes to going over my book. The values in equipment bought "audiophile net" through audio outlets, are, I insist, as good relative to the "ordinary phonograph" as they ever were before the Great Tidal Wave of Hi-Fi this year. The differences, tone quality for tone quality, dollar for dollar, are still very much the same. If "ordinary home phonographs" are improved, which I do not deny, then so, in proportion, are the separate units of this season as well.

And this I will continue to assert however loudly the hi-fi ads may scream. I'll say it no matter how many famous conductors and musicians give ecstatic testimonials for table hi-fi, nor how many beaming movie stars emote for 4-D sound in the home. I will keep suggesting to people who ask what to buy that they acquire a good audio catalogue and pick out parts, just as I have been suggesting these seven last years.

If You Can't be Bothered . . .

What about the hi-fi phonograph, then? Well, it has its good place. There never was a time, these last seven years, when I didn't regularly run into people who just couldn't be bothered with fancy equipment and, moreover, who really didn't care very much about the possible tonal difference. I long ago learned to bow gracefully to this point of view. Some of my most musical friends have it. I have personally bought, in past years, several unmentionable table portables with three-inch speakers for friends who were entirely delighted, though the sound of the things made me wince. People are like that. They were seven years ago and they are still. Only now they buy "high fidelity" machines, and love 'em.

Now, you can get a ducky little home machine that in point of fact will actually reproduce a 10,000-cps tone, though the distortion in the upper regions may or not be worse than the blissful high-end silence of yesteryear. Now, this same machine will reproduce an audible bass of remarkably low pitch, though the attendant boominess may or may not add to your musical enjoyment. Now, instead of one cramped speaker pointing outward you may have three, or a brace of them pointing in various direc-

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tions—which, quite seriously, is one of the more positive improvements to be found in the new machines. Sound should be spread out, sound-source masked, and the much-vaunted and wholly mis-named "3-D" speaker technique is good, without qualification.

But all in all, 3-D stereosonic, magic miracle hi-fi and all the rest, the "ordinary home machine" still fills the same old bill, and fills it very well, better than ever before. Let's allow it the hi-fi title—that battle is lost, and it's going to be called hi-fi, amazing, astounding, the Last Word in Ultra-Concert-Hall-Realism, the phonograph that is Too Great to be Called a Phonograph and all the rest, whatever we may say or think, and that is that. The advertising battle for hi-fi is lost—but we still have, in separate-unit equipment, the advantages we have had right along, waiting to be promoted.

And so, with the beginning of another Audio Year, with sensations in magnetic tape records and players and lots more in the offing, let's get on and through the era of tail-chasing. I'm looking forward with enthusiam to some real developments this coming year, brand new, original, and not even faintly similar to somebody else's good idea.

Industry Notes...

Pilot Radio Corporation's two-day showing of its new 1954 line of high-fidelity tuners, amplifiers and portable phonos, held in New York's Hotel Warwick, brought out virtually all leading distributors and dealers. Particular approbation was accorded the new Pilot tuner with microammeter tuning indicator, and the new table-top-type 15-watt amplifier selling for less than a hundred dollars . . . **Ampex Corporation** chose June 10 to introduce the new Model 600 portable tape recorder to music critics . . . Congratulations were accorded **George Gero,** president of the Paterson, N. J., advertising agency bearing his name, by more than a hundred friends and clients who gathered to celebrate opening of the agency's new quarters. Co-hosting with Gero was **Harold Becker** who operates the agency's New York Office.

With the signing of a new contract, **Thordarson-Meissner Division of Maguire Industries, Inc.,** continues its enviable record of 59 successive years without a strike or labor stoppage of any kind; credit goes to Gene Powers, general manager, who is marking his 17th year of negotiating union contracts. Powers has never encountered a strike or slowdown, nor has he ever found it necessary to call in state or federal mediation services. (Ed's Note: CONGRATULATIONS in caps.) . . . **Gramer Transformer Corporation,** Chicago, has purchased the **Halldorson Transformer Company,** also Chicago, from **Chicago Standard Transformer Corporation,** the parent company. No personnel changes anticipated and the entire Halldorson line will continue to be available to the distributor trade.

Mrs. Azilda Nielsen is newly-elected president of **Best Manufacturing Co., Inc.,** Irvington, N. J., pioneer manufacturer of sound reproducing equipment. Mrs. Nielsen is the widow of the late E. W. Nielsen who was president of Best at the time of his passing last February . . . **Hudson Radio & Television Corporation** has opened a new sound demonstration room in its downtown store at 212 Fulton St., New York City. Measuring 25 by 40 ft., the new



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studio is fully equipped with the latest in comparison facilities, and already has stimulated greatly improved sales according to Edward Saumell, manager.

RCA Victor has signed an agreement with **Magnecord, Inc.,** for the right to distribute RCA's planned music service throughout the United States and Canada; Magnecord will make the service—which will be especially programmed on tape by RCA for industry, hotels, and other commercial outlets—available for redistribution through music operators on a lease basis . . . **Sylvania Electric Products Inc.,** has announced initial plans for a 210,000 sq.-ft. building in Williamsport, Pa., to be used as a centralized packaging area and for finishing operations in the manufacture of vacuum tubes—bids will be invited within the next few weeks according to Arthur L. Chapman, vice-president.

Livingston Electronic Corporation is introducing both monaural and binaural tape recordings of the same program material which has heretofore been available only on discs; binaural releases will be confined to staggered-head spacing for playing on Magnecorders, with stacked-head recordings available on special order. Playing speed is 7.5 ips . . . In order to provide for expansion of hi-fi speaker production, **Jensen Manufacturing Company** has acquired new manufacturing facilities outside of Chicago for small speaker manufacture, thus releasing space in main plant which will be devoted to hi-fi units . . . Officials of **Raytheon Manufacturing Company** were joined by high-ranking Naval officers in opening and dedication of a new ultra-modern $2,000,000 electronics laboratory overlooking Hanscom Air Force Base, Bedford, Mass.

Industry People...

Organizational changes at Collins Radio Company, announced by **Arthur A. Collins,** president, include the following appointments: **R. S. Gates,** executive vice-president; **L. E. Bessemer,** vice-president, manufacturing; **R. T. Cox,** vice-president, research and development; **J. G. Flynn, Jr.,** vice-president, sales, and **M. W. Burrell,** second vice-president . . . Entire industry heartened by returns to work of **Bill Filler,** co-owner of New York's Terminal Radio Company, following surgery.

Among guests at Pilot Radio Corporation's trade and press showing of new models was **Steve Cisler,** owner of San Francisco's "Good music station" KEAR—reported staggering increase in interest in hi-fi on the Pacific Coast . . . **David A. Coffin,** manager of Raytheon's missile and radar division, has been named assistant vice-president . . . **Laurence B. Lueck,** formerly chemist in the magnetic products division of Minnesota Mining and Manufacturing Company, has been appointed vice-president and general manager of the E. M. C. Recordings Corporation, St. Paul, Minn. E. M. C. will initially issue educational pre-recorded tapes for school use.

Frank Swinehart has joined the engineering staff of The Turner Company, Cedar Rapids, Iowa—formerly with the Astatic Corporation and the Brush Development Company . . . **Dominick J. Canano** has been elected vice-president of S. O. S. Cinema Supply Corporation in charge of TV studio and film production sales; another S. O. S. promotion finds **William H. Allen** named production manager . . . **James W. Bayless,** general plant manager, has been elected a vice-president of Capitol Records, Inc. . . . **Aldo Lachman,** at one time with the loudspeaker division of The Cinaudagraph Corporation, has joined R. T. Bozak Company as vice-president in charge of manufacturing.

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Housed in sturdy metal cabinet, finished in bronze hammerloid, the Hartley unit may be panel-mounted or used as an attractive remote control unit at some distance from the other equipment. Cathode follower output permits long leads to main amplifier without frequency discrimination.



The non-resonant Hartley 215 Speaker Systems are available in single, dual, and 4-speaker models, and are priced from $50.75.

See your Hi-Fi Dealer or write Dept. CG-1

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The generator section produces the mixed low and high frequency signal required for intermodulation testing. A direct-reading meter measures the input to the analyzer section and indicates the percentage of intermodulation.

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DOES THE IMPORTANT JOBS NO OTHER TAPE CAN DO!

Revolutionary new Soundcraft LIFETIME® Magnetic Recording Tape takes over where others fail. This high-fidelity tape: • Banishes program timing problems due to tape. • Preserves priceless recorded material for a lifetime. • Stores perfectly in any climate. • Is a third as strong as machine steel. • Will never break, cup, curl, tear, dry out or grow brittle.

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Just as the reflection of a perfect mirror is faithful to the original image, in every detail, so too does IRISH Green Band RECORD, RETAIN and REPRODUCE the original sound with flawless fidelity.

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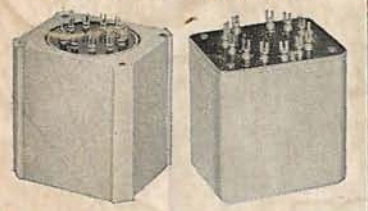
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TRANSFORMERS REACTORS · FILTERS

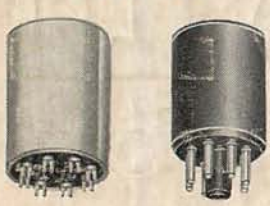
FROM STOCK . . .

HIGHEST FIDELITY



Linear Standard — Hipermalloy

COMPACT

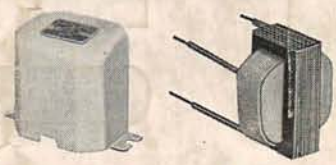


Ouncer — Plug-In



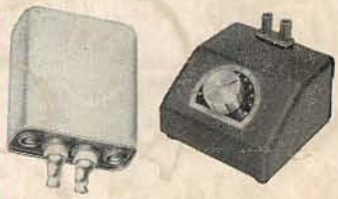
Magnetic Amplifiers — Multi-Shielded Inputs

AMATEUR MINIATURE



Special Series — Sub-Ouncer

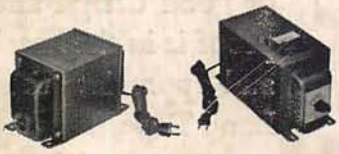
HI-Q TOROIDS



Inductors — Decades

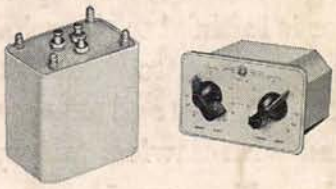


Replacement — Signaling and Control



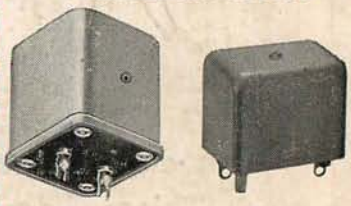
Stepdown — Line Adjustors

CONTROLLED RESPONSE



Filters — Equalizers

VARIABLE INDUCTORS



Non-Hermetic — Hermetic

TO SPECIFICATIONS . . .

RUGGED . . . INDUSTRIAL

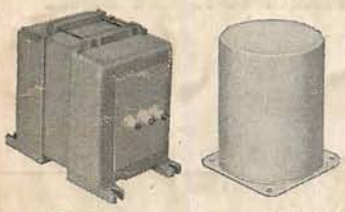


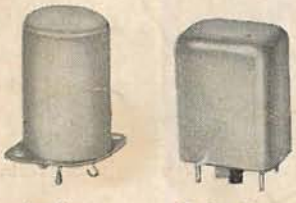
Plate — Audio

HIGHEST FIDELITY

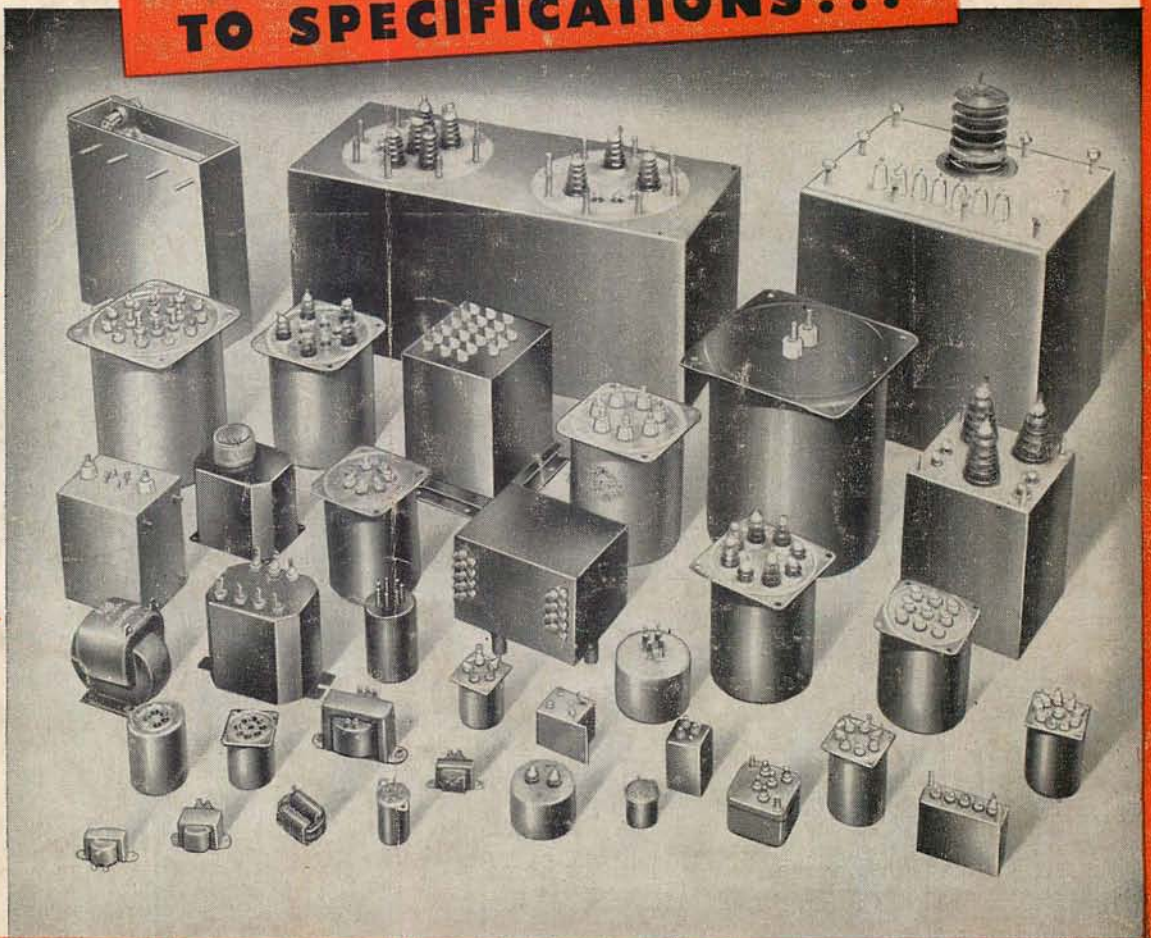


Amplifier Kit

HERMETIC . . . MIL-T-27



Audios — Pulse Units



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