AUDIO

JULY, 1961
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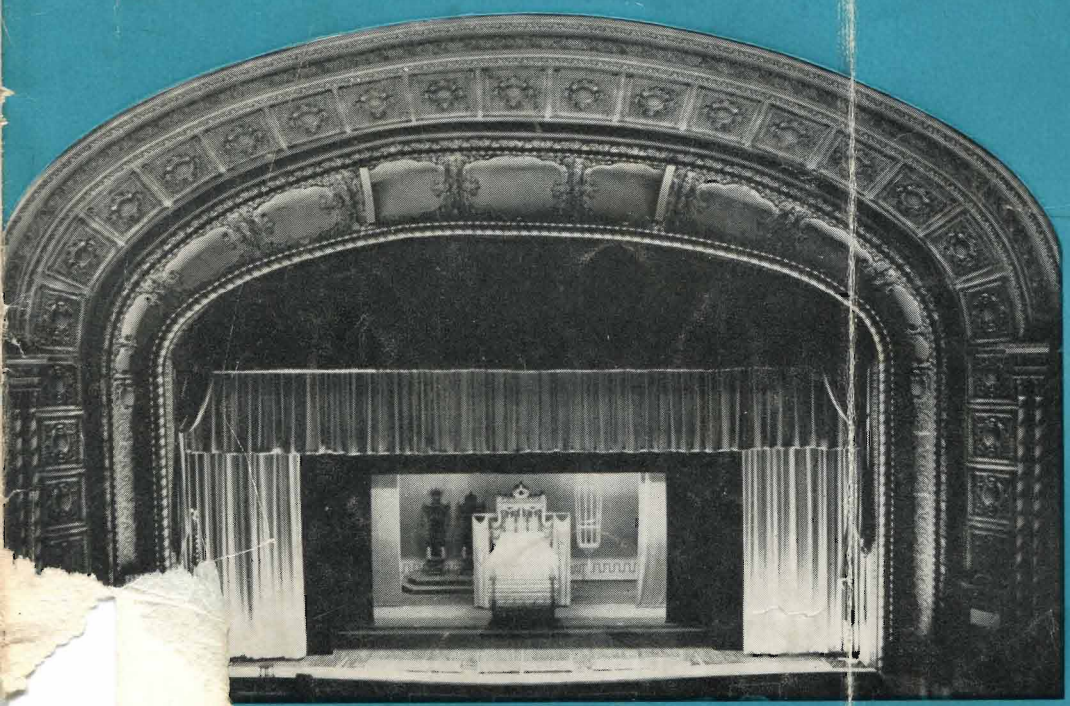

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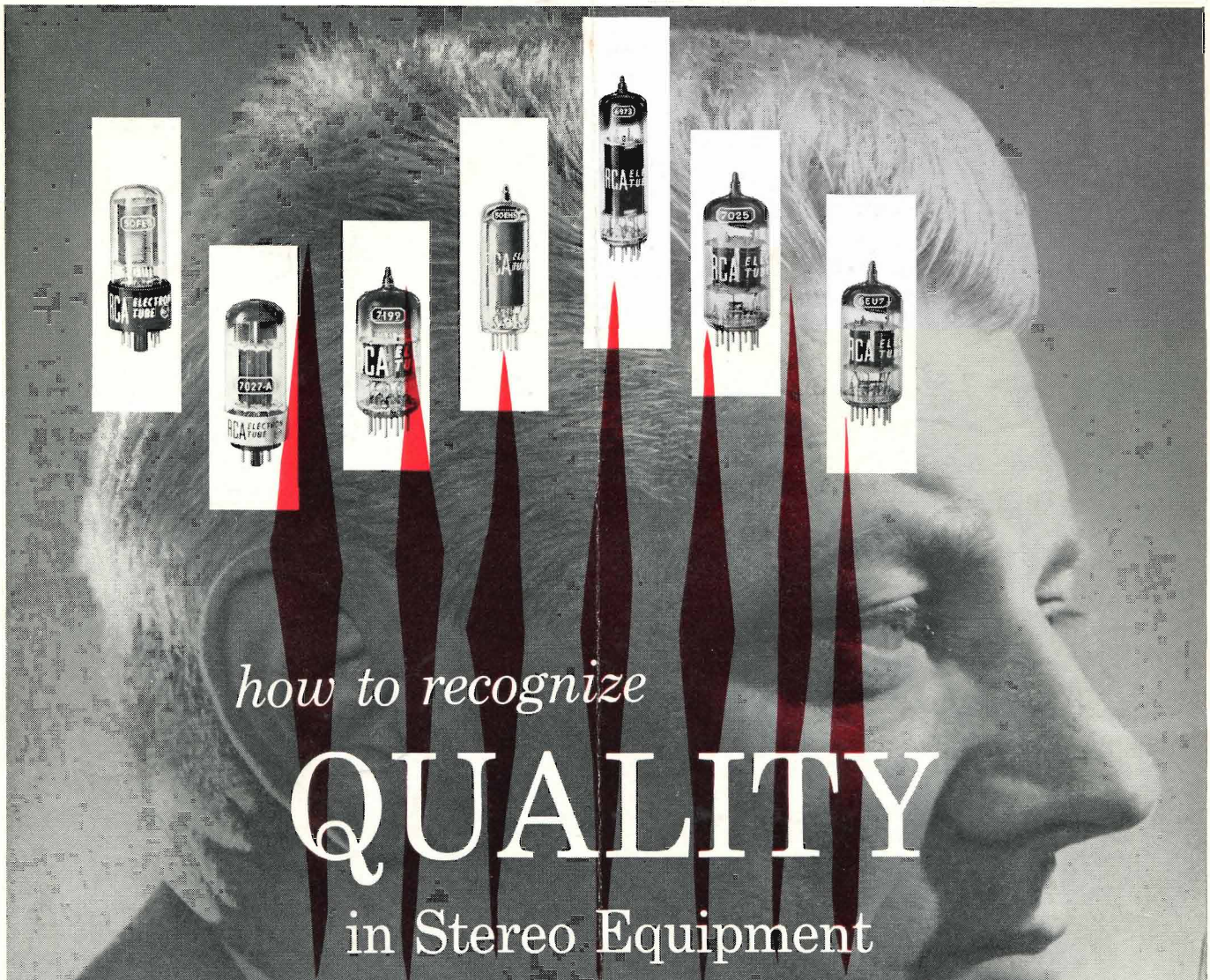

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AUDIO

JULY, 1961 VOL. 45, No. 7

Successor to RADIO, Est. 1917

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AUDIO in General

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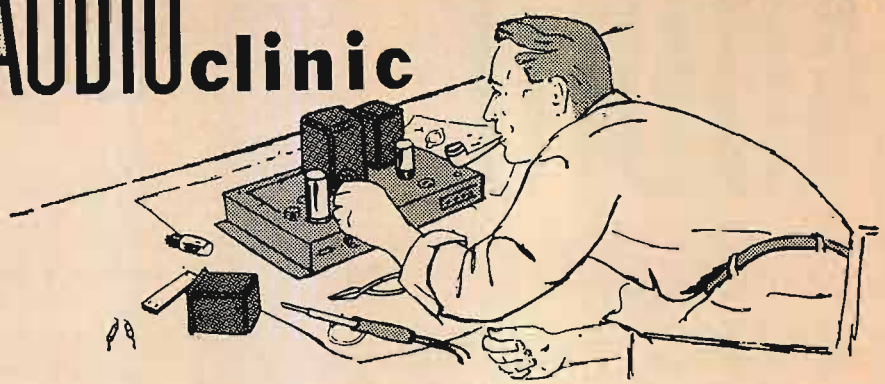

JOSEPH GIOVANELLI*

Fixed Bias Stabilization

Q. Some time ago I constructed a dual power amplifier quite similar to the one by C. G. McProud as described in August, 1958, AUDIO *except for the tube complement. Cathode bias as shown in the abovementioned article was used. Results were satisfactory. I recently decided to change to fixed bias (for no very good reason). The results this time were not so satisfactory.*

My problem is that the grid No. 1 voltage is not steady but swings back and forth over the scale as much as 10 or 15 volts making it impossible to adjust bias or to balance to any accurate setting. A Simpson 20,000-ohm-per-volt VOM was used in all measurements.

Tubes, components, and circuitry have been thoroughly checked. The sound output is slightly greater but it is not as clean as when cathode bias was used. I am using a common bias supply. The same conditions of fluctuation exist whether this is feeding either one or both amplifiers.

What is causing this condition? R. W. Robinson, North Hollywood, California.

A. The characteristic common to output tubes is that, under fixed bias conditions, high-resistance grid returns cannot be used. For example, a circuit operating with cathode bias, can function successfully with a grid return resistor of 0.5 megohm. The same circuit, however, operating with fixed bias, will probably function improperly with grid returns whose values exceed 100,000 ohms.

The reason for this situation is that contact potentials developed between grid and cathode cannot leak off quickly enough when high values of grid-return resistances are used. Of course, these contact potentials are present when cathode bias is used, but the cathode resistor acts as a servomechanism, or governor.

When the grid tends to swing negative as a result of these potentials, the current through the cathode resistor decreases. This decrease, however, causes a decrease in voltage between cathode and ground. This, in turn, results in the grid swinging somewhat more positive.

The reverse would be true if the contact potentials were such that the grid tended to swing positive.

In fixed bias circuits, the cathode is directly grounded. Hence, circuits of this type are deprived of this means for stabilization.

When the size of the grid-return resistor is decreased, the value of the coupling capacitors must be increased in proportion to the amount of decrease of the grid-return resistor. Failure to follow this procedure will cause a degradation in low-frequency response.

Distortion in FM Receivers

Q. I have a question concerning FM stations. On two stations here I notice that when the announcers take over, the "S's" are distorted. What causes this? All the other stations available to me show no voice distortion at all. James C. Valestin, St. Louis, Missouri.

A. First of all, I should point out that this type of distortion is not at all uncommon. When you notice this kind of thing on the "S's", you also often notice it on cymbal crashes, brass passages, and the like. If you do not, then it would appear that the stations involved use more deviation on their spoken announcements than they do on their music portions, and this is indeed sometimes done to increase the effective coverage of the commercial messages.

This "S" distortion is usually caused by the FM stations signal deviation being larger than the bandwidth of the tuner's i.f. bandpass. Such a situation can be caused in at least three ways:

1. First, assume that the tuner is not properly aligned. Some tuners are of the "staggered" type. If the i.f.'s are peaked on such a tuner, their bandpass will be reduced to a point which will result in clipping of the modulation envelope. A very strong station may be received with enough strength to thoroughly saturate the limiters and thus broaden the response curve sufficiently to allow the signal to be heard more or less normally. This, however, is not too likely a situation.

2. Second, it is possible that the two stations to which you refer are overmodulating. Even if your tuner is properly aligned, a station which is overmodulating can have a deviation of the carrier frequency beyond the capability of the tuner's i.f. strip.

3. Third, perhaps the signals of the two stations in question are weak compared to the ones which sound normal to you.

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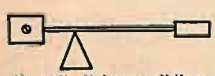

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The weaker the received signal, the narrower the response of the i.f. is likely to be. Even when your tuner is properly aligned. A point can finally be reached where the response of the tuner is too narrow for good sound reproduction.

Mobile FM Reception

Q. I would like to convert an FM tuner for mobile use in my Volkswagon. (This is a 6-volt system.) My Eico tuner seems suitable because of its sensitivity and a.g.c. Do you consider such a conversion practical? If so, would you suggest a suitable power supply and audio circuit? It would seem that impedance matching of the vertical, 50-ohm auto antenna to the usual 300-ohm balanced tuner input would be important. How does one accomplish this? Raymond Hardy, Ellicott City, Maryland.

A. I believe that it is practical to convert your Eico tuner for mobile use. I have a friend who did just that with admirable results.

If your car is already equipped with an AM radio, your problem is comparatively simple. Use the audio strip and power supply of this radio. Work out a switching system so arranged that, in the first position of this switch, the auto radio will work as usual. In the second switch position, the filament power and B+ to the r.f. and i.f. portions of the radio will be disconnected and will be diverted to the appropriate portions of your Eico tuner.

If the B+ provided for the r.f. and i.f. sections of the receiver is quite low and filtered by too much decoupling, it would be better to permit this voltage to remain on the r.f. and i.f. portions of the auto radio.

Instead, the B+ requirements for the tuner should be derived at the point from which the audio output stage obtains its B+.

The audio input of the auto radio should at this time be switched from the AM detector to the audio output of the Eico. B+ should be applied to the Eico at the cathode of its rectifier tube. If the B+ voltage is somewhat low but is well filtered, the voltage may be applied at the output side of the filter system in the tuner. The 6.3-volt secondary of the power transformer should be disconnected from the filament circuit. The rectifier tube should be removed from its socket.

(With careful attention to the wiring of associated cables and plugs, it will be an easy matter to remove the Eico from the car and install it in your home music system if it is so desired.)

If your Volkswagon is not equipped with an auto radio, a power supply and audio amplifier must be supplied. Various manufacturers construct power supplies suitable for this purpose. Remember that the B+ voltage and current ratings must be equal to the needs of both the tuner and the amplifier. The amplifier itself need not be elaborate. A pair of 6AQ5's in push-pull, driven by a 12AX7 voltage amplifier and phase splitter will probably meet your requirements. In fact, the two 6AQ5's could be easily replaced by a single 12BH7.

(Continued on page 6)

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LETTERS

The June Issue

SIR:

First, my sincere congratulations on a most informative issue. The articles on the new system of FM Stereo were extremely well written and easy to understand.

However, one small item does have me a little confused. On page 21, the article by Mr. von Recklinghausen is accompanied by a figure showing the basic waveforms. By my calculations, the drawing of the channel B output has part of the positive position of the waveform missing. I would appreciate knowing if this is but a simple mistake by the printers or if I am missing the point somewhere along the line.

Once again, let me congratulate you on what I feel to be one of your best issues.

DONALD L. MARKLEY,
Transmitter Engineer, WIRL,
Peoria, Ill.

(*And congratulations to you, Mr. Markley, for your recognition of an error by the draftsman—this is one we can't blame on the printer—but we should have caught it, regardless of whose error it was. The fourth vertical space from the left should show a waveform similar to that of the sixth space, though at a steeper angle. We regret, as always, such an error, and we shall correct the drawing before reprinting the article in the 1961–1962* AUDIO GUIDE —see page 16. ED.)

Stereo Adapter Problem

SIR:

As an audiofan who has saved his pennies to purchase the finest components possible, I was quite happy to read in the *New York Times* of the F.C.C. decision to permit stereophonic broadcasting.

I took great care in selecting my tuner, which has all the necessary knobs and settings with gain controls on the back for channels A and B—so all I should need was a $15 adapter and, according to the manufacturer's booklet, remove the two screws holding a plate on the chassis, attach the adapter and plug in, and I would be ready for the long-awaited multiplex.

I paid over $150 for my tuner, and now the manufacturer of it brings out an adapter for more than half that, and the new adapter duplicates all the knobs on my present tuner, the only exception being in the indicator lights. *And,* having a custom-made cabinet of walnut, there will have to be additional expense in altering the cabinet.

The manufacturers are taking audiofans for a sleigh ride in the month of June. The whole situation brings up unpleasantries which will not be easily forgotten by myself and friends of mine who are on the same sleigh.

As a subscriber, I believe you should take an active part against this deception on the part of these component makers. I have repeatedly read where we who are subscribers to AUDIO and other magazines are the sounding board to the manufacturers. Well, let's sound off.

D. J. BERTE,
3467 Eastchester Rd.,
New York 69, N. Y.

(*Considering that the F.C.C. decision was announced on April 20, we feel that the manufacturers who have put any adapter on the market in such a short time have done a remarkable job. It is more than likely that adaptable adapters will be offered to fit in tuners sold with built-in accommodations for them as soon as these manufacturers can get around to it. If they don't, we would be the first to agree with you. But as to the figure of $15—we think that was a little too optimistic, and was probably colored by a large manufacturer's claim that its adapter could be had for around $8, which was undoubtedly based on being built into a tuner. We should think that a median figure of, say, $40 should be reasonable as a unit to be installed in places designed into tuners previously sold, but not for complete self-powered adapters.* ED.)

Current Flow Again

SIR:

Having read both Mr. Nissen's letter in the March issue and Mr. Goeller's letter in the April issue, I'd like to add a few thoughts of my own on this controversy regarding current flow. These are:

1. The so-called "conventional current flow" (as opposed to electron flow) is based on the old discarded notion of electricity as a "mysterious fluid." In short, it is based on the "juice" concept of current flow dating from *before* the days of Benjamin Franklin.

2. The fact that most engineering text books represent current flow from positive to negative, and from plate to cathode in a tube, just proves to me that they are old-fashioned. To add to the merry confusion, these same books define the ampere as "6.28×10^{18} *electrons flowing past* a point in one second." Incidentally, I have always marvelled that it comes out exactly $2\pi \times 10^{18}$ electrons.

3. I was taught the "conventional flow" myself a long time back, but I soon gave it up when I began to teach electronics

(*Continued on page 50*)

AUDIO CLINIC

(*from page 4*)

The resulting 1.5 watts of output will be adequate for your car.

The use of the 12BH7 will reduce the power supply requirements of the amplifier.

I do not recommend that you use the conventional auto radio antenna. The antenna system normally used for auto reception of AM stations cannot be used with your FM tuner because this antenna is vertically polarized. FM stations employ horizontal polarization.

Instead, make a small folded dipole. Place it on a part of the windshield where it will be free from surrounding metal and in a position where it is or its lead-in will not obstruct driving vision. Conventional twinlead can be used to feed your tuner. Shielded twinlead is preferable for suppression of ignition noise. Ground one end of this shield at the tuner. This antenna will have to be a compromise between the optimum length for such a dipole and the length you must actually use in accordance with the space available to you.

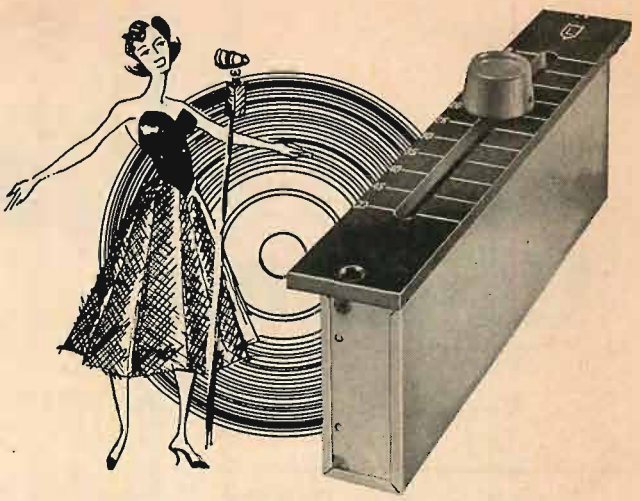
Ignition noise can sometimes be further suppressed by the use of suppressors on both the generator and spark plugs. The generator should be tried first.

The foregoing antenna procedure is satisfactory for use with your Volkswagon because its engine is in the rear. Had the engine been located in the front, it would be better to locate the dipole on the rear window. Æ

Langevin

"Between the Artist and the finest recording"

MX-111 STRAIGHT LINE MIXER CONTROL



The MX-111 Straight Line Mixer Control is a highly developed slide-wire unit using resistances in a ladder configuration to afford unusual facility in operation on control consoles. It is used to blend signals of various origin for music scoring, re-recording, high quality public address, radio and TV broadcasting. It requires only 1½" of horizontal panel space (1¼" with alternate escutcheon) and is 6½" long. It is the most compact unit of this type available, and extends only 2¼" below the top of the mounting surface. Several units can be operated with one hand when mounted adjacent.

FEATURES

1. Smooth, Silky Operation for Easy Control — Most important to the operator is the overcoming of friction in the mixer control. In the MX-111 precision-built mixer, a nylon bearing rides along a longitudinally honed, hardened chrome-plated shaft. Smooth operation is the result of the exceedingly low coefficient of friction; only 2 grams of pressure is required to overcome the inertia and bearing friction of the control assembly.

2. Low Contact Noise for Clean, Clear Signal — A single contact brush fabricated of the same material as the resistance wire prevents generation of thermal voltages, contact oxidation and consequent noise. This brush is connected to the input circuit by a beryllium copper spring strip, eliminating the need for additional noise inducing brushes.

3. Exclusive Dirt and Lint Barricade for Trouble-Free Performance — An accessible lint and dirt trap over the windings eliminates the cleaning nuisance formerly associated with this form of control. In addition, the contact portion of the winding itself is upside down, so that the tendency of foreign matter is to fall **off** rather than **on.**

4. Plug-in Design for Easy Maintenance — Connections are made by an integral plug to the connecting cable socket. This permits rapid disassembly for inspection and cleaning.

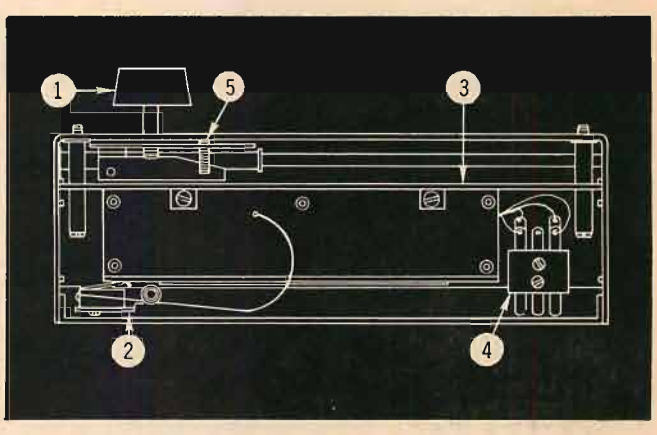
5. Friction Adjusting Screw for Angle or Vertical Mounting — For those recording engineers who desire less freedom of movement in the control, or for the designers who wish to incorporate a steep or vertical slope to the control panel, a friction adjusting screw on the guide shaft is accessible through the front slot on the control in which the knob assembly rides.

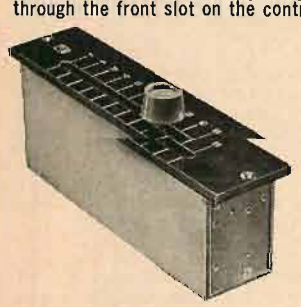
SPECIFICATIONS

Circuit, Ladder; **Frequency Response,** Flat, within ±.5 db at all settings from 0 to 20 kc; **Accuracy of Resistors,** ± 2%; **Input Level,** Maximum: 1 watt or 25 volts rms; **Slider Pressure,** 20 grams; **Static Friction,** Within 2 grams of sliding friction; **Insertion Loss,** 6 db; **Total Excursion,** 4⅛"; **Impedance,** Standard 600/600 ohms. Special impedance of 150/150 ohms may be obtained on order; **Knob,** Supplied with red knob as standard; **Dimensions,** 6¼" long by 15/16" wide by 2¼" high. Height with knob: 3¼"; **Escutcheon Plate Dimensions,** 1½" or 1¼" wide by 7" long by 3/16" thick; **Panel Finish,** Engraved black anodized dural; **Multiple Mounting,** 1½" or 1¼" centers between adjacent units according to escutcheon used.

ORDERING INFORMATION

Model MX-111 Straight Line Mixer Control with red knob, cable socket and plug, complete with escutcheon. Weight, net, ½ lb., 1 lb. shpg. **Price, Net Each $44.00**





MX-111-2 2-Gang Mixer
Price Net With
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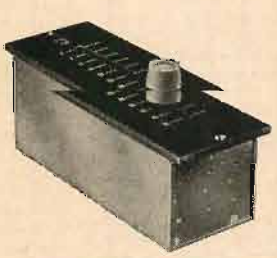

MX-111-3 3-Gang Mixer
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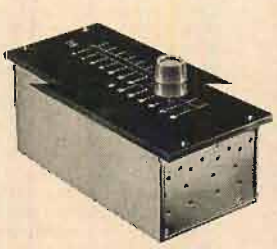
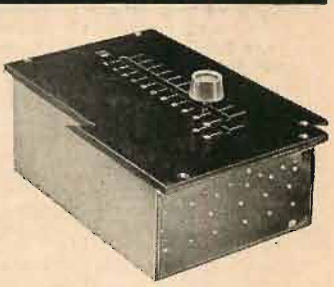
Escutcheon $135.50



MX-111-4 4-Gang Mixer
Price Net With
Escutcheon $181.00



MX-111-6 6-Gang Mixer
Price Net With
Escutcheon $271.50

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Arthur Lyman: Percussion Spectacular
Hi Fi Record L 1004

It's been common knowledge for some time that good recordings of percussion instruments provide a critical test of a playback system. Unfortunately, during the early months of the stereo disc, most of us discovered that this theory was rather difficult to apply. What seemed like distortion, low output, and limited frequency response on most records, percussion or otherwise, temporarily made stereo discs a poor source of musical test material. Actually, when considered in retrospect, our deprivation was not so severe as it seemed at the time. We now know that distortion, low output, and limited frequency response in the first stereo cartridges presented a problem of equal proportions. In point of time, some three years were to go by before pickups could do justice to the material that was engraved in some of the early stereo discs. If you don't believe me, get a copy of an early stereo record that was ahead of its time in audio quality and play it with the best of today's pickups.

Arthur Lyman's latest stereo job prompted me to do just that. Listening to this "Percussion Spectacular" with its exceptionally crisp sound I began to wonder how some of the pioneer stereo discs would stack up against this one. Recalling that a few stereo records had sounded quite impressive when the first moving magnet cartridges made their initial appearance on the market, I proceeded to dig back in my files all the way back to the year 1957. Many of the records of that vintage now sound fine when played with a stereo pickup that made its first appearance at the 1960 New York High Fidelity Show. The greatest surprise was Concert Disc CS-21. Already a rarity today, it was titled "Re-Percussion" and featured an ensemble under the direction of Dick Sehory. This, of course, was made some time before RCA hired him for the famous series in Chicago's Orchestra Hall.

Lyman's four-man group juggles its dozens of instruments in a succession of tunes with South Sea flavoring. It's a highly international lineup he features in this release. The combination isn't easy to imagine yet here is a musical group which appears nightly in the Shell Bar of the Hawaiian Village Hotel playing *Arrivederci Roma,* American folk songs, Ravel's *Bolero,* and a traditional Hebrew folk song *Havah Nagilah.*

The Virtuoso Band
Vanguard VSD 2093

If you happen to own one of the truly great band recordings in stereo, Vanguard's "Queen's Birthday Salute" (VSD-2011), you'll know what to expect in this release by the Royal Artillery Band. While it doesn't have a 21-gun salute and the rumble of horse-drawn artillery, this latest record by the band deserves equally extensive circulation. The emphasis here is on the talents of the band's soloists. Side one displays the tradition of virtuosity in England's oldest and largest military band. It has a history that goes back to the 1760's. To set the pace, Major S. V. Hays opens with a fiery specialty for three trumpets and band that will really set you back on your heels. Other highlights are a trombone trio and solos for tubaphone, euphonium, and coach horn. The second side of the disc features the massed band in medleys of French, German, and Sousa marches. This one will bring you up to date on what the stereo disc can do with a top-notch band.

Carnival (Original Cast)
M-G-M SE 3946

Many listeners will go along with the choice of "Carnival" as the best musical of the current Broadway season by members of the N. Y. Drama Critics Circle. Only "Camelot," among this year's shows, shares Carnival's immediate melodic appeal. Few recent productions rival it in tasteful application of professional know-how in building up that special magic found only in the better shows. Although the fact is not mentioned anywhere on the jacket of M-G-M's original cast recording, "Carnival" has an excellent head start because it is based on the story of the hit movie "Lili." (There's a switch.) Anna Maria Alberghetti portrays with radiant conviction the waif-with-big-hat made famous by Leslie Caron. Her singing, now that she has a part to play, is far more effective than it was in previous recorded efforts. It's certainly the most touching element in the little French circus depicted in the show. The highlights of the score are Lili's home-town memories in *Mira* as the show opens and her unaffected yet moving treatment of *Love Makes the World Go Round,* a theme that runs through the entire production. Outstanding also, are the three wonderfully zany ditties she sings with the puppets. Of these, the Spanish castanet number, *Yum, Ticky, Ticky, Tum, Tum* lasts for much too brief a time on the record.

As for the other members of the east, Kaye Ballard, last seen in "Golden Apple," has the leading comedy role as a magician's assistant. No recording can possibly do justice to the circumstances of Miss Ballard's big scene in the show. One of the more unorthodox opportunities for her specialized talents comes in her duet with Marco the Magnificent—delivered within the magician's box as he pierces it with swords.

The entertainment values of this album leave no room for question. Quite another matter is the lack of stereo in the particular stereo version of the recording I happened to obtain for review. My first reaction was understandable in this day of generally trouble-free stereo discs. When the record started, I found myself thinking that my pickup had suddenly lost all its above-average stereo separation. This had never happened to any of my cartridges yet there was the bulk of the signal all huddled at a point midway between the speakers. After checking out the cartridge and finding it up to par on normal stereo discs, I tried the rest of the bands on the record. Listening to one channel at a time and switching rapidly from one to the other, I was forced to conclude that the signals in each channel sounded virtually alike.

The tape version of this show (MGM STC-3946) has adequate spread of stereo and the lyrics are more easily understood. Unfortunately, the reel I received for review had instances of severe distortion in the sibilants.

La Dolce Vita (Original Sound Track Recording) **RCA Victor FSO-1**

I am not prepared to argue that the most talked-about Italian film in years has attained fame on the basis of its sound-track music. Federico Fellini's depiction of ultra-high living in modern Roman cafe society has already racked up enormous receipts prior to its American premiere. Since there is every indication that the film will be equally successful in this country, it is easy to see why RCA Victor decided to revive their international label in order to present this continental attraction in proper style.

Whatever impact this Nino Rota score has on records, it will register fully only with those who see the film. Tied together by a surprisingly bland theme that crops up throughout the picture, the musical background is a mixture of Italian and American idiom. Several of our tunes are twisted into new shape for use here, including a wry treatment of *Jingle Bells.* I haven't heard the mono version but the dubbed sound of the stereo disc is quite poor. But then, after you've spent umpteen millions on a movie, you've got to economize somewhere.

Mantovani: Song Hits from Theatreland
London ✪ LPM 70044

When this recording first appeared on disc some three years ago, Mantovani rooters were regaled with a group of some of the very best Broadway tunes. Top shows of the past two decades by Cole Porter, Rodgers and Hammerstein, Frank Loesser, Lerner and Loewe, and Irving Berlin were represented. The basic value of the collection and the recent vintage of London's sound made this one of the most attractive theatre packages ever turned out on the Mantovani assembly line. It's easy to see why UST selected this particular album for release on tape. Anyone in the process of building a tape library that calls for some show music with a high degree of polish will have to consider this item.

Les Elgart: Half Satin—Half Latin
Columbia ✪ CQ 362
Warren Covington: It Takes Two to Cha Cha **Decca ✪ ST7-8980**

The release of these two reels indicates that tape fans are still interested in the name value of a band even when shopping for a Latin beat. The orchestras on these tapes do not depend on Latin music to maintain a reputation with dancers. Yet the record companies seem to have discovered that an unknown band from South America with an impeccable beat is not as easy to sell in this country as our own name bands. Les Elgart, in the first of these reels, reworks several standard domestic tunes into a Latin format. His arrangements are pretty far out in relation to Covington's. It isn't every day that one hears a theme from the ballet "Slaughter on Tenth Avenue" in Latin tempo. Track two contains standard dance fare with pronounced exchanges between the saxes on the left and brasses on the right. Reverberation is a factor to be considered but a moderate amount of juggling of bass controls should bring it under control.

Warren Covington leads the Tommy Dorsey orchestra in a program made up of Latin tunes. Although the percentage of South American favorites is much higher than in the Elgart album, the band is not as smooth and there is more than a suspicion of groping for Latin style in some of the selections. Covington's sound is realistic and uncluttered but party throwers may wish to search further if they're looking for the real thing in Latin tempo.

Stan Freberg Presents the United States of America **Capitol W 1573**

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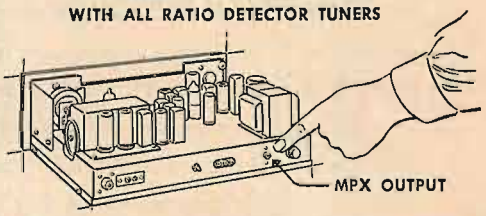

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has embarked on a lengthy and cool spoofing of the leading events in American history. Stan Freberg, who first won disc fame with his "St. George and the Dragonet", offers in this release the first volume of a projected four-album series for Capitol that should unnerve the sturdiest historian. A large cast of actors, singers and musicians falls in with the redoubtable Freberg in songs and sketches of a revue especially created for records.

The impetus for this project came from the CBS radio show Freberg did in 1957, a series still remembered for its sly reappraisal of Washington, Lincoln, Paul Revere, and General Custer. As usual, Stan is all over the place. Besides acting in the juiciest roles in the skits, he collaborated with Billy May in the music and Kenneth Sullet, a Los Angeles advertising man, in the concoction of the book and lyrics, This volume ("The Early Years") takes us from Columbus to the Battle of Yorktown. Some of the sharper barbs are encountered in Benjamin Franklin's reluctance to sign the Declaration of Independence and haggling by Washington over the price of a boat rental before braving the Delaware. Freberg fans are going to be very happy with this one. The stereo version gives the actors far more space for their tableaux but the comedy lines (punch and otherwise) are adequately served in the mono disc.

The Music of Frank Loesser
RCA Victor LSC 2486

Arthur Fiedler and the Boston Pops Orchestra take their turn in salutlng one of today's more individual-sounding tunesmiths. Some of these songs taken from five Loesser shows sound more inviting in the Pops treatment than they did in the original cast recordings. Stereo is not the only reason for this happy state of affairs. The size of the pit bands heard in the cast records does not approach the nearly hundred figure we take for granted in the Pops productions. Another significant difference is the acoustical setting. The cast of a show invariably assembles in a studio when recreating a stage performance. In this recording, as in most of the recent Pops sessions in Boston's Symphony Hall, the players are deployed on the flat floor of the auditorium. In this way, full advantage can be taken of the hall's unique acoustics.. Starting with the opening "Guys and Dolls" medley, there's no mistaking the fact that this is show music in a new dimension. Other Loesser shows covered are "Most Happy Fella", "Greenwillow", "Where's Charley?", and "Hans Christian Andersen". Jack Mason and Richard Hayman share the arranging honors.

The bright numbers tell us that the Pops group hasn't lost the supple rhythm that sets it apart from our other large orchestras. The musical instinct of Fiedler's Bostonians makes it easy to spot the areas where Frank Loesser has extended the boundaries of the American musical stage. A release such as this more than makes up for the dozens of records of indifferent character that try to enter the market each month.

Mort Sahl: The New Frontier
Reprise R 5002

Who says our politically-oriented comedians are unable to change with the times? Mort Sahl is introduced at the beginning of this recorded appearance at the "Hungry i" as America's youngest statesman among comedians. Sahl came to power, as he himself might put it, during an administration somewhat different from the one currently in Washington. Yet here he is in his latest release, lambasting the Democrats with the same ferocity he once used on the Republicans. The rapid-fire delivery hasn't changed as he disgresses from his own digressions, with the audience at his heels all the way. His comments are by no means limited to politics. Television, films, and air travel are still considered topics but the emphasis is on the foibles of the Kennedy administration. As Sahl is quick to point out in the course of his monologue, with a new "group" in Washington, his current barbs are finding favor with a new audience.

(*Continued on page 61*)

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MIDSUMMER MUSINGS

1. REMEMBER THE MAGAZINE?

"Your Favorite Music—Indoors or Out —Even In Your Car—At One Touch of a Button" . . . Take a good guess at what that could be. You'll probably come up with the right one. "Just *drop in the cartridge,* push one button, and enjoy one hour of continuous music," the ad continues. And in case you think that's all there is to it, there's this: "Choose from an extensive library of the world's finest music, classical and popular, all on compact Westrex Tape Cartridges." It costs $89.94 and you can get it at Macy's, battery-operated and portable. For $149.94 (call it $150) you can have AM-FM-Short Wave radio too. Quite a package. Just keep this in mind in case you think the issue of reeled tape vs. the tape magazine is settled for good. Not quite.

There's nary a word, at this early writing, from that other giant, CBS, concerning the famed tape cartridge—magazine —that appeared briefly last year in preview and was to be further developed before a potential launching on the market —if and when. But it was about now that it was due and possibly you'll know all about it by the time you read this. Could be. I have heard of at least one other tape magazine system under development, unlaunched as yet, and I suspect there are more of them hiding here and there in the commercial underbrush or the developmental underground. The magazine tape system is still obviously looking for a niche, big or little, in our music reproducing entertainment. Chances are it will find it.

I'll stick my neck 'way out at this stage and suggest that magazined tape is not going to *replace* anything. It won't replace the disc recording by any stretch of my imagination or yours. Not even via wafer-thin long-play midgets that change automatically on a tape player, just like discs —that's the CBS system.

And I very much doubt if any magazine development can stop the 4-track reel-to-reel tape business, either, at this late date. Tape of that sort, I'd say, has very nicely found its niche, worked out a going relationship with the larger disc field (offering the same stereo musical recordings, or some of them, in convenient sizes up to the "Twin-Pak" reels that contain music from two standard LP stereo records). The playing machines are now widely available and the newer ones, with stereo recording as well as playback, offer an added boost of versatility to the 4-track tape system.

Don't think that this versatility isn't going to be heightened by stereo on the air. That final link in the main stereo system should do wonders for the home tape business. What?—You think that maybe people will just record their stereo music off the air and refuse to buy tapes? No sir. I think it has already been made clear that already-recorded tape can live very nicely alongside of home-made tapes that are copied from other people's LP's or taken off the air. So can discs. What may seem to be a serious "leak" of musical material for free is actually not a serious problem.

The very fact that if you want you may get your music for nothing but tape cost via a considerable amount of home work and with many a doubt as to quality, timing for tape length, and editing—this potential bonanza seems merely to create new confidence in the tape user. Gives him the feeling he can do as he pleases in all sorts of ways. And he's ready to buy more recorded tape, strangely enough, because of that very confidence, that feeling that he doesn't have to if he doesn't want to.

The magazine, then, is going to have to fit in and around present facilities, which are *not* going to be pushed off the map. That's my guess. I suspect it was Columbia's too, when that company introduced its magazine system with such unusually careful reservations as to its ultimate exploitation, in contrast to RCA's joyfully jubilant all-out launching of *its* unhappy tape cartridge.

If I guess right, Columbia's planners have been doing very sober market research (while technical development of the new machine and its new tape continued) into every niche and cranny that seems likely to support coexistence.

That would also be the thinking behind the Westrex development, above. Note that the machine is deliberately launched in a very special and limited category, the miniature portable form, battery run. No home record players mentioned. No consoles, no hi fi attachments. Nothing bigger than half the size of the smallest disc *or* tape player now available. Where else, I ask, could a magazine tape player find so little competition in its way? No mention of stereo. I gather that Westrex isn't even going to try to buck that market—and probably with good sense, given a beach-style portable! After all, mono music still has a few common-sense advantages. After all, too, most of us are now reaching a common-sense feeling that you can't have stereo *everywhere,* all the time, and maybe it should be kept in its proper place, which is plenty good. Not in the beach portable, nor in the automobile, please.

Columbia's magazine does offer stereo; it has three tracks, in case there's a need. That third track could do all sorts of things over and aside from stereo. Synchronizing signals would go very nicely on it and—boom!—you have a whole galaxy of new uses built around home movies, slide projectors and so on. Also, mind you, a very impressive professional and technical potential quite aside from the entertainment market. No telling where there's an end to all this.

One-Niche

It seems to me, therefore, that the magazine tape promoter is likely to face a rather special sort of choice, when a decision is ripe, when it becomes necessary to decide how and when and where. It is mainly this: shall our magazine tape fill *one* niche and fill it well and calculatedly? Or shall we aim for many niches, each perhaps a specialty area, requiring special adaptation and/or special sales and distribution?

It's a tough sort of choice to make and any company with common sense in its management would prefer at least at the beginning to concentrate on one niche alone, or a few related niches, and push hard for a big place in the market. This could explain the Westrex deal very nicely. A special niche has been chosen, cannily. Just one—portable music, miniaturized. If there are others, Macy's isn't telling Gimbel's, nor you and me.

The trouble with any special niche is that it is likely to have inherent limitations as to sales volume. Maybe not for a smaller or middle-sized outfit. But when a big operator like CBS gets into something, it must *sell,* astronomically, or fail. Something tells me that CBS would not be willing to subsist on beach portables alone, as a vehicle for a Columbia tape magazine. It has to be bigger—much bigger.

But if the magazine, as is now clear, is unlikely to push the existing systems off the market, if coexistence is going to be the rule, then there seems to be only one possible answer—the multi-niche answer. And that is a very problematical one at best, full of dangers for anybody.

Multi-Niche

The multi-niche approach involves what I might call fluid assets—not financial ones but technical. What I mean is economical interchangeability, the same mechanism for all the niches with as small a variation as can be managed.

Just make the one device, in the millions, load it up and fire it off in many directions at once, in the thousands niche by niche. Scatter your fire, but aim carefully, choose hittable targets.

This, you see, could explain Columbia's cagey close-to-the-chest game during these last months since the existence of the CBS basic development was revealed. They had the central device, all right. (And they wanted us to know it, to give RCA's more conventional cartridge a needed *coup-de-grace;* or so I've figured for myself.) But they were not at all sure yet what ought to be done with it. They merely had plans —many plans, many possible lines of development. Rumor said, for instance, that CBS has been tinkering with a 15/16-ips speed, to take advantage of the relatively improved performance-versus-speed that is inherent in the new tape and small-gap heads. Now what would *that* be for? Not for music, I'll wager. Might be used for all sorts of things, with the sky the limit. Compact information filing. Dictation. Talking books—hours of speech on each wafer-sized magazine plus automatic changing of a stack of them.

Yes, the potential niches for the CBS basic tape magazine, in conjunction with the 3M organization at the tape end, are really staggeringly plentiful. In fact it is conceivable that the propagation of recorded music might never show up at all, or turn up as a relatively minor side-operation. But this last seems to me unlikely, because a company as big as CBS just doesn't launch a "minor" operation in the

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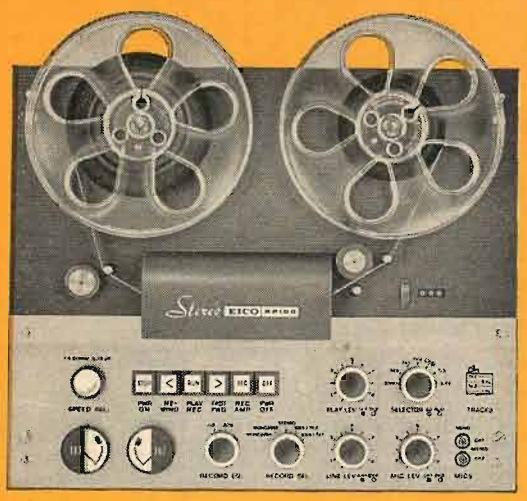

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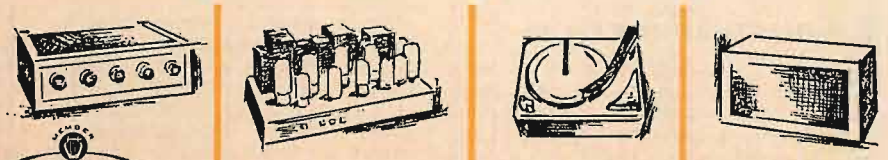

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area of recordings. It must be adequately big to advertise via the Columbia label, (and with sizeable hunks of the Columbia music catalogue available, remember), or it won't appear at all. I have rows of RCA magazine tapes out of the RCA Victor catalogue, and the boxes even have the same cover art as the corresponding disc release. (Well, I have one row, anyway. A good many of the boxes you saw on display at the hi fi shows a couple of years ago were necessarily dummies—indicating how far a big company must go to make its operation look "big" from the outset.)

Let The Cat Out

So there you have my picture, which might just possibly be *the* picture. One-niche magazined tape from Westrex and Macy's. Multi-niche magazined tape evolving—who knows where?—at Columbia.

It would be funny if CBS finally went one-niche and, say, came out with the Columbia Office Dictator, the littlest dictator of them all. Or the Columbia Audible Memo, the home filing system to end all filing systems. Or the CBS Tape Memory, perfect for small businesses. Or the World Library of Great Literature. Or the CBS-Berlitz Portable Linguaphone—carry it in your purse. Let *it* do the talking for you. Plug-in cartridges to fit all travel situations. Good niches.

But I think I have a bigger and better niche than any of these. This one would be called the Columbia Automatic Household Programmer. Wow! What an idea! (And there goes another fortune down the drain for me.)

All you'd do would be to plug in your pre-set tape magazine and the day would take care of itself, fully automated. The roast would cook, the baby's bath would fill up and drain, the washing machine would go on (and turn itself off, of course).

Set your radio for a CBS-automated wake-up alarm and for CBS go-to-sleep music; turn up the furnace in the morning, turn off the porch light at midnight. Catch those weekly TV programs on the dot, automatically. Start the hi fi at cocktail time.

You could even program a set of audible reminder-signals, at suitable moments during your busy day. Can't you hear your own voice, around 8:15 a.m. on a Monday morning, saying "Time to go, boy—eight minutes to make the bus." Or "Don't forget the hair-dresser." Or "Today is dentist day—remember?" (This would be the Automatic Memo feature).

You might even arrange to let the cat out at eleven o'clock, via one of those cat doors people have. You wouldn't need to wind him.

Oh yes—the pay-off. Naturally, no two days are just alike. So the CBS Automatic Household Programmer would come with a cartridge for each day of the week, plus spares for holidays and emergencies. Then all you'd have to remember would be not to plug in the Thursday cartridge on Wednesday.

I guess what you'd really need, come to think of it, would be a cartridge programmer to program the cartridge. An Automated Calendar. That's *my* last word.

2. MINIATURE DREAM-FI

Now wait a minute. Maybe we *could* have stereo at the beach. I shouldn't have talked so fast against it. In fact, as I muse along, I can think of a neat system to satisfy my beach leanings and for general picnic siestas and campside musicales of a starry night. I don't mean the standard "stereo" gadgetry already on the market. I mean something that would produce the "Sound of Music," reasonably complete down to the musical bottom and undistorted up to the top. I guess it takes the summer doldrums to make me think like this, but . . .

Well, I hate to prod KLH again, but there is your nucleus-prototype for my system, in the shoe-box Model Eight speaker. By all means, let's have one from somebody else, too. I mean a quality speaker system that squeezes a maximum of good sound into an arbitrary minimum of space, via maximum-throw small speakers and probably with the aid of a specially-curved amplifier output.

I don't mean anything "Ultimate"—but I do mean the very best in sound that is now possible under these circumstances. Bass, more or less flat, down, say, to 100 cycles of fundamental. (A wild guess, but this would do nicely.) Top tailored to fit (a slight droop), but clean all the way out. Acoustic output big enough to fill up a small room loudly and to be heard in the unreflected Great Outdoors—that means a lot of acoustical wallop. KLH has it already.

My beach stereo would need two such speakers and it's obvious that the power amplifiers should be built right into the case, transistorized, minus heavyweight output transformers. (*Definitely* not with lightweight ones!). If you can get an amplifier into the arm of a pair of hearing-aid spectacles, then you can put a bigger one with more transistor power into a shoe-box speaker. With batteries—of course. Alternative line-voltage plug would be desirable, as always in such portable transistorized equipment, though maybe not too necessary if the current drain is low enough.

Then we'll want one of those battery record player gadgets, one that runs well and folds up well too. It'll play 33 rpm's only. It'll take a 12-inch LP, somehow or other. That's not so easy to manage, I'll admit, but it is essential. For the seven-inch type of music, we can now count on the "compact 33" platters.

Guess the tone arm would have to be foldable too. Why not? It ought to be featherweight, anyhow, and you could fold it on itself with the cartridge inside and thus protect the stylus in transit. The whole player would, in my way of seeing things, fold slimly into a small handbag.

Of course there would have to be a preamp, unless your music is to come from a ceramic stereo cartridge. I'd be inclined to go along with the better ceramics now available, though you could build in a stereo preamp if you really had to. However, I suspect that if it were small enough and transistorized, the noise problem might be so serious as to overshadow any quality advantage of the magnetic cartridge. (Noise in a preamp is of course enormously harder to control than in a power amplifier such as those built into my hypothetical speaker boxes.)

Radio? Well, I'd be inclined to leave this to the portables already available, but by all means I would suggest a pair of inputs on our little system to take a radio signal in stereo or mono. Let's not limit ourselves unduly. Many of the better miniature radios now have provision for an output to external amplifier-speaker systems, or might be jiggered a bit, with care, to do so. You'd have to bypass the built-in power amplifier on many models, of course, unless you power your little external speakers directly out of the radio amplifier, for so-so sound by any stretch of the imagination. We're talking big, remember. Big in a relative sense.

(*Continued on page 51*)

THE RECORDING THAT WASN'T

... It's happened to lots of magnetic tape users

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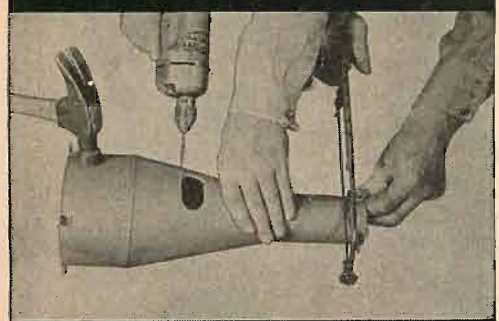
For safe, distortion-free storage of large quantities of vital magnetic tapes. Designed for Military Establishments, Radio & TV Broadcasters, Automated Plants, Libraries, Laboratories, Gov't. Agencies, etc.



Composite photo demonstrating that magnetic shielding qualities of NETIC alloy material are not affected by vibration, shock (including dropping) etc. Furthermore, NETIC does not retain residual magnetism nor require periodic annealing.

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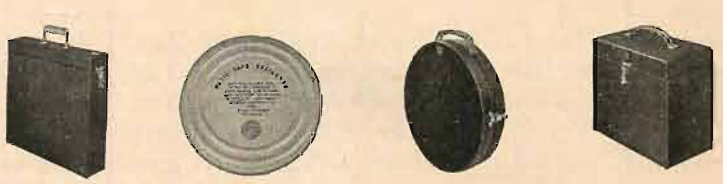

For complete, distortion-free protection of valuable tapes during transportation or storage. Single or multiple containers available in many convenient sizes or shapes.

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EDITOR'S REVIEW

AUGUST AND THE AUDIO GUIDE

MOST READERS are familiar with the traditional August issue of Audio which features a complete buyers' guide to the high fidelity equipment which will be on the dealers' shelves during the fall and, presumbaly, for the coming year. This particular issue is printed in much greater volume than the average and will be continuously available throughout the entire year, and it is one which is treasured by the enthusiastic audiofan during its entire season, even though he knows that he can get another at any of the high fidelity shows for a year after its original issue. However, since we have had the "something new has been added" ingredient in the past two issues and will continue to have more in the August issue—and that something new is, of course, FM stereo—we have decided to reprint all of the FM stereo articles in the form of a book which will be available September First. And to make the book more valuable to every audiofan in the country, we will include the buying guide section of the August issue in its entirety so you can pore over these pages without wearing out the regular issue of the magazine. In those instances where you are called upon to loan the buyers' guide issue to some friend, you can offer him the book and not disrupt your complete file of the magazine.

We feel that our coverage of FM stereo in the June issue was just about as complete as could have been accomplished in the time between the F.C.C. announcement and the deadline for closing the issue. And just in case anyone wonders, let it be said here and now that no one—to the best of our knowledge—knew in advance either when the decision would be handed down or what it would be, although some of the better informed radio engineers in Washington offered some educated guesses—which is engineerese for estimate—as early as the February hi-fi show there. While it is not often that a monthly magazine gets the opportunity to act like a daily newspaper and create a scoop, that is just exactly what we did in our June issue (if we may be permitted a small amount of "horn blowing" on our own behalf). While the magazine actually went to press on the 15th of May, its usual deadline, the Csicsatka-Linz article reached our office on the 11th, and Mr. Saslaw's comprehensive recapitulation of the entire FM stereo picture was completed around noon of the 12th, we were able to bring our readers some technical information about a subject over which they had been speculating for over a year.

We feel sure that the average reader—and, in fact, most audiofans—will want to retain this information indefinitely. We know that it is accurate (except for a minor error in one of the drawings in Mr. von Recklinghausen's article, as pointed out in a letter on page 6, and which will be corrected in the 1961–62 AUDIO GUIDE), and we feel that this material may well be considered a primer in the whole art of FM stereo. The material in this issue, and that to follow in the August issue will all be included in the book, making it a real reference on the entire subject.

The book will be announced commercially—that is, with a coupon inviting readers to forward a dollar each for their individual copies—in the August issue. But, in the meantime, just remember that if you may have loaned the June issue to one of your friends permanently, all is not lost—you will still be able to have the information for your permanent files. So be one of the first to order a copy—better still, order ten copies in case you have ten friends whose book-borrowing propensities exceed their book-returning ones.

TAPE RECORDER SURVEY

It is not often that we ask a favor of our readers, since we feel that the normal correspondence keeps us in touch with their likes and dislikes, but this month we are making an exception to the rule. The Reader Service Card, which usually appears following the last page of the inside section and just before the third cover, normally contains a "bingo" card (which has lots of numbers and offers readers the opportunity of acquiring further information about our advertisers' products and about equipment profiled or described as a new product without any more effort than circling a few numbers, adding your name and address, cutting out the card and dropping it into the mailbox, and which normally contains also a subscription card for the benefit of those newsstand buyers who have decided that it is easier to get AUDIO in their own mailboxes than on the stands, is changed for this month only. Instead of the subscription card there is a questionnaire about tape recorders on which we seek to determine readers' preferences for the characteristics of machines as well as an inquiry into the characteristics of the machines they now own. Since we have not asked anyone to sign his name or give his address, it is obvious that we have no ulterior motive like getting names onto a mailing list. We just want to know. And we are willing—even anxious—to pay the four cents just to get your cards back with the appropriate boxes checked. If every one of these cards were to be returned we would even be happy, because it is the experience of surveys of this type that a ten per cent return is high, four per cent about average. However, we believe that our readers are of higher caliber than those of most magazines, and consequently we expect about twenty five per cent. Incidentally, the bingo card is still there, and the subscription card will be back in August, but for this month we have a special request to make.

And anyway you look at it, the magazine *does* lie open better after you cut out the cards and return them—and furthermore, that's what they are there for—and another thing, this month's card is different.

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Only the Stanton Fluxvalve can provide the exclusive and patented features which make it the finest pickup available.

The significance of a document . . . a LETTERS PATENT conferring *exclusive* rights and privileges on an individual to manufacture and vend an invention both *new* and *useful* . . . further signifies a most important responsibility upon that individual.

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WE urge you to go to your dealer for a 380 FLUXVALVE DEMONSTRATION— we know you will find its quality of performance almost beyond belief.

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The Stanton Fluxvalve and Stereo Fluxvalve are patented (and patents are pending) in the United States, Great Britain, Canada, Japan and other countries throughout the world.

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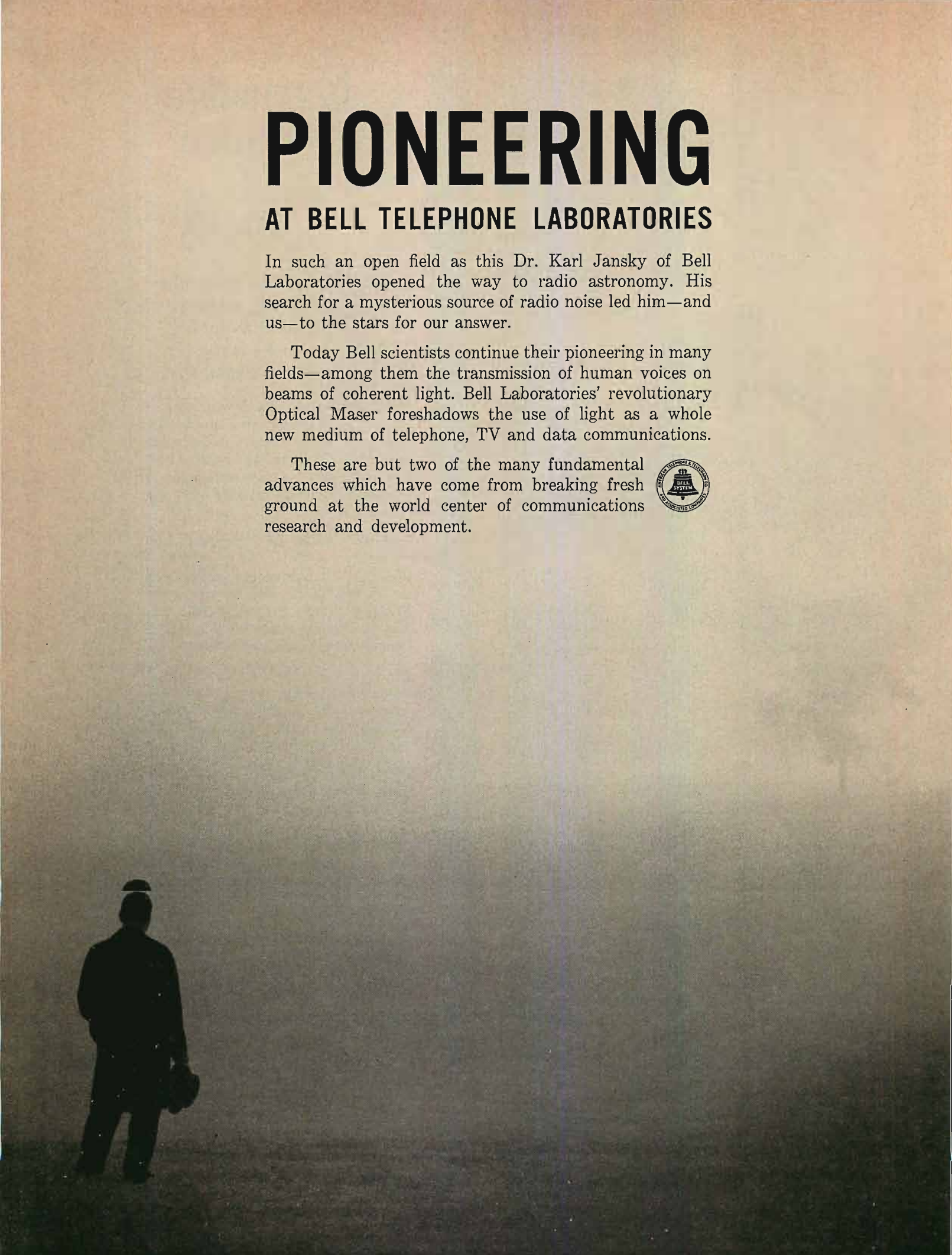
In such an open field as this Dr. Karl Jansky of Bell Laboratories opened the way to radio astronomy. His search for a mysterious source of radio noise led him—and us—to the stars for our answer.

Today Bell scientists continue their pioneering in many fields—among them the transmission of human voices on beams of coherent light. Bell Laboratories' revolutionary Optical Maser foreshadows the use of light as a whole new medium of telephone, TV and data communications.

These are but two of the many fundamental advances which have come from breaking fresh ground at the world center of communications research and development.



The Line Radiator

R. J. PAWLOWSKI*

The line radiator provides limited vertical distribution of sound thus reducing acoustical feedback in theatres and other places where live performances are addressed to a live audience. The result is enhanced realism.

SOUND REENFORCEMENT, particularly where speakers and microphones are used in close proximity, presents a difficult problem for the sound engineer. The purpose of this article is to convey information obtained from research and development of a new concept in public-address speakers designed specifically to reduce the feedback problem as well as to provide the realism of a live source.

The prime purpose of a sound system is, of course, to provide those in the audience with the illusion that no such system exists—that all sound they hear is reaching them direct from its original source.

Providing this illusion can be difficult and costly. However, new techniques discovered during the development of the line radiator loudspeakers can greatly simplify the most difficult problems and provide fine quality sound coverage at a modest cost. Further, these small, compact loudspeakers ease mounting problems for any installation.

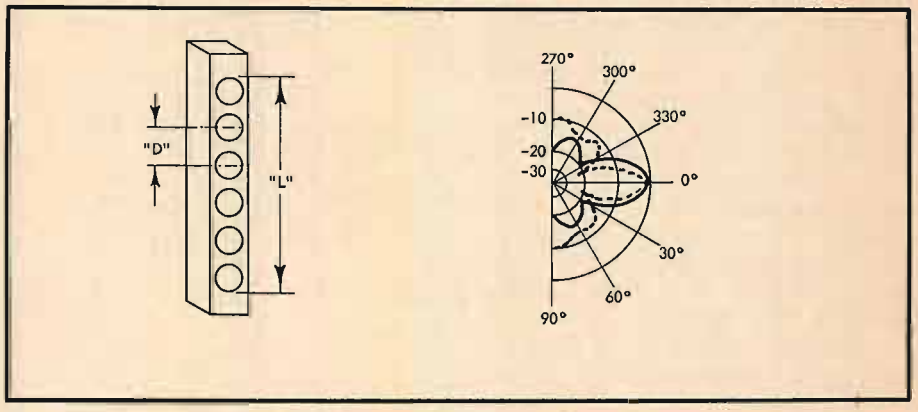


Fig. 2. Geometry of column loudspeaker: (A) "D" = distance between speakers, "L" = effective column length; (B) Vertical polar distribution with dotted line curve indicating result of increasing "D".

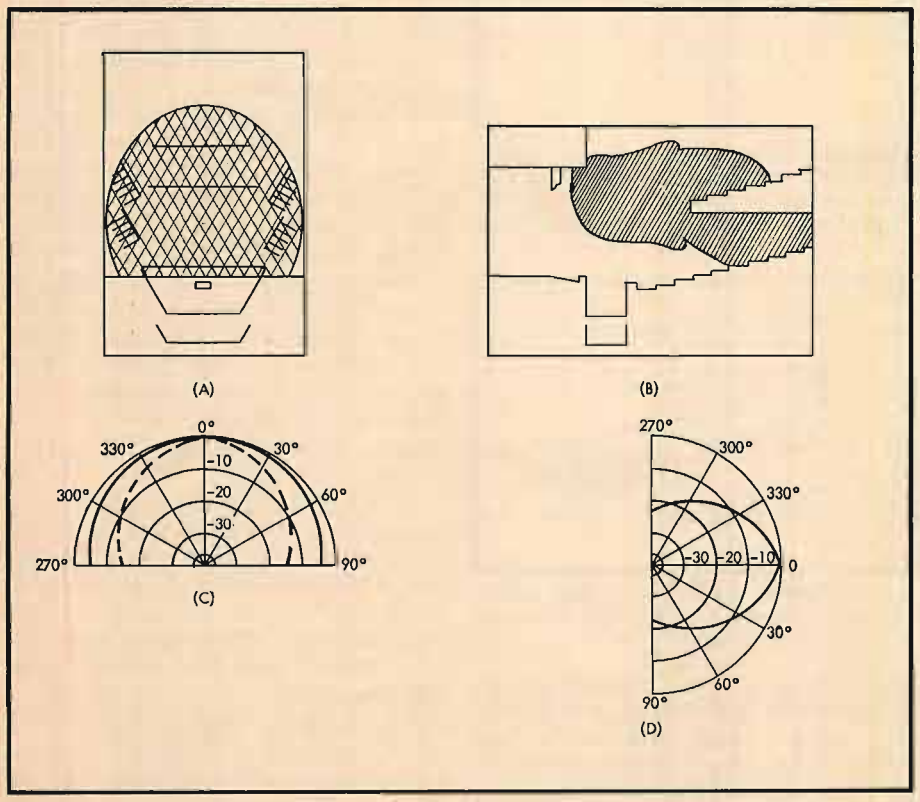


Fig. 1. Sound distribution of column loudspeakers in typical theatre: (A) Floor plan with dark area indicating horizontal coverage at 5000 cps; (B) Elevation with dark area indicating vertical coverage; (C) Horizontal polar distribution (——500 cps, ------5000 cps); (D) Vertical polar distribution (——500 cps, ------1500 cps).

The information presented below is the result of over one year of research, both in the laboratory and in field testing to confirm the theory which evolved as work proceeded.

Acoustic Feedback

Acoustic feedback is a major problem when performers are working at great distances from the microphones. Poor acoustic properties in large rooms such as theatres, amphitheatres, gymnasiums, and churches are among the many conditions that cause or add to acoustical feedback. By a brief discussion of existing installations, we will illustrate the reasons behind the development of these new loudspeakers.

One of the most common methods of installation is to strategically locate a number of cone or horn-type loudspeakers throughout the area to be covered. There are several disadvantages to this type of installation. Sound which is projected from the ceiling or from the side walls causes fatigue and is distracting because the eyes focus on one point while the ears attempt to focus on another. In large areas time delay causes phase distortion and becomes a problem which

* *Engineer, Electro-Voice, Inc., Buchanan, Mich.*

is difficult to correct. Installations in which the microphones are required to pick up voices at distances of ten or fifteen feet completely rule out this speaker arrangement.

A second common type of installation utilizes horn-type loudspeakers with wide-range response, placed in the vicinity of the stage, platform, or pulpit. The loudspeaker widely used in this type of installation is the multicellular horn which is usually located in the proscenium arch. The greatest advantage of this arrangement is the effect of realism. This is an important point, for nothing is more pleasing than attending a theatre where all the sound appears to come from the actual source of the sound. The great disadvantage, however, is that acoustic feedback between speaker and microphone limits working distance to the microphone. Because of this, satisfactory coverage of a stage is often limited or impossible.

The acoustic properties of the room are also a controlling factor. Where acoustics are poor, the combination of reflected and direct sound will cause feedback. With the use of directional microphones, feedback can be controlled. However, where microphone working distance is ten feet or more, this arrangement will not be satisfactory.

The third type of speaker system which is relatively new in this country but which has been used widely in Europe for many years, is known as the columnar loudspeaker. This loudspeaker assembly consists of a number of cone type loudspeakers stacked vertically, one above the other, in a long narrow cabinet. In fact, some column installations exist where a cabinet is not used, and the loudspeakers are oriented somewhat as the stripes on a barber pole. This is required to obtain wider spread of the high frequencies. Because such installations are both unique and of questionable value, we will limit our discussion able value, we will limit our discussion to speakers stacked vertically in a cabinet and facing in one direction.

The characteristics that make columns advantageous are efficiency that approaches that of a horn loudspeaker, enhanced horizontal distribution, and narrow vertical distribution. (About 30 deg. is normal.) Vertical distribution will vary with column length; the longer the column, the more narrow the vertical distribution. However, this can be overdone, and the speaker tends to become too directional to provide full audience coverage.

Columnar speakers properly installed near the source of sound, at the stage or pulpit, provide the advantage of realism. The quality of the reproduced sound can be far superior to that of public-address loudspeakers of approximately the same size and cost.

The inherent disadvantage of the column is the presence of lobes in the vertical plane of distribution caused by characteristics of the column itself. This is a major cause of acoustic feedback.

Before discussing these loudspeakers further, we shall briefly review the polar distribution patterns involved. (A) and (B) in *Fig.* 1 illustrates a typical floor plan and elevation of a theatre. (C)

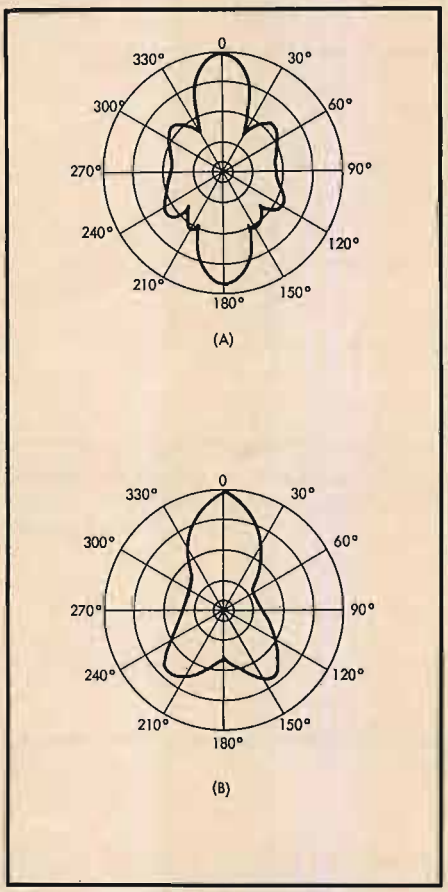


Fig. 3. Vertical polar distribution at frequencies above 4 wavelengths of: (A) Typical column speaker; (B) Straight line radiator.

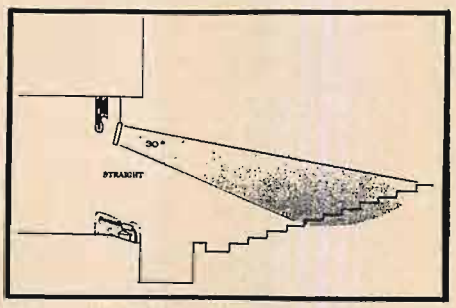


Fig. 4. Theatre installation of line radiator with microphone in low intensity area.

and (D) in *Fig.* 1 are the polar patterns of horizontal and vertical distribution of a typical column loudspeaker. Zero db is the reference level determined by the sensitivity rating of the loudspeaker. This information is extremely important to the sound system engineer.

Examination of (C) in *Fig.* 1 reveals that at a frequency of 5000 cps, the angle of coverage is much smaller than at 500 cps. The energy at 90 and 270 deg. is 5 db lower at 500 cps and 15 db lower at 5000 cps in reference to the energy directly in front of the loudspeaker. This fact is contrary to much published information on column loudspeakers, but it is easily proved in the laboratory or on an actual installation. This point is extremely important; a columnar loudspeaker does not have low intensity areas at 90 or 270 deg. in its horizontal plane of distribution *at any frequency.*

The polar distribution in the vertical plane [(D) *Fig.* 1] is completely different from that of other loudspeakers since the output tends to beam. This is caused by the characteristics of loudspeakers mounted in a line.[1] The curves shown in *Fig.* 1 through 6 are not theoretical, but are those actually measured in an anechoic sound chamber in the Electro-Voice laboratory.

Extensive research into the action of columnar speakers disclosed the two characteristics most important to proper design which are the length of the line and the distance of separation between the speakers. As D increases, (A) *Fig.* 2, a point is reached where the column ceases to act as a line source and becomes a series of point sources. This introduces lobes at 90 and 270 deg. with intensities almost equal to that at 0 deg. [See (B) *Fig.* 2.] The horizontal distribution pattern is essentially unchanged.

Since the main purpose of these systems is to suppress feedback, investigations were made to determine the maximum distance possible between speakers which would allow them to operate as a line source in the desired frequency range. The information gained in this research made possible the development of a series of improved columnar speakers which operate as a true line source.

The line source has one undesirable characteristic which must be eliminated to make it best serve our purpose. When to make it best serve our purpose. When the length of the line source is four wavelengths or more compared to the frequency reproduced, lobes again become a problem as shown in (A) of *Fig.* 3.

To eliminate these lobes, a filter[2] was designed to roll off the output of groups of speakers at the extremities of the column at predetermined frequencies, which effectively shortens the length of the line source. In essence, the speaker has an acoustical length that varies inversely with frequency.

The advantage of this design is shown in (B) of *Fig.* 3. In this example the line source is one wavelength long at 230 cps. The line is four wavelengths long at 920 cps. (Wavelength is inversely

[1] Wolff & Malter, *IRE Journal*, 1930; p. 209.

[2] Electro-Voice Patents Pending

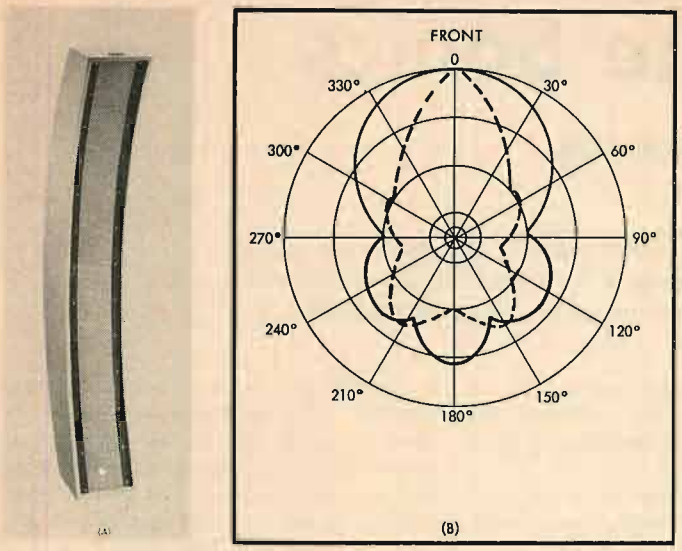


Fig. 5. (A) Electro-Voice curved line radiator; (B) Vertical polar distribution of curved line radiator (——) as compared to straight line radiator (------).

proportional to frequency.) The filter is designed to cut off half the speakers at the frequency corresponding to four wavelengths of the line. The line now appears two wavelengths long at this frequency, and the vertical distribution pattern will become essentially a two wavelength pattern.

In conjunction with suppressing the lobes, an area of low intensity occurs at 90 and 270 deg. This is a great advantage, since the microphones will normally be placed in this area, and feedback caused by direct sound is substantially reduced. This allows more satisfactory coverage of the area in which the loudspeaker is used.

The correct installation of a system utilizing straight line loudspeakers and microphones in close proximity is shown in *Fig.* 4. This was determined both by theory and practical installations made in theatres, churches, gymnasiums and auditoriums. One particular test was made to compare a line radiator with and without a filter. The loudspeaker was mounted as shown in *Fig.* 4 and the line radiator was placed at twenty feet above the microphone. The filter in the line radiator was switched in and out of the circuit. Levels were adjusted to a point just under the feedback threshold and a person standing fifteen feet from the microphone spoke at a conversational level. The output obtained with filter was noticeably greater. This conclusively confirmed the laboratory findings.

Previously, it was stated that narrow vertical distribution could be a disadvantage. This was found to be true of one particular theatre used for field test work. Four straight line radiators were needed for adequate coverage. Two were directed under the balcony and two into the balcony. As can be seen, straight line radiators must be mounted low, and they do have the disadvantage of losing sound level because of absorption by the audience. This reduces available level in the extreme rear of the room involved.

Since the verticle distribution of sound provided by the straight line radiator (or a conventional columnar speaker) is quite restricted, more than one column will be required to cover a large theatre, church or any long room. This is brought about both from the standpoint of power requirements and the fact that the speaker assemblies must be positioned at various angles to adequately cover the audience. These problems can be greately reduced through the use of a curved line radiator.

The Curved Line Radiation

The curved line radiator[3] was developed to simplify sound installation and increase realism of the performance. One loudspeaker if this type will replace two or more straight line radiators, yet maintain the advantages mentioned above. Maintenance of the low intensity area in the vertical pattern of the straight line radiator is the principal factor in the control of acoustic feedback. This characteristic is maintained even though the vertical angle of coverage is increased. To accomplish this, the line radiator was formed into a concave curve as shown in (A) of *Fig.* 5.

In this configuration, the radius of the curvature is critical as is the distance between the speakers within the line. Polar distribution in the horizontal plane is essentially the same as the straight line radiator. The polar distribution in the vertical plane, however, is quite different as shown in (B) of *Fig.* 5. The angle of spread is at least twice that of the straight line. Sound intensity at 90 and 270 deg. is still quite low when compared to intensities within the angle of distribution. An even more important characteristic is that the lobe characteristic of the conventional columnar speaker is entirely eliminated.

The advantage of the curved line radiator can be seen in *Fig.* 6. Its placement is now higher than that permitted by the straight-line type. When mounting in this manner, two factors become important: (1) The distance from the speaker to the microphone is increased. This added distance along with low vertical intensity becomes more effective in controlling feedback. (2) The added height directs the sound to the entire audience without loss due to absorbtion.

Tests made in one large theatre resulted in placement of two curved-line radiators on the proscenium arch. The center of the loudspeakers, directed at the first balcony, covered the entire theatre with excellent sound reenforcement. Two curved-line radiators were used in place of the four straight line radiators. Five microphones were used in the footlights of the stage. Stage coverage was excellent to its full depth, a distance of 30 feet from the microphones. With the arrangement shown in *Fig.* 6, every seat was the "best seat in the house."

Conclusion

The "line radiator" is a sophisticated and improved sound column which is an invaluable tool for the sound technician which will provide excellent sound if the following points are kept in mind during installation:

1. To obtain the best possible performance from the system, the microphone(s) must be located in low intensity areas of the line radiator polar distribution pattern.
2. The straight-line and curved-line units must be mounted differently to obtain maximum coverage.
3. Movement of the line source vertically causes little change in direction of sound, while a small horizontal movement is very noticeable.
4. The polar distribution of line radiators tends to beam the sound vertically, but have side coverage horizontally. They are not "dead" off the sides and must *not* be mounted in the same horizontal plane as the microphone.

If these points are followed, installations which have given borderline results and those which have been considered impossible may now give excellent results with a minimum of cost, time, and labor. Æ

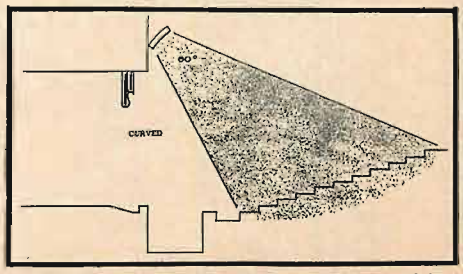


Fig. 6. Vertical distribution of curved line radiator in theatre.

[3] Electro-Voice Patents Pending

Sub-Marine Sonics

VICTOR BROCINER*

A speaker with a 2-in. diaphragm, underwater, can produce sound equal in quality to a good 12-in. speaker in free air. The reason for this is the much higher acoustic resistance of water as compared with air.

IN THIS AGE of background music, hi-fi, stereo, audio-visual teaching, and aural work instructions, we are literally surrounded by sound. And we think of this sound almost exclusively as vibrations of *air*. Let anyone mention underwater sound, and most people's thoughts turn to sonar, to sonic depth finders, and the like. It may come as a surprise that a field of application has been steadily developing for underwater reproduction of voice and music.

Formation swimming and underwater ballets are performed to music. The music the audience hears cannot penetrate the water at all, and is unheard by the performers. Special means must be provided to enable them to hear the music to which they must keep time. As an example of the extent to which one application has been standarized, the Synchronized Swimming Rules of the American Athletic Union of the U. S. specifically state: "The organization holding the competition is responsible for—providing an underwater speaker."

Similarly, skin divers are cut off from communication with the rest of the world, except through visual signals and such crude sonic means as tapping metallic objects together. This makes instruction particularly difficult and impedes efforts at group action. Here, again, underwater sound restores the vital missing link of aural transmission of intelligence.

With the current increase in outdoor living and the accompanying popularity of swimming pools, there is also widespread use of "patio" speakers—weatherproof speakers to bring outdoors hi-fi music and other program material. Among these who like to take music with them are swimmers. Normally, a cool-plunge into the depths of a pool brings virtual silence except for the swirl and bubbling of the water. But today one's reaction need no longer be "Who turned off the music?" Music in the water is becoming almost as common as music in the air.

Now let us take a look at the underlying theory of sound reproduction in water.

* *Manager of Engineering, University Loudspeakers, White Plains, N. Y.*

Sound in Water

To transmit sound, a medium must have the following attributes:

1. Mass
2. Elasticity
3. Low internal friction or viscosity

A comparison of water with air in respect to these properties is interesting. Water has a density 780 times that of air. Water decreases in volume one part in 20,000 per atmosphere of external pressure. Air decreases in volume by one-half when the normal pressure is increased by one atmosphere. The velocity of sound is determined by these two factors. In air it is 344 meters per second. In water, it is 1440 meters per second, or 4.2 times as great.

Considering the wide differences in these properties between the two media, it is not surprising to find that they also differ in their specific acoustic resistance, in the ratio of 3300 to 1. This is derived from the data already given, since, for plane waves, specific acoustic resistance:

$$R_A = \rho c \qquad Eq.\ (1)$$

where ρ = density
and c = speed of sound

Hence:

$$\frac{R_A\ water}{R_A\ air} = 780 \times 4.2 = 3300 \qquad Eq.\ (2)$$

It will be recalled that specific acoustic resistance, multiplied by the area of a vibrating surface is the mechanical resistance, R_{MA}, which is a measure of the power transferred to the medium for a given velocity v.

$$P_A = R_{MA} \cdot v^2 \qquad Eq.\ (3)$$

Radiating surfaces whose dimensions are large compared to a wavelength produce plane waves, and the power radiated is easily calculated from *Eq.* (3). ated is easily calculated from *Eq.* (3). As the source decreases in size, the wave tends to become spherical; as a result of its divergence, the value of R_{MA} decreases as the square of the frequency (inversely as the square of the wavelength), for radiation from a piston in an infinite baffle. The variation of R_A with frequency is shown in *Fig.* 1 for both air and water.

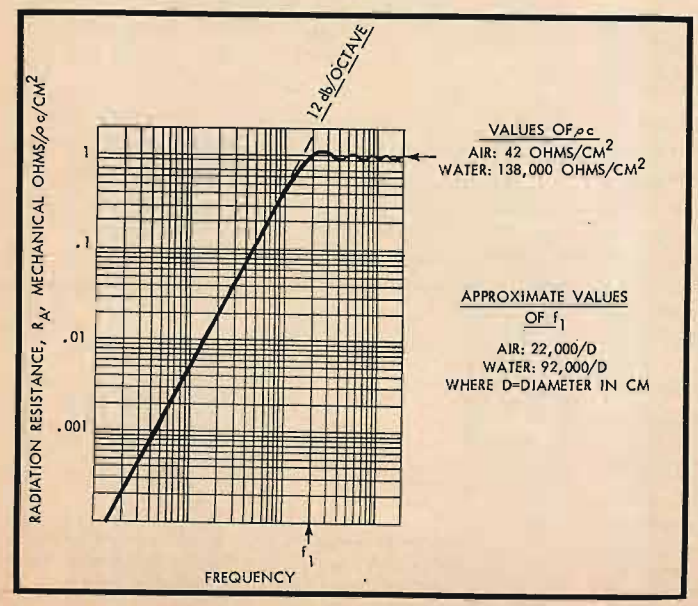


Fig. 1. Variation of acoustic resistance with frequency for both air and water.

Calculations on Underwater Speakers

Since the value of R_A is so large, compared to air, it should be possible to use a fairly small radiating area in an underwater speaker. For a 2-inch (5-cm) diaphragm, the transition point, f_1, or the "bend" in the radiation resistance curve, occurs at 18,600 cps. This means that, over the useful range, operation will take place on the sloping portion of the curve. This means that the speaker must be mass-controlled, that is, resonance

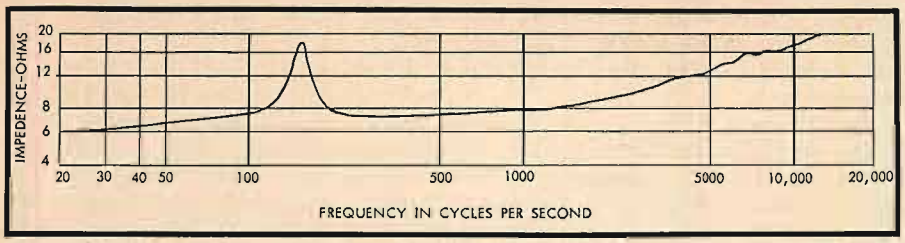


Fig. 2. The high value of the mass load pushes the primary resonance down to 155 cps.

must occur at the lower end of the frequency range.

Practical considerations dictate that the speaker be enclosed in a compact housing. Consequently, it will radiate into a full sphere—4π steradians. For full spherical radiation:

$$R_{MA} = \frac{\pi \omega_2 \rho D^4}{4c} \qquad Eq.\ (4)$$

where $\omega = 2\pi f$

ρ = density of water
D = diameter of piston
c = speed of sound in water

This equation of the straight, sloping portion of the curve in *Fig.* 1.

In simplified form:

$$R_{MA} = 2.15\ f^2\ D^4 \times 10^{-4} \qquad Eq.\ (5)$$

For a 2-in. (5-cm) diameter diaphragm at 1000 cps

$$R_{MA} = 13{,}450\ mechanical\ ohms$$

In air, the same piston would have a radiation resistance of only 88 ohms at 1000 cps. The comparison would lead one to think that a great deal more efficiency could be obtained in water than in air. There is, of course, a difficulty.

In either medium, a certain mass of the medium itself moves as if it were attached to the diaphragm. This "mass load" creates a mismatch of impedances between the piston and the medium. In water, as can readily be believed, the mass load is very great. Quantitatively:

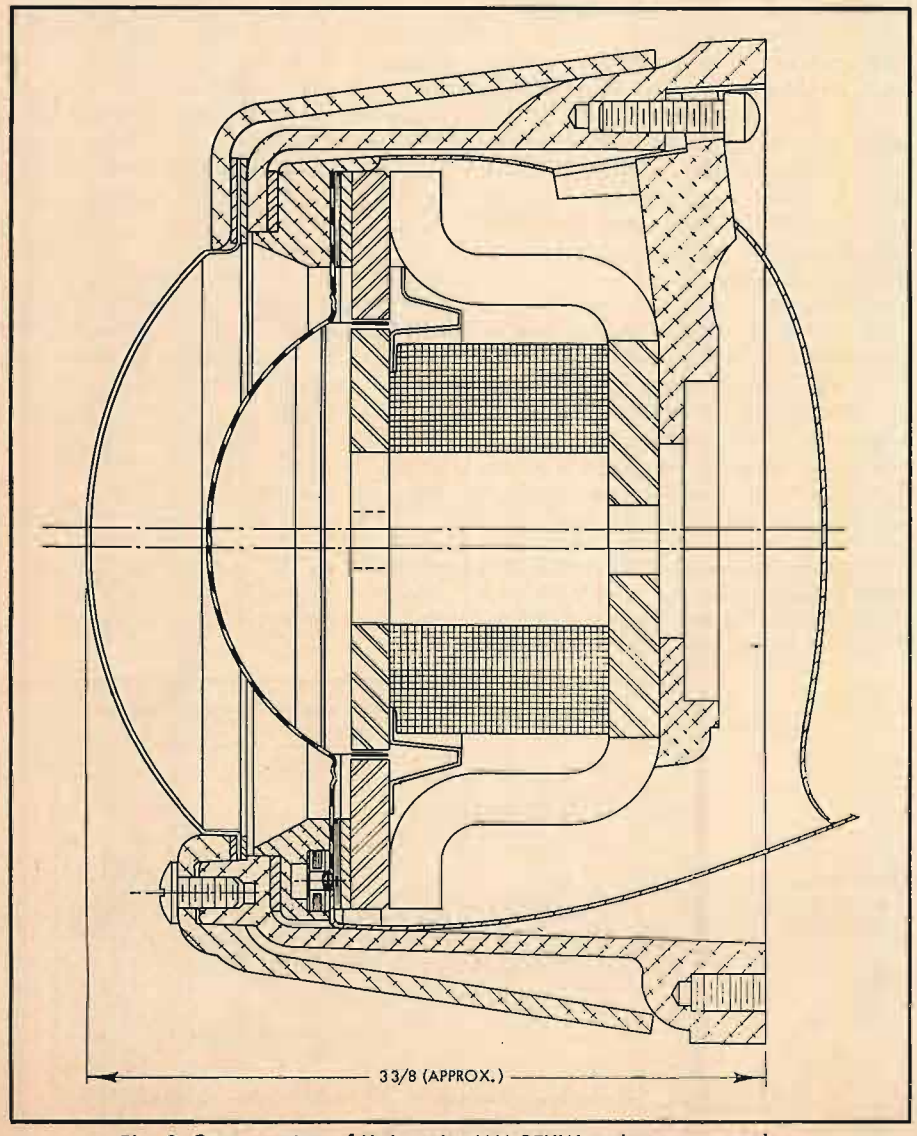


Fig. 3. Cross section of University MM-2FUW underwater speaker.

$$M_A = \frac{D^3}{3} \qquad Eq.\ (6)$$

where D = diameter of the diaphragm, in cm
M_A = mass in grams

For the 5-cm diaphragm we have been considering, $M_A = 63$ *grams*. This is many times the mass of the voice coil and diaphragm taken together. At 1000 cps the reactance of the mass load

$$2\ \pi\ f\ M_A = 26{,}900\ ohms$$

which is double the radiation resistance.

For an efficient magnetic structure with a flux density in the gap of about 13,000 gauss, the efficiency comes out something under 2 per cent. This is quite comparable to the efficiency of a high-quality 12-inch speaker used in air.

The high value of mass load is helpful in one respect: it pushes the primary resonance of the 2-in. diaphragm down to 155 cps (*Fig.* 2) providing good bass reproduction. As for the high end, a 2-in. rigid piston in water should radiate well up to f_1 (*Fig.* 1) which we already calculated as 18,600 cps. We are quite justified in calling this a hi-fi speaker.

Directivity and sound distribution are determined, first, by the fact that the diaphragm diameter is small compared to a wavelength even at the highest frequencies of interest, and by the "closed-box" effect of a swimming pool. The second point requires some explanation.

When a sound wave travels from one medium to the other, the amount of reflection is determined by the ratio of the "characteristic impedances" of the two media. The values of interest are as follows:

Substance	Specific Acoustic Resistance (mechanical ohms/cm²)
Air	42
Water	140,000
Brick, Rock, Concrete, Tile, Marble	700,000–1,000,000

These figures tell us that a sound wave in water will be reflected at least 80 per cent when encountering a wall, and, surphisingly, that the reflection at the water-air interface is over 99.9 per cent. The result is that the pool acts like an exceedingly live room in which reverberation is high. This distributes the sound quite uniformly throughout the water and greatly increases the average sound-pressure level.

Construction of the Speaker

For a direct radiator of 2-in. diameter, a domed diaphragm offers advantages in rigidity and ease of fabrication. Such a diaphragm is integral with its supporting surround, that is, the entire assembly is molded in one piece, which facilitates design of a watertight assembly. Diaphragms of this type are used in public

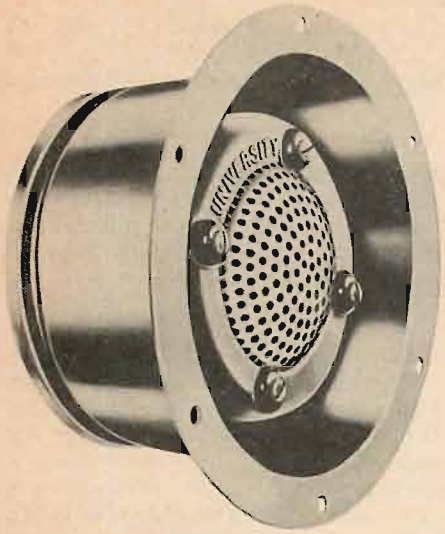


Fig. 4. University model MM-2FUW underwater speaker.

address as well as hi-fi compression driver units for use with horns, and are most often made of phenolic-impregnated cloth, or of aluminum alloy. The latter is much too delicate and subject to corrosion to be used in continuous contact with water. One would expect the phenolic type to be ideal for this application, since it is used in weather-resistant, outdoor speakers. Unfortunately, it was discovered that impregnated cloth practically dissolves after prolonged immersion!

After a long period of experiment, a suitable material named "Unilar" was developed for the application. It is tough, completely impervious to water, and capable of being molded to shape. To the last property should be added the words "if you know how." It was only after a period of intensive development at University Loudspeakers that a satisfactory method was worked out for molding the "Unilar" diaphragm. Underwater speakers using these molded diaphragms have been in production for some time and a great deal of field experience has indicated completely satisfactory preformance. A cross section of the center assembly of model MM-2FUW is shown in *Fig.* 3 and a photograph of the entire speaker is shown in *Fig.* 4.

The University underwater speaker is constructed essentially like a compression driver unit as far as mechanical assembly is concerned. The diaphragm is in direct contact with the water on its convex front face and is mechanically protected by a perforated stainless steel grille. The back of the diaphragm has access to an air chamber which is hermetically sealed by the watertight housing. The enclosure is of the so-called "infinite baffle" type. The connections to the voice coil are brought through the housing by means of watertight terminals which have waterproof cables soldered on the outside. A third lead is provided for grounding the case of the speaker. The entire section containing the terminals is coated with waterproofing compound.

An interesting feature of the design is its simplicity. Sufficient rigidity is incorporated into the diaphragm assembly to enable it to withstand the pressure of several feet of water without any complicated pressure-compensating means, and a simple and reliable device is used to insure that the coil is properly centered axially in the magnetic field, with the modest variations in water pressure encountered in various applications.

Use of the Underwater Speaker

The frequency range of the MM-2UW is 100–10,000 cps, its impedance is 16 ohms, and it will handle 30 watts of integrated program material under water. It distributes sound almost uniformly throughout the pool in which it is used, although for larger pools, or for cases such as swimming instruction classes in which there is a high level of turbulence in the water, several units should be used. Not only will the noise level in the water be more effectively overcome, but each speaker can be operated at a lower level, avoiding excessive sound intensities in the immediate vicinity of the units. For example, two speakers would be recommended for a pool 30 × 60 feet; 4 units would be recommended for the same pool if it is expected that there will be a good deal of turbulence or noise in the water.

Underwater speakers come in two types: those primarily designed for installation in a "wet niche" light box, in pools which are being planned or which are now under construction, or which already have wet niches of the size required, as well as associated conduits and watertight flush junction boxes in the deck surfaces near the pool area; and for existing pools which do not have these facilities. The Model MM-2UW is recommended for the latter type of installation and MM-2FUW for the former. Preferred operating depth is 2 feet.

It will be necessary for the user to make a mounting ring for the "built-in" type of speaker, since there is no standardization in the size of wet niches in swimming pools. This adapter may be made of marine plywood or cut from sheet aluminum 1/32-in. to 1/16-in. thick, 2S or 3S alloy, ½ H to H hardness. The inner diameter of the mounting ring is 6-in., and the wet niches must be sufficiently large so that screws to mount the ring do not interfere with those which mount the speaker. Stainless steel, aluminum, or zinc-coated steel bolts may be used, but not brass. It is also desirable that there be enough space in the niche to accommodate a sufficient length of cable, coiled neatly in the niche behind the speaker, to permit removal of the unit from the water in the event that servicing should be required, without the necessity of drawing the cable down through the conduit, re-installing it after repairs are completed, and so on.

The speaker for already constructed pools may be mounted to the side of the pool by means of the integral adjustable bracket. The exact hardware required to do this is selected by the user, but will usually take the form of wood screws, which are driven into rawl plugs inserted into holes in the concrete made with a masonry drill. It should not be mounted in a location where it might be used as a step.

An easy alternative to the above method of mounting involves the use of a special adapter such as the University SPA Adapter. The adapter is substituted for the triangular base that comes with the speaker, and screwed to the end of a ½-in. threaded IPS pipe. This pipe may be cut to the desired length, bent, and hung over the edge of the pool or drainage gutter.

The case of the speaker should be grounded to a grounding lug in a junction box, if one is involved in the installation, or some other earth ground. Æ

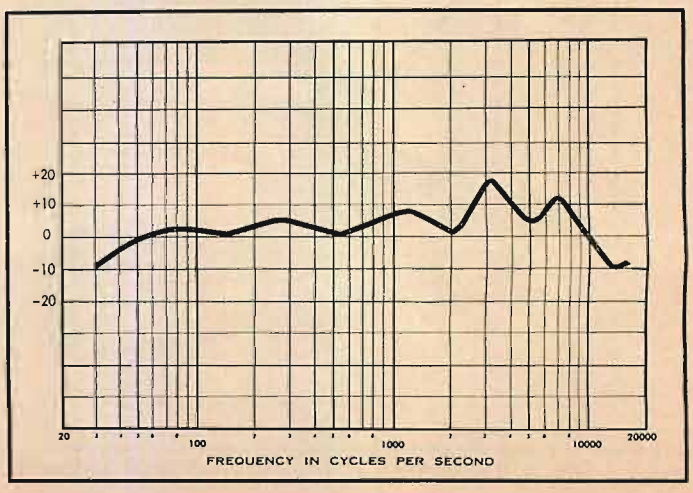


Fig. 5. Response of MM-2FUW speaker in tank.

A Synchronous Oscillator FM-Stereo Adapter

This FM-stereo adapter is designed to convert most existing FM tuners to stereo. All that is required is 0.5-volt output at the FM detector.

LEONARD FELDMAN*

NOW THAT THE Federal Communications Commission has approved a system for stereophonic FM broadcasting, Crosby Electronics Inc. (a subsidiary of Crosby Teletronics Corporation—one of the initial proposers of FM multiplex) set about to fill the many requests from dealers and consumers for a medium priced, reliable adapter for FM-stereo. The result of this work is the Crosby Model MX-101 (see *Fig.* 1). Measuring only 5¼ × 4½ × 9-in., the Model MX-101 is a universal adapter, in that it will decode stereo when connected with any tuner or receiver which provides at least 0.5-volt total output from the multiplex output jack of the particular receiver with which it is to be used when total deviation at the transmitter occurs. This criterion renders virtually all tuners usable with the MX-101 although there are some tuners which have outputs lower than 0.5 volt and therefore will not provide sufficient 19,000 cps pilot carrier to insure "lock in" of the local oscillator.

* *Vice-President, Crosby Electronics, 135 Eileen Way, Syosset, N. Y.*

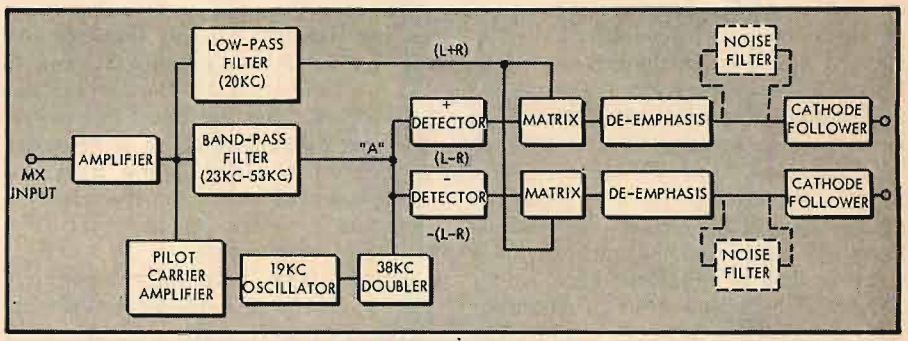


Fig. 2. Block diagram of the MX-101.

Fig. 1. Crosby MX-101 FM-stereo adapter.

Circuit Block Diagram (*Fig.* 2)

The entire signal recovered from the multiplex output jack of the existing tuner or receiver is first fed to a stage of amplification. Approximately 10 db of over-all amplification is provided in this stage. The amplified composite signal is then utilized in three distinct fashions. The upper block consisting of a low-pass (23,000 cps cut-off) filter removes everything from the composite signal but the pre-emphasized L+R (monophonic) signal. This signal will be used subsequently for matrixing with the recovered L-R signal.

The center block, consists of a band-pass filter which passes frequencies from 23,000–53,000 cps. These are the signal elements which contain the L-R information in the form of carrier suppressed, double sidebands. For example, a 1000 cps L-R tone would be represented in the composite signal by two sidebands, 37,000 and 39,000 cps, the 38,000 cps subcarrier having been suppressed from the normal AM waveform.

The first lower block consists of a 19,000 cps pilot-carrier amplifier. It will be recalled that this pilot carrier, as prescribed in the approved system, can have a maximum amplitude of only 10 per cent of full modulation of the main carrier. As was noted above, a tuner having an output of 0.5 volt for full modulation would produce only 0.05

volts of 19,000-cps pilot carrier and even this low voltage would only be present under conditions of full limiting in the tuner or receiver. Thus, even lower tuner outputs may be expected in practice. For this reason, the pilot signal must be further amplified. It is this amplified signal which is used to synchronize the normally free-running 19,000 cps local oscillator which is shown as the next block in this lower chain.

Much thought has been given to the importance of stability in this local oscillator. For example, let us consider an oscillator with 0.02 per cent stability. Well, 0.02 per cent stability of a 19,000 cps oscillator represents 3.8 cycles of drift under free-running conditions. The FCC, in its report, indicates that *3 deg.* of shift is all that can be tolerated between the transmitted pilot and the 19,000 cps generated in the receiver itself. Three degrees represents 1/120 of *one cycle*. Obviously, such oscillator stability could only be achieved if a crystal oscillator (probably oven controlled) were used in home adapters. The economics of the situation preclude such refinements. Thus, it is not so much oscillator stability that is important here, as the ability of the pilot carrier to effectively *lock* the local oscillator to its own frequency and phase. For this reason, emphasis has been placed on adequate amplification of the 19,000 cps pilot.

The properly phased and "locked" oscillator output is then passed through a doubler stage, which results in a 38,000 cps output in every sense the equal of the carrier originally suppressed at the transmitter. (This carrier was dubbed an "exalted carrier" many years ago by Mr. Murray Crosby.) The carrier is reinserted (by passive mixing) to the related sidebands and the conventional and familiar AM envelope may be readily observed at point "A" in the block diagram.

To recover the L-R content of the signal, we need merely use a conventional AM detecting diode. Since both (L-R) and – (L-R) will be required for algebraic matrixing, however, two such diodes are actually used, connected in opposite polarities.

The L+R signal (which has been waiting patiently all this time) is now added to (L-R) to produce 2L and to – (L-R) to produce 2R. Because the signal derived from the tuner has as yet not been de-emphasized, it is necessary to pass the resultant L and R signals through conventional 75 microsecond de-emphasis networks, to restore correct frequency response.

It has been universally recognized that while the monophonic listener receives a non-degraded signal-to-noise ratio even when stereo transmission is in progress, the stereo listener will not be so fortunate. Estimates of signal-to-noise degradation for the stereo listener have been made by knowledgeable engineers at anywhere from 13 to 20 db for a given signal strength. This means that what *was* a 40 db signal-to-noise ratio for a given condition (and therefore quite tolerable) may now result in a 20 db signal-to-noise ratio when stereo is broadcast (recognized by one and all as quite intolerable). Of course, antenna installation improvement may well provide part of the answer. Unfortunately, most FM set owners are conditioned to the idea that a "hank of wire" loosely thrown around the living room baseboard is all that is required in the way of an antenna for FM reception. This simply won't do for stereo. Recognizing that we can't change everyone's thinking overnight, we have therefore incorporated a "noise filter" at the output of each channel which should help to cut down "hiss" in noisy areas. *Caution:* It will also cut down highs—in much the same way that the "record scratch filter" on your amplifier does. It is our feeling, however, that stereo without hiss and with some sacrifice of high-frequency response is still better than stereo steeped in background noise. If noise had been what we wanted we could have been content with the AM-FM simulcasts which we hope are seeing their last days!

The block diagram then shows a pair of cathode follower outputs, to enable long cable lengths between adapter and

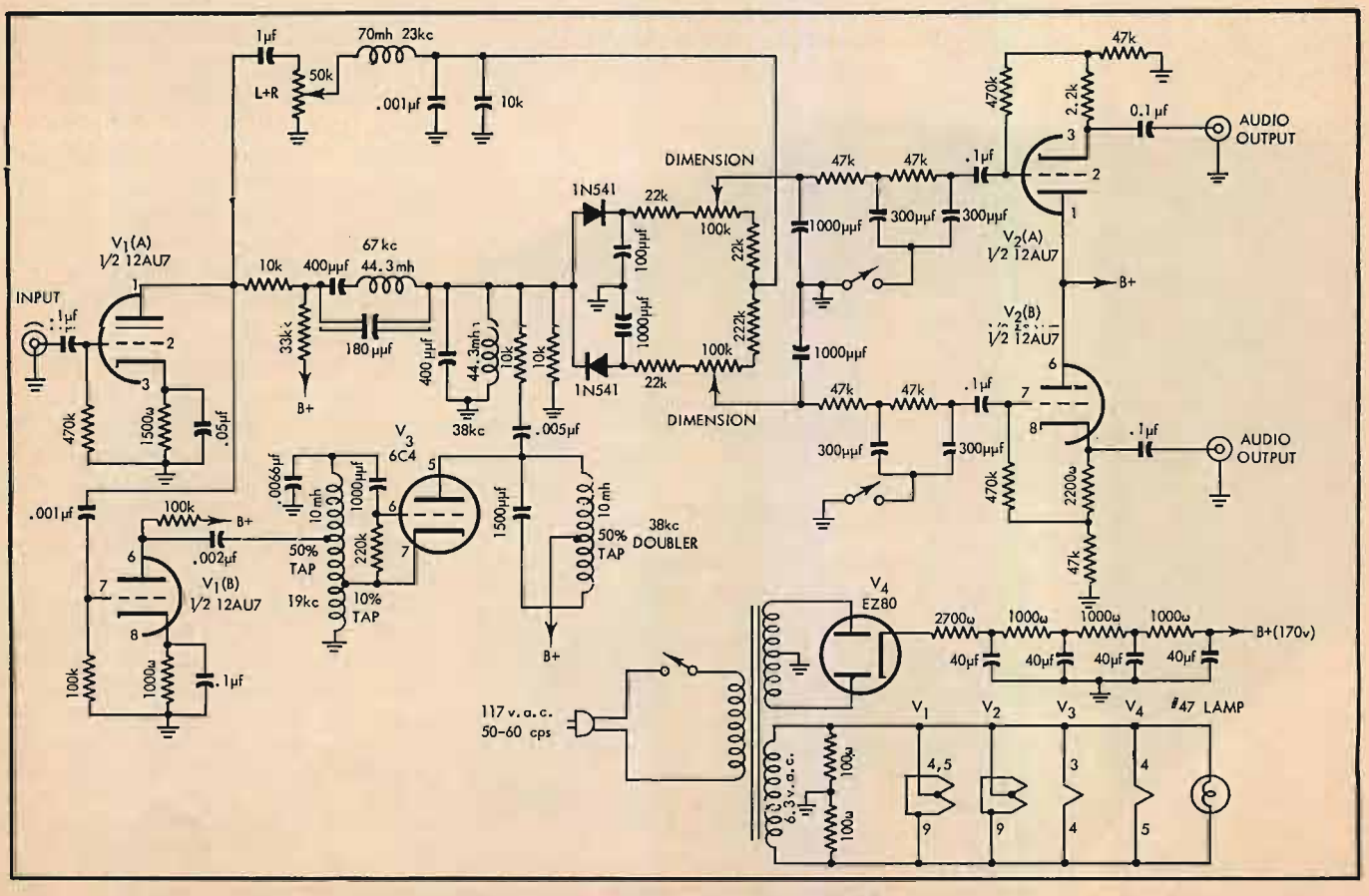


Fig. 3. Schematic diagram of the MX-101.

amplifier with no sacrifice of highs and no increase in hum.

Circuit Diagram of the MX-101

A complete circuit diagram of the Model MX-101 is shown in *Fig.* 3. The reader is cautioned that certain elements of this circuit are covered by patent and may not be utilized for commercial purposes without a licensing agreement.

There are several points of interest which can be seen by referring to this schematic. One section of a 12AU7 is used as the first amplifier of the composite signal. The other half of this 12AU7 is used as the pilot carrier amplifier. It will be noted that tuned circuits are not used in this second stage. These were not necessary for two reasons. First, the value of coupling capacitors chosen (0.001 μf to the grid, 0.002 μf from plate to oscillator tank circuit) are sufficiently small as compared with their terminating impedances as to attenuate main channel (30 cps to 15,000 cps) frequencies. Secondly, both these groups of frequencies and those associated with the L-R channel (23,000 to 53,000 cps) are sufficiently removed in frequency from the 19,000 cps oscillator as to cause no pulling effect on the oscillator itself. Had straight amplification of the 19,000 cps signal been used in lieu of a local oscillator, the amplifying circuits would all require high-Q tuned circuits throughout, to prevent possible doubling of the higher audio frequencies and their subsequent interference in the "exalted carrier injection" process.

The oscillator itself is a conventional Hartley type, in which the synchronizing signal is applied at a centertap on the coil of the tank circuit. Approximately 6–8 volts (of 19,000 cps) can be measured at the top of the tank circuit and, as a consequence, 10 volts or more of d.c. bias will be measured at the grid of the 6C4. It is operation at this nonlinear point of the 6C4's dynamic curves that results in substantial doubling in the tank circuit in the plate of the 6C4, which is, of course, tuned to 38,000 cps. Observation of the waveform at pin 5 of the 6C4 by means of an oscilloscope will show sine-wave trains in which the first cycle is somewhat greater in amplitude than the second, with the third cycle larger again, the fourth smaller etc. This indicates that the signal, although predominantly 38,0000 cps, does contain a small amount of residual 19,000 cps signal as well. The presence of this residual 19,000 cps signal in no way affects the performance of the signal as a carrier suitable for reinserting into the (L-R) sidebands. A .005 μf capacitor serves to couple the subcarrier to the junction point of the two detecting diodes, at which point all the sidebands are also present. The choice of correct amount of subcarrier for injection at this point was perhaps the most difficult decision which had to be made in the design of the MX-101.

On the one hand, approximately 30 per cent modulation of the total envelope would lend itself to the most distortion-free AM detection and audio recovery. On the other hand, it is desirable to recover as much audio as possible in one fell swoop, so that no further audio amplification would be required and so that best signal-to-hum performance might be obtained. To complicate the situation further, there is absolutely no consistency from tuner to tuner as to the amplitude of subcarrier sidebands that might be obtained (since this factor is governed strictly by the design of the given tuner) as compared with available 38,000 cps carrier (which is governed purely by the adapter itself).

It was decided, after a survey of many existing tuners, that from 3 to 4 volts of 38,000 cps carrier should be made available at the "insertion point" (junction of diode detectors). The reasoning was as follows: Most tuners produce approximately 1 volt output at their detector outputs under conditions of 100 per cent deviation (75,000 cps). As has been stated, the first amplifier stage has an over-all gain of about 10 db, so that approximately 3 volts would be obtained at the plate of the 12AU7. This signal is divided by the two plate resistors (10,000 and 33,000 ohms) by about 3 db and then another 6 db of attenuation is provided by the action of the filter termination (10,000 ohms) at the junction of the diodes, so that approximately 1 volt is again present at the junction of the diodes, for conditions of maximum modulation. Therefore, 1 volt of AM on 3 to 4 volts of the 38,000 cps reinjected subcarrier results in an AM envelope which is just about ideal for best detection by the diodes. However, even double the output of L-R subcarrier components from some particular tuner would result in less than 50 per cent AM of the total envelope and would still not produce inordinate distortion figures upon detection of the waveform. Conversely, a tuner having only 0.5 volts of output for 100 per cent modulation would produce an AM envelope of nearly 20 per cent and would result in recovered audio somewhat lower than in the foregoing case, but certainly adequate in terms of the signal-to-hum capability of the adapter.

Following the L+R channel (upper part of the schematic), it will be noted that a 50,000-ohm potentiometer determines exactly the right amount of L+R to be matrixed with (L-R) and −(L-R) signals available from the 1N541 detectors. This control, normally factory adjusted, is important for still another reason. While the FCC permits equal modulation of both the main and subchannels, it is quite possible that individual stations may wish to vary that formula at the beginning. L-R in average musical programming is invariably less in amplitude than L+R. Thus, to take advantage of as much signal-to-noise capability as possible, a station may wish to transmit (L-R) at slightly higher relative amplitude than L+R. The station can do this without deviating from FCC specification, since (L-R) normally is lower in amplitude than L+R just by virtue of the nature of most stereo programming. Should a station arbitrarily elect to take advantage of this situation, it will be necessary to readjust the relationship between L+R and L-R at the receiving end for optimum stereo separation. The converse may be true at first, as well. Some stations may, because of present equipment limitations, be forced to *attenuate* the L-R component with respect to the L+R component simply because their subcarrier equipment is not presently capable of 90 per cent modulation of the main carrier. In this case too the L+R to L-R relationship may well have to be readjusted for best stereo separation.

At first glance, the "dimension" control may appear to be a repetition of the control just discussed. It actually differs in two ways. First, it is a front panel control, accessible to the user. As such, it can be used to "touch up" separation, increasing or decreasing the separation effect at will. For the perfectionist, however, it serves still another function. You will recall that deemphasis takes place *after* matrixing in this particular design, and that this deemphasis should be 75 microseconds for both L+R and L-R. For the L-R segment, this de-emphasis network consists of 22,000 ohms (nearest the diode) in series with 50,000 ohms (one-half of the 100,000-ohm dimension potentiometer), followed by a 1000 $\mu\mu$f capacitor to ground. This represents 72,000 ohms and 1000 $\mu\mu$f or 72μs. (Actually, some stray wiring capacity contributes the additional few microseconds required.) In the case of the L+R channel, the deemphasis network is made up of a 22,000-ohm resistor (closest to the 70 mh low-pass filter) and the other half of the 100,000-ohm dimension potentiometer followed by the same 1000 $\mu\mu$f capacitor for a total of 72 microseconds. Now, while the capacitor used in this network is common to both L+R and L-R, the resistive component is not. Had fixed 75,000-ohm resistors been used, instead of potentiometer-plus-resistor combinations, even five per cent resistors might result in a maximum of

(*Continued on page 62*)

More About Recording Perspective

WILLIAM G. DILLEY*

Modern recording and rerecording techniques permit achieving perspectives which place the listener in two or more places at once. In these cases the recording is no longer an attempt to recreate a live performance in the home.

WHEN YOU SIT DOWN to listen to your favorite record or tape in the quiet of your own home, do you ever consciously evaluate your listening position in terms of sound from the recording itself? Does it sound like you are close to or far from the performance? Are you listening from within the orchestra pit or are you seated in the last seat in the top-left balcony? Does it sound like you are in a huge concert hall or in a small room? Is the drum a deep mellow sounding "boom" or do you hear the "ping" of the tightly stretched skin before and after impact?

Why, exactly, is this recording your favorite choice? Is it because of the musical content alone or does the recorded presentation of the material influence your decision?

It is obvious that a specific performance can be recorded in many different ways, each of which can sound markedly different from any other. This difference in presentation has been referred to, arbitrarily, as the "recording perspective."

While we have already discussed, in general terms, certain limited aspects of the recorded perspective, it is in order that we further investigate this subject because of the increasing influence that it may have upon recorded material. Previously, for the purpose of standardized discussion, we defined "recording perspective" as those impressions received, during tape playback, of: (1) size of the recording hall, (2) distance from the source, and (3) dynamic range—when divorced from additional playback acoustics (i.e. headset listening). It was also stated that all possible perspectives were included between the physical limits of the orchestra center to the furthermost point in the concert hall. While this is quite true for live *listening* and served the purpose for simple analysis, actual recording practices reveal that many more perspectives are possible. The item of interest here being that in addition to duplicating perspectives as they actually exist it is possible to *create* new perspectives that have no counterpart in actuality. This last statement warrants repetition in different terminology: there may be *no* location in the recording hall where you can *listen* to the performance and hear what you heard during the tape playback. The purist might object to a recorded program presented in a perspective that cannot exist in a natural live environment but usually he is not even aware of the insult to his "pure" ears. Let us take a look at the possibilities available to the individual about to make a tape recording. From a strictly practical standpoint, the number of perspectives obtainable is a function of the amount of equipment available and so the recording process itself may be broken down, initially, into two general categories:

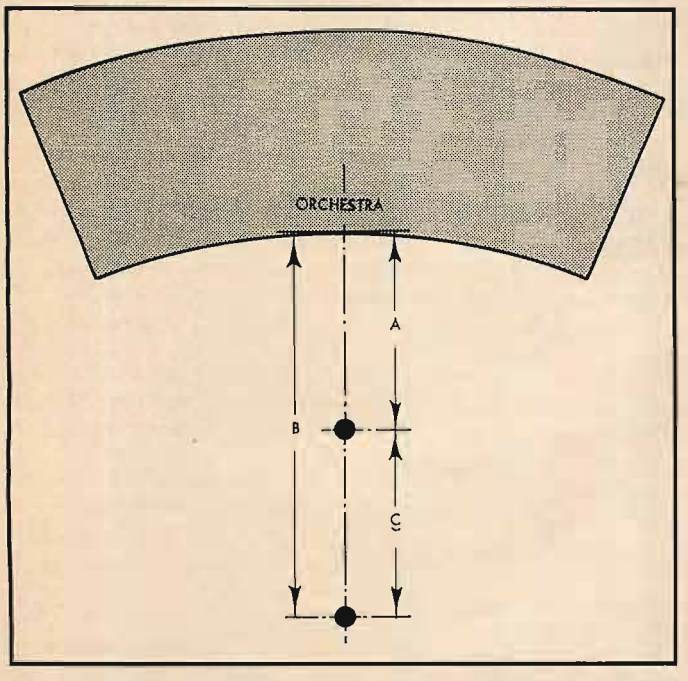


Fig. 1. Maximum (A) and minimum (B) perspectives possible with single microphone recording.

(1) That process which provides a finished tape at the conclusion of the recording session.

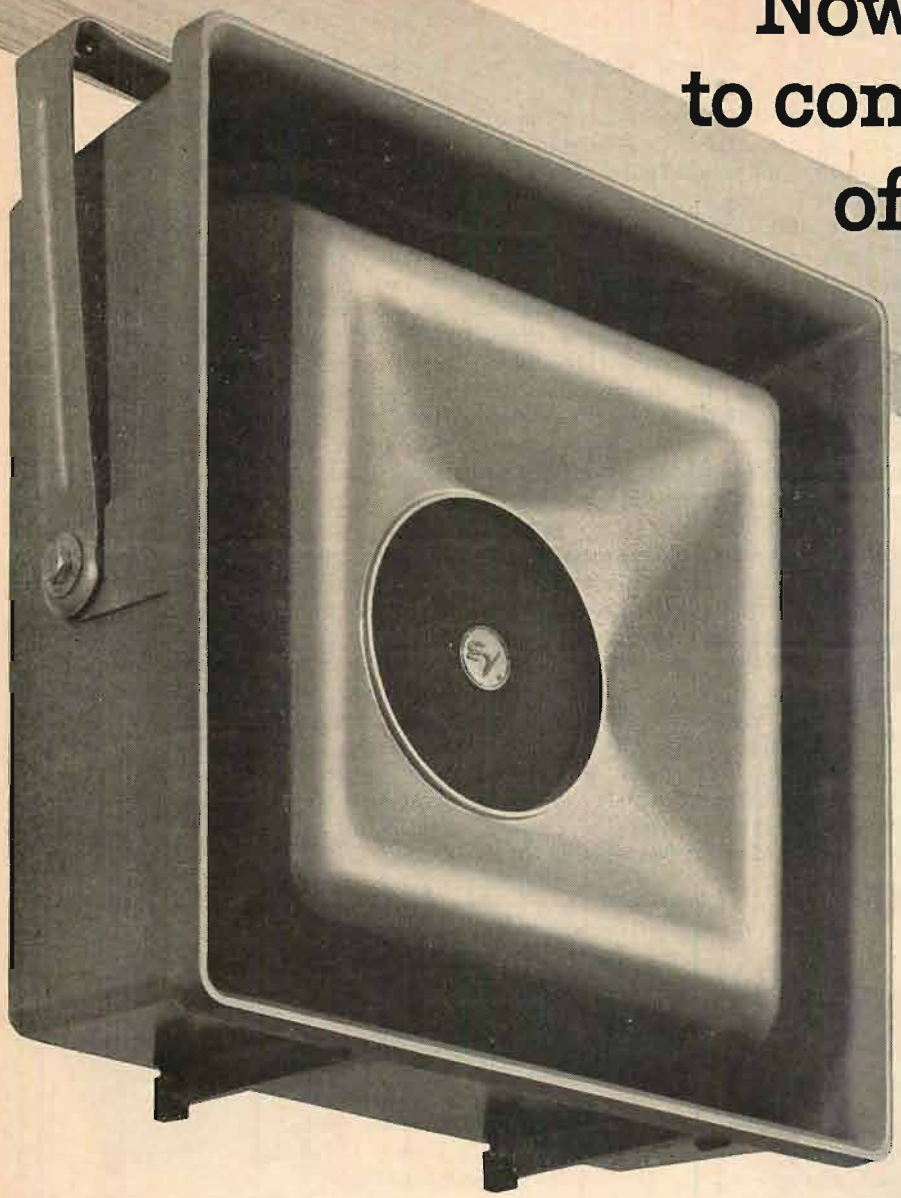
(2) That process which later combines or supplements the material recorded during the recording session.

Usually the amateur recordist operates in the realm of the first category and professional recordings are made in the second category.

Looking at the recording operation in the first category, the number of perspectives obtainable is again further limited by the number of microphones available. Using a single microphone, the closest placement will be that minimum distance that will allow a balance of all instruments to be attained while the farthest microphone placement will be that distance at which excessive reverberation occurs (see *Fig.* 1). The distance between these two points represents the amount of latitude available to the recordist for obtaining a difference in perspectives. This small distance will vary according to the microphone, the hall, and the size and level of the source. When recording a large orchestra in a large, live hall with an omnidirectional microphone, these two points may overlap depending upon what the recordist considers to be excessive rever-

* *577 East Avery St., San Bernardino, Calif.*

Now is the time to come to the aid of your outdoor party!



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Size: 21½" H x 21½" W x 8½" D
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beration (see *Fig.* 2). It is obvious that the proximity effect (presence) must be compromised to achieve balance with large groups. It is also obvious that the recordist is at the mercy of the hall acoustics with respect to reverberation. Some reduction in reverberation can be realized from front placement employing a cardioid microphone, but where overhead placement is dictated and an omnidirectional mike must be used, no control exists over reverberation without adversely affecting balance and proximity effect. This type of recording represents the most limited range of perspectives and the final perspective is not so much chosen as dictated by the size of the group to be recorded and the environment (size and liveness) in which the recording is to be made.

Using two microphones allows much more latitude in that the choice of mike placement distances increases. It is possible to get closer while still maintaining balance, and it is also possible to reduce or increase the recorded reverberation by this same amount of increased allowable microphone movement.

Multiple miking further increases the ability to control balance, proximity effect, and reverberation *independently* and it is here that it becomes possible to create perspectives that do not exist in actuality. Close mike techniques may be employed utilizing as many microphones as desired and mixing all inputs prior to the recorder—with ultimate balance at the discretion of the mixer operator. It is obvious that the balance does not have to be in the same proportion as originally performed and instruments with very little carrying power can be raised to dominant solo level if desired. Reverberation can be increased by utilizing additional microphones placed at increasing distances from the source, and, of course, it is possible to have a very close perspective while still maintaining amounts of reverberation normally associated with a distant listening position.

While almost any type of recording can be made with an abundance of microphones and mixing facilities, it must be remembered that the natural reverberation of the hall is used in varying intensities from various positions, and that existing resonances, peaks, and dips caused by local focusing points and hall shape may be recorded also.

It would, therefore, be advantageous to record in surroundings that are free from resonances and, in fact free from excessive reverberation and then, after the recording is completed, add the reverberation as desired. Such an approach is practiced in studio recording and leads us into the second category—that of combining or supplementing the material that has been previously recorded.

The major difference in this type of operation is that additional mixing and rerecording may take place *after* the original recording is made. In addition to being able to add uncolored reverberation as desired (intensity, decay time, or slope) electronically or acoustically, through rerecording the flexibility of multiple track recording is available. This allows mixing of the individual tracks in the proportions (or directions, for stereo) desired as well as allowing reverberation effects on individual tracks without affecting the content of the other tracks.

The possibilities are many as indicated by the following examples: A common use of separate track reverberation *prior* to mixing and rerecording is that associated with the recording of vocalists. With the voice of the vocalist recorded on a separate track it is possible to add reverberation to this track without affecting the perspective of the accompanying background music on other tracks. Or, conversely, allow a close-mike technique with the singer's voice while adding reverberation to a background chorus on other tracks. One recording company actually does both with a vocalist during each recording; the vocal track exhibits a close-mike technique through part of the record, and an extreme reverberation effect (approaching echo) on the chorus parts.

Stereo has made possible the technique of alternating channels with the same material. Another form of additive rerecording familiar to most people is the well known sound-on-sound technique.

Now, for a few examples of what would be required in the way of live performance listening in order to duplicate some of the perspectives that are normally used in tape recording. To obtain the effect of a singer that has been recorded with a close-mike technique and reverberation added later, you would have to be two people: one very close to the singer for the proximity effect, and one much farther away (or in another room) to receive the reflected sound for the reverberation effect. Neither position alone would give you the recorded result. For the perspective obtained from the close-miking of a large orchestra, you would be required to place an ear about a foot away from each of several different locations (depending upon the number and level of mikes used) simultaneously and, if reverberation were then added to this recording, you would again be required to be simultaneously in another location much farther removed from the source. If the recording session took place in a relatively small and well-damped studio, there might be no location in the room where you would be able to hear the large amount of reverberation which was added electronically.

Of course, to duplicate the perspective of a single vocalist who has performed two or more parts (melody and harmony) by sound-on-sound methods, a live performance would require the services of a singer with more than one head.

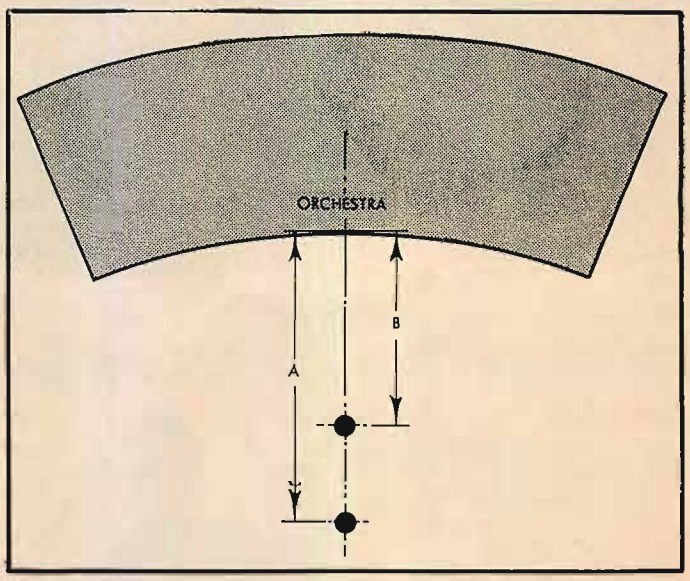

Fig. 2. Recording a large orchestra in a large, live hall with an omnidirectional microphone forces compromise with proximity effect to achieve balance.

These examples of some perspectives which cannot occur at a live performance, are not given to prove that the methods are bad or good. They merely show what *is* being done, and what *can* be done in the way of obtaining and creating recorded perspectives.

A good engineer, when provided with the necessary equipment, is capable of providing almost any kind of perspective required. The difficulty of this particular problem is that very few people are capable of defining, *in standard terminology,* the impressions which they wish to receive upon tape playback. Æ

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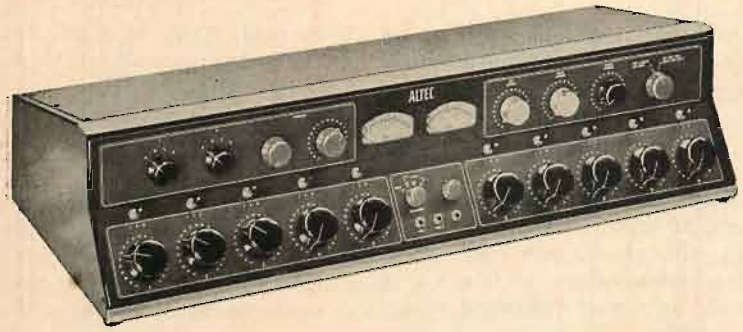

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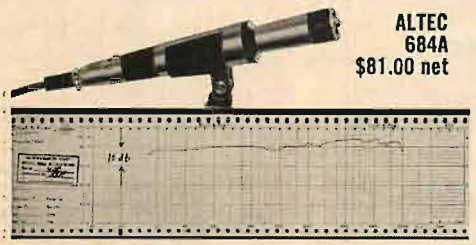

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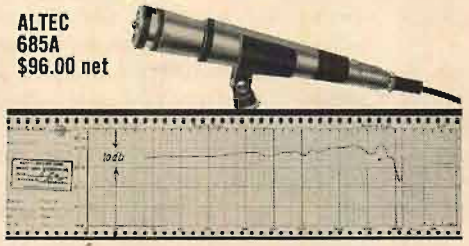

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To Phase Or Not To Phase?

E. A. SNAPE III*

To phase, or not to phase? That is the question faced by any audiofan in the process of setting up a stereo system. Whether it is better to ignore an out-of-phase system, or to undergo the agony of attempting to determine proper phasing by listening tests is a problem of stereophony that requires discussion and clarification.

ANYONE, EVEN SLIGHTLY CONVERSANT with the techniques of stereo sound reproduction has heard lip-service paid to the importance of proper system phasing[1]. The idea is to have all speaker cones moving in the same direction at the same time when the system is reproducing a monophonic signal. If, for example, the speakers are out of phase; the left speaker cone may be moving away from you, at the same instant that the right speaker cone is moving toward you. The effect of out-of-phase operation of a stereo system has been called variously: "inconsequential", a "large hole in the middle", and a "complete collapse of the stereo curtain of sound."

In the author's eight-year acquaintance with the vagaries of stereophonic reproduction, it has been found that the effects of improper speaker phasing do in truth vary from inconsequential, to a general destruction of the stereophonic curtain of sound. Factors governing the severity, and even the very noticeability of these effects, are:

(1) *The nature of the recording.* A widely separated two-channel stereo recording of the "ping-pong" variety loses very little by out-of-phase reproduction. It is quite impossible to detect a 180-degree phase reversal with many of the ultra-widely separated recordings being released currently. By contrast, a stereo playback of a recording made with phantom center-channel techniques will be much degraded if playback channels are not properly phased. Similarly, it is very important that proper phasing be maintained in recordings where only two or three microphones are used for the stereo pickup. In many popular music recordings, however, as many as fifteen or twenty microphones have been used. The phase relationships of the sounds captured by these recording methods are generally so confused that it matters little whether playback equipment is properly phased or not.

(2) *The size and acoustics of the listening room, and positions of the loudspeakers and the listeners within the room.* In certain rooms, when the listener's position is away from the stereo center axis (see *Fig.* 1), the out-of-phase mode sometimes sounds better than the in-phase mode.

(3) *The degree of aural acuity and perception of individual listener.* E. T. Canby has suggested, and the author's personal experience seems to confirm, that listeners sensitivity to phasing varies considerably from person-to-person, and within any given individual over a period of time. At certain times, attempts to determine proper phasing of two stereo channels for a given recording can be absolutely frustrating, especially if the listener is fatigued. After a night's rest, and with all other conditions held the same; the same listener has no trouble in determining proper phasing.

The novice stereofan soon learns that determination of proper phasing by listening tests is not always as easy as equipment instruction manuals and popular articles imply. It is likely that more than one of us has been driven to distraction by attempting to follow the inadequate approach and sketchy instructions offered in these manuals and articles.

The following excerpt from a stereo amplifier instruction manual is better than most, but still somewhat misleading to the novice. "To check for proper phasing, play a monophonic recording so that one signal comes from both channels. Then move back and forth between the speakers. If the phasing is not correct, it can be rectified by interchanging the leads between one of the amplifier channels and its associated speaker. There should be no need to change the phasing once the system is set up properly." Fortunately, these instructions advise the use of a monophonic sound source. A few instruction books blithely ignore this fundamental necessity, and one or two make no mention of phasing whatsoever.

Let us suppose that we are novice audiofans in the process of checking our newly installed stereo system. The implication of the foregoing instructions is that by merely walking back and forth between our stereo speakers we will readily be able to discern whether they are working in phase. In actual practice, the chances of being able to do this seem to be poorer than fifty-fifty. Being novices, we are not sure whether the sounds we hear emanating from our speakers are in phase, or not. We decide that we had better reverse the leads to one speaker just for comparison sake.

We know that it is unwise to operate a power amplifier without its output load, so we carefully shut off the a.c. power before crawling behind our loudspeaker to reverse leads.

Two minutes later, if we are lucky; we are once more parading between our speakers and listening for some dramatic change in the quality of the sound. The only trouble is that we have already forgotten how things sounded before, and there is no obviously discernible difference in the sound. Now is the time for the crucial decision. To phase, or not

(*Continued on page 58*)

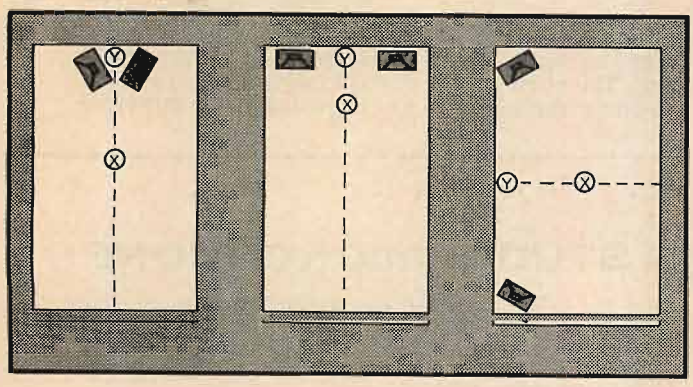

Fig. 1. Three typical stereo setups. Dotted line indicates stereo center axis. "X" indicates approximate position of listener. "Y" indicates apparent position of phantom monophonic source when system is properly phased and balanced.

* *7528 Watson St., Philadelphia, Pa.*

[1]Some authorities, notably Paul Klipsch, refer to "polarity" rather than "phase" in this context. Mr. Klipsch's terminology is technically correct, but for the purpose of this article we will adhere to the more popular usage.

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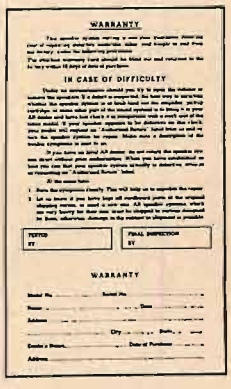
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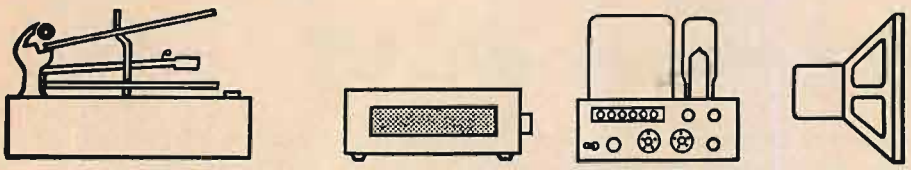

DYNA-TUNER MODEL FM-1 TUNER KIT.

The Dynatuner FM-1 is clearly the exception that proves the rule. The rule that we are referring to is the one which decrees that any product sold to a consumer has to be highly styled. One need only look casually at the equipment gracing dealers' shelves to understand that "style" is applied to functional devices solely for visual effect. Apparently, underlying this rule is the belief that performance is not sufficient to capture the consumer. Although this thesis has some validity, it is obvious that many apply styling to make a product seem what it is not.

Figure 1 clearly demonstrates that the FM-1 is an exception to the rule stated above. It is simple, straightforward, and unpretentious in visual appearance. The only application of a more luxurious material, a cast plastic lens, permits the tuning indicator and the tuning dial to be read with extra ease. Somehow, in spite of the lack of expensive styling, the FM-1 has a certain elegance which seems to be innate in well-engineered devices.

Underneath its simple exterior, the FM-1 encloses an FM tuner which is clearly in keeping with its facade. It is not the most sensitive tuner one can buy, nor does it pretend to be, but it provides a level of performance easily in the upper rank. Also, as a kit, it builds very easily. There is one slight fly in the ointment (it should really be classified as a flea) and we shall discuss this at length in another section.

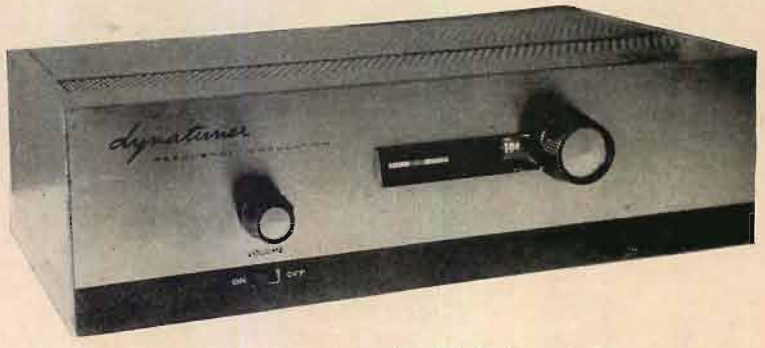

Fig. 1. Dynatuner Model FM-1 tuner kit.

Circuit

The circuit of the FM-1 consists of a cathode-coupled tuned r.f.-amplifier stage using a 6AQ8/ECC85 dual triode; a screen-coupled oscillator-mixer stage using a 6AT8A triode-pentode; four i.f. amplifier stages with progressive limiting using two 6BA6 and two 6AU6 tubes; balanced wide-band ratio detector with matched semiconductor diodes; a cathode follower isolating the detector from the emphasis network, and a multiplex takeoff using one-half of a 12AX7/ECC83; an anode follower, wide-band feedback audio output stage using the other half of the 12AX7/ECC83; a tuning indicator using a 6FG6/EM84 "eye tube" and a power supply utilizing a 6V4/EZ80.

The antenna circuit includes provision for matching either a 75-ohm unbalanced or a 300-ohm balanced transmission line. From the antenna, the signal enters the cathode-coupled dual triode r.f. amplifier circuit. The triode section of the 6AT8A is used in a "tickler feedback" tuned-grid oscillator circuit. The oscillator is temperature compensated, and operating parameters are chosen so as to make a.f.c. unnecessary. The pentode section of the 6AT8A is used as the mixer. The tube is self-biased. The oscillator is injected into the screen circuit to provide isolation of the oscillator tuning circuit from the signal tuning circuit at the mixer grid. This simplifies the adjustment and the tracking of the front end, and also reduces radiation of the oscillator energy into the antenna, which would cause the antenna to transmit to nearby receivers and television sets. The i.f. transformers are undercoupled for minimum phase shift across the pass band. This simplifies alignment of the i.f. section since it is merely necessary to tune for maximum signal to achieve optimum adjustment. 6BA6 variable-mu pentodes are used for the first and second stages and 6AU6 sharp-cutoff pentodes are used for the succeeding two stages. Each i.f. stage acts as a limiter when the signal input to that stage reaches a predetermined point. The receiver is sufficiently sensitive that the last limiter is effective on input noise. The ratio detector utilizes a balanced-bridge configuration which balances out noise and signal rectification occurring in the plate circuit of the last limiter tube. The tuning-eye tube acts as an indicator showing when a station is tuned properly and is connected to the last limiter grid circuit. It will indicate a signal as low as one microvolt, approaches maximum closure at ten microvolts. It can't be overlapped at higher signal strengths. The center of the channel is always indicated. The power supply is a conventional full-wave rectifier which provides additional power-handling capability for a multiplex adapter.

Construction

The Dynatuner FM-1 is an exceedingly easy kit to construct. The primary reason for this is that printed-circuit boards are used for all circuits excluding only the power supply. There are approximately two dozen wires used in addition to the printed-circuit boards. Not only does this make for extremely easy construction but certainly it provides little variation in circuit from kit to kit. There were a few places, however, where holes in the circuit boards were covered by components which had been previously soldered in place. In addition, there were a few places which were "extremely tight" as far as getting a reasonably-sized iron into the correct position.

The construction manual is quite adequate for even the "uninitiated" kit builder, although there were a few points which might prove a little difficult for a person with no knowledge of electronic terminology. For example, in one step the builder is asked to "insert the ground straps into each of the tube sockets." It is quite likely that the novice builder would be at a loss to determine which of the many pieces of hardware a ground strap might be. Other than these few understandable lapses however, the manual is quite adequate and detailed

We did, however, run into that bugaboo of the kit builder—defective parts The first i.f. tube and the plate-load resistor for the oscillator were, respectively, shorted and open. Although constructing the kit took a scant six hours, it took us several more to locate the defective parts and replace them. Of course, our part bin and tube stockpile was sufficient to supply the needed parts. Most likely the average constructor would have to get his parts from the Company, that is if he could locate the trouble in the first place. It would seem to us that a kit is the one place where defective parts cannot be tolerated. And yet, it does seem to be a fairly common experience The last three kits that we constructed had component-part errors which would seriously vex the novice. It is to be hoped that we are experiencing the unusual situation.

Alignment

The FM-1 is aligned in three sections: the i.f., the detector, and the front end. And they are aligned in that order. I.f. alignment is relatively simple, being merely a process of peaking each i.f. transformer starting from the last one and working forward to the first one. The correct "peak" is determined by loudness of the sound or maximum closing of the tuning eye.

The detector alignment is the area wherein the flea was stuck in the ointment. Primarily the procedure is to detune the top slug of the detector transformer, tune the bottom slug, and then tune the top slug. In tuning the bottom slug, the tuning eye is disconnected from its normal circuit location and connected to a point in the circuit where it can detect the signal through the bottom coil of the trans-

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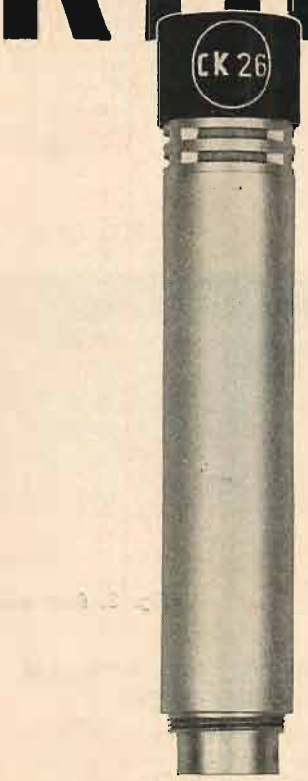

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former. In order to avoid the problem of values changing when the set is turned off and on (due to change in temperature), the manual recommends that this procedure may be accomplished with the set turned on if great care is exercised. In other words, the builder is asked to solder and unsolder connections with a "hot" chassis. In our view, this is something that should *never* be done in a kit, especially considering the fact that there are several hundred volts within a fraction of an inch of the soldering iron. In addition, during this procedure the soldering iron must be held in one hand and a pair of long-nosed pliers in the other in order to remove the connection; a difficult procedure even under the best conditions. We feel that it *should not even be suggested* that a novice undertake this procedure with a "hot" chassis. Granted that the voltages and currents available are not deadly, it is certainly sufficient to startle a novice to the point that everything might go flying—soldering iron, pliers, tuner, and all.

In any case, the purpose of this procedure is to connect the tuning eye to a point where the bottom coil can be peaked. Then the tuning eye is again disconnected and attached to the output of the detector, and the top slug is adjusted until the output is balanced.

The front end alignment is relatively simple. First the oscillator is adjusted for both high and low ends of the scale; then the tuning capacitor is adjusted for maximum signal; then the r.f. coil is also tuned to maximum signal.

Except for the "hot chassis" objection, the alignment procedure for the FM-1 really works quite well. We were unable to "improve" alignment with conventional techniques.

Performance

The published specifications for the Dynatuner FM-1 are excellent and were met in all major categories. Before going into these, we should like to mention two significant points which we feel deserve mention. First of all, despite the fact that it does not include a.f.c., this tuner did not drift at all even after long periods of operation—at one point it was operated continuously for forty-eight hours (it was left on accidentally). The second point worthy of note is the relative absence of inter-station noise while tuning from station to station, a usual characteristic of ratio detectors. Although this point is not earth-shaking in scope, it certainly is a worthwhile tension reducer.

By IHFM standards, the FM-1 has a usable sensitivity of 4 microvolts. This may not be sufficient to pull in Moscow, but it certainly pulled in all the stations we could possibly want in our locality. Frequency response is within 0.5 db from 10 cps to 40,000 cps. Audio output is 2 volts at 100 per cent modulation.

In summation, the Dynatuner FM-1 is a well-engineered, excellent-performing FM tuner, which is exceedingly easy to construct as a kit. It should be well within the capabilities of even the novice. It is relatively inexpensive too! G-27

Fig. 2. Roberts Model 990 tape recorder.

ROBERTS MODEL 990 4-TRACK STEREO TAPE RECORDER.

The Roberts 990 is a 4-track monophonic and sterophonic recorder and playback machine which will also play back two-track stereo It plays and records at both 7½ and 3¾ ips (a 15 ips changeover kit is available as an accessory). The 990 has separate left- and right-channel amplifiers, each amplifier being mounted on its own chassis and being individually removable.

A quick glance at *Fig.* 2 makes it immediately obvious that the Roberts 990 is all function with not one piece of unnecessary metal on the entire machine. Looking at this machine "in the flesh," one gets the feeling that this is one machine that does not consist of thin sheet metal and low-cost components and in fact, it does not. Beneath the surface there is a sturdy mechanism consisting of precision mechanical parts (most of the sheet metal is of a heavier gauge than is normally found), and apparently good quality electronic components. Of course, insofar as the electronic components are concerned, we could not be sure as to their quality because they were all manufactured in Japan by firms with whom we have only a slight acquaintance. We would say, however, that the Roberts 990 is unusually well constructed for its category.

We should explain what we mean by "its category." We usually categorize tape recorders into three general classes: professional, serious amatuer, and "audio snapshot" variety. Obviously the Roberts 990 is intended for the serious amateur. In reality we might even say the *very* serious amateur because this machine is certainly near the top of its category.

The Mechanism

The driving mechanism of the 990 is relatively simple in concept and in practice. The hysteresis-synchronous drive motor is connected to the capstan pulley by means of a heavy rubber belt. The surfaces of both the motor shaft and the capstan pulley are crowned to give better traction to the belt. For forward tape motion a pinch roller pushes the tape into contact with the capstan. The pickup reel is also in motion, thus keeping the tape at the proper tension at all times. Motion is imparted to the pickup reel through a rubber idler which contacts both the motor shaft and the rearmost section of the pickup reel. This rear section transmits the motion to the front section (which is in positive contact with the tape reel) by means of a felt disc which acts as a slip clutch so that the tape tension does not become excessive.

Figure 3 shows the mechanism in rest position. For fast forward, the pickup reel idler is raised to contact the front section of the pickup reel, thus driving it directly at high speed. For rewind, the two idlers on the left of the motor shaft drive the feed reel in the reverse direction.

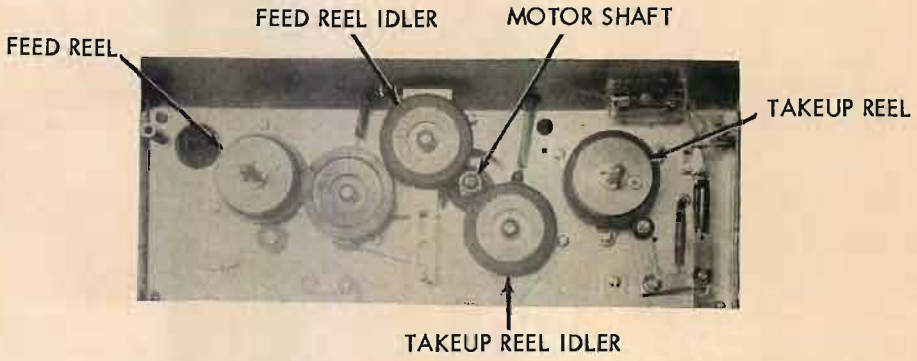

Fig. 3. Reel drive mechanism.

Speed change is effected by removing a thumb screw on the capstan and slipping off the 7½-ips bushing. The remaining shaft is precision machined to provide the 3¾-ips speed.

In order to achieve 4-track monophonic and stereo record and playback, and 2-track stereo playback (with relatively good-quality playback), the Roberts 990 uses mechanical means for raising and lowering both the record and erase heads. In reality, by means of this head-shifting technique, the Roberts 990 provides head positions which would otherwise only be possible with a 3-head machine if the switching were done electrically.

In operation the 990 is exceedingly effective. Tape handling is smooth and positive. We attempted to "catch" the machine by changing direction rapidly many times and found that it responded quickly and without looping the tape. In addition, the machine was noise free in operation, almost all the noise that was present emanating from the fan which cools the motor. All controls operated easily and with a positive feel.

The Electronics

The electronics in the 990 are typical of its category with nary a surprise in both chassis. During playback, low-level signals (head) are fed to the grid of an EF86. From there it goes through the tone control to the grid of half a 12AD7. Then the signal goes through the volume control to the grid of the other section of the 12AD7, which acts as a driver for the output tube, a 6BQ5. The bias and erase

(*Continued on page 57*)

—not only the best, but the most complete line of long-excursion, infinite baffle, precision speaker systems...

LINEAR-EFFICIENCY SYSTEMS

THE OLYMPUS

infinite baffle system without peer

Sensational sight, sensational sound, remarkable bass, indetectable crossover, incredible transient response, transparent highs, smoothest wide-angle projection... Every superlative ever used to describe a precision transduction system has been applied to the new JBL Olympus. The system includes a new 15" Linear-Efficiency low frequency unit, the LE15; new high frequency driver, the LE85; new slant plate acoustical lens, exponentially-tapered horn, and new dividing network. All unite to reproduce sound so clean, so smooth, so intact that the Olympus is destined to establish a new standard for this type of system. The free-standing, trim, beautifully-proportioned enclosure is available in all JBL wood finishes and with choice of carved wood or fabric grille.

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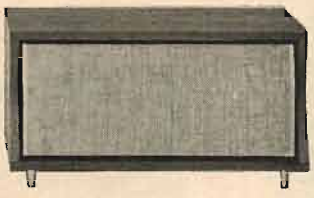
Aristocrat of bookshelf-size speaker systems, the JBL Ranger-Minigon provides integrated stereo through radial refraction, the same patented method used in the fabulous JBL Ranger-Paragon. Minigons accommodate either LE8 full-range units or JBL Model S5 two-way systems. Grille may be either the unique louver assembly shown here or fabric.

THE MADISON



THE DALE

THE JBL MADISON

An exquisitely-styled minimum volume enclosure, the Madison reflects the Danish design influence and is especially popular in oiled teak or walnut finish. Finished four sides and front for vertical or horizontal placement. Takes the LE8 speaker or S5 system.

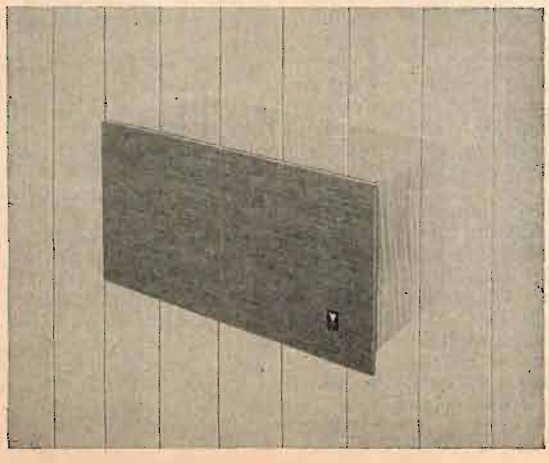
THE JBL DALE

A timeless, elegant, modern design with removable legs and hangers on back (also on Madison) for wall mounting. Finished four sides and front. All finishes and grille cloths available.

HIGH QUALITY, LOW COST COMPACT LINEAR-EFFICIENCY SYSTEMS

THE LANCER 33

It is possible to offer typical JBL precision response, fine cabinet craftsmanship, and lasting-listening satisfaction at a lower price than ever before by making a simplified enclosure, longer production runs, limiting choice of finishes, using one grille, and providing somewhat less flexibility. The Lancer 33 is a ducted acoustical enclosure with an LE8 eight-inch, full range speaker. Lancer finishes are those most frequently asked for—tawny walnut, oiled walnut, dark mahogany, ebony, and pumice. Grille cloth is beige linen-weave.



THE LANCER 66

Similar in appearance to the 33, the Lancer 66 is a "buttoned-up" enclosure with a two-way, dividing network system with an LE 10 and new high frequency unit. Performance is remarkably smooth and transparent. Lancer speakers are factory installed.

and for building in...

THE JBL WILTON

Unfinished, the Wilton is furnished with either the LE8 or S5 system factory installed. Offered with either a flush grille or overlapping grille for use when built into a wall or partition.

Whatever your choice... exponentially-tapered horn, bass reflex or infinite baffle system... you'll find your ideal speaker in the extensive JBL line. Write for complete catalogue.

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JENSEN TF-3 THREE-WAY SPEAKER SYSTEM.

Jensen has been making speakers for a long, long time. They make elaborate and expensive speakers and systems for concert halls, public address systems, and for the home—and they even make inexpensive little speakers for inexpensive speaker systems. In truth, Jensen is a speaker manufacturer. If there is one thing they know well, it is how to make speakers. The TF-3 is a good example of this. In its category it more than holds its own.

Of course, now that we've used the word "category," we are obliged to "place" the TF-3 in the scheme of things. Simply stated, the TF-3 is what is known as a bookshelf speaker system. It contains four speakers in a 3-way system in a tube-vented, acoustic suspension type of enclosure. In essence, this type of enclosure provides an acoustic suspension similar to the completely sealed enclosure, while at the same time achieving greater efficiency. It is the type of compromise which attempts to derive the benefits of both systems.

The speakers include a 10-inch "Flexair" long-travel woofer, a pair of cone-type midrange units, and a "sonodome" high-frequency unit. The necessary crossover networks are built in.

To further characterize the TF-3, one should note that it is on the lower end of the price scale, although by no means is it at the lower end of the sound scale. The units we received were unfinished utility models with a hardwood surface. It took a walnut stain beautifully, and we imagine it would take other stains as well.

Thus we can see that the TF-3 is in a category which encompasses book-shelf speaker systems which are very moderately priced. As we noted before, the TF-3 more than holds its own in this category.

Performance

Often when reviewing speaker systems we are very careful to note that our comments are weighted by personal preference. Here, of course, we were referring to the listening tests. In addition to personal preference, we should also add that the listening room influences our decisions considerably. For example, when we first heard the TF-3's in our own home, we were unable to install them in the room wherein we normally did our major listening. Therefore we set them up in another room (actually in a section of our workshop) and proceeded to listen away. After a considerable length of time we began to get somewhat disturbed because the sound emanating from the speakers was somewhat "boxy." There was a distinct "mountain" in the mid-range (it could be heard in voice, trombones, and other such instruments). Subsequently it became possible for us to install the speakers in our normal listening area, and lo and behold the mountain became a molehill. Yes, it still existed, we could still hear the "bump" in the mid-range, but nowhere near as pronounced as we had previously experienced and perhaps even this slight bump was "room effect," not the speaker. The moral of this story is that loudspeakers, in common with people, are affected by environment.

Finally, when we were able to give the TF-3 a fair listening test, we discovered that it has a good high and low end with a slight rise in the mid-range (?) and an exceedingly smooth over-all sound. We especially enjoyed the high end.

For those with limited space and budget the TF-3 is an excellent choice. For those with a mid-range budget it is still an excellent choice. It is a good choice for anyone who wants a wide-range speaker system in a small enclosure. G-29

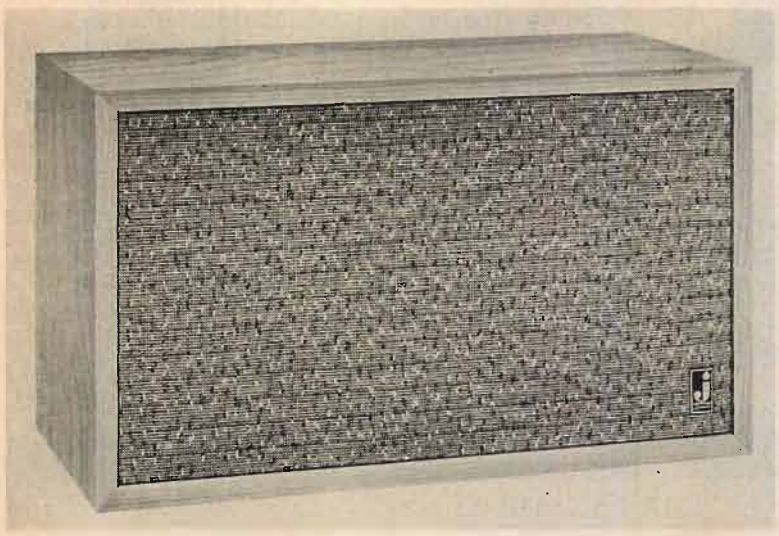

Fig. 4. Jensen TF-3 speaker system.

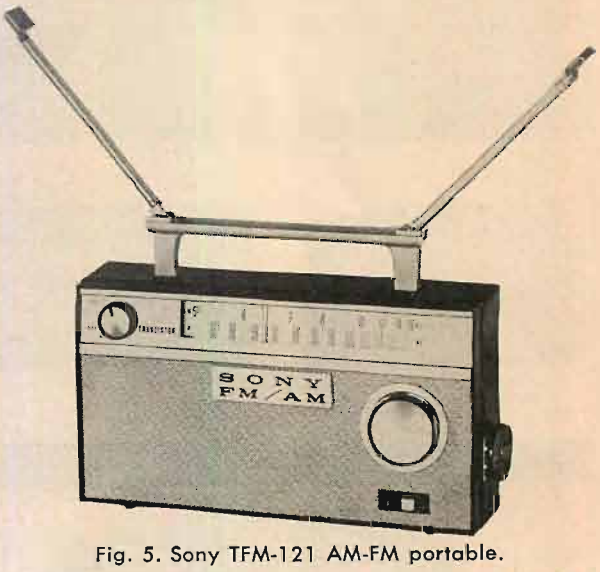

Fig. 5. Sony TFM-121 AM-FM portable.

SONY MODEL TFM-121 AM-FM PORTABLE

If we appear to be unduly interested in some of the recently introduced "consumer" type merchandise employing transistors, it is only because the actual performance of the equipment is comparable, from a quality standpoint, with conventional tube-type equipment. And while the average audiofan may feel that there are no "hi-fi" qualities to these units, it is probable that he has not listened to them except with their own audio amplifiers and the small loudspeakers that the case size necessitates.

However, some of these miniaturized sets are equipped with detector output jacks, and that in itself indicates that someone might possibly want to employ the unit to feed a conventional (or transistorized) component amplifier and a good loudspeaker.

When the detector output is plugged into a good amplifier and fed to a high-quality loudspeaker system, the FM sound quality compares favorably with one of the better known FM tuners. For actual listening, we are forced to admit that on A-B test it would be difficult to tell the difference on local stations. With a published sensitivity of only 19 μv, the TFM-121 will obviously not compare as a distance getter, but for local reception it can serve very well as an FM tuner source for any hi-fi system. If there is any drawback, it is the relatively low output signal of around 0.1 volts, but most modern preamps have adequate gain to overcome this objection.

Even on AM the quality is satisfactory —rather better than the average "clock model" AM set that graces so many kitchen counters and bedrooms. The AM section consists of a mixer-oscillator stage followed by two i.f. amplifier stages, detector, and a three-stage audio amplifier, all feeding the 3 x 5 in. oval loudspeaker. The "detector" takeoff follows the volume control and cuts out the built-in audio amplifier.

The FM section consists of an untuned r.f. amplifier stage, mixer, oscillator, three i.f. stages, followed by a discriminator, audio-a.f.c. amplifier, and the three-stage output amplifier. The first two i.f. stages are common with the AM section. The a.f.c. voltage is fed from an amplifier stage following the discriminator to the base of the oscillator transistor to vary the frequency in the proper direction to hold the station in tune.

The audio amplifier consists of two RC coupled stages with the latter transformer coupled to a pair of transistors in Class B, which are in turn coupled to the loudspeaker circuit by another transformer. One jack is provided for the discriminator output, one for the output from the arm of the volume control, and two in the speaker circuit—one simply paralleling the external circuit with the internal loudspeaker and the other connecting the external circuit and disconnecting the internal speaker.

The set operates on four size "C" flashlight batteries with a zero-signal current drain of around 18 ma on FM and 14 ma on AM. Total current drain depends on audio output, since the final stage is Class B. Operating life on one set of batteries averages about 150 hours on AM, 100 on FM.

A slide switch on the front directly under the tuning control serves to reduce treble response in the audio amplifier stage when desired. The AM-FM switch is at the right side of the case, and the power switch is combined with the volume control at the upper left of the panel. A jack is provided to connect an external AM

(*Continued on page 57*)

DISTORTION AND NOISE BANISHED!

OTL Stereo Amplifier
SM-W203
10-inch 3-way high-impedance speaker system
CS-252S

SM-W203 contains no output transformer which was absolutely necessary for conventional amplifiers. A single-ended push-pull circuit has been adopted and the matching impedance is taken at 400—900 ohms. Consequently, if a high-impedance speaker operating in this range is connected, the vacuum tube circuit of the amplifier and the voice coil of the speaker are directly coupled, and the amplifier output is led into the speaker without loss or distortion. The greatest merit of SM-W203 lies in the superb bass and treble characteristics and distortion-free reproduction even at full power application.

In SM-W203, all likelihood of hum generation is removed by DC ignition of the preamplifier, and consideration has been taken to achieve the best possible listening condition through provision of high-cut and low-cut filters as well as a loudness control.

Simultaneously with the offering of SM-W203 on the market, high-impedance speaker system CS-252S, which is made to match the stereo amplifier perfectly, is offered.

CS-252S is a 3-way speaker system using a 10-inch woofer. It amply proves how superior the OTL system is as a reproduction system. The stereo system combining SM-W203 and CS-252S is absolutely guaranteed to satisfy you completely since you are desirous of the highest tone quality.

The PIONEER is prepared to make available to you high-impedance speakers in so far as woofers and mid-range products are concerned.

Specifications Of the SM-W203

Tubes Used	: 21 tubes and 4 diodes
Power Output	: 11 watts per channel
Frequency Response	: 10—120,000 cps
Tuners: Channel 1	: AM medium wave
Channel 2	: AM medium wave and FM
Inputs	: MAG, X'TAL, AUX, FM MPX.
Outputs	: 400—900 ohms for speaker, for recording tapes, for stereo-headphone

Specifications Of The CS-252S

Speakers	: 10 inch woofer 5 inch mid-range speaker Horn type tweeter
Impedance	: 400 ohms
Frequency Response	: 40—16,000 cps.
Power Inputs	: 15 watts
Sensitivity	: 102 db/watt

pioneer

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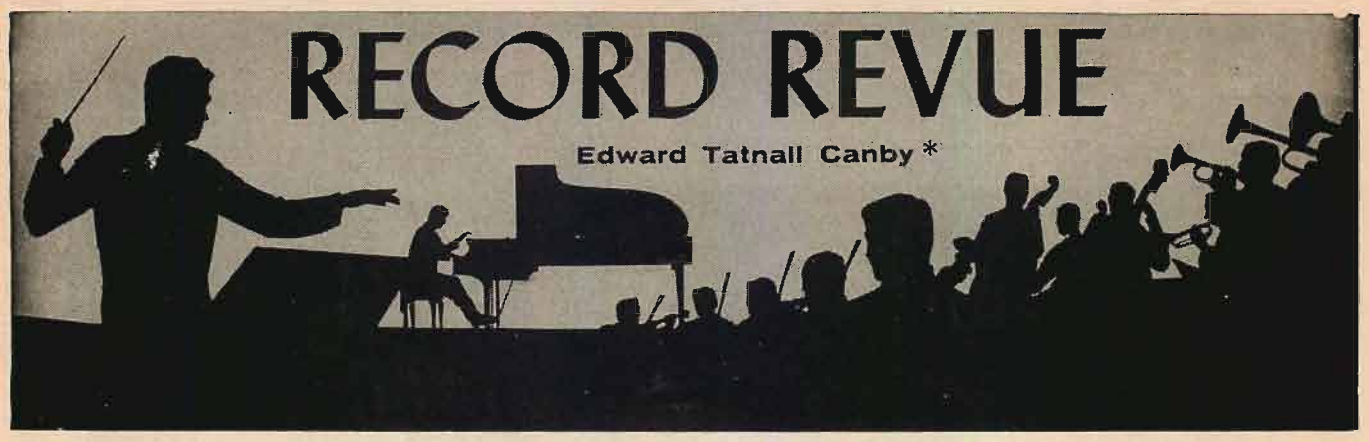


RECORD REVUE

Edward Tatnall Canby *

BAROQUE

A Bach Program at Royal Festival Hall, London. Fernando Germani.
Capitol SG 7225 stereo

A traveling organist is like no other musician, for he plays on individual instruments no two of which are more than remotely alike in detail—the difference is much greater than, say, the difference between the drive and "feel" of the many brands of automobile that a licensed driver supposedly can operate.

Germani is a ranking organist out of Italy, the titular organist at Saint Peter's in Rome (where he probably seldom plays) and an all-round virtuoso who has managed to cope with a very large number of existing important organs in his constant recital tours. I last heard him on a famous old Dutch organ, in Alkmaar; here he is on the newest of the new, relatively speaking, the big poly-purpose "classic" organ in Britain's recent Festival Hall. He does his usual serviceable job.

It's the organ that counts most here, and it's a very British one, I'd say. Remember, the British have been conservative in organs—they didn't even get to use pedal boards until comparatively recently. They still have a healthy contempt for the "screaming whistles" of the new neo-Baroque organs (and the old ones that have been so handily restored) and most organ playing in England sounds now much as it has in the past, ever so dignified and proper, very traditional and a bit stodgy on the whole.

Granted that this is a gross generalization; in any case, the Festival organ is one of those new all-purpose jobs that theoretically can play anything from Buxtehude to bop, though on this one both styles would be tempered with proper caution. It's a very dignified sound, colored just enough to lift Bach out of the French-organ sea of late Romanticism, situated in a hall that has just enough reverberation not to sound overly dead. Moderation in all things is the rule, and somehow, even an Italian organist like Germani can't make this rather large organ sound other than pure British.

Handel: L'Allegro ed il Penseroso. Pears, Morison, Watts, Harwood, Alan; St. Anthony Singers, Philomusica of London, Thurston Dart.
L'Oiseau-Lyre SOL 60025/6 (2) stereo

In such music as this, out of a period when the details of vocal sound can only be guessed at, the practical effect of an otherwise good performance becomes a matter of nationalistic style as of today. This is first of all a very British performance; whereas Decca's excellent version reviewed in December, was in the best "New York" style, which generally means a cooperation of variously trained musicians from assorted backgrounds.

It's mostly singing, of course, this Handelian succession of solo pieces with chorus thrown in here and there, alternately heaping praise on melancholy and on gaiety. This recording features a brace of typically British solo voices—the best—with a typically British chorus as backing. The orchestra is properly authentic. British voices? Hard to describe, but I can mention a certain nervous whiteness of tone, a taut, somewhat breathy delivery, sincere and very "speaking," often to the detriment of smooth production. And, of course, a very British accent. In any case, you'll recognize the sound in five seconds flat.

The Decca recording features the voice of soprano Adele Addison, a negro voice utterly unlike that of the British Elsie Morison. Both are tops, but you'll have to choose your voice-type to suit yourself, here as in the other parts. Even Decca's chorus is as American (full of wobbles and not well blended) as L'Oiseau-Lyre's is British (minus vibrato, somewhat chaste but with perfect diction and attack).

Now if the musicologists would just tell us how we should train our voices, starting at, say, ten years of age, to produce the vocal sound that old Handel actually expected in *his* time . . . well, we might begin by turning out a few *castrati,* to fill the soprano roles.

Buxtehude: Suites XIV, XIX (harpsichord); Solo Cantata "Singet dem Herrn"; Magnificat. Musica Sonora Ensemble, Nolte.
Musica Sonora Record No. One.
(P.O. Box 87, Evanston, Ill.)

This Chicago-area performing group begins here a series of Buxtehude recordings, presumably paralleling performances in concert. On side 1 of this first disc are two fine keyboard suites—which might well be taken for Bach: the somewhat stylized and complex "dance suite" format, allemand, courante, sarabande, gigue, is very like that of the familiar keyboard suites of Bach and Handel

Don't Miss This

Wagner: Tristan und Isolde, complete. Nilsson, Uhl, Resnik, Krause, Van Mill; Vienna Philharmonic, Solti.
London OSA 1502 (5) stereo

What a huge undertaking, to record all of this four-hour marathon-opera into one package! And what a show it makes in stereo.

The album is a true spectacular, i.e. with all the modern trimmings, a complete libretto, to follow the story word by word, a wealth of printed and pictorial material concerning the opera and its performers. But this one has an "extra" (no charge) in the form of a whole LP record, "Project Tristan," devoted to a stereo account of the actual rehearsals and recordings sessions for the stereo opera. Two complete sides. I found it the best show of its type I've heard yet, as well as the longest, giving a superb look-hear into the complex process of stereo opera recording as well as enjoyable glimpses of the principals involved, the conductor, singers Nilsson, and Resnik, the recording director. Their mixed gabble of German and English (mostly German) is amusing and for those who can't follow it there is a complete printed translation! That's a neat touch. Excellent use of the stereo medium, the rehearsals in one speaker, the commentator in the other, the finished takes sampled now and then in full stereo for contrast.

As London points out, this "Tristan" in stereo is not intended as a literal reproduction of an opera house performance, but rather an imaginative re-creation in a medium unknown to Wagner. I am heartily in favor of such thinking. About time it came out in the open, to replace all the guff about "best seat in the concert hall," etc.

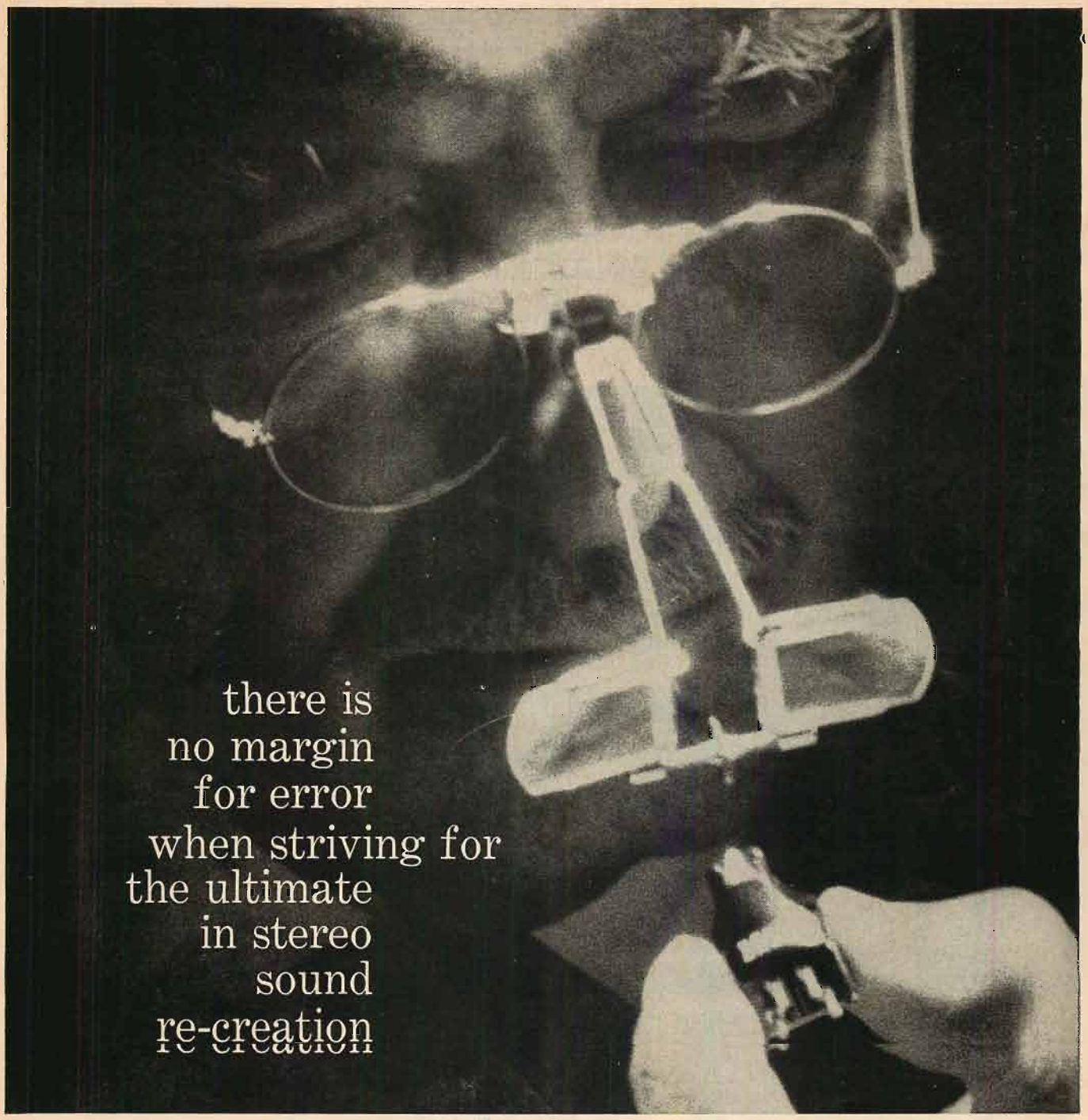
London's re-creation is rather special. The big Wagnerian orchestra is spread out close to you and very widely; its impact throughout is tremendous. You'll hear all sorts of things you never heard before, and they are good things musically. (All big music is over-optimistically fuller of meaning than any one performance can project.) The playing under Solti is taut, expressive, beautifully phrased.

The singers are a bigger problem and stereo hasn't yet really found what to do with them. In mono days, opera singers came closer and closer, seemed mostly at arm's length, in front of an accompanying orchestra. Now, stereo has reversed the trend. London's voices are never really closer than the orchestra itself and very often are so distant as to seem actually well behind it, especially in places that ask for "off-stage" entrances. The effect is rather "off-mike" at first, though not to the real detriment of the musical impact. We'll get used to this sound. I found less satisfactory a kind of boxy, closed-in feeling in those passages where the voices are nearer at hand. Isolation booths? More likely a matter of a second mike setup in a separate part of the hall (the stage), for the singers, with the singers' and the orchestra's reverberation slightly at odds as superimposed one on the other in the final result.

Nilsson's Isolde is the best since Flagstad, and reminiscent of hers too, but Flagstad had a greater classic dignity, less persistent vibrato, heavenly quiet tones. Nilsson is a fine actress, romantic rather than classic. Her big voice gets wobblier as the passion mounts. Her ear and her pitch are both infallible but the dramatic wobble tends to confuse things at the high points. (If you don't care what pitch she sings, it doesn't matter.)

Uhl, like so many recent Tristans, lacks the real Tristan metal though he is musical, a good stylist and a fine singer. This is a matriarchal "Tristan und Isolde" again, though the secondary males are up-coming and excellent—young Krause and that big basso (Marke), Arnold Van Mill.

* *780 Greenwich St., New York 14, N.Y.*



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(and far removed from any actual dance music). Buxtehude is at his most formal here, appropriately for the music, which is more "chamber" (as we'd say) than his popular organ works and cantatas, composed for the people at large. This is solidly competent playing on a large harpsichord (recorded at high level, much louder than the large ensembles on the other side). Donald Isaak is the performer.

The Cantata and the Magnificat are less successful, if more ambitious. In the Cantata, the solo soprano does a heartfelt if somewhat amateurish job, her voice not steady nor well controlled in rapid passages, her pitch nervously a bit sharp, with a waver. The companion violin is firmly didactic rather than poetic.

The more elaborate Magnificat's two sopranos do very nicely together as a team, but the three other soloists are of the church choir sort, loud, wobbly, unstyled and indifferent in their pitch. The chorus sings with attention and enthusiasm but with many a vibrato and not much ensemble.

Because this group is sincere and in earnest, Buxtehude's intentions are generally well realized, in spite of my criticisms. The spirit is excellent. But the more modest German performers on the Barenreiter Musicaphon Buxtehude disc reviewed in last month's issue can sing and play rings around these people.

NEW DIMENSIONS

New Dimensions in Organ Sound. ("The King of Instruments"). Catharine Crozier, Aeolian-Skinner organ Opus 1309 (1959).
Washington SWAS XIV stereo
(mono: WAS XIV)

Did you know that organs had opus numbers? This is the fourteenth record in Aeolian-Skinner's series "The King of Instruments," offering professional programs played on the company's products, in this case a 1959 model. Music is of course the primary vehicle. But the organ itself is the first thought, the performer the second. The performers are the big pros in the field: the music is the stuff they usually play, which runs often to narrowness of interest (for the non-organist music lover) and equally often to narrowness in the intrepretation. If you are no organist, you'd better pick carefully among these discs, though they'll all satisfy you in the fi.

Crozier is a potent lady organist who reminds me, somehow, of the gal who drives an Olds 98 and beats the traffic lights. After all, it takes only a will and a know-how; the motive power is all there, whether you're man or woman! Her masterful playing of the enormous, unique big-Romantic sonata by the 24-year-old genius Reubke (he died at that age) shows how far towards high-Romanticism the organ had already gone in 1858, 'way back. Reubke knew what it should do, this monster transfiguration of the Romantic orchestra into pipe-organ terms, with its thunders, its swells and pianissimos, its grandiloquent crescendos and dyings-away. You'd think he had borrowed from César Franck: but Franck wrote many years later and it was Liszt and Wagner who inspired the Reubke concept.

Like most Romantic organ music, this piece is for us much too long and far too moody on a giant scale. It roars and rants, whispers, admonishes, pants and moans, for a whole side and a half of LP—a lot. (The rest is a brace of coloristic little modern French pieces, tricky but nothing very much.) You'll do best with it, as I did, by turning on your biggest wattage in stereo. The house will shake its foundations in the loud parts but the soft sections will at least be audible without tiptoeing.

Schuller: Seven Studies on Themes of Paul Klee.
Fetler: Contrasts for Orchestra. Minneapolis Symphony, Dorati.
Mercury SR 90282 stereo
(mono: MG 50282)

So many foundation-commissioned recordings of contemporary music now appear that, paradoxically, few reviewers can hope to cope with them all, not to mention few listeners. This one isn't the most important of the year, but it surely offers a recordful of interesting and pleasurable sounds from two agreeably forceful personalities. That's a lot. Both composers are old pros with orchestral effects, immensely knowing in their use of sheer sound. Both are pretty darned clever, moreover, in their knowledge of the musical language, each in his own modern dialect. The communication, with Mercury's skilled assistance, is optimum.

Gunther Schuller, age 36, has burst forth from a mere horn player (Metropolitan Opera) into a highly assured young man of all sorts of musical and literary talents, whose music is both arrestingly avant-garde and reassuringly "square." Schuller's music is music for the millions, not the precious few; but the millions will have to take it or leave it on his terms, which are tough ones, let me tell you. Tough and interesting, combiuing modern jazz, violent dissonance, serialism (twelve-tone composing). Arab folk music and what-have-you. Music is music, to Schuller, wherever he may find it. You'll find yourself going along by sheer force of his personality—he's a determined young man who knows how to say what he wants.

Clever idea, to do a series of miniatures to paintings of Paul Klee. Good public relations and good musical inspiration, too, just enough contact between the visual Klee and the musical Gunther to set the Gunther wheels going, without fanciful poetizing or elaborate music-painting symbolism. (Paul Klee, unlike many artists, was an ardent and really knowing music lover.)

The famed "Twittering Machine" of 1922 (on the record album cover) produces fabulous twitterings in the orchestra-machine. "Abstract Trio"—Klee used many a music-prone title—is played by an abstract trio

here, numerous assorted instruments but never more than three at a time. The "block-like shapes" of "Antique Harmonies" are redefined by Schuller into musical blocks, as Schuller says, "on a dark, dense background . . . reaching a climax in the brighter yellow of trumpets and strings." A fine bit of musical jazz blues, acutely modern, portrays "Little Blue Devil"—it's a tour de force of ingenious writing, you'll have to admit.

On the reverse we have a very different piece, a somewhat glibly conventional modern semi-symphony, made extremely listenable by two elements, an expert use of the orchestra and a light-hearted, fancifully skittish sense of humor. Not a very important work, this "Contrasts," but you will be amused to hear the multiplicity of "influences" in it, ranging from Sibelius to Bartok and on to Robert Russell Bennett, all very neatly blended and homogenized with plenty of orchestral foam.

Bartok's "Concerto for Orchestra" keeps appearing—and, indeed, that orchestral work was actually Bartok's own "Contrasts" for orchestra; he wrote the only other piece with this name that I know of, "Contrasts" for violin, clarinet and piano, and could have named his larger work similarly on the basis of Mr. Fetler's own idea, contrasts of every sort within an orchestral piece.

I found only the last movement hard to take, becoming overblown and noisy; the first three movements are charmingly spare and very entertaining as sheer organized stereo sound.

Hindemith: Three Sonatas for Organ. E. Power Biggs, Flentrop organ, Harvard.
Columbia MS 6324 stereo
(mono: ML 5634)

I'm a great admirer of Mr. Biggs, America's organist, and I know that his unflagging advocacy of the classic-type, or "Baroque," organ has had much to do with its renaissance into wide popularity. Biggs has now run through most of his Baroque repertory on records; he has been turning elsewhere of late, both to the Romantic school and to those moderns that can be played on his own type of organ.

The new Flentrop, his home instrument, is all-mechanical, as of the Seventeenth century, with no swell boxes and no electronics, minus high pressure air and minus "nicked" pipes (for softened sound). It's good for Hindemith, who writes thickly and needs clarity.

However, sometimes I think the Biggs enthusiasm outdoes the Biggs playing. In this fairly rigorous contrapuntal music, Biggs plays competently but not, I'd say, with much musical subtlety in phrasing. Even so, and with such clean organ color and articulation, the solidly expressive and often humorous Hindemith gets through neatly. This isn't "sacred" organ music, of course, just music for organ, to be played as music, and the less sanctimonious the better. It'd be fun on a Mighty Wurlitzer, with side drums.

Hindemith: Sonata No. 3 for Piano (1936). Barber: Four Excursions, Op. 20. Martin: Prelude No. 7. André Previn, piano.
Columbia MS 6239 stereo
(mono: ML 5639)

The most striking thing about this somewhat erudite disc of modern piano music is that its performer, André Previn, is a jazz-man, not to speak of conductor, pops arranger, film-score writer (*Elmer Gantry*), etc. This is the modern way—from jazz to super-classical, from twelve-tone back to blues, and the trend is quite serious: these many once-separate areas of music are coming together more and more widely as time goes on, as people hear each other, teach each other, influence each other.

He's a better pianist for being a jazz-man and arranger, let me tell you. I have always had a disconcerting feeling that though a "classical" pianist may get by via sheer finger dexterity, a jazz man *must* hear what he does, whatever it may be. This shows up nowhere better than in such music as Hindemith's, which is actually very "sensible" music in its construction, as thorough and systematic as any by Bach himself. It can be *heard*—but often isn't. You can play the notes without having the faintest idea what is going on.

But if you do hear what's happening, as Previn does, the music makes sense in the listening. Of course!

The Hindemith "Sonata" is as uncompromisingly thick and Germanic as it ought to be, as uncompromisingly full of fugues, motival ideas, counterpoint and all the rest that is of the Germanic tradition. But the Hindemith sparkle is there, too. As for Samuel Barber, his "Excursions" take us into a brace of American styles, from a gentle boogie to a folk-like tune for variations and—the finale—a barn dance. Nice, skillfully written, mild. Martin's somewhat heavyweight "Prelude" shows the old Swiss predelictlon for the Wagnerian, neatly wrapped up in a small modern package. I sort of got lost in it.

Reger: Piano Concerto, in F Minor, Op. 114. Rudolf Serkin; Philadelphia Orch., Ormandy.
Columbia MS 6235 stereo
(mono: ML 5635)

This is a labor of persuasion; but not many of us will be persuaded.

Big musicians often get this way. Sir Thomas Beecham never gave up urging Delius upon his listeners. Bruno Walter espouses Mahler. Nadia Boulanger pushes Fauré. Koussevitsky used to promote Rousell, up in Boston. When you get to be musically important enough to choose your own programs and to plug your own genuine loves, you will be bound to do this sort of thing unless you are dishonest with yourself.

Serkin espouses Reger as a great cultural compatriot and indeed the man was a top in-

fluence in the musical world of the early Nineteen Hundreds. But he was a then-conservative—he championed the old concept of "pure" music as opposed to "program" music when that idea was pretty much dead except in music appreciation classes. It was by 1910, anyhow, when this huge, heavyweight post-Romantic "pure" concerto was first heard. No program. No story attached.

I suppose it *is* a significant work, and I respect Serkin's mid-European judgment in bringing it forth; I also like his playing, which puts the bounce of fervent energy and enthusiasm into a turgidly dated mass of sound. But ugh!—do I have to like *everything* that is worthy?

A second and a third try would probably bring me around, but I'm not going to go through with it. You will, of course, if you are attuned to big, spectacular, old-fashioned heavyweight concerto playing, at length.

Debussy: La Mer; Danses Sacrée et Profane.
Roussel: Bacchus et Ariane, Suite #2.
Lamoureux Orch., Markevitch.
Deutsche Gramm. DGS 712040 stereo

Beethoven: Overtures (Coriolan, Leonore #3, Consecration of the House, Egmont).
Lamoureux Orch. Markevitch.
Deutsche Gramm. DGS 712019 stereo

Here is Deutsche Grammophon's French department hard at work, one record all-French and the other all German. Fair division.

Markevitch, one of the last of the emigré Russians to join that amazing Franco-Russian school of activity that centered around the great ballet impresario Diaghilev, is a brilliant conductor of French music and his own Lamoureux orchestra does a taut, tasteful job on the Debussy and Roussel. As for Roussel, it's no coincidence that another Franco-Russian, Koussevitsky, used to play that composer regularly in Boston, which is almost the only American place where he is known well. Rousell seems to be one of France's lost-cause composers (in the outside world), as Delius is in England. For all his impeccably stylish writing, most of us find Roussel competently long-winded, though technically interesting via pungent and effective orchestral writing.

The Debussy Danses, composed on order to show off the then-new chromatic harp (it could play anything), are as we now see them pretty derivative—from other Debussy. He wasn't above that sort of thing by any means, when opportunity offered, and he did it well. The harp never sounded so harpy; but the music is dated.

As for the other disc, the reverse-twist Beethoven (German music by a French playing ensemble for a German record company), it is a fine example of the best French treatment of that composer—and it will sound pretty funny to non-French listeners. Somehow, French Beethoven is blatty, tinny, thin and over-tense, minus the fine German dignity that *we* (whoever *we* are) think it must have. The French worship Beethoven just as we do; but they like him in their own style.

Part of it is in the French wind instruments, notably the blatty, wobbling horns (with vibrato—utterly unthinkable in Beethoven). But there's more to it than that. Best thing is just to listen and get used to thinking like a Frenchman; then this Beethoven will reveal its considerable strengths to you.

SOLID FARE

Beethoven: Symphonies No. 1, No. 8.
Vienna Phiarmonic, Monteux.
RCA VICTOR LSC 2491 stereo

RCA Victor has one of the world's oldest and best all-around maestros by the tail here, and I wish they would pin him down to recording more often—he's caught now and then on the fly, in Vienna, Boston, even Paris, as a sort of guest performer. This one would seem to result from RCA's arrangement with English Decca (London), which normally records the Vienna Philharmonic. (Interesting question: is this, then, RCA Living Ffss?)

The prognosis is good here for a workable combination, the great home orchestra of Beethoven's own city with the dynamism of

Monteux' French background. He's big enough not to be provincial in an over-French way. The big concepts are excellent, the music lean and lively, the style never forced. Even so, I felt, there was some roughness in the playing; I would guess that the somewhat sluggishly comfortable Viennese performance has here been hepped up and speeded up, and the Viennese players haven't yet quite adjusted to Monteux' way of doing things. But they're with him most of the time.

Mendelssohn: Scotch Symphony; Scherzo from the Octet, Op. 20. Boston Symphony, Munch.

RCA Victor LSC 2520 stereo

It's getting so I really don't know what to say about the many Boston Symphony recordings with Munch that keep coming along. I had expected, confidently, that this would be something special; the companion recording of the "Reformation" Symphony was absolutely superb, to my great delight. (But the "Italian" on its reverse side struck me as dull as dishwater.) Instead, though there are flashes of the marvelous music-making of the "Reformation" recording, this one mainly settles on the usual Munch-Boston type of performing; expert and impeccably tailored but somehow listless, dull, surprisingly tasteless. It happens again and again and it must be Munch. He evokes our enthusiasm mainly in French works and notably in Berlioz, whom he champions as Walter champions Mahler.

To mix metaphors, the current BSO playing is to me like tasteless velvet. It looks good, it's polished, beautiful to behold, in the best of taste, yet minus musical flavor. The difference is in a million details and, if I'm right, in a single pair of musical ears, that somehow do not require the BSO to play *musically* in the deepest sense. Munch's ears. Who else?

P.S. And why that tired old orchestral arrangement of the sparkling Mendelssohn "Octet," the *Scherzo*, that gets used for every recording, every performance that needs a quick few minutes of "fill," to time! The BSO doesn't need to show off its playing skill; imaginative programming would have found something better.

Thomas Schippers Conducts Opera Overtures. Columbia Symphony.

Columbia MS 6238 stereo
(mono: ML 5638)

This is a good opportunity to assess the talent and character of this conductorial wonderboy who has reached top pro status and isn't yet 30. (Conductors really begin to go at 75.) The record is decidedly revealing.

First, of course, Schippers is flashy and professional—who wouldn't be in his position at such an early age? He knows he is good, always did, is assured even when he's wrong. You can hardly expect a young conductor to work with the mellowness and wisdom of, say, a Bruno Walter.

Second, the man is excellent at the warhorse sort of Italian opera material, as here represented by Verdi and Rossini. (He conducts at the Met now.) He's good, too, at such special material as the D'Indy impressionism of one obscure French opera here, and at the modern conservatism of his mentor, Menotti ("Amelia Goes to the Ball"). An expert and efficient conductorial workman, Mr. Schippers.

But, third, he is impetuously narrow, still. His Mozart "Marriage of Figaro" overture is a coarse desecration of a sensitive and beautiful score. It is a war horse, too, but not this kind, please.

All in all, it looks as though Menotti is a hot man for Nineteenth century repertory, with a Franco-Italian slant.

The String Quartets of Franz Joseph Haydn. (a) Op. 71. #3; Op. 74, #2, #3. (b) Op. 71, #1, #2; Op. 74, #3. Griller String Quartet.

Vanguard VSD 2033, 2044 stereo
(also mono)

Haydn: String Quartets Op. 54, #1 and #2. Amadeus String Quartet.

Angel 45024

(Note: *Here's what sometimes happens to*

(*Continued on page 61*)

CHARLES A. ROBERTSON*

STEREO

Dave Pell: The Old South Wails
Capitol ST1512

Leaders of the young modernist groups no longer need look scornful or apologetic, depending upon whether or not the person asking happens to hold the purse strings, when turning down requests for *When The Saints Go Marching In,* and other standard Dixieland fare. One of Dave Pell's side lines involves publishing stock arrangements to many of his albums, and the latest one is designed to make a dozen two-beat classics palatable to soft-swing octets. No less than six top California arrangers were hired for the job, and the old tunes receive gentle treatment at the hands of Marty Paich, Bill Holman, Med Flory, Bob Florence, Harry Betts, and Johnny Williams. The leader's tenor sax is always soothing, while Jack Sheldon contributes a few lively moments on trumpet. Dixieland stalwarts may not approve, but they must admit something new has finally happened to the *Saints.* Drummer Frankie Capp sets the right tempos for dancers, and the stereo version sounds quite saintly.

New Orleans: The Living Legends
Riverside 9356/9357

New Orleans jazz never sounds quite the same away from its birthplace, and this two-album set is the first in an ambitious series that was recorded last winter in the French Quarter. Not only did Riverside dispatch a crew and equipment to record the musicians on home grounds, but the veterans selected are those who remained in the city for most of their careers and all play in a style unadulterated by outside influences. The American Federation of Musicians recognized the [illegible] of musicians recognized the historic importance of the project and set aside union rules so that members and non-members appear together for the first time. Among the twenty-seven men are several never recorded on modern equipment before, including Louis Cottrell, president of the Negro musician's local and a sterling clarinetist in his own right. Eight different groups are represented on the introductory set by numbers not scheduled for repetition in subsequent volumes, and the complete series is bound to win many new friends for traditional jazz, besides giving future musicologists a more accurate insight into jazz origins.

Because other commitments prevented Riverside's Bill Grauer and Orrin Keepnews from making the trip, responsibility for carrying out the project was turned over to Chris Albertson, the newest member of the producing staff. Herb Friedwald, a young New Yorker and recent graduate of Tulane University, acted as his assistant on the venture. He went down a week in advance to prepare a recording schedule and line up the hall.

Starting out in a January snowstorm on a nonstop drive to New Orleans might not be every engineer's idea of a good time, but to Dave Jones it was the "ideal assignment" he had always wanted. In fact, it was the attraction of traditional jazz that started him more than a decade ago toward his present career as free-lance engineer. Jones was also called in to work with Riverside's Ray Fowler on the engineering of location dates at the Five Spot Cafe and Thelonious Monk's Town Hall concert. When Fowler was unable to go to New Orleans, Jones gladly loaded his portable equipment into a station wagon, picked up Albertson, and made the trip in less than two days. His two Ampex 350–2 tape recorders are spring mounted on iron frames to withstand the jolting of country roads, and a pair of AR-3 speakers go along for playback. The best of the old Empirical recordings boast an open-hall sound that is eminently suited to traditional jazz, and the meeting hall picked for the sessions turned out to be ideal for achieving the same effect. Today's equipment, Jones readily admits, even allows for added improvements.

"In those days," he comments, "the choice was between the advantages and disadvantages of a large hall or a small studio. I could never see crowding a band into such small quarters that the artificial aid of an echo chamber became necessary, but soloists could be recorded with greater presence. I always preferred the natural sound of a good hall, but improper balance could easily cause a blurred, muddy effect. Better microphones, plus the benefits of stereo, make it a great deal safer now to record in a hall. I was able to give Jim Robinson's trombone all the presence it needed, without masking any of the other instruments. I tried for a combination of the old traditional sound and the closer miking usually given modern groups. Sony condensor mikes were used, and with Beyer stereo headphones I rarely needed to listen to a playback over speakers."

"The hall, which belongs to the Society of Young Friends, was all I could ask for." Jones Young Friends, was all I could ask for," Jones states, "and the musicians felt right at home. Albertson gave considerable thought to picking numbers not recorded too often before, if at all, even taking along a few collector's items he hoped might bring back old memories. Our orders were to make five albums, but the music is still there and we came back with enough material for eight or more. My only regret is to have missed the bands which marched for two hours at Alphonse Picou's funeral a week after we left. Bill Russell and Dick Allen, his assistant on the Tulane Archives project, dropped in to watch us record, and I think Russell is satisfied that *I didn't* follow his advice about not getting mixed up in the recording business."

The sound of the ancient hall, together with the sharp detail of expert stereo miking, contribute to the finest recording ever given New Orleans veterans, and they live up to it in every way. Since the local musician's union withheld its blessing from most recent recording projects, Louis Cottrell's playing is relatively unknown and jazz encyclopedias omit the name, even though his father was the drummer who developed the press roll and taught Zutty Singleton. The son studied clarinet under Lorenzo Tio, who was also Barney Bigard's teacher, and his mellifluous tone and phrasing are in the same great tradition. His work with Jim Robinson's band impressed Albertson enough to schedule an extra trio session, and anticipation for the rest of the set rises to fever pitch wih Cottrell's solo on his own *You Don't Love Me.*

Among other finds uncovered in union ranks is seventy-year-old "Sweet Emma" Barrett, a pianist whose only previous recording with Celestin's Original Tuxedo Orchestra dates from 1925. Known for her custom of wearing red silk garters and cap adorned with tinkling bells, she still possesses remarkable vocal prowess and drives the band furiously on *Sweet Emma's Blues.* Also Emmanuel Sayles, who recorded last in 1929 with the Jones and Collins Astoria Hot Eight, returns to spark three separate groups on banjo or guitar. Albertson hoped to use Emil Barnes, but the venerable clarinetist was still too weak after a recent stroke. To make this cross-section complete, Barnes is heard playing in good form with Kid Thomas and his Algiers Stompers, as recorded by Russell and Friedlander last summer at Tulane.

With such names as Willie and Percy Humphrey, Peter Bocage, Charlie Love, Albert Jiles, Alcide Pavageau and Albert Burbank, the remainder of the roster reads like a Who's Who of New Orleans jazz, and topping the list are Billie and Dede Pierce with their own *Freight Train Moanin' Blues.* If future volumes fulfill the promise shown here, the entire series will comprise an authoritative document of a music that is also a way of life. As recordings presented only a partial view of New Orleans jazz until now, writers of jazz histories can get ready to revise their estimates of traditional jazz and add a new chapter on people they never heard before. But history books have yet to elaim the music, and this introductory set is a live and exhilarating listening experience.

Big Miller: Revelations And The Blues
Columbia CS8411

After appearing at the Monterey Jazz Festival last year, Big Miller headed for Hollywood where he worked at Shelly Manne's club and turned out this album of newly-minted blues. Miller prepared all the numbers to order for the date, excepting Lucky Millinder's leisurely *Slumber Song,* which has Ben Webster crooning a lullaby on tenor sax in the background. The latest developments among local musicians in the marriage of gospel fervor with the blues shout are covered, and Miller receives the brotherly aid of such distinguished deacons as Red Mitchell, Jim Hall, Plas Johnson, Ernie Freeman, and Ike Isaacs. On *The Monterey Story,* a collaboration with Teddy Edwards, the singer tells all about the recent events further up the coast and extends an invitation for everyone to come back this year. A rare stereo treat takes place when Miller picks up tambourine to mark the beat with Frank Butler, who again proves himself as the drummer to hear. The two hit it off just right rhythmically, and the hefty blues singer never sounded better.

Al Hirt: Swingin' Dixie
Audio Fidelity AFSD5927

Recent television appearances have introduced Al Hirt to a great many people who never heard the New Orleans trumpeter before, and some undoubtedly wonder if the burly, bearlike figure of a man could be Peter Ustinov in a new disguise. Others simply marvel that such an uninhibited personality and so much brazen brass ever got on television in the first place. The majority quickly fall under the spell of his forceful and exciting sound, and quite a few go out to buy his records the next day. Hirt is rapidly becoming one of the hottest items in the stores, which just goes to show what a little exposure at the right time can do for a dixieland leader. Audio Fidelity has the best of Hirt already stacked away in the catalog, and the fourth volume presents more of the same, with flamboyant sextet readings of such perennial favorites as *Moonglow, Deep River, Memories Of You,* and *Lonesome Road.* One of Hirt's specialties is bright, swing treatments of old jazz standards, and he romps merrily through *South, Shine,* and *Farewell Blues.* Good stereo spread, with Hirt's horn coming down the center track like a well-oiled Diesel engine.

* *732 The Parkway, Mamaroneck, N.Y.*

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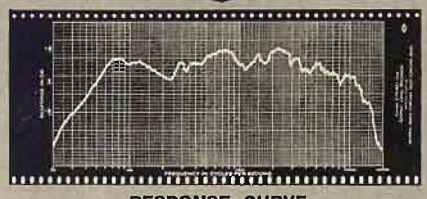

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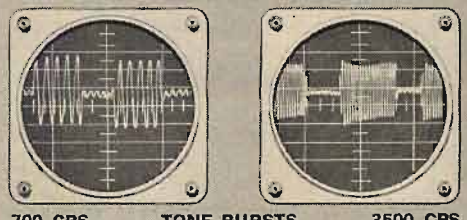

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Gloria Lynne; I'm Glad There Is You
Everest SDBR1126

After turning out a string of LP's with the backing of studio groups and carefully constructed arrangements, Gloria Lynne ventures on a date accompanied by the trio which has worked with her in clubs for more than eighteen months. The album title recalls her memorable television performance of the Jimmy Dorsey tune on Harry Belafonte's New York 19, and the fact that it draws the post position here makes it a hard entry to beat. Earl May, who heads the trio and works out the arrangements with the singer's help, starts a dark horse in *Birth Of The Blues,* which in revitalized form is a sure bet for a rainy day and muddy track. Several of the songs have graced the winner's circle at one time or another, including *Young And Foolish, Old Man River,* and Irving Berlin's *What'll I Do.* Two that belong there after this outing are Ronnel Bright's *Sweet Pumpkin',* and Alex Wilder's *Trouble Is A Man.*

What lifts this program far above the ordinary though is the complete understanding between Miss Lynne and the trio. May on bass, Herman Foster on piano, and drummer Grassella Oliphant anticipate and subtly reinforce her every vibrant whim. Foster has several LP's to his credit, but his exceptional talent for accompanying a vocalist is revealed here for the first time when rich, fullsome chords fill out the stereo background.

Rene Bloch: La Pachanga
Capitol ST1530

Pachanga is the name of the newest Latin-American dance craze inspired by a popular song written in 1959 by Eduardo Davidson in Havana and is all about going to a party or fiesta. In this country, the dance becomes the theme, and it involves a conglomeration of North and South American steps, plus some waving of pocket handkerchiefs. Originating at the Palladium, a Broadway dance hall dedicated to Latin rhythms, the dance spread across town to the floor of El Morocco late in the winter, was banned at the Stork Club, and completes its journey across the continent in the album. Rene Bloch, a graduate of the Perez Prado orchestra, leads his Hollywood crew in the title tune, includes three other Davidson compositions, and helps fill out the set with four originals of his own. A choral group supplies lyrics, but the liner is bare of instructions as to when the handkerchiefs go into action. Look for a rival company to package both items as standard equipment next month. Until then, enjoy the alluring sound of Bloch's flute and play catch-as-catch-can with the stereo display of compulsive rhythms.

Theodore Bikel: From Bondage To Freedom
Elektra EKS7200

The Wilcox Three: The Greatest Folksongs
The Wilcox Three: The Greatest Folksongs Ever Sung
RCA Camden CAS669

Whenever an old folk ditty becomes popular and the hitmakers take over, fears are expressed that the music soon will be debased out of existence. As the music is stronger than ever after all the punishment administered over the last decade, it should be evident by now that the real danger lies in what happens to the promising young singer or unknown artist who is suddenly discovered and launched with all the publicity usually reserved for presidential candidates. Being of show business himself, Theodore Bikel knows just how far to go and still not alter the basic character of a song. Bikel's every performance is a model worth studying, and his keen sense of theater often leads to the discovery of a new and different set of dramatic values.

In turn, where a song's emotional content is concerned, Bikel is always ready to learn from the people who first gave it meaning and life. Germany, Israel, Scotland, Spain, Russia, and Ireland are among the countries he visits this time, and the quest is for such rallying cries against tyranny and oppression as *Follow The Drinking Gourd, Scots Wha Hae,* and *Rising Of The Moon.* Bikel finds these freedom songs share a similarity of emotion, stemming in many cases from the same book as the verses Isaiah, 41, and Ezekial, 37, which he sings to Dov Seltzer's settings. Fred Hellerman directs the orchestra, and John Quinn engineered the date.

The Wilcox Three is a new group from Hawaii, and the name comes from the high school dormitory where the members first got together and entertained fellow students. They may be singing television commercials next year, but all are teenagers now, full of pineapple juice and youthful enthusiasm. Already the leader has adopted a stage name, changing Douglas Hatlelid, as folksy a surname as anyone could want, to a showier sounding Chip Douglas. His teammates are Fred Claassen and Steve Tilden, and together they treat ten folk standards like newly discovered toys. *Darling Cory, Tom Dooley,* and *Goodnight, Irene* have all withstood rougher handling, and those arranged by Douglas skim along as lightly as a surfboard. They were recorded in Hollywood, and the stereo version is well worth the price in vitamins alone.

Benny Bailey: Big Brass
Candid 9011

Phil Woods: Phil Talks With Quill
Epic BN554

Even those jazz fans who remain indifferent towards efforts to bring back big bands are certain to be warmly receptive to small groups formed from within a band, and this newcomer is among the best. Benny Bailey's trumpet played an important part in the rise of the Quincy Jones band, and the leader takes frequent note of the fact ou the stand by featuring a composition of his own called *Meet Benny Bailey.* Fellow luminaries Phil Woods, Julius Watkins, Les Spann, and Buddy Catlett combine in a septet setting to complete the introduction, which also serves to launch what may be the first of a long series by members of the band. Bailey, who visited this country last fall after seven years adroad, has since returned to Sweden, but the band's next European tour should bring them together again.

Jones refers to Bailey as a trumpet man who has authority, and there is no denying that band experience has given him the power and glorious tone needed to speak out in any company. No one who has heard him with Jones will be surprised at the assurance with which two blues and swinging band pieces are handled. He never becomes too domineering, however, and his open and muted horn solos flow with gentle lyricism on the ballads, *A Kiss To Build A Dream On,* and *Alison.* The close camaraderie of the Jones band is evident throughout, and the leader contributes the earthy *Hard Sock Dance,* besides arranging *Maud's Mood.* Watkins delivers a searing French horn chorus on *Tipsy.* Pianist Tommy Flanagan and drummer Art Taylor fill out the rhythm section, and Bob d'Orleans engineered.

Phil Woods turns out to be the real sur-

Phil Woods turns out to be the real sur-prise of the date, complementing Bailey perfectly with a warm, full tone and a more direct style than he has shown before. He plays bass clarinet, in addition to his cusomary alto sax, and seems to have joined Cannonball Adderley in an exploration of the blues side of Charlie Parker. A good example of the pre-Jones stage of the Woods sound may be found in a stereo conversation with alto-saxist Gene Quill on Epic. As both men are much alike in tone and phrasing, stereo performs a great service here in punctuating their remarks clearly in ensemble passages on *Doxie I and II, Dear Old Stockholm,* and *Scrapple From The Apple.* Bob Corwin, pianist in the quintet, assists with quotation marks of his own.

Art Blakey: A Night In Tunisia
Blue Note ST84049

Except for the commencement exercises used as album title to get thing underway with a drum showpiece from Art Blakey, this set consists solely of originals written and arranged by current members of The Jazz Messengers. A prime exhibit is Bobby Timmons' *So Tired,* the latest in the line of succession to the throne occupied by the pianist's

zens. This because he states that engineers are all "conventional-current-flow" men whereas technicians and practical electronics men are believers in "the unsophisticated electron flow concept," and are therefore not quite respectable. (What is so sophisticated about conventional current flow?)

Now my hat is off to the many good design, development, and other engineers in the field, but it cannot be assumed that all engineers are in this classification. Too many of these conventional-flow boys are mere "paper shufflers" and "report writers" who have specialized so long in a narrow field that they have forgotten what little theory they learned in college. Moreover, many of these have not kept up with the state of the art through continual study.

As for the design engineers "who develop the glorious electronic equipment of the future, etc." (to quote Mr. Goeller), what are many of these chaps but "chief catalog jugglers"? Too often they are merely the boys with the largest number of order catalogs on their desk.

However, there is hope for even these fellows (in spite of their conventional current-flow concept) since after five or ten years' association with good electronic technicians they may pick up a fair electronic theory background.

Then they will no longer try (for example) to self-bias a tube to class A operation with a half-megohm cathode resistor due to a mistake made on their slide rules.

MR. DEAN M. TONELLI,
1133 N. Lillian Way,
Hollywood 38, Calif.

(*We imagine that many engineers who* know *their subject and* practice *it will "have at" this teacher's letter.* ED.)

THIS MONTH'S COVER

This month we follow sound underwater (rather it follows us) by means of a University underwater speaker. For full details about this speaker read Brociner's article entitled "Sub-marine Sonics" which starts on page 22. By the way—for those of you who do not possess a dictionary—natatoria means "places for swimming."

Also on the cover we show the stage of Morris Civic Auditorium in South Bend, Indiana. If one looks very closely at the proscenium arch, he will discover two Electro-Voice model LR4 curved line radiators. These speakers have more virtue than being inconspicuous—read about it than being inconspicuous—read about it in Mr. Pawlowski's article starting on page 19.

AUDIO ETC.

(*from page 14*)

It isn't easy to set up exact quality values for such a system, but I am thinking quite seriously along price-no-object lines. Well, only *some* object, anyhow. This system would be good, maximum-good, using every bit of ingenuity that the mind can discover, taking advantage of our newest technology all along the line. It might cost $150–200 or more. It would be worth it, and no chance for confusion with a million "ordinary" portables, made out of plaid-covered cardboard and plywood with cheap speakers and cheaper amplifiers for their so-called hi fi. Not that at all. Something much better. Maybe it ought to cost $300.

All that remains, if you've followed me this far, is to fix up the carry-ability. We have two speaker boxes and a purse-sized player. The idea would be to have them snap together, or fit together, into one little suitcase-sized bundle. That would mean ingenuity and forethought; but with some tricky shaping here and there it could be brought off handsomely. The speakers, for instance, might be L-shaped instead of oblong, to fit against each other into an oblong carrying unit. You might, furthermore, fit the record player, folded up, into a space between the speakers when they are put together. Terrific! Then, you see, you'd have one single piece of luggage, shaped like a small suitcase and easy to tote.

The records? Ungh. I hadn't thought. . . Well, you'd better plan on toting them separaely, I guess. But we might offer a handy record-tote bag, a foot square and with an accordian pleat, for expansion to as much as three inches. You could have a seven-inch pocket, too, inside, accordian-folded against one inside wall when not used. Or it could snap on, inside or out, with ordinary clothes snappers. Use it separately if you have seven-inch records only. Or buy it separately.

The snap-on feature is good; you could have permanent snap-on fasteners on both the big and little carriers so that as many as three might snap together for bigger capacity. Carrying belts would be snap-expandable to fit any record load; just snap together.

That's enough. I'll expect to put in a claim for royalties when you get my portable hi fi into production for me.

P.S. Weatherproof? Now come, come! A weatherproof exterior, plastic or otherwise, and the actual speakers would be mounted so that their front surface would be inside the package when packed up for travel—also the little record player. Nope, it wouldn't float, and I don't think you'd be likely to use it out in the pouring rain. Semi-weatherproof would be plenty. Æ

ABOUT MUSIC

HAROLD LAWRENCE*

Electronic Music—Home Style

IT IS POPULARLY believed that, in order to create electronic music, a composer must have nothing less than the sort of intricate and costly equipment found in, say, the Northwest German Radio Network, or the sound laboratories of Phillips at Eindhoven. Foundation grants, government subsidies, and academic support all seem to be as intimately connected to electronic music as is the ground crew of scientists to an interplanetary rocket ship. Nevertheless, some electronic music actually is made in the home. In New York City alone, three examples come to mind: Edgard Varèse, the dean of electronic composers; Louis and Bebe Barron, the husband-and-wife team responsible for the score of the science-fiction movie, *Forbidden Planet* (1956); and Tod Dockstader, whose *Eight Electronic Pieces* were recently released on LP. It was refreshing to learn that another private individual, unknown to Ford, Rockefeller, or Columbia University, has been quietly at work making electronic music for the past year and a half. His name is Peter Glushanok, a movie director, musician, and former head of a music school.

Music and photography have been closely intertwined in Glushanok's life for nearly 25 years. Before World War II, he was a flute player and music school director. He turned to photography in 1938, converted the school auditorium's broom closet into a darkroom, and soon discovered that he had a natural affinity for pictures, both still and moving. The war cut short his administrative career and he obtained a position with the O.W.I. as a lensman, eventually becoming a topflight director. Among his directorial achievements are numerous films for the U.S. State Department; a pair of Martha Graham films, *Appalachian Spring* and *A Dancer's World;* and *Francesca*, a film produced for the Foster Parents Plan. In addition, Glushanok did the camera work for *"Hymn of the Nation"* (starring Arturo Toscanini and the N.B.C. Symphony), and consequently earned the unique distinction of having been the only musician (albeit non-practicing) ever to give orders to the Maestro during an orchestral rehearsal. Glushanok also conducts classes in film making at C. C. N. Y.

Glushanok lives in a sprawling, thick-walled, high-ceilinged apartment overlooking Riverside Drive. For his electronic workshop, he has appropriated a corner room and filled it with musical instruments and audio gear. He spends virtually all his non-movie time here, compiling tape cells, tinkering with his equipment, and putting together new compositions. The rest of the household is alive with the sounds of *non-*

* *26 W. 9th St., New York 11, N. Y.*

Fig. 1. Peter Glushanok and equipment.
(Photo by Harold Lawrence)

Fig. 2. Mr. Glushanok operating some of his sound sources.

(Photo by Harold Lawrence)

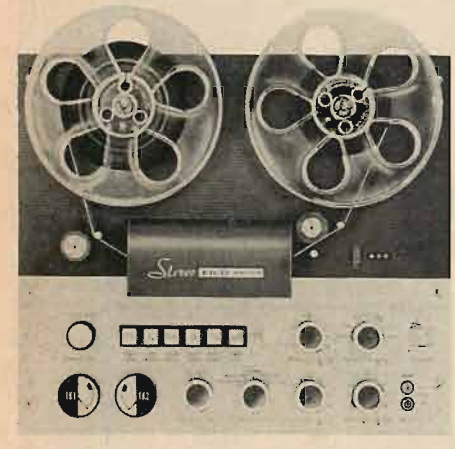
electronic music—daughter Judy practices the piano, son Paul plays jazz trumpet and percussion, and wife Ruth manipulates the FM radio dial. When all the Glushanoks are at home, a regular Dutch concert takes place. Easily the most energetic member of the family, however, is père Glushanok, who often works far into the night, unmindful of time and hunger pangs.

It all started about 18 months ago with the purchase of a tape recorder and microphone. Glushanok had always wanted to record his sister, Marusia, a folk singer who refuses to set foot in a recording studio, but does not mind recording at home. Glushanok recorded two recitals of Russian gypsy melodies, both of which were later released on Monitor Records (565/6). This recording experience aroused his musical curiosity, and he became fascinated with the possibilities of the tape medium. At first, he experimented with "structurized" sounds, slamming doors, rapping tables, and recording voices, prepared piano, violin, and other objects and instruments, all of which were put through the paces of variable speed, equalization, and dynamic change. Monophonic and single-source recording, however, quickly proved to be a technical straight-jacket, and since Glushanok had by now developed a passionate interest in electronic music, there was only one direction to take. So, during the next few months, he tramped home cradling in his arms one audio unit after another. At the time of this writing, Glushanok possesses the following conmponents: four tape recorders (a Crown "Broadcaster", a massive old Crown "Royal", a Magnecord Model PT6AH, and a Magnecord Model 728); a Marantz 40-watt amplifier with preamplifier; a Blonder-Tongue "Audio Baton"; a mixing panel; four microphones (Telefunken Model CM 51, RCA Model 77DX, Electro-Voice contact-type Model 805, and Altec Model 639); a pair of E. M.I. speakers; a reverberation system; and

(Continued on page 59)

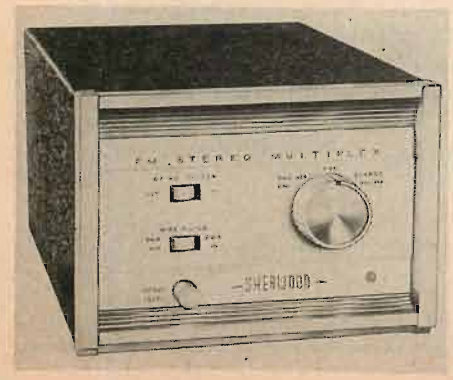
NEW PRODUCTS

• Stereo/Mono 4-Track Tape Deck. Designed for professional and home use, the Eico Model RP-100 tape deck has many features found in the most expensive models. The RP-100 includes a 14 transistor playback and record amplifier, electronic push-pull bias-erase oscillator, and full-wave rectifier; a hysteresis-synchronous capstan drive motor, and two heavy-duty, four-pole induction motors to drive the reels. The entire transport mechanism is extremely simple. There

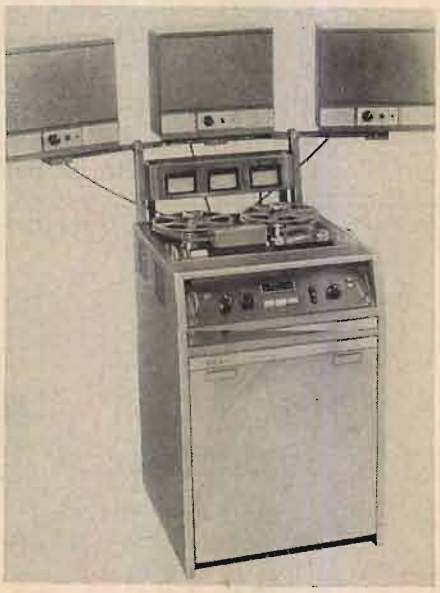


are only three mechanical linkages in the deck. Each head is provided with a four point professional mount, and the record and play heads have laminated mumetal pole pieces, interchannel mumetal shielding, and mumetal outer shielding. Use of separate record and playback heads and amplifiers permit off the tape monitoring, and selected sound-on-sound operation without changing connections. In playing or recording, a d.c. solenoid actuates the pinch-roller. Tape lifters are actuated by an a.c. solenoid during fast winding. Controls are all electric, all pushbutton, and the "record" button is interlocked with the "run" button to prevent inadvertent erasure. The frequency response at 7½ ips is 30–15,000 cps plus or minus 2 db; noise is 55 db below maximum recording level, and wow and flutter are 0.2 per cent. At 3¾ ips the frequency response is 30–10,000 cps plus or minus 2 db, wow and flutter are 0.25 per cent. The RP-100 is available fully wired and tested, for $395.00, or as a semi-kit with the entire tape transport fully assembled and tested, and with the electronics in kit form for $289.95. Eico, 33-00 Northern Boulevard, Long Island City 1, New York. **G-1**

• FM-Stereo Adapter. The new Sherwood Model S3MX is a self-powered, FM-stereo adapter designed to work with a variety of FM tuners ranging from those with a high multiplex signal output (such as is possible from Foster-Seely discriminators) to low output FM tuners (characteristic of wide-band ratio detectors). Unique features of the Model S3MX adapter are two front panel switches to add a sharp filter at 67,000 cps (for complete removal of background musical programs) and a hiss filter for use in fringe area reception. The power on-off switch automatically returns the stereo adapter to normal monophonic operation of its associated FM tuner. Complete interconnecting cables, instructions, and modification parts are included with the adapter to improve the stereo performance of most older tuners. The Model S3MX contains four tubes plus rectifier, and achieves a subcarrier sensitivity of 100 mv to 2 volts. Hum and noise is 60 db below rated output, and the audio output is 2 volts at one-half per cent distortion. Power consumption is 20 watts. Model S3MX sells for $69.50 less case. Also available is the Model A3MX, which is similar to the Model S3MX, but is not self powered, and is designed specifically for use within the chassis of the Sherwood Models S2200 and S3000-III. It does not have the separate hiss filter, and the 67,000 cps filter is in the circuit at all times. The price of the Model A3MX is $49.50. Sherwood Electronics Laboratories, Inc., 4300 N. California Avenue, Chicago 18, Illinois. **G-2**

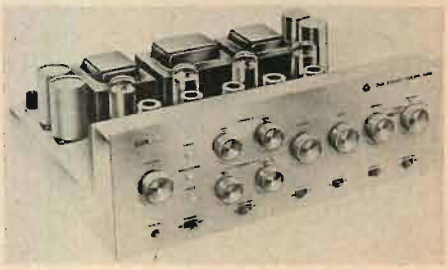


• All Transistorized Professional 3-Channel Tape Recorder. Claimed to be the world's first all transistorized studio model 3-channel tape recorder using one-half inch tape, the Sony Model ES-13 has been designed for broadcasting, phono recording, and other requirements for professional quality of recording and reproduction. The set includes tape transport, three independent amplifiers, amplifier control section, VU meter, cabinet, and three monitor speaker cabinets. The tape transport is driven by three motors, is



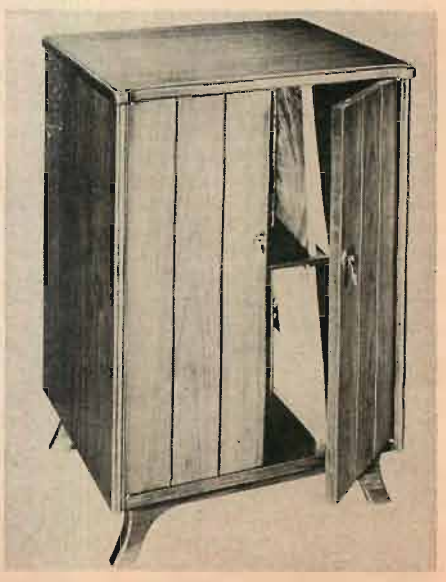
provided with a stabilizer, plug-in head assembly, and an automatic tape lifter which functions during fast winding. The mode selection utilizes pushbuttons, each with an indicator lamp. The electronic section is separated into six different units, each of which may be individually removed for service. Each unit is keyed to assure correct installation. The control panel may be turned over for easy checking, and the tape transport can be turned up 155 deg. The built-in time indicator shows how long the set has been in operation. The built-in voltage stabilized power supply has a safety device to protect the system when the voltage stabilizer fails to operate. Sony Corporation of America, 514 Broadway, New York 12, N. Y. **G-3**

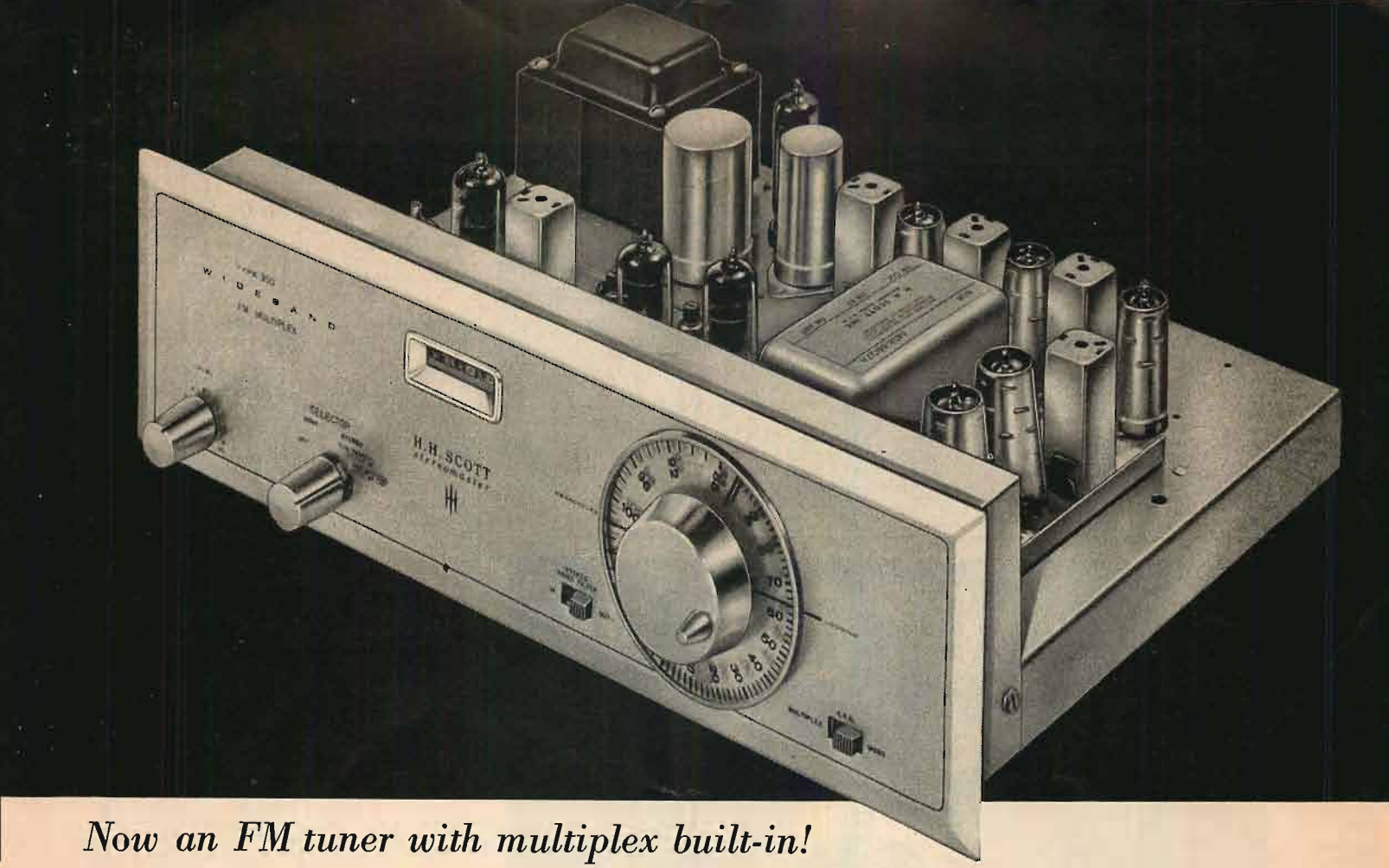
• 50-Watt Stereophonic Amplifier. Featuring complete control of sound distribution, the new Harman Kardon Model A-500 amplifier provides the listener with complete flexibility in adjusting his system to the particular acoustical characteristics of his room. Special features of the A-500 include a front panel "ambiance" control for regulating the volume of a "center" channel system, or the volume of any reverberation units; blend control indicator lamps to show the exact degree



of blend; a stereo headphone jack on the front panel which automatically disengages speakers when the headphones are plugged in, and an illuminated pushbutton on-off switch. It also has a speaker phasing switch; individual base and treble tone controls for each channel; a zero to infinity balance control; a blend control to eliminate the "hole in the middle" effect by introducing variable blend between the two channels; a contour control to boost the bass of both channels at low listening levels; separate high and low filters to eliminate rumble or record hiss; and a tape monitor switch which permits monitoring tapes while recording. The circuit features two 7355 tubes per channel; self-biased, tetrode-connected, in class AB_1 operation. The A-500 amplifier is priced at $159.95. It measures 15¼-in. wide by 5 7/16" high by 12" deep (excluding knobs) and has a brushed gold front panel. Harman Kardon, Inc., Plainview, L. I., N. Y. **G-4**

• Record Cabinets. The Rockford Model 106 Record Cabinet is a two-shelf, free-standing floor unit, designed to match other Rockford equipment cabinets in appearance. Its two 20-inch-wide shelves will handle records up to 12-in. in diameter. It is available with either removable base or legs. It is furniture crafted in natural walnut, hand-rubbed mahogany, blonde, or ebony. Rockford Special Furniture Company, 2024 Twenty-third Avenue. ture Company, 2024 Twenty-third Avenue, Rockford, Illinois. **G-5**





Now an FM tuner with multiplex built-in!

New H. H. Scott FM Stereo Multiplex Tuner uses Wide-Band design for top performance

Here it is! No adaptor needed! The world's *first* Wide-Band tuner designed specifically for multiplex! H. H. Scott's new Model 350 FM Multiplex Stereo Tuner heralds a new era in FM reception.

The FCC, in its recent acceptance of FM stereo multiplex, said that the approved system ". . . like any multiplex transmission system, will increase energy transmission at the edges of the channel involved. Accordingly, *for optimum stereophonic reception, the (tuner's) bandwidth . . . must be considerably greater than that of monophonic (tuners). . . .*"*

From our very first design . . . the revolutionary 310A . . . H. H. Scott incorporated substantially wider IF bandwidth than conventional tuners. This gave better selectivity and usable sensitivity. The new 350 FM Multiplex Stereo Tuner incorporates this same exceptional circuitry allowing reception of even weak multiplex stations with amazing clarity. You get other benefits, too — the 2 MC Wide-Band detector provides superior rejection of interference and complete freedom from drift. The Wide-Band design of the IF's and detector give the new 350 a remarkable *usable* sensitivity of 2.5 μv measured by stringent IHFM standards . . . one of the best measurements of a tuner's ability to effectively receive weak multiplex signals.

If you are considering a new tuner, or addition of an adaptor to a conventional narrow-band tuner, you owe it to yourself to first listen to the new H. H. Scott Model 350 Wide-Band FM Multiplex Stereo Tuner. Its superiority in sound quality . . . its ability to receive weak multiplex signals . . . its complete freedom from drift . . . are so dramatically different that you will not want to settle for less.

Important Technical Information

Important Technical Information

Usable (IHFM) Sensitivity: 2.5 μv. 10 tubes, 11 diodes. Famous H. H. Scott silver plated front end. Tuning meter. Performance matches FCC transmission specifications. Can receive either monophonic or stereo multiplex programs. Special circuitry for perfect stereo tape recording. Dimensions in handsome accessory case 15½"W x 5¼"H x 13¼"D. Matches styling of all H. H. Scott amplifiers. **$199.95,** East of the Rockies.

*see paragraph 36, FCC Report and Order, Docket no. 13506, 4/19/61. Emphasis ours.

Wide-Band Multiplex Adaptor

Important News for H. H. Scott Tuner Owners

H. H. Scott has once again protected your investment against obsolescence. Your tuner, regardless of age or model, can be quickly converted to multiplex with the new Model 335 Wide-Band Multiplex Adaptor. Because of H. H. Scott's unique no-compromise Wide-Band design, we can guarantee superior multiplex reception only when the 335 and an H. H. Scott tuner are used together. 5 tubes, 8 diodes. **$99.95,** case extra.

H.H.SCOTT

H. H. Scott, Inc. Dept. 035-07
111 Powdermill Rd., Maynard, Mass.

Please rush me full details on your Wide-Band Multiplex Tuner and Adaptor. Include new 1961 catalog.

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

Export: Morhan Exporting Corp., 458 Broadway, N.Y.C.

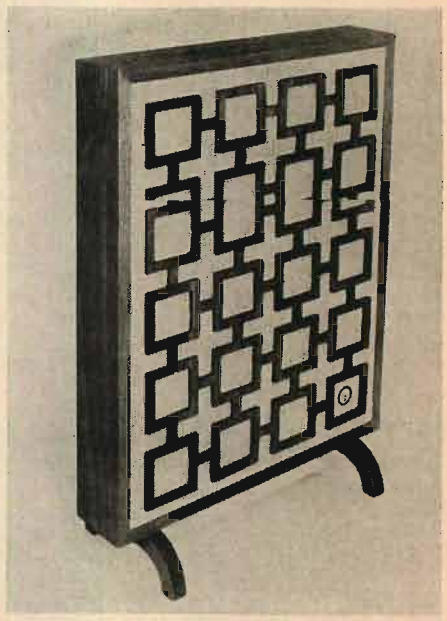
● **Playback Compensator.** Intended to recreate full dynamics in home playback systems, the new Fairchild "Compander" was developed from operating data compiled by the professional products division of Fairchild. The "Compander" complements in playback many of the controls placed on recordings due to the geometric limitations of the disc and the magnetic limitations of tape. The device scans the output of the home playback amplifier, and dynamically increases higher level signals in order to recreate the dynamics of the studio or concert hall performance which existed before any controls were placed upon the recording. The unit does not affect low-level or medium-level passages. Features of the unit include action indicators which visually show operation of the sensing device, plus providing an insight into left and right information on

the disc or tape; threshhold controls; and the ability of the device to be reversed and used as a level control in home tape recording, or public address. The "Compander" is complete and requires no a.c. source. It is connected to both the output and input of the amplifier. All necessary cables are provided. The "Compander" does not introduce distortion because it is not in itself an amplifier, only a sensing and control device. It is definitely not a reverberation device. Price is $75.00. Fairchild Recording Equipment Corp., 10-40 45th Avenue, Long Island City 1, N. Y. **G-6**

● **FM Receiver.** Designed to provide background music for office and home, the new Grommes Model 510 FM tuner-amplifier should be of particular interest to doctors and dentists, as well as other business offices where background music is desired. The Model 510 is a complete FM tuner, preamplifier, and amplifier in one compact attractive unit. The amplifier has phono, tape, and microphone inputs. The microphone input enables the unit to function as a public address system at the same time it is providing background music. Controls include loudness, bass,

and treble, and the tuner section has a three-gang tuning unit with an electronic tuning eye. The circuit consists of two broad-band i.f. stages, dual limiters, and a ratio detector. The price of the Model 510 is $149.95. An enclosure is available for $10.00. Grommes, Division of Precision Electronics, Inc., 9101 King Avenue, Franklin Park, Illinois. **G-7**

● **Thin Loudspeaker System.** The new "Sonoteer" speaker system introduced recently by Audax, employs five speakers but measures only four inches thick. Featuring a return to the open baffle principle, the "Sonoteer" produces the figure-eight sound pattern usually associated with this type of speaker mounting. Thus greater coverage can be achieved if this speaker is appropriately placed. Housed



in an oil rubbed walnut frame with a filigreed pattern of matching wood over the speaker cloth, the "Sonoteer" weighs only 18-lb. and costs $79.95. The "Sonoteer Contemporary" Model CA-70 is the first in the Sonoteer's series which will include cabinets of traditional, classic, and provincial designs. Rek-O-Kut Company, Inc., Corona, N. Y. **G-8**

EQUIPMENT PROFILE

(*from page 36*)

oscillator, a 6AR5 pentode, is located in the left amplifier and supplies bias and erase, respectively, for both heads. Except for this, both amplifiers are identical. Bias frequency is 60,000 cps.

During recording the signal from either a microphone, a phonograph, or a radio tuner is fed to the grid of the 12AD7 amplifier section and from there to the 12AD7 driver section, and then to the 6BQ5. It is then fed to the record head while at the same time the oscillator is supplying the appropriate bias. Separate equalization circuits for 7½ or 3¾ ips are built in and switch selected.

As previously noted, the components in the electronic section seem to be of good quality and are mounted on terminal boards, which seemed rather thin in view of the quality level established by the mechanical components. In this vein, the wiring also did not seem to be of the level one might expect from the mechanical section.

Performance

The performance of the Roberts Model 990 can be divided into two sections: mechanical and electrical. Let us consider the mechanical performance first. Wow and flutter is less than 0.12 per cent rms. This puts it in a very exclusive category. Frequency response during record at 7½ ips is 40 to 13,000 cps, ± 2 db. As we noted before, as an operational mechanism, the Model 990 performed exceedingly well, handling tape with gentleness and firmness, and never losing control. The mechanism which shifted the heads operated exceedingly well and placed the heads precisely where they were supposed to be.

The electronic performance did not quite measure up to the mechanical performance. Harmonic distortion was 5 per cent at 5 watts output in the playback position of the audio amplifier. Somehow we got the feeling that this machine was intended primarily as a recorder, to be played back over a more elaborate system than the one contained beneath its wooden exterior.

In summation, the Roberts 990 tape recorder is a precise, sturdy tape recorder which should provide many, many years of excellent service. Although it is near the top of its category in quality, it is hardly at the top in price. All in all, it is quite a good buy for the serious amateur re- a good buy for the serious amateur recordist. G-28

SONY TFM-121

(from page 38)

antenna, if desired, and terminals are provided inside the back cover for an external FM antenna. For normal use, however, the two telescoping antenna rods (which collapse and form an integral part of the carrying handle) are sufficient. With an external antenna, sensitivity is rated at 7 μv on FM. The unit, which weighs 3.2 pounds, is attractively styled with a black plastic case and gold colored perforated metal front.

In view of the CD recommendation that every home should have a battery powered radio, this one can well serve for both entertainment and Conelrad reception. To this end, the 640 and 1240 points on the AM dial are indicated by a red arrow. After using the TFM-121 in a variety of locations over a period of more than six months, we are firmly of the belief that it has become indispensable to us. G-30

TO PHASE OR NOT TO PHASE

(*from page 32*)

to phase? We can go on reversing leads in this fashion "ad nauseum," or we can decide that it is not worth the trouble for a difference in sound so subtle as to be almost non-apparent.

Fortunately, there are one or two approaches to the problem that are more sane than this.

Color-coded leads. If all components of a stereo system from source to speakers are matched, phasing becomes easier A very simple expedient is to use color-coded connecting leads between the amplifier output terminals and speaker terminals. The color coding merely insures that both speakers are connected to the amplifier terminals in an identical fashion. If the common terminal of amplifier channel A connects to terminal 1 of our left speaker, we must similarly connect the common terminal of amplifier channel B to terminal 1 of our right speaker. It may reasonably be assumed that if the speakers are attached in an identical manner, the system is properly phased.[2] This is all well and good for completely matched stereo channels. What about non-matched stereo systems using components which differ from one channel to another?

The phase-reversal switch. With non-matched stereo systems, a listening test is the most practical way to determine proper phasing. A phasing switch will make such a listening test easier and more practical to perform; and regardless of whether a system is matched, the switch is a useful adjunct. Most recently marketed stereo amplifiers incorporate a phasing switch as one of the front panel controls. While this is convenient, it is not necessarily the best place in the system for such a switch. An otherwise good stereo amplifier An otherwise good stereo amplifier should not be rejected merely because it has no phasing switch. Such phase reversal is usually accomplished between the output transformer and the speaker, but at least one recently introduced stereo preamplifier incorporates a phase-reversal control that operates by selecting between cathode or plate output of one of the electron-tube stages in one stereo channel. This method of phase-reversal opens up a whole new realm of control possibilities for stereo, including phantom center-channel output from conventional two-channel amplifiers null balancing of system levels, and positive determination of program source phasing. Discussion of this method of phase-reversal is beyond the scope of this article.

We can make a phase-reversal switch of our own that will be easier to use than the built-in variety. An inexpensive double-pole double-throw toggle switch wired according to *Fig.* 2 is all that is needed to reverse the phase of one stereo channel quickly and at will. The advantage of this home-made variety is that it may be made with leads long enough to reach the stereo center-axis where listening tests must be performed. In most setups the stereo amplifier is located at some distance from this critical listening zone, and if the phasing switch is mounted on the amplifier it will be necessary to enlist the aid of an assistant to throw the switch while you take up a fixed listening position along the stereo center-axis to make A–B listening comparisions.

Balancing the system. Before the system can be phased by ear, it must be properly balanced for levels. Although there are numerous meters and null devices being offered as aids in setting stereo system balance, the best method still involves a listening test using monophonic program fed to both channels. In fact, nearly all meters and null-balance devices must be initially calibrated by ear. The monophonic source can be fed to both channeds simultaneously or individually. It is important to sit

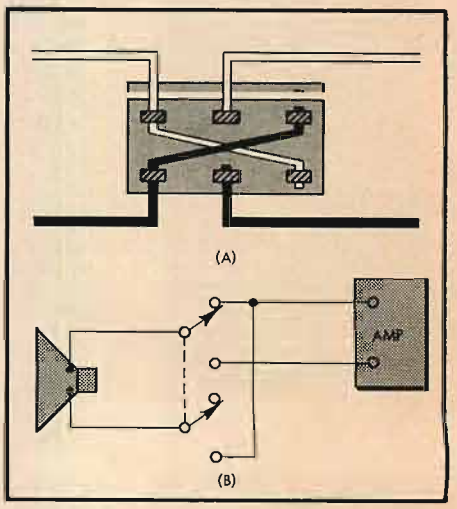


Fig. 2. Wiring and schematic diagrams for double-pole double-throw toggle switch used to reverse polarity in one channel of a stereo system. One pair of leads is attached to the amplifier output terminals, the other pair to the loudspeaker terminals.

[2] If you are unsure which is terminal 1 on a particular speaker take a flashlight battery and attach leads to the positive and negative terminals. Touch leads to terminals of speaker. Note which way the speaker cone moves. Mark positive terminal. Repeat the procedure with the other speaker, marking the positive terminal when speaker cone moves in same direction as previous speaker. Consider the positive terminal as terminal 1.

along the stereo center axis when balancing the system by ear. It will help to have an assistant switch back and forth between channels and adjust levels, while you maintain a fixed position along the axis. If you prefer to feed both channels simultaneously rather than individually, your assistant will merely adjust levels at your direction until you are satisfied that the apparent source of sound is roughly centered between speakers, so that neither speaker is overpowering the other. It is suggested, that a final touch-up balancing check be made from your favorite listening chair, after the system has been properly phased.

Proper use of the phase-reversal Switch. Continue to feed a monophonic signal to both channels. It may help to employ a substantial amount of bass boost, being sure to boost both channels equally. A recording of a single male voice or solo instrument seems easier to phase than some other program sources. In some cases, it may even help to play the recording at a slower speed. Place yourself along the stereo center-axis and at about the middle of its length. Switch the phase-reversing switch back and forth while listening carefully to the sound. If you cannot reach the switch from your listening position, have your assistant switch according to your instructions. The difference between in-phase and out-of-phase operation should be readily discernible. The in-phase mode will cause the sound to come from a definite spot about half-way between the speakers. In the out-of-phase mode the sound will lack this apparent single, centrally-located source; and will float vaguely about the room. It will seem to come from the two speakers that it is really coming from, rather than a single phantom source between the two speakers. Many people find it helpful to close their eyes while listening for this single, phantom-source that indicates proper phasing. If you have trouble determining the properly phased mode of operation; move in or out along the center axis and try again. Also, try a different source of monophonic program. If this fails, and you find yourself becoming increasingly confused; it is better to give-up temporarily and try again at a later time.

Chances are, however, that if you follow the foregoing instructions you will have little trouble in phasing your system. Once properly phased, you will be able to sit back and enjoy your stereo system, fully confident that it is not suffering the sometimes subtle, sometimes acute degradations of improper phasing. Be sure to mark the phasing switch, or remember its normally-phased setting. The only time you need to change this setting will be to accommodate an odd-ball, out-of-phase stereo program source. If you are ever in doubt about the phasing of a particular program source, be sure to return to monophonic operation when making a listening check of that source.

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ABOUT MUSIC

(*from page 53*)

a special switching unit designed to replace patch bays. As for the musical sources, there are numerous bells, cymbals, a Balinese gong, an African Mbira, a Clavioline, a battered piano, and a set of kettledrums. In a pinch, Glushanok also borrows his son's percussion instruments. borrows his son's percussion instruments. All this can hardly rival the elaborate facilities available to such composers as Stockhausen, Schaeffer, Ussachevsky, Luening, and Gassmann (see AUDIO, May 1961), but it seems to serve Glushanok's purpose for the time being. With these tools, he has already produced a large number of electronic works, including a commissioned score for Audio Productions.

It should be noted that, less than two years ago, Glushanok was no more familiar with the process of sound reproduction than with the insides of an IBM computer. But, with the help of his friend, Irving Glasgal (an ex-lawyer, now free-lance audio engineer), he has made up for lost time, ravenously devouring information on audio theory and practice. Hearing him describe the steps he has taken to secure the best possible signal-to-noise ratio would warm the cockles of an engineer's heart. Glushanok makes no show of his newly acquired knowledge, leaving the technical details to Glasgal, to whom he will often say: "This is what I want. Can it be done?" Glasgal accordingly built the mixing panel and reverberation box, and rewired so much of the other equipment that, in some cases, only the shells remain of the original units.

Glushanok's entry into electronic music

Glushanok's entry into electronic music was no less precipitous than his plunge into audio. He knows no electronic composers, and had heard few electronic works until two months ago. This does not mean that he was unaware of this "new languag," or disinterested in other men's work. "Self-isolation," Glushanok explained, "is sometimes necessary to find one's footing in a new field. Several years ago, I was commissioned to shoot a film of the Budapest String Quartet in the Elizabeth Sprague Coolidge Auditorium of the Library of Congress. Someone informed me that another movie had been made in the same hall with the Coolidge Quartet, and I was asked whether I would be interested in seeing it. I replied that I certainly would like to view the film, but only after I had completed *mine*. I had purposely avoided that picture because I realized that, consciously or otherwise, it might affect my own approach to the subject, and I preferred to start fresh. Similarly, when I began to write electronic music, I

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buried myself in my room, learned how to use all my equipment, and accumulated a large library of basic sound materials. Now I'm eager to listen to other electronic music, only because I've mastered the basic techniques of my medium and produced a respectable output of electronic works."

What direction has Glushanok taken in his solitary labors? Not a pure electronic composer, he chooses his raw material mainly from nature, and only occasionally from electronics. He uses no oscillators. In fact, the only electronic source in Glushanok's work consists of controlled feedback. All others are electronically-treated sonorities derived from traditional instruments, voices, and objects and instruments of indeterminate pitch. His use of melodic material sets him apart from the *musique concrète* school. He really belongs to the company of multi-source composers. Disagreeing with those electronic men who believe that there is no life left in "traditional" music, Glushanok insists he is "not ready to sound the death knell of 'live' music." AE

LIGHT LISTENING

(*from page 10*)

Norman Luboff: Apasionada
RCA Victor LSP 2341

In its second release on this label, the Luboff choir moves into higher gear. Unlike the introductory album issued some months ago, designed for the most part to acquaint RCA dealers and customers with the choir's versatility, this recording finds Norman Luboff settling down to the exploration of a single theme. All the songs in this collection have some sort of Latin-American background. Real oldtimers such as *La Paloma, Cielito Lindo,* and *Ay, Ay, Ay* rub shoulders with the less well-known *Apasionada* and *Amorita.* The engineering concept on the part of RCA's West Coast crew follows accepted practice, duplicating in the living room the normal image of a highly-trained mixed choir.

Melachrino Strings: Music of Jerome Kern
RCA Victor LSP 2283

The relaxed and seemingly effortless style of the Melachrino Strings and Orchestra finds an ideal outlet in the music of Jerome Kern. As in earlier albums by this organization that summarized the output of Sigmund Romberg and Victor Herbert, Melachrino now concentrates on the top favorites in the Kern treasure house. In terms of solid listening enjoyment, this gimmick-free disc should be money in the bank for as long as you own it. No matter how frantic becomes the search for thansitory novelty in some segments of the record industry, it's good to report that most of the major labels continue to meet their responsibilities in turning out releases of lasting value AE

RECORD REVUE

(*from page 45*)

well-intended reviews, in our efforts to fit them into available publishing space. These discs were received in late 1958, for the Angel, and the summer of 1959, for the Vanguards, and I reviewed them for the September issue —1959. But space disallowed, and back they came as overmatter. I tried again—and again this review got into the not-published category. A year ago I made up a compendium of accumulated reviews-not-used, but once more the jinx placed this same review in the overmatter and back it came, unpublished. I tried still again for August, 1960—no luck.

Now, with the hope that it still says something, I'm trying once again, with apologies for the delay! E.T.C.)

Haydn quartet nomenclature is painfully hard on the eyes (as above) but the music is good for the ears, decidedly. You're not likely to exhaust the supply of these quartets in your casual listening—there are eighty-odd, composed over a long span of years, and even the very earliest, virtually the first true string quartets ever written, are masterfully composed. There's a little serenade movement from one of the very first that is often heard in restaurant and mood music form, for instance. (It's better where it belongs, with four solo strings.)

Vanguard's Griller Quartet is the leading British group, mature (1928), seasoned, in today's fast-moving musical world a pleasingly old-fashioned quartet with a big, poetic sound, rather lush, a reverent musical approach that makes the most of every musical detail in relatively leisurely fashion. The Haydn Quartets don't suffer at all under this treatment—indeed, it avoids both the overly high-power speed treatment and that slightly prim, overfussy sound that are often associated with Haydn quartet playing today. Perhaps there is more intensity of playing to be found in the work of other quartets—Budapest, for instance—a longer line and more sublety of phrasing; but the Grillers make up for this in warmth, humanity, and vigor. Their playing is excellent for inquiring minds who want to know what quartet music is like under good home listening conditions.

Angel's Amadeus Quartet is a younger group (three of them were five years old when the Griller was founded), nominally British but actually three-quarters Austrian; its name is Mozart's middle name. Its playing is correspondingly more of a contemporary sort, leaner, somewhat drier and less Romantic, with more emphasis on over-all shape and structural details, less on leisurely melody on the loose. In corresponding fashion, Angel's recording is drier, closer, the string tone more edgy and leaner than Vanguard's for the other group.

Stereo (in Vanguard) is important in defining the space in which the music is played, rather than as a means for separating the instruments. (They don't spread out in a straight line, in any case.) You won't worry as to whether the cello is heard on the right or the left—it's unimportant. What counts is the stereo room-realism. That's plenty, and it justifies a great deal of excellent chamber music stereo, right down to single instruments, in a realistic space.

Brahms: Intermezzi. Glen Gould, piano.
Columbia MS 6237 stereo
(mono: ML 5637)

The fabulous Glenn here turns his somewhat moody attention to that quiet, lush, highly involved piano music of the old man Brahms, the "Intermezzi" of Opus 76 (somewhat earlier) and 117, 118 and 119, composed in the thoughtful twilight of the last years, physically easy to play, musically of a high concentration with elements of the late Beethoven style transmuted into Brahms—shifted accents, harmonies ahead of the beat, overlapping chords. It takes a big hand but no great technical mastery to play these. It takes an acute musical ear to sense their late-Romantic intracacies.

Gould has the ear and the sensibility for this type of music as not too many young pianists do. This is a fine recording principally because of that: he *hears* the music. (In true turn-of-the-century style, he discovers and brings out all sorts of inner melodic lines that most performers will not have noticed in years of playing.)

As for styling, Gould is his moodily Romantic self, a young man's romanticism and

not really the seasoned, introspective thinking of the mature Brahms. As always, he is uninhibitedly mannered. His excessive rubato (uneven hesitations, used to make an effect) will annoy most pianists and many listeners. And, in his own special style, not one of these works is made loud and showy, not even those which are occasionally given that treatment by more impatient pianists. All is quiet and subdued; but the sense is highly musical, the comprehension acute. Can't ask for more.

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ADAPTER

(*from page 27*)

15 μs difference in the de-emphasis characteristic of the L + R channels compared to the L-R. Such discrepancy would, in turn, alter the relative amplitudes of L + R and L-R at the high-frequency end of the spectrum to such a degree as to provide virtually no stereo separation at these higher frequencies. It can be readily appreciated that the amplitude of L + R must be equal to L-R at *all* frequencies for proper matrixing to take place and proper stereo separation to result.

For this more subtle reason, the dimension control was added. It is intended to be set at its midpoint, but slight rotation clockwise or counterclockwise may result in more precise and fuller separation at all frequencies. The effect is quite discernable even by the relative neophyte.

The printed-circuit noise filters are quite conventional. They have a high-frequency rolloff reaching a maximum of 12 db per octave and having a three db attenuation point at around 5000 cps. The pair of cathode followers are also quite familiar, and enable cable lengths of up to 200 feet or so to be used with no ill effects.

The entire adapter is self powered and consumes a mere 25 watts. It may be hidden out of sight, if desired, once initial adjustments have been made. Æ

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Industry Notes . . .

Ampex Appoints Key U.S.T. Personnel

In a series of appointments coinciding with the consolidation of UST functions at the Bloomfield, N. J. office, Herbert L. Brown, Ampex V. P. announced the appointment of Ted Wallerstein, Dick Blase, and John Spellman. Ted Wallerstein, formerly President of Columbia Records, will assume responsibility for the operation of UST. Dick Blase, formerly Manager of Felsted Division of London Records, has been appointed National Sales Manager. John Spellman, UST's Product Manager, will now also manage production and service functions. All of UST's production and administrative functions will now center in the East, except for mastering and central accounting.

Bell Sound and Bel Canto Merge Marketing

K. L. Bishop, General Manager of Bell Sound Division, has been assigned the responsibility for all consumer products divisions of Thompson Ramo Wooldridge, Inc. R. A. Molloy will continue as Manager of Bel Canto, but Mr. Bishop will supervise the operation. Combining the marketing operations is intended to increase the efficiency of both divisions as well as to strengthen their mutual positions in the tape and tape recorder industry. To make this combined effort more effective, Bel Canto will move its operation to the new Bell factory being constructed in Worthington, Ohio. The move is expected to be completed in December.

Harwood Named P.R. Director by Shure

Formerly serving as the firm's advertising manager, H. T. Harwood has been named to direct all phases of Shure Brothers stepped-up promotional program, including sales promotion, advertising, and public relations. Prior to this new appointment, Harwood was advertising manager for 15 years.

Scott of Annapolis renamed "Ravenswood"

Scott, a brand name used by Annapolis Electroacoustic Corp., will be changed to "Ravenswood" as the result of a court decision, according to Leon J. Knize, president of the company which has been marketing "reflection coupler" stereo speaker systems.

ADVERTISING INDEX

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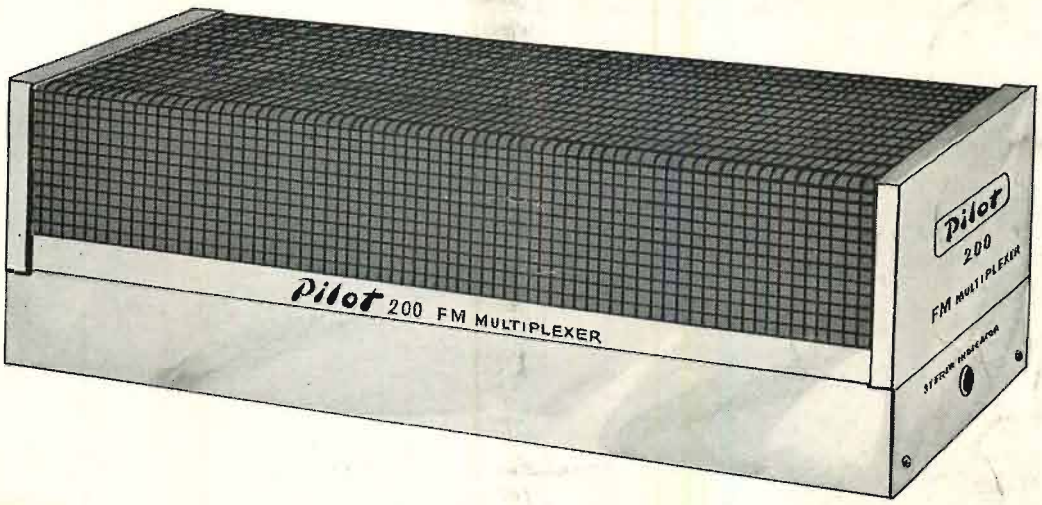

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