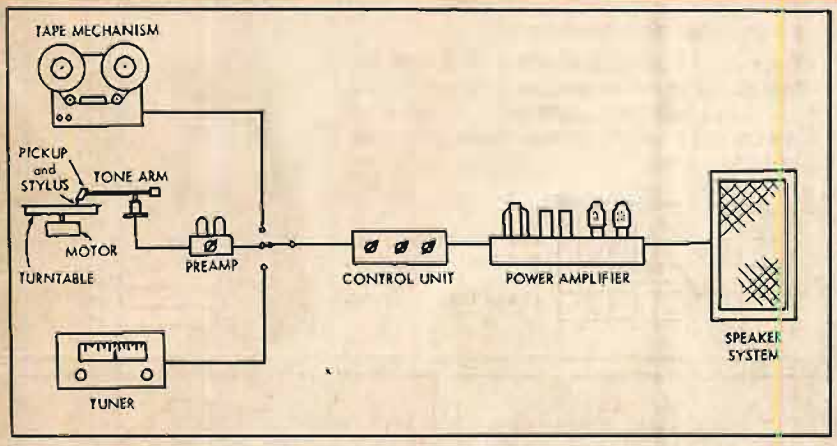
AUDIO

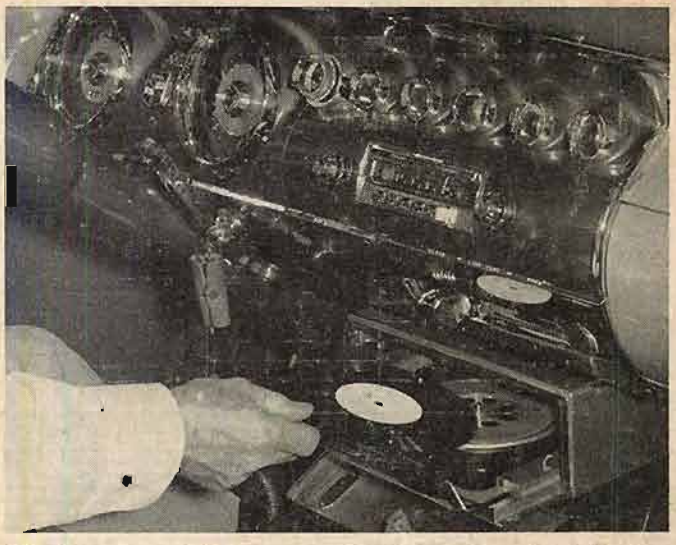
ENGINEERING MUSIC SOUND REPRODUCTION

DECEMBER, 1955

50¢



In his third chapter on SOUND, Edgar Villchur discusses the components that make up a sound reproducnig system for the home, ranging from the simplest to the most complicated, and outlines their requirements. See page 24.



Tired of commercials during your Sunday afternoon drive? Want to choose your own music while you travel across the country—or just to the market? New motophono is the answer. See page 15.

HIGHWAY HI-FI—Records while you ride

AT HOME WITH AUDIO

THE SOUND REPRODUCING SYSTEM

THE SCHOBER ELECTRONIC ORGAN—Part 1

LARGEST PRODUCERS IN THIS FIELD FOR TWO DECADES...

HIGH Q INDUCTORS
FOR EVERY APPLICATION

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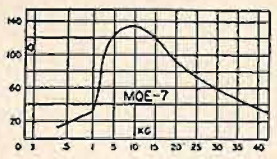
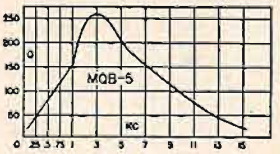
MQ Series
Compact Hermetic Toroid Inductors

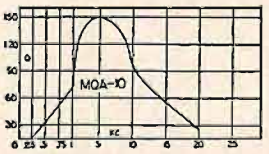
The MQ permalloy dust toroids combine the highest Q in their class with minimum size. Stability is excellent under varying voltage, temperature, frequency and vibration conditions. High permeability case plus uniform winding affords shielding of approximately 80 db.



MQE
15 stock values
from 7 Mhy.
to 2.8 Hy.



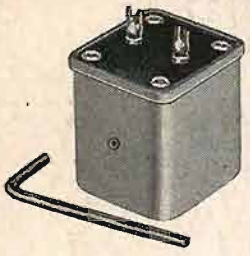
MQB
12 stock values
from 10 Mhy.
to 25 Hy.



MQA
19 stock values
from 7 Mhy.
to 22 Hy.

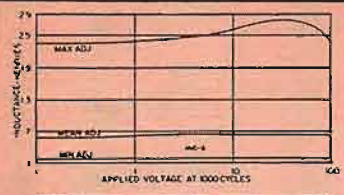
MQ drawn case structure.

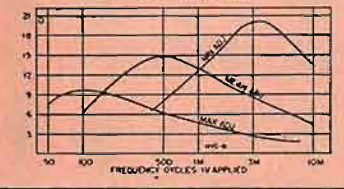
	Length	Width	Height
MQE	1/2	1-1/16	1-7/32
MQA	11/16	1-9/32	1-23/32
MQB	1-5/16	2-9/16	2-13/16



VIC case structure

Length	Width	Height
1-1/4	1-11/32	1-7/16





Type	Mean Hys.	Type	Mean Hys.
VIC-1	.0085	VIC-12	1.3
VIC-2	.013	VIC-13	2.2
VIC-3	.021	VIC-14	3.4
VIC-4	.034	VIC-15	5.4
VIC-5	.053	VIC-16	8.5
VIC-6	.084	VIC-17	13.
VIC-7	.13	VIC-18	21.
VIC-8	.21	VIC-19	33.
VIC-9	.34	VIC-20	52.
VIC-10	.54	VIC-21	83.
VIC-11	.85	VIC-22	130.

VIC Variable Inductors

The VIC Inductors have represented an ideal solution to the problem of tuned audio circuits. A set screw in the side of the case permits adjustment of the inductance from +85% to —45% of the mean value. Setting is positive.

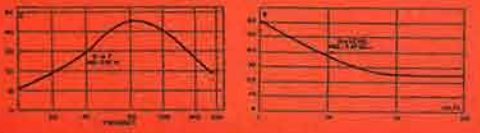
Curves shown indicate effective Q and L with varying frequency and applied AC voltage.

MQL Low Frequency High Q Coils

The MQL series of high Q coils employ special laminated Hipermalloy cores to provide very high Q at low frequencies with exceptional stability for changes of voltage, frequency, and temperature. Two identical windings permit series, parallel, or transformer type connections.

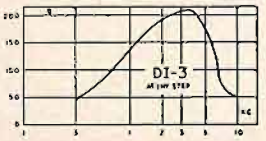
MQL-1	2.5/10 Hys.
MQL-2	5/20 Hys.
MQL-3	50/200 Hys.
MQL-4	100/400 Hys.

MQL case
1-13/16 dia. X 2-1/2" H.



DI Inductance Decades

These decades set new standards of Q, stability, frequency range and convenience. Inductance values laboratory adjusted to better than 1%. Units housed in a compact die cast case with sloping panel ideal for laboratory use.



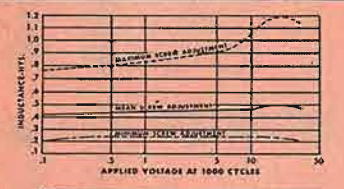
DI-1	Ten 10 Mhy. steps.
DI-2	Ten 100 Mhy. steps.
DI-3	Ten 1 Hy. steps.
DI-4	Ten 10 Hy. steps.

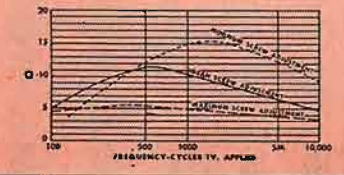
DI DECADE

Length	4½"
Width	4⅜"
Height	2⅜"

HVC Hermetic Variable Inductors

A step forward from our long established VIC series. Hermetically sealed to MIL-T-27 . . . extremely compact . . . wider inductance range . . . higher Q . . . lower and higher frequencies . . . superior voltage and temperature stability.





Type No.	Min. Hys.	Mean Hys.	Max. Hys.
HVC-1	.002	.006	.02
HVC-2	.005	.015	.05
HVC-3	.011	.040	.11
HVC-4	.03	.1	.3
HVC-5	.07	.25	.7
HVC-6	.2	.6	2
HVC-7	.5	1.5	5
HVC-8	1.1	4.0	11
HVC-9	3.0	10	30
HVC-10	7.0	25	70
HVC-11	20	60	200
HVC-12	50	150	500

HVC case structure.

Width	Length	Height
25/32	1-1/8	1-7/32

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DECEMBER, 1955 VOL. 39, No. 12
Successor to RADIO, Est. 1917.

AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

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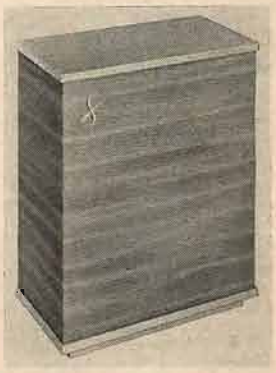
RADIO MAGAZINES, INC., P. O. Box 629, MINEOLA, N. Y.

A Speaker Designed for Miss (or Mrs.) Hi-Fi

Women, it is well known, are sensitive creatures, and the sensitivity extends to audio reproduction. Distortion and harshness (particularly in the middle and higher frequencies) are more readily apparent to women than they are to most men. To satisfy their sensitivity, it is necessary to minimize intermodulation distortion and frequency modulation distortion, the major causes of this harshness and "fuzziness." With this in mind, Sherwood Electronic Laboratories, Inc. has designed the new Forester speaker system.



The Forester system, using three separate speakers to cover the audio range, is designed with the same engineering approach used in $400 and $500 "dream set" systems. The fundamental requisite of all such good multiple speaker systems is *complete acoustical and electrical isolation* of each speaker. When the proper isolation has been achieved, intermodulation distortion is held to an indiscernible minimum. In complying with this concept, the Sherwood system uses a 300 cps 4-element, 12-db/octave crossover network (some manufacturers use a less effective 2-element, 6-db/octave network).

The Forester system employs a true horn-loaded low-frequency section powered by a 12-inch driver. Completing the system are an 8-inch, heavy-duty mid-range unit with a 14.6 oz. magnet and a wide-angle 5-inch tweeter. All three speakers are separately housed in their own sealed cavities.

Electrical measurements of the system reveal only 0.5% intermodulation distortion with input of 10 watts. This figure should be compared with 12% for a typical single-cone speaker and with 5% for a coaxial unit. As a result, the Forester provides an unusually "clean" and "smooth" performance which was immediately apparent to those who heard it demonstrated at the Chicago and New York Audio Fairs. The system will handle up to 35 watts program material with negligible distortion.

Complete Forester systems are priced from $189.00 and are available in a variety of cabinet styles. Also included in the line are "do-it-yourself" kits priced from $129.50. Modernization kits from $49.50, which include the 8-inch mid-range speaker, 5-inch tweeter, and crossover network may also be obtained for use with your 12-inch woofer. Further information on Sherwood amplifiers, tuners, and Forester speaker systems may be had on request by writing Dept. 12A, Sherwood Electronic Laboratories, Inc., 2802 W. Cullom, Chicago 18, Illinois.

AUDIO PATENTS

RICHARD H. DORF*

I HAVE NOTED a rather alarming tendency in the last few months each time the Patent Office Gazette comes into view. This weekly publication carries vital information such as the number, name, and one drawing and claim on each patent issued during the week. Where at one time there was no dearth of audio material, both interesting and routine, issuing from the Patent Office, today it is no longer so.

After several years of scanning the Gazette and a large number of current patents, it is easy to see that the roster of weekly patents is a pretty fair index to what the technical world is interested in at the moment—though the "moment" may actually be a couple of years or so delayed since it takes at least that long to have a patent issue after the initial application. My impression is that the audio brains have either decided that audio is as good as it can get and sales departments are having such a good time that the inventors aren't being pushed any more, or that there really isn't anything left to invent.

A further corroboration of the situation comes from my request in print a few months ago for comments from readers on what they would like to see invented and what they have been working on when they got stuck. This request went practically unanswered. It is, of course, possible simply that no one reads this department or that readers can't find 3-cent stamps, both of which I refuse to believe because there is plenty of other kinds of mail. I also refuse to believe that there is nothing further to be invented in audio, taking a lesson from that omniscient gentleman who made a similar statement back in the 1890's.

What, then, is everybody doing? Why hasn't someone shown us how to avoid wasting a shameful percentage of amplifier power input in trying to generate a little output? Where is the genius who is destined to come up with a speaker which will generate faithful sound without trying to move a ton of physical weight at high speeds as the present nonsensical reproducers do? (Loudspeaker manufacturers—please keep your tempers; I am the same character who firmly believes the internal combustion engine is the Rube Goldberg supreme and cannot possibly work.) (*And a DC-7 couldn't possibly fly.* ED.) What bushel is hiding the light of the savant who will tell us how to make a tape recorder which will not require us to thread the blasted tape every time we want to use it, yet which will retain the editing and other flexibility that present or past—mostly the latter—tape magazines don't have? Why must we continue to fool around with motors and mechanisms for recording and playback when the inventor who will accomplish the same thing in a cheap and practical way with nothing moving but electrons need only get his brain working to reap a rich harvest? Which company is going to produce an audio control system with all the flexibility we prize but without all the knobs and dials we now need, so that Aunt Mary, who just likes music but is disinclined to operate what looks like the instrument panel of a medium bomber, can get her music with maximum results and minimum damage? Who is going to produce a magazine for phonograph records so that instead of hunting for a wanted disc, extracting it from the shelf, putting it on the turntable, and locating the stylus, we can just dial the record we want—but without spending the new-car price—and what are they doing now instead of getting down to business?

Why do we have to buy several expensive loudspeakers when we want to eliminate point-source effect, when the man who can show us how to do it easily, cheaply, and without consuming any more than single-speaker space is probably down at the drugstore guzzling a soda? How about binaural phonograph records with the same time, cost, and simplicity as today's outmoded monaurals—where are you, boy? Finish your lunch and get back to the lab! Where is that electronic piano-harpsichord We've been looking for, at half the cost of a cheap spinet piano and the tone and action of a Steinway grand?

What are all these people doing? Are they too well fed? Did someone tell them there's no money in inventing—that they'd better take jobs manipulating slide rules in unison like a ballet chorus just because that's safer and yields free insurance plus a retirement plan? Are our engineering schools finding it so easy to make the boys read books that they are forgetting to make them think? Are manufacturers so present-wise and future-foolish that they can't see the necessity for well endowed research departments filled with contemplative pipe smokers who are allowed to concentrate on the wheels and cogs inside their heads rather than the machinery on the production lines? Maybe, like all revolutionary societies which achieve success, become well fed, and begin to look with disfavor on anything new, the audio industry is having too much success and has lost its ardor for trail blazing. Maybe engineers and technicians have become too well trained to attempt to do what theory tells them they can't do—instead of trying it anyhow and finding that the theory wasn't complete or has to be changed.

The engineering world is just like the dynamic American economic system. Technology has to keep moving just to stand still, and it has to move even faster to make any progress. Technology in general is doing just that. Audio technology is at the danger point, and the present sales boom won't last forever. Let's get moving!

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

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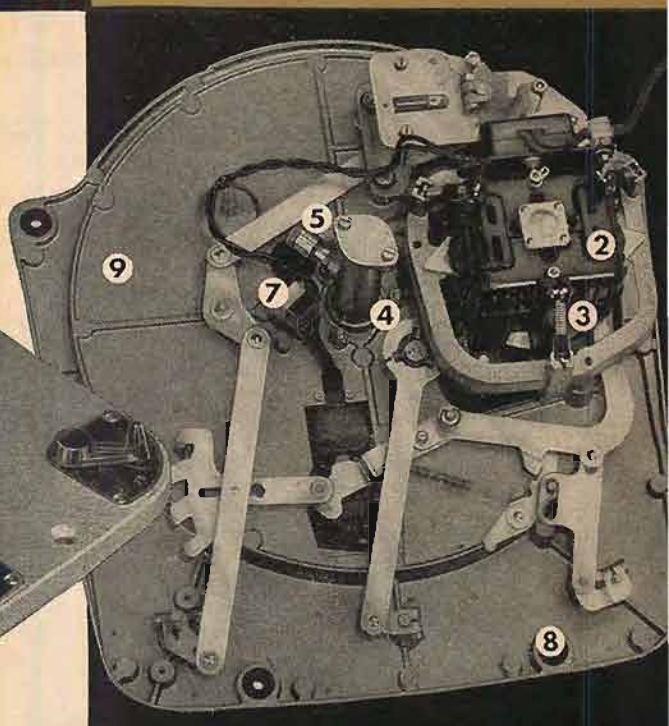
World's Finest

now presents its new

MODEL 301

"the Professional"

transcription turntable



MODEL 301
Transcription
Turntable
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WHY RECOMMENDED: This machine has been designed to provide the professional user and quality enthusiast with a unit supreme in its class . . . truly the world's finest transcription turntable for use in the home!

FEATURES:

1 TURNTABLE: 12" diameter . . . 7½ lb. cast aluminum . . . dynamically balanced, and precision-machined. Permanently "true" center boring fitted with phosphor bronze bushing.

2 NEW HEAVY-DUTY MOTOR: 4-pole shaded design, specifically engineered for this unit. Entirely Garrard-built heavy die-cast housing. Dynamically balanced armature. Rotor set into permanently accurate, self-centering, self-lubricating phosphor bronze bushings.

3 FREE-FLOATING ISOLATED MOTOR MOUNT: A newly developed GARRARD principle, whereby the entire motor is suspended in air by two sets of counterbalancing tension springs. This unique mounting eliminates even the barest possibility of vibration being transferred to the unit plate.

4 NOISELESS MAIN SPINDLE: Rotates on single, specially designed frictionless semi-elliptical bearing of phosphor bronze which eliminates noise and rumble and is simple and inexpensive to check and replace.

5 BUILT-IN PRESSURE LUBRICATING SYSTEM: Oversized grease-housing permanently mounted on main spindle to insure continuous, proper lubrication at all times. Knurled knob, easily accessible from top of unit for turning, forces additional lubricant into spindle, when required.

6 VARIABLE SPEED CONTROL: Simple, foolproof eddy current brake permits instantaneous variation of all 3 speeds. Positive action at all times through permanent magnet, which interacts with revolving metal disc. No friction, no loss of efficiency.

SPEED SAFETY LOCK: Makes it mandatory to shut unit off before switching speeds. An important safety device, preventing jamming of idlers and operating mechanism.

7 RESISTOR-CONDENSOR NETWORK: Eliminates shutoff noise, which is normally induced through pickup to loudspeaker.

PERFECTED TURRET-DRIVE MECHANISM: Large, true pulleys actuate oversized live rubber intermediate wheel, which is mounted on ball bearings and retracts upon shutoff.

SHUTOFF BRAKE: Stops free turntable revolutions when unit is switched off.

8 EXCLUSIVE MOUNTING—SUSPENSION SYSTEM: Permits unit to be mounted firmly to motorboard in fixed relationship to tone arm. Entire motorboard (including turntable and tone arm) is then spring-suspended on base. Special conical Garrard springs and other hardware provided.

9 HEAVY UNIT PLATE: Entirely die-cast and aluminum.

SPECIFICATIONS: Voltage: Dual range, 100 to 130 and 200 to 250 volts, 50 cycle pully available. **Wow:** Less than 0.2% **Flutter:** Less than 0.05%. (Gaumont—Kalee Wow and Flutter Meter Type 564) 3000 cycle constant frequency records at 33⅓, 45 and 78 rpm. **Rumble:** Virtually non-existent. **Cabinet space required:** 16" back to front x 13¾" wide x 2½" above (excluding pickup) and 3½" below top of motorboard. Weight: Net 16 lbs., Gross 20 lbs.

INDIVIDUAL INSPECTION REPORT and owner's manual: Great attention has been given to quality control details appreciated by the connoisseur; including the most exhaustive performance test-procedure ever devised by a gramaphone manufacturer. Accurate measurements of speed, wow, flutter, rumble, flash and insulation are contained in an individual inspection card, enclosed with each Garrard Turntable and referring to that turntable *only*. Also furnished are a comprehensive 24 page book-bound owner's manual and a permanent, heavy-duty stroboscope.

Typical installation on base with a popular tone arm.

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ABOUT MUSIC

HAROLD LAWRENCE*

Assisting At The Piano . . .

ALTHOUGH NO ONE refers to a psychologist as a "psychologyist," the word "accompanyist" is still in circulation—a minor but revealing indication of the way in which members of this profession are frequently regarded. Even to many of those who pronounce the word correctly, the accompanist is little more than a shadowy figure making discreet noises around the curve of the concert grand. In critical reviews, he is generally an afterthought: "——— was the able accompanist," "Assisting at the piano was ———," or, "Mr. ——— was throughout an alert and sympathetic pianist." The more cynical music lover describes the accompanist as a disappointed soloist, just as the violist is labelled a frustrated violinist, or the critic a thwarted musician. In the hierarchy of the world of music, the accompanist ranks low indeed. There are pianists who would sooner bone herrings than accept an accompanist date.

Music's second-class citizen has not only the soloist and public to blame for his predicament. Reconciled, or rather resigned, to being "in harness," the experienced accompanist will take the line of least resistance. If he is an able assistant, he will adapt his style to that of the soloist, anticipating a change of pace, an alteration of tonal color, or a crescendo and diminuendo. But the more skillful he becomes, the more the danger of his losing sight of the ultimate goal: that of making music *together*. How many times have we heard a singer rise on an impassioned phrase while the accompanist, though dutifully playing louder, hardly generates enough excitement to palpitate a jelly fish? As a matter of fact, the *forte* (not to mention *fortissimo*) is rarely found in some accompanists' equipment. They sometimes have to use it, but they'd rather not. This desire not to obtrude affects phrasing as well as dynamic range. Finding himself alone with a melody, our accompanist will perform it a bit faster than he should and in a most routine, "let's get it over with" fashion, so that when the soloist takes over, the contrast will be to the latter's benefit.

At sonata recitals the accompanist's stigma is occasionally removed. Here the pianist is an equal partner in the musical activities. Furthermore, applause is meant for him, too. At the conclusion of a piece, he needn't remain seated, rising only when beckoned. Simultaneous bowing, however, is still a rare occurrence on the concert platform. With all due respect to such pianists as Emanuel Bay, Alexander Zakin, and Ralph Berkowitz, the public pays to hear Heifetz, Stern, and Piatigorsky. There are exceptions, of course, both in concerts and on recordings. In the combination of a pair of stellar personalities, each receives top billing, as in the following cases: Bruno Walter and Lotte Lehmann, Artur Schnabel and Pierre Fournier, Rudolf Serkin and Pablo Casals, Robert Casadesus and Zino Francescatti, Alfred Cortot and Maggie Teyte, and Vladimir Horowitz and Nathan Milstein.

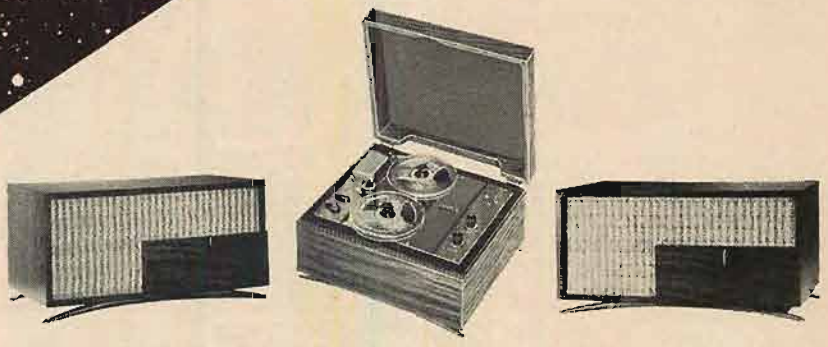
Some accompanists have achieved high reputations in their field. Among them is at least one who is proud of his métier. His name is Gerald Moore. Virtually every famous singer of the past three decades and many of the world's greatest instrumentalists (not to mention countless other lesser known musicians) have benefited at one time or another from the superb accompaniments of this English pianist. Moore is a regular visitor to E.M.I.'s studios where his records number in the hundreds. He is

* *26 West Ninth St., New York 11, N. Y.*

Gerald Moore—"The Unashamed Accompanist"

GIVE AN AMPEX

for a once in a lifetime Christmas



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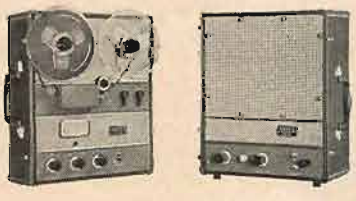
Overwhelming! The startling realism of true stereophonic sound that only a superb tape machine can provide. And what a gift for the family. The 612 achieves vivid reproduction . . . music that seems to have actual presence right in the living room. It plays full and half track tapes too. Complete Stereophonic Sound System, in custom designed cabinets, is priced at $699 — a lasting investment in listening and enjoyment.



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AMPEX CORPORATION

Distributors in principal cities (see your local Telephone Directory under "Recording Equipment.")
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SIGNATURE OF PERFECTION IN SOUND

934 Charter Street, Redwood City, California

also the author of several books including *The Unashamed Accompanist* (1943), and *Singer and Accompanist* (1954). In October, 1954, he gave a lecture-recital in a well-filled Town Hall. He began his program by playing the accompaniment to *Il Bacio*, a dreary succession of oom-pah chords. This was by way of illustrating "what most people think accompanying consists of." He then proceeded to show the other side of the coin. The art song, he said, is actually a *duet* for voice and piano, and should be regarded as such by the artists involved. By not realizing this, the pianist—more often than the singer—fails to exploit the technical as well as interpretive resources of his instrument.

Understanding the text of a song is also vital to the correct accompaniment. Moore recalled a story about Hugo Wolf's *Bitt' ihn, O Mutter* (Beg him, O Mother). The daughter is pleading with her mother to prevent Cupid from releasing his dart. A budding young lady accompanist chose the song as an audition vehicle for Moore. As she seemed about to bang the opening notes, Moore interrupted her with: "Do you know what these words mean?" "Yes," the student replied. "O, mother, bite him!"

While devoting most of his program to Schubert, Brahms, and Wolf leider, Moore also examined sonata playing with the same mixture of wit and instruction. Most of the program is now on a delightful Angel recording entitled *The Unashamed Accompanist* (35262).

Unfortunately for the accompanist, there are still many pieces and songs of the *Il Bacio* variety left in the repertoire. Paganini's *Moto Perpetuo*, Kreisler's *Liebesleid*, and Saint-Saëns' *Introduction and Rondo Capriccioso* are a few examples. What the soloist frequently overlooks is the fact that his virtuoso training, at home in works of this kind, becomes a handicap elsewhere. There are actually times when he accompanies the piano part. Take Beethoven's *Spring* Sonata: it opens with a theme played by the violin above a gently rippling, eighth-note pattern. At the eleventh bar, the roles are reversed; but in some cases, you'd never know it. The gentle rippling is transformed into a Kreutzer étude with raised fingers, while somewhere in the distance the poor pianist timidly enunciates the melody.

An ideal "live" balance, on the other hand, can be and has been destroyed in the recording studio, where microphone placement makes for critical differences. Even one of the world's leading accompanists, Gerald Moore, has fallen victim to improper engineering, unwittingly drowning out baritone Dietrich Fischer-Dieskau on an HMV performance of Schubert's *Der Erlkönig*. In the majority of instances of imbalance, however, it is the name artist who recommends the setup that will favor his own part. Of course, with two prominent musicians in the studio, the technicians must remain impartial.

At the turn of the century, string quartets were "led" by the first violinist. Today, the term is outmoded. The accompanist likewise is coming into his own. But what he still wants, when the music demands it, is not less taxation, but more representation.

by
h.h. Scott

Revolutionary New Turntable Has Everything

710-A Stroboscopic Turntable, $125.00*

New acoustic filtering keeps out ALL interference

■ New turntable design principle, acoustic filtering, prevents speaker, building and motor vibrations from ever reaching the turntable. This frees record playing from distortion found in conventional systems.

■ Center-gear drive, with torsional filtering, eliminates "garbling" of high frequencies which results from the flutter inherent in rim drive.

■ Separate vernier control of each speed allows super-exact pitch adjustment. Convenient pushbutton selection of 33⅓, 45 and 78 rpm speeds.

■ Optical stroboscope for extremely precise speed settings, even while record is playing.

■ Built-in vibration isolation and pickup arm mounting system simplify installation.

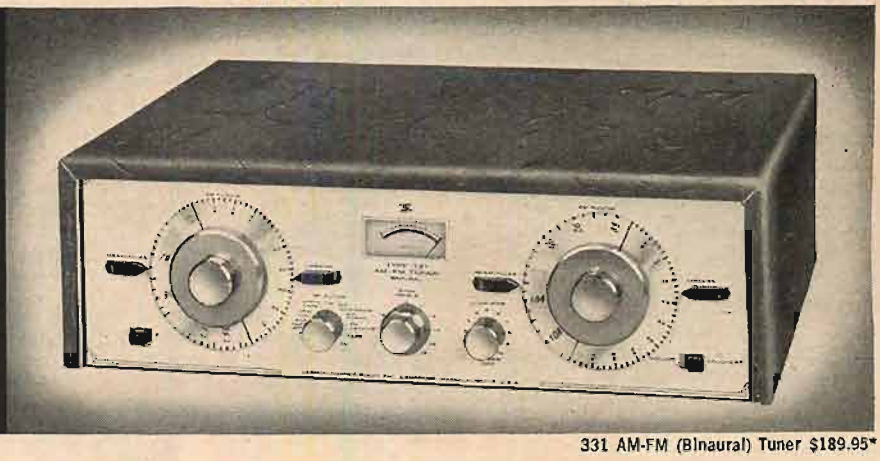
TECHNICAL SPECIFICATIONS

Rumble more than 60 db below recording level — wow and flutter less than 0.1% — built-in slip-clutch permits cueing — heavy non-magnetic cast aluminum turntable — heavy-duty special induction motor with dynamically balanced rotor and extremely low hum field — pickup arm mounting board furnished with turntable — dimensions: 16⅞" x 14½" x 7⅛" — accessory mahogany base $14.95*

*Slightly higher west of Rockies.

All-In-One AM-FM with Equalizer Preamplifier

by
h.h. Scott



331 AM-FM (Binaural) Tuner $189.95*

The perfect answer where space is at a premium

■ Includes complete equalizer-preamplifier with Bass, Treble and Loudness controls, plus four-position record compensator.

■ Same sensational AM, FM, and binaural performance as in 330 tuner described above.

■ Special provisions for playback of pre-recorded tape through your music system.

■ New two-speed planetary-drive tuning; high speed for instant station choice, slow speed for precise tuning to weak stations.

■ New chassis design of the 331 and 330 makes custom installation very simple. Beautiful accessory case available for using tuner on table top or shelf.

TECHNICAL SPECIFICATIONS

FM and AM sections same as 330, above — selector switch for two high level inputs, four equalization curves (RIAA-NARTB-Ortho., Orig. AES, Orig. Col, EUR 78), NARTB tape playback, FM, AM wide range, AM normal, AM distance — bass and treble controls — two magnetic pickup inputs — recommended for use with any H. H. Scott power amplifier — beautiful accessory case $9.95

*Slightly higher west of Rockies.

FREE — valuable booklet on high-fidelity amplifiers!

Send this coupon, with your name and address, or write for FREE BOOKLET A-1255 and complete catalog on amplifiers, tuners, turntables, and noise suppressors.
H. H. Scott, Inc., 385 Putnam Ave., Cambridge, Mass.

h.h. Scott

385 PUTNAM AVE. • CAMBRIDGE 39, MASS.

LETTERS

No Needling?

SIR:

My article in the October issue ("The record dealer views the stylus problem") has, by all the evidence, caused a considerable stir, especially among record dealers. Many of them have written kind comments about the article relating to our mutual needle problems. Many interesting letters have also been received from individuals outside of the music industry—engineers, executives, and so on—also commenting favorably. In all truth, we have yet to receive one letter making adverse criticism about this article.

Many thanks for printing the story.

SAM GOODY
235 W. 49th St.,
New York 19, N. Y.

(*Thanks for writing it.* ED.)

Sealed Records

SIR:

Mr. Bartok's problem with sealed records is a real one, and I can understand the failure of his experiment since I am one of the customers on which it failed. Unless I am familiar with a particular recording I would hesitate to buy it without a hearing.

I agree with Mr. Canby that it would be nice to buy records undamaged by the record butchers that often frequent the record shops. The seal that is not a seal is of little value, as one local record dealer found after opening one for me only to find that someone else had been there first.

Surely there must be a solution to this problem, at least for those dealers that handle a relatively large volume. I have often wondered why the demonstration record principle is not used in a joint plan between manufacturers and dealers. Some large dealers have done this on their own, and I feel that some mutual arrangement could be worked out that would help everyone.

Let us not give up yet.

DONALD S. BLISS
Route 2, Box 419,
Albuquerque, N. M.

Employment Register . . .

Positions Wanted and Positions Open are listed here at no charge to industry nor to individuals who are members of the Audio Engineering Society. Positions Wanted listings from non-members are handled at a charge of $1.00, which must accompany the request. For insertion in this column, brief announcements should be sent to AUDIO, P. O. Box 629, Mineola, N. Y. before the fifth of the month preceding the date of issue.

● Leaving army in July '56. Seeking permanent employment career in audio and hi-fi. Degree in Physics; Phi Beta Kappa; lifetime interest in music and sound. highly experienced in dealing with the public; excellent facility with technical equipment and literature. Married, age 26, own car. Desire to locate in Wash., Phila., N. Y., or Boston area. Box 1201, Audio.

★ **Audio Engineer.** Experienced hi-fi and PA circuit and prototype development. Must be familiar with practical measurement techniques and capable of bench work. Challenging work with a leading New York manufacturer. Box 1202, Audio.

Price cut!

...and just in time for Christmas!

SAVE $2.00 ON EVERY REEL

Here's your favorite recording tape—"SCOTCH" Brand Magnetic Tape 111 at a new low price! "SCOTCH" Brand slashes the price from $5.50 to just $3.50! Take advantage of this giant saving to stock up on the tape used by radio stations the world over.

"SCOTCH" Brand Magnetic Tape 111 offers you superior recording results... reel-to-reel uniformity, higher fidelity and the exclusive new "Loop-Lok" reel for easier threading. No wonder it's the first choice of engineers here and in almost every country abroad!

Buy now. See your dealer and treat yourself and your recorder to the best in sound. And don't forget you save $2.00 on every reel!

REG. U.S. PAT. OFF.

SCOTCH
BRAND

Magnetic Tape 111

The term "SCOTCH" and the plaid design are registered trademarks for Magnetic Tape made in U.S.A. by MINNESOTA MINING AND MFG. CO., St. Paul 6, Minn. Export Sales Office: 99 Park Avenue, New York 16, N.Y.

NEW LITERATURE

• **ORRadio Industries, Inc.,** Opelika, Ala., in a new folder titled "How Magnetic Tape Is Made," offers free to owners and operators of tape recorders, students, and others interested in magnetic recording, a great deal of useful and interesting information about the manufacture and quality control of magnetic recording tape. The publication thoroughly describes and illustrates in a series of photographs every step in the manufacture of tape, from start to finish. Written in the language of the layman, this booklet will be of great interest to every tape recorder owner. Your request for a free copy should be directed to Dept. 25 at the address shown above. **D-1**

• **Harman-Kardon, Inc.,** 520 Main St., Westbury, N. Y., has just announced a new 17-page full-color catalog containing information on the complete line of H-K high-fidelity instruments. Profusely illustrated, the booklet pictures each unit in an appropriate setting with brief specifications and descriptive highlights. This catalog will give the reader not only an understanding of the various Harman-Kardon hi-fi components, but will also assist him in gaining full comprehension of the term "high fidelity." Copies are available from hi-fi dealers throughout the country or by writing direct. **D-2**

• **Shure Brothers, Inc.,** 225 W. Huron St., Chicago 10, Ill., explains the function and importance of the pickup cartridge in a high-fidelity system in a booklet issued in behalf of the new Shure "Music Lovers" cartridge. The publication contains considerable information on the potentialities of barium titanate cartridges for hi-fi reproduction. Thoroughly described is the new Shure cartridge and its "needle-shift" design which eliminates turnover of either the cartridge or the stylus, and the simple method of replacing the stylus in seconds. Copy will be mailed on request. **D-3**

• **General Industrial Company,** 5746 N. Elston Ave., Chicago 30, Ill., has just published a new and colorful catalog which features many items that have been added to General's standard line consisting of inter-communication systems, steel shelving, lockers, and storage cabinets. Shown in a wide variety of sizes and capacities are plastic drawer cabinets which are ideal for small tools, nails, etc. Copy will be mailed free on request. **D-4**

• **Ohmite Manufacturing Company,** 3680 Howard St., Skokie, Ill., gives specifications and features of the new Ohmite line of small wire-wound vitreous-enameled resistors with axial leads in a two-page Bulletin No. 147 which has just been published. Listed in the folder are the two sizes, 5 and 10 watts, which are carried in stock in a wide range of values. Also shown is a price schedule. Copy will be mailed on request. **D-5**

• **Bakelite Company,** 300 Madison Ave., New York 17, N. Y., presents a wealth of information of great value to manufacturers of electronic equipment in a new, revised "1956 Condensed Reference File of Bakelite Plastics and Resins." The 12-page booklet summarizes technical data about the wide range of special and general-purpose Bakelite phenolic, vinyl, styrene, polyethylene, fluorothene, polyester, silicone and epoxy plastics and resins, and Krene film and sheeting. More than 50 plastics and resins are described under the headings: Molding Materials, Extrusion Materials, Laminating Plastics, Bonding Materials, Vinyl Calendering Materials, Protective Coating Resins, Flexible Packaging, Flexible Film and Sheeting, and Plastic Rigid Sheets. Copies of the booklet are available to business firms on request. **D-6**

• **Electro-Voice, Inc.,** Buchanan, Mich., does a superb job of illustrating and describing the entire line of E-V professional microphones for TV and broadcast use in a new 32-page catalog which is of equal value to station management and engineers. The booklet gives detailed application information, also features and specifications for each E-V microphone used in TV and broadcasting. Operating principles are described as well as operational features such as polar patterns, frequency-response curves and wiring diagrams. Development and manufacture of the microphones is explained in a special section. Requests for copy should specify Catalog No. 120. **D-7**

EDITOR'S REPORT

END OF SHOW SEASON

WITH THE FIRST OF DECEMBER comes a *temporary* cessation of audio shows, giving us time to mix into the greatest show of all—Christmas. And a good thing it is, too, for it would be more of a chore than usual to try to attend audio shows and keep up with the required amount of shopping—including both that which we want to do and that which we feel obliged to do. Naturally, many of us will indulge some of our Christmas savings for new pickups, turntables, changers, arms, amplifiers, speakers, and cabinets, or at least we may try to get away with it, and anyhow, there's no harm in dreaming, is there?

Perhaps it is just as well that the last of the shows ends on November 6, for by Christmas time we may (possibly) have forgotten just what it was that we wanted most and would acquire as soon as the budget permitted. And even though budgets become strained traditionally over the year-end, there is still a surprisingly large volume of sales during the months of November and December.

The Industry's first show under its own banner was held in Philadelphia, and a most successful show it was, we are told by our associates who attended. This is only the forerunner of more industry-run shows, and it is likely that they will continue to be as successful as the first one.

The show in Mexico was also industry run, and it too was a complete success. Measured by what the exhibitors expected and planned to consider a success, the show rang up an impressive 200 per cent. The AMIAF had convinced itself (not us, we admit, modestly) that an attendance of 5000 would be considered good—yet the three-day exhibit played to a house of over 10,000. And it was by far the most beautiful audio show ever held so far, with decorations and flowers that would do credit to the plushiest fashion exhibit. Since we recognize that we may be somewhat prejudiced by the reception we received at the hands of the people in Mexico, we have asked Leonard Carduner to describe the show to our readers, assuming that in one trip he may not have succumbed to the lure of our neighbors to the South.

EYES IN BACK AND IN FRONT

It is the usual custom in December for editors to review their progress over the past year and make optimistic statements about the coming twelve months. We have tried that many times, and after turning out what we consider to be a masterpiece of literature, we seem to remember that it sounds familiar. Checking back to the previous December, we often note that the material is an almost verbatim copy of the earlier effusion. So this year we will refrain from much eulogizing and promising and say only, "Let's look at the record."

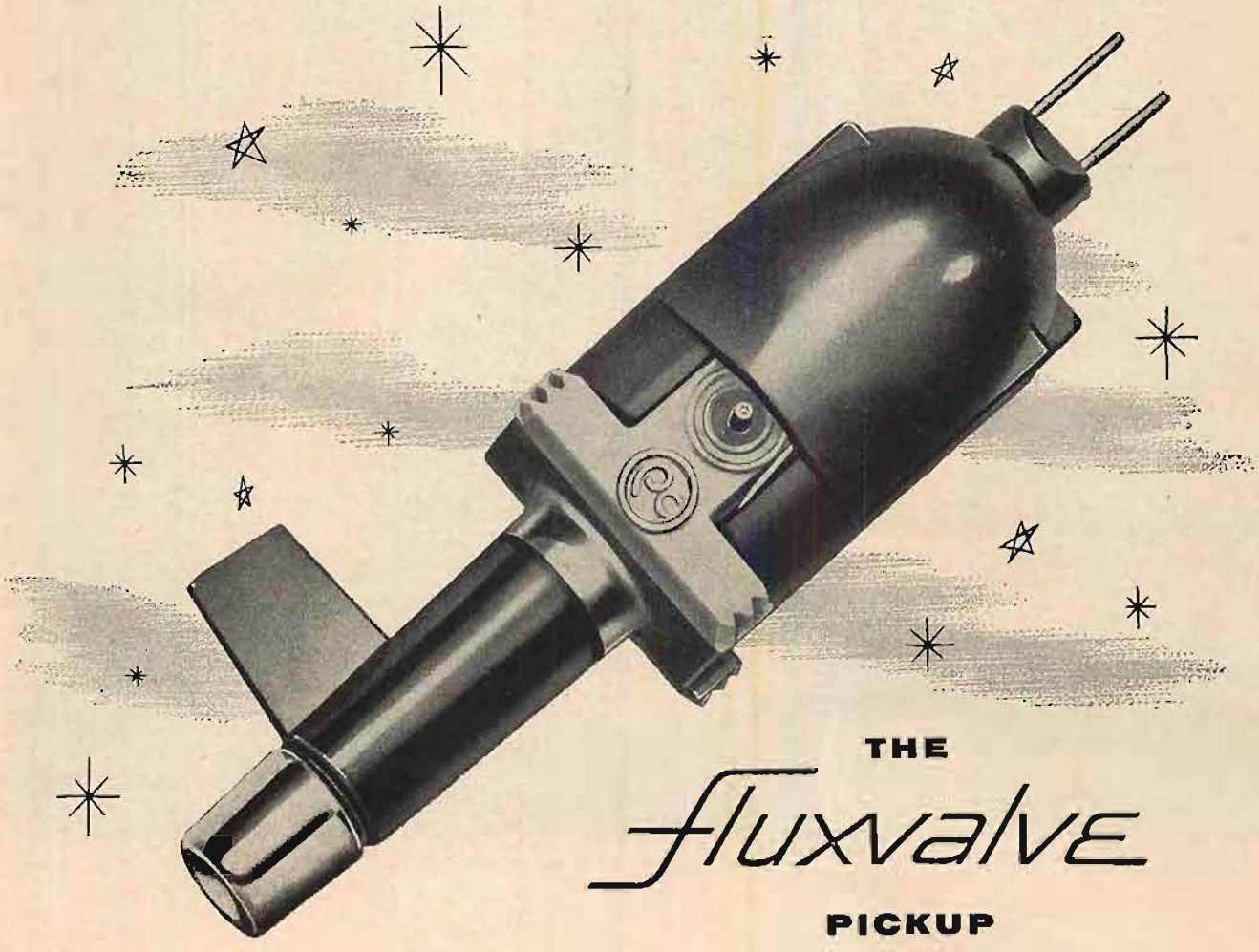
Our worst fault in '55 was in coming out late, starting with late Spring and continuing until October. Now we are nearly up to normal again—one cannot catch up completely in one month, anyway—and we promise we shall *try* to stay there. Even the most unbelievable of excuses actually happened to us this year—one of the two-color presses *did* break down.

This year, we shall keep our New Year resolutions to ourselves, so if we fail only our conscience will bother us. After all, we do want Audio to be your favorite magazine, and that is what we strive for constantly. We can only promise to keep on trying.

Merry Christmas & Happy New Year

from all of us to all of you

the first really new pickup in a decade



THE

fluxvalve

PICKUP

Made by perfectionists—for perfectionists. The FLUXVALVE is literally the cartridge of the future, its unique design meets the demands of all presently envisioned recording developments, including those utilizing less than 1 mil styli.

There is absolutely nothing like it! The FLUXVALVE Turnover Pickup provides the first flat frequency response beyond 20kc! Flat response assures undistorted high frequency reproduction — and new records retain their top "sheen" indefinitely, exhibiting no increase in noise . . . Even a perfect stylus can't prevent a pickup with poor frequency characteristics from permanently damaging your "wide range" recordings.

With this revolutionary new pickup, tracking distortion, record and stylus wear are reduced to new low levels.

The FLUXVALVE will last a lifetime! It is hermetically sealed, virtually impervious to humidity, shock and wear...with no internal moving parts.

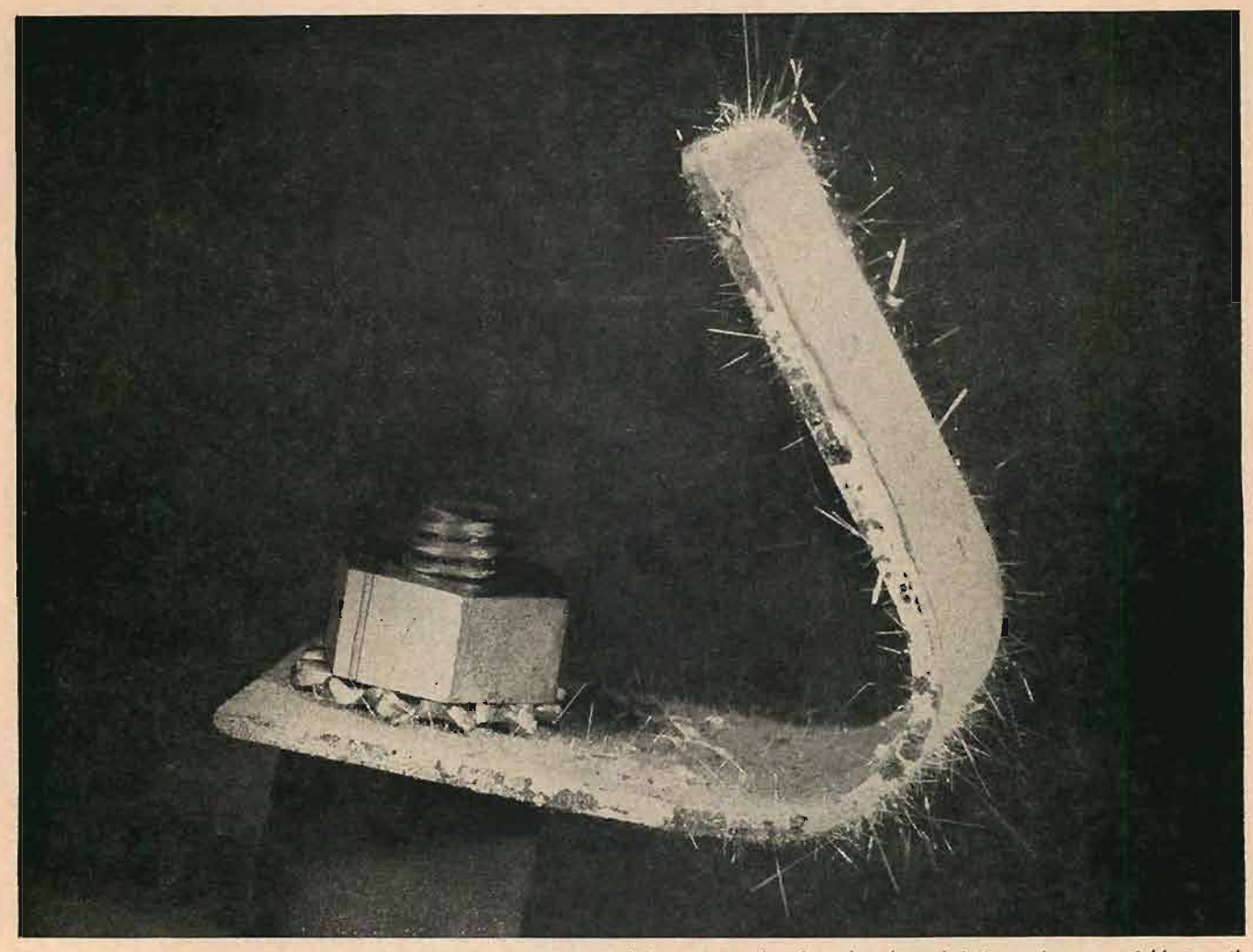
The FLUXVALVE has easily replaceable styli. The styli for standard and microgroove record playing can be inserted or removed by hand, without the use of tools.

For a new listening experience, ask your dealer to demonstrate the new FLUXVALVE...words cannot describe the difference...but you will hear it!

"FOR THOSE WHO CAN HEAR THE DIFFERENCE"

PICKERING & CO., INC.
OCEANSIDE, LONG ISLAND, N. Y.
PIONEERS IN HIGH FIDELITY

...Demonstrated and sold by Leading Radio Parts Distributors everywhere. For the one nearest you and for detailed literature: write Dept. A-9.



Whiskers on tin-plated steel, enlarged 6 times. Immense yield strength of metals in whisker form was discovered by Bell scientists.

The clue of the metal whiskers

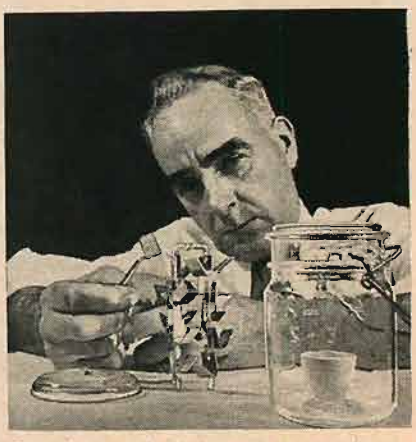
The habit of close observation at Bell Laboratories often turns "tremendous trifles" into important scientific progress. Such a case occurred when unexplained short circuits in wave filters seemed to be associated with a zinc-plated mounting bracket.

Close scrutiny disclosed a whiskery growth on the zinc plating. Similar whiskers of tin were found growing on tin-plated equipment. Studies showed the whiskers to be tiny single crystals of metal.

Suspecting that these unusual crystals might be of essentially perfect structure, alert Laboratories scientists saw an opportunity at last to test an important metallurgical theory.

The scientists studied the whiskers, grew larger ones, and showed that the crystals had enormously high yield strength as predicted by the theory for perfect crystals—a strength far greater than for the same metal in any other known form. This clue has opened new frontiers in the study of what makes metals strong or weak, and has excited metallurgists all over the world.

Thus, another new advance has come out of the Bell Telephone Laboratories practice of scrutinizing *everything* that can play a part in better telephone service.



Through the study of thousands of specially cultivated whiskers, Bell scientists seek to prevent treacherous growths in telephone equipment.

BELL TELEPHONE LABORATORIES

IMPROVING TELEPHONE SERVICE FOR AMERICA PROVIDES CAREERS FOR CREATIVE MEN IN SCIENTIFIC AND TECHNICAL FIELDS

Electronic Organ In Kit Form For Home Construction

RICHARD H. DORF*

In Three Parts—PART I

Full details on design and construction of AGO-spec concert organ which can be built by anyone from kit parts.

NOW THAT ELECTRONIC ORGANS can be designed and built to sound just about any way the designer wishes —up to and including a really fine imitation of pipe-organ sound—the future appears to contain a genuine boom in organ sales among the general public. Electronic organs are nothing new, however, to a large group of people (most of them technically inclined) who have for years wanted to build one and many of whom have spent countless hours trying to evolve successful designs and/or duplicate commercially built units. Unfortunately, experience is the best teacher in this kind of work and there is little practical experience to draw on; this, and the necessity for some very special parts not available from electronic supply houses, has kept the number of successful amateur organ efforts down to a very small handful.

Recently, however, The Schober Organ Corporation[1] has come out with what appears to be the answer to the organ constructor's prayer — a full concert organ which can be built by anyone, with or without technical experience— from several kits of parts accompanied by exceptionally clear and informative instruction material. The kits are expected to attract not only the people who have long yearned to build an organ, but also those who may never have thought of it before but would like an organ and find attractive the idea of acquiring one for less than half the price of its commercial equivalent. There are 24 separate kits which, when assembled, make up the complete organ, leaving the constructor with nothing to seek out on his own except solder and ordinary radio tools. To increase the price advantage and make things easy for the constructor of modest income, each of the kits may be bought separately when and as the money becomes available.

There is nothing toy-like about the Schober Organ, nor is it an abbreviated or cut-down version of anything. It has two full 5-octave manuals, full 32-note pedal keyboard, 19 stops giving as many authentic-sounding pipe-organ tone colors, and six inter- and intra-manual couplers. Playing dimensions conform to those set up by the American Guild of Organists for pipe organs. The instrument is played exactly like a pipe organ—including registration—and sounds so much like one that the first question from many nontechnical people is, "Where are the pipes?"

* *Electronics Consultant, 255 West 84th St., New York 24, N. Y.*

[1] *35 Dail St., New Hyde Park, N. Y.*

Fig. 1. The complete Schober Electronic Organ in the console designed for it.

Design Standards

Designing a fine electronic organ for home construction is a bit more difficult than designing one that is to be sold in stores as a complete unit. In addition to assuring that the instrument will be as good musically as its commercial counterpart, special approaches and techniques must be used in physical design to make certain that the average (and also the less handy than average) constructor will be able to understand the job and do it with a minimum of error and profanity. The detailed descriptions later in this article will show how this has been done. Suffice it to say at this point that three principal factors are important:

1. *Unitized construction.* In the electrical equipment there are functionally 20 separate sections. In a commercial organ these might be combined into a few major groups, with each group

Following the phenomenal success of the industry-sponsored Philadelphia High Fidelity Music Show held in November of this year

THE INSTITUTE *of* HIGH FIDELITY MANUFACTURERS

a non-profit corporation devoted to the advancement of quality in sound reproduction

ANNOUNCES that it will hold its first

NEW YORK HIGH FIDELITY SHOW

during

SEPTEMBER 1956

These industry-sponsored shows are intended to provide the place and the opportunity for new audio developments, techniques and equipment to be seen, heard and appraised by the general public. The readers of this magazine are earnestly solicited for their views on show format and practices, that these shows may better serve the growing public interest in high fidelity.

Please address all replies to: **Show Plans Committee**

INSTITUTE OF HIGH FIDELITY MANUFACTURERS, INC.

25 Broad Street, New York 4, N.Y.

foil; it was only able to retain its shape partially, and that for very few playings. Subsequent technical improvements, however, made the phonograph a popular device by the turn of the century. It is curious that our modern recording system, in which the record is a mechanical copy of the original master, is more closely related to Cros's system than to Edison's. Emil Berliner, the father of the moulded or cast record, began his research work by successfully carrying out Cros's proposals.

The Mechanical or "Acoustic" Phonograph

It would be useful to consider the design of the non-electric phonograph, as illustrated in (A) of *Fig.* 3—3. A better insight can thereby be gained into the function of the various components of a modern electronic system.

The wave forms frozen into the record groove control the vibrations of the playback stylus when the groove is traveled past the stylus by a revolving turntable. These stylus vibrations, although they contain a fairly large amount of mechanical energy, engage practically no air, like the revolutions of a bladeless electric fan. The needle is therefore attached to a diaphragm, which vibrates in sympathy with the stylus and has a much larger surface area in contact with the air of the room.

But even the reproducing diaphragm doesn't get a sufficient bite of the air for practical purposes. Therefore the diaphragm is placed at the narrow throat of an acoustical horn, and the actual usable sound emerges into the room from the much larger mouth of the horn. The system works somewhat as though the diaphragm area were really that of the horn's mouth.

It can be seen that all of the energy radiated by the horn is taken from the mechanical vibrations of the needle, and the forces between needle and record groove are necessarily very great. This has obvious implications for record wear, but perhaps more important, the demands for power placed on the "sound box" or "speaker" (old-fashioned terms for the needle-diaphragm-head assembly) place a severe limitation on musical fidelity. High distortion and peaked and severely limited frequency response are to be expected.

The Phonograph Amplifier

The solution to this problem lies in changing the function of the phonograph pickup, from the primary generator of sound power to a device which controls an outside source of power. If the power from the outside source is made to oscillate in imitation of the needle vibrations, two benefits can be derived:

1. The final output of the sound derived from the record groove can be much louder.
2. The power demands on the pickup itself are no longer heavy. The pickup can be designed for quality rather than loudness; the problems of uniform, extended frequency response, and low distortion, are considerably lessened. So, incidentally, is the required weight on the pickup and the grinding away of the record groove.

The controlling of an outside source of power to conform to given oscillations is called *amplification.* The first phonograph amplifier was pneumatic: the needle was made to actuate an air valve, which periodically throttled a flow of compressed air. Most of the work of radiating sound power was thus performed by the air compressor, and the stylus was relieved of part of its burden.

All modern sound reproducing systems use amplifiers, but unlike the first pneumatic systems these amplifiers are electronic. The phonograph pickup is no longer a sound generator but an electric generator. It produces small alternating voltages at its terminals, whose wave forms conform to those of the groove and of the recorded sound. The pickup has to generate very little power, because the output voltage can be amplified to almost any desired degree. The amplified electrical power must finally, of course, be converted back into sound by a loudspeaker. The two types of reproducing system, electrical and purely mechanical, are shown in *Fig.* 3—3.

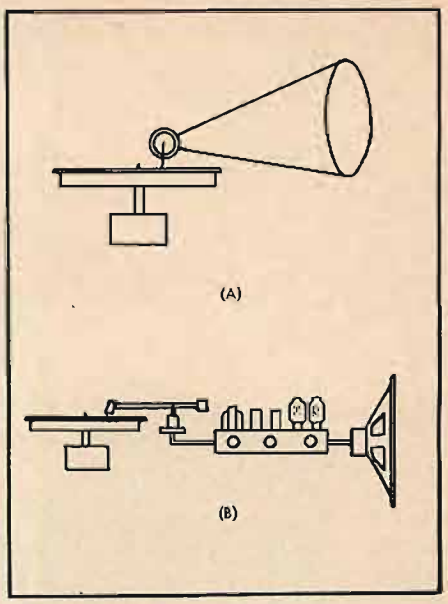


Fig. 3—3 (a) The mechanical phonograph (b) The electric phonograph.

The Modern Sound Reproducing System

The purpose of the historical approach used above has been to furnish the reader with an appreciation of the reason for the modern audio system being designed as it is. With the electronic amplifier supplying the brute force, so to speak, the mechanical components—pickup and loudspeaker—can be built in such a way as to suppress the natural resonant tendencies inherent in mechanical vibratory systems.

Before discussing each of the audio components in detail, it would be useful to make a brief survey of the entire reproducing system. The complete system is illustrated in Fig. 4–3.

First of all the disc record must be revolved by a *motor* and *turntable.* The chief operational requirements of this part of the system are that it revolve at the correct speed, that the speed be constant, and that extraneous vibrations do not communicate themselves to the pickup.

The first of these requirements is for the purpose of keeping the reproduced music at the same absolute pitch at which it was recorded: too fast a turntable speed will make the pitch sharp, and too low a speed will make it flat. The second condition listed, constant speed, is required in order to avoid pitch variations, or "wow". The third requirement, lack of extraneous vibrations,

(*Continued on page 51*)

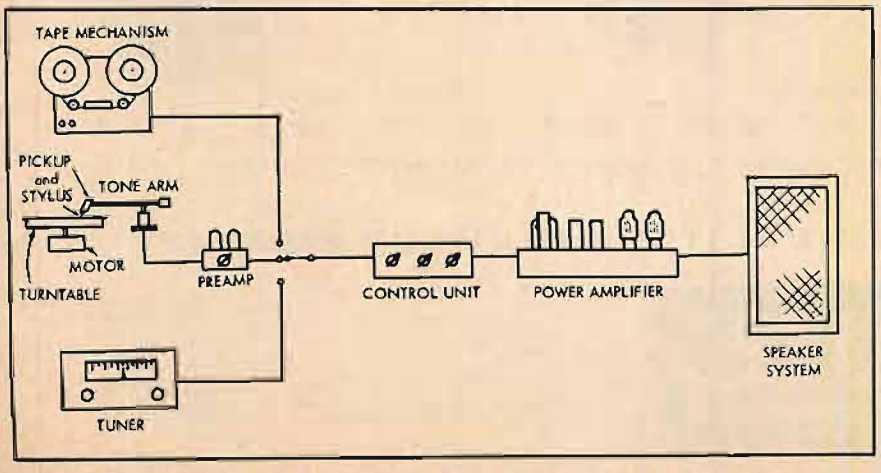
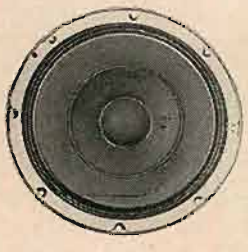


Fig. 3—4 Diagram of a complete modern sound reproducing system.

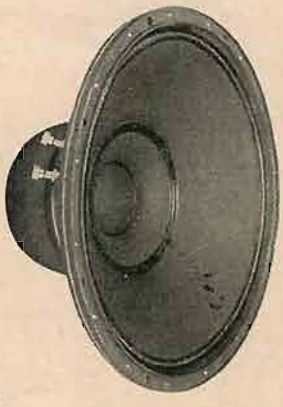
Developed in Altec Lansing's famous acoustical laboratories, the **biflex** speakers represent an entirely new concept in loudspeaker design. This new development, multiple concentric compliances, permits stepped sections of the cone to radiate different frequencies, thereby achieving a smoother and more extended frequency range than previously attainable from a single cone loudspeaker.

The performance of these new Altec **biflex** speakers is so amazing that they must be heard to be believed. See your Altec dealer soon for a demonstration of their range and fidelity.



408A
8", 15 watts, 60-13,000 cycles, $24.00

412A
12", 20 watts, 40-13,000 cycles, $45.00



415A
15", 25 watts, 30-13,000 cycles, $60.00

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The Sound Reproducing System

SOUND—Chapter 3

EDGAR M. VILLCHUR*

A discussion of the background of the phonograph and a description of the major elements of a home music system as used today in installations of various sizes.

THE PHONOGRAPH is a classic example of an invention that cannot be credited wholly to one man. In 1877 Edison directed his assistant, John Kruesi, to construct the first complete record-reproduce system, but sound recorders were sold on a commercial basis as early as 1860, and Thomas Young's "A Course of Lectures on Natural Philosophy" described and illustrated a crude but practical sound recorder in 1807.

Young's recorder consisted of a sharp metal stylus held by spring tension against a revolving cylinder, the cylinder coated with wax and turned by a governor-controlled gravity motor. When a vibrating body such as a tuning fork was held against the stylus, a wavy line was cut into the wax. This line represented the wave form of the vibrations, and it could be studied and analyzed at leisure. The recorder was a mechanical draftsman, that could sense very small motions and record pressure changes that took place within a period of a very small fraction of a second.

By 1856 Léon Scott de Martinville had constructed the "phonautograph" (self-writer of sound) illustrated in *Fig.* 3—1. The sound wave-form was scratched by a hog bristle stylus on the surface of a cylinder coated with lampblack, but the big advance over Young's machine was the fact that the phonautograph could record directly from the air. The force of the acoustical vibrations was concentrated by a horn onto a diaphragm, and the stylus was attached to the diaphragm, so that the recording needle did not have to actually touch the vibrating source of sound. This device, which corresponds in function to the modern oscilloscope, was a catalogue item of the Paris firm of Koenig, and was sold as a measuring instrument to acoustical laboratories.

The phonautograph which is at the Smithsonian Institution at Washington would undoubtedly reproduce music if a proper record were placed on its revolving cylinder. The theoretical possibility of playback was understood then, too, but the lampblack records were useless for playback, as their grooves were not rigid enough to direct the vibrations of a playback needle. About half a year before Edison got his brainstorm Charles Cros conceived a method for bringing the groove sinuosities back to life as sound. The lampblack recording was to be photo-engraved on a metal cylinder, and running a needle through the hard groove would then cause the needle to vibrate from side to side, in the same time pattern as the hog bristle stylus that first inscribed the line.

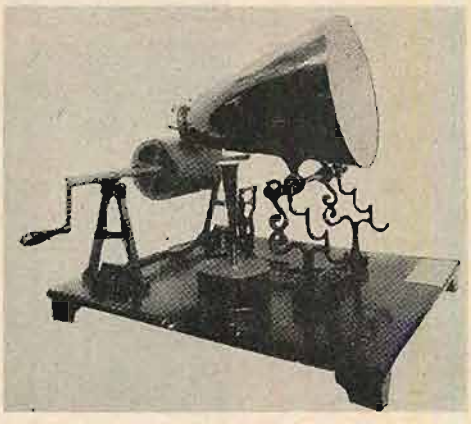


Fig. 3—1 The phonautograph of Léon Scott de Martinville—a commercial sound recorder of the eighteen sixties.

For reasons which may be related to nineteenth century differences in tradition between the scholar and the industrial engineer, Cros didn't even construct a working model, but merely filed a complete, sealed description of his system with the *Academie des Sciences*. On the other hand, less than a month after Edison first conceived of a reproducing phonograph the country was reading about a working unit in newspaper headlines. There was a great stir of excitement over this amazing tonal imitator, (see *Fig.* 3—2), with public demonstrations, lectures before august scientific bodies, and a visit to the White House.

The excitement soon died down, as the Edison machine was an impractical toy, with neither permanent records nor usable fidelity. The recorded groove was indented into a semi-hard material, tin

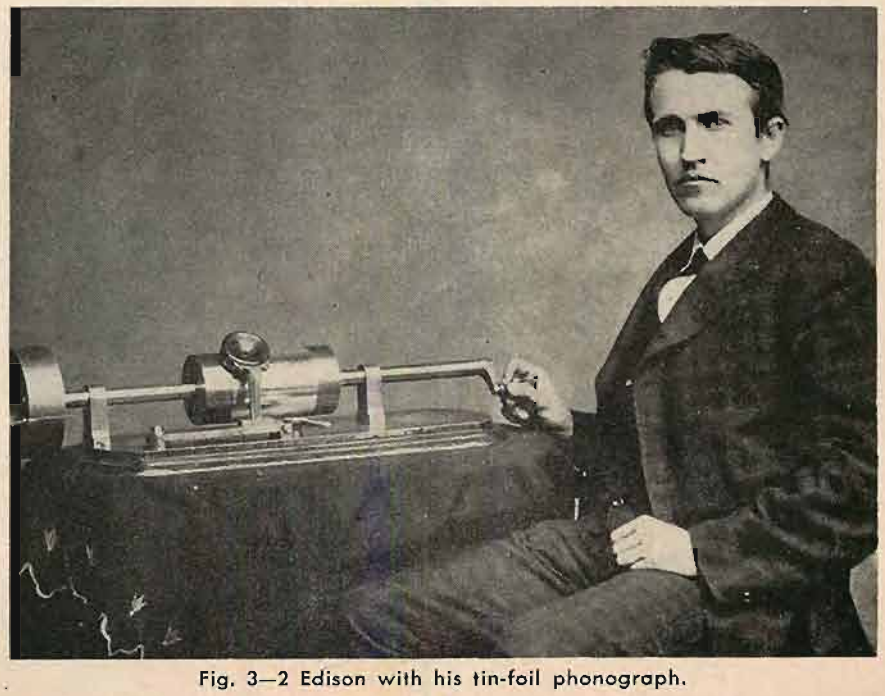
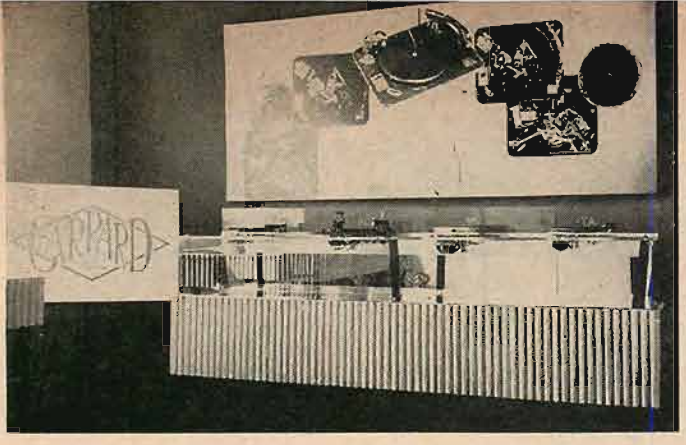


Fig. 3—2 Edison with his tin-foil phonograph.

* *Woodstock, N. Y.*



Mexico's First Hi-Fi Fair

LEONARD CARDUNER*

Observations from one familiar with U. S. audio shows on the occasion of his first trip to Mexico and his visit to the first fair South of the Border.

IT WAS, PERHAPS, entirely fitting and proper that our first visit to Mexico should have coincided with the first Mexican High Fidelity Fair and that the first two words of Spanish that we learned should be "Alta Fidelidad" or High Fidelity.

Surrounded as we are by photos of the display end of the first Mexican Fair, we will restrict our own observations to the "human" side of the exhibition, as we saw it.

The first thing with which we were impressed was that the Fair took place in what is considered to be the very best hotel in Mexico City! It is an amusing sidelight that after the first day of the Fair, the management of the hotel informed the sponsoring committee that the hotel would *not* be available to them for the following year! It appears that the hotel owners were not aware of the amount of noise which would be created (more about this later), nor were they quite prepared for the number of visitors! As the hotel is rather a small one, by United States standards and as there were only two small elevators in use, those of our readers who have attended Audio Fairs in various cities in the United States can well imagine the resulting chaos. In fact, at various times during the day the queue for the elevators extended right across the lobby, outside into the street and around the corner of the hotel.

The people who came to this Fair were extraordinarily well behaved, very quiet and spurred on by a genuine interest in high fidelity. By proportion, there were more women accompanying the men than we are accustomed to seeing at our Shows. However, there were no children and we would be inclined to say that the average age of the visitor was somewhere around 40 years.

In fact, the thing that was most impressive was the orderliness and courtesy of the visiting public. The hallways in the hotel were unusually good looking, decorated in colorful, cheerful pastels. Outside of each room were large vases of beautiful flowers, together with easels bearing a large display card of the exhibitor. We failed to see a single one of these vases or display signs disturbed or upset in any way, although many thousands of people passed

* *British Industries Corporation, 80 Shore Road, Port Washington, N. Y.*

Upper left: Garrard of Mexico displays both sides of changers. Right, top to bottom: Example of fine cabinetry by Villareal, Guadalajara; G.E. provides living-room setting in Presidential suite; Collaro displayed old phonographs, new changer; Corporacion Mercantil showed Stromberg-Carlson line; decoration is typical of all exhibits.

name components, which we list with their specifications, carefully scanned:

1. Argos bass-reflex speaker cabinet DBR-2, ported above and below the 12-inch speaker opening; a version of the distributed port.

2, 3. Electro-Voice 82D cartridge with diamond stylus for LP; separate 82S with sapphire stylus for 78's. Ceramic elements, with response flat ±2.5 db at 20–15,000 cps with new standard RIAA curve. High-level output works into 3-meg load at 0.5 volts. No inductive hum pickup; a compliance of 1.5 for clean highs; distortion less than 2 per cent.

4. Garrard RC80 automatic record changer, pusher type platform; three speeds; plays all size records. Interchangeable plug-in-heads for either crystal, ceramic or magnetic cartridges; tonearm muting switch activated between change-cycle. Comes completely wired ready to play, with two empty cartridge shells, 45 rpm spindle.

5. General Electric S-1201-A 12-inch full-range speaker, 8 ohms impedance, 25-watt output, frequency range 50–13,000 cps; magnet weight 14.5 ounces.

6. Harman-Kardon model A-200 AM-FM tuner. Seven tubes plus selenium rectifier. Counter-weighted tuner control has built-in AFC defeat. Armstrong FM circuit with Foster-Seeley discriminator. FM sensitivity 3 mv for 20 db quieting, 5 for 30 db quieting. AM is superheterodyne circuit, automatic volume control and built-in ferrite loopstick antenna. Phono input and a.c. receptacle.

7. Pilot 10-watt amplifier model AA-903, Williamson type, with preamp. Seven tubes including rectifier and push-pull output tubes. Controls for on-off volume, bass and treble, and equalizer selector for LP, NAB, AES and foreign recordings. Frequency response ±1 db from 15 to 40,000 cps. Distortion less than 1 per cent at 10 watts, hum level 70 db below 1 volt. Three inputs for radio and auxiliary equipment, and one with adjustable impedance for matching various magnetic cartridges.

The point is that these are by no means "junior" components, in any sense of the word. They have been selected with an eye on cost, it is true, but they are of known make and proven design and so you are going the hi-fi way, all the way. Which means that, while adding up to a total of around $275, the resulting system compares with anything that the ready-built boys have to offer and we fancy its components are rather superior in flexibility, variety, adaptability—they, or their successors (if any) and because they have been housed with these objectives in mind. Change any of the components? That is a possibility, but not before and unless they get infinitely better, class for class: and that is how the junior hi-fi powerhouse has been rigged. But not for damaging disembowelment—not when changing a unit for a better means just removing a disposable, thin ply panel board, mounting the new apparatus and putting it back, with new holes drilled in a new board, is all.

Growing into Hi-Fi

We hold that any escape from the adenoidal sounds generated by the unregenerate pre-war phono pickup, or from the buzz-box tuners of the same era, is a good escape. Making fully good our youngster's escape to hi-fi called up our sense of dedication to a task needing to be as well done as we knew how, down to the last swipe of the waxing cloth across the as yet unformed face of the as yet unformulated design of a cabinet or cabinetry in which or to which the components could be congregated or secured.

The family bookshelf, a many-used thing, figured in our final decision as to a mode of housing. It formerly held books and the encyclopedia; now it is children's toys, blocks, balloons, rag dolls, roller skates, etc.Etc. They have also contained a portable phonograph, a toy accordion, a musical jack-in-the-box. The toy accordion has long since been enthusiastically torn apart, and a displaced person is now the box's jumping jack. Displaced also from its ever so well-intrenched importance, the old-line portable phono, now good only up to the point of pleasing the three-year old's playing those ages-old nursery rhymes, at the quickly spun-out 78-rpm rate. Not that the 78's have played their interest right out the window, kids being notedly conservative in their likes, but that record players are today obviously better sounding, even to ears so young. So the portable phono is now the sometime play-thing of the three-year old, because the handling of it is her proud new ability. When, as a result of her conditioning to things of higher fidelity the nine-year old put in her wish for an hi-fi outfit of her own, the convenient and patently versatile shelvings (16 inches deep) suggested the germ of a rather simple solution to the placement of the system.

To Encase or Bookcase the Hi-Fi?

Or so it seemed, at first glance. Aside from first having to get the components then fitting a container around them (which is the sensible thing to do) the shaping up of the enclosure needed more than a glancing think. Shaping up, in the sense that the tuner, amplfier, and record player if concealed too well or affixed too permanently to panels or onto slideouts might be serviceable for use but not service-able for maintenance. And there was the question of open display on the shelves, today's factory-fitted tuner and amplifier cabinettes being quite attractive in themselves. Perhaps a desirably inexpensive solution, but ruled out because the clutter of wires and trailing cord sets might expose the youngsters to danger of shock, not to mention having to push-pull the record player—all of it involving too much direct handling of the components. Evidently, the units had, in turn, to be protected against mishandling by the kids, yet placed for easy servicing and parts replacement, and arranged for easy operation, too. Also, since the shelves provided housing-in-depth for the hi-fi equipment, a front close-off would be adequate. And for the reasons mentioned above, a close-off designed to hold each component securely, at rest and in operation, and give access to the works.

As worked out, the solution took shape as a frame, 60 inches long by 19 inches high, with three doors, modelled in essence after the abovementoned triptych altarpiece. The frame is built with solid walnut top and bottom rails 1¾ inches thick by 2½ inches wide, solid walnut upright inside stiles of the same dimensions; and narrower stiles at each end, 1 inch wide by 1¾ inches thick. The two middle uprights are double-dowelled to the top and bottom crosspieces and cold-glued as shown in *Fig.* 3. The thinner end stiles are mitred and held in place with three screws set flush into reamed-out holes at each end (*Fig.* 4). These are covered with walnut veneer to conceal the screw heads (*Fig.* 5) which also gives a glimpse of the frame-with-door arrangement. Note the mounting of the shelves holding the tuner and the amplifier, their fore-edges cut on a bias along the arc of the radius through which the shelf must travel to swing clear.

The amplifier used in this system is integral with preamp, the chassis therefore being just too deep to clear the door opening, though it too is mounted on a bias-cut shelf. As both doors were designed symmetrically, in proportion to the width of the center door, and all of it kept to an over-all size to fit the bookshelf area, the full swing-out of the amplifier unit was accomplished by mounting its control panel to slide in a slot molding at the top, while slits cut into the shelf accommodate the slender (⅛-inch) round bolts with hex nuts used to secure the chassis to the shelf, with just enough play to allow the amplifier chassis to be slid far enough over by hand (about an inch) to swing clear when it needs to be inspected. In fact it is quite accessible through the opened record player door (*Fig.* 6).

Incidentally, both the tuner and the amplifier control panels are of ¼-inch walnut veneer plywood, cut to fit these components (*Fig.* 7) and mounted with four wood screws to the back of the doors, which makes them easily removable if need be without expensive cutting over of the furniture-finished doors. A

(*Continued on page 59*)

Fig. 10. The summing up: The bookshelf houses the components in depth; the walnut-veneer frame with doors does the load-bearing. Note flush setting of control knobs; also friction drop-lid hinge holding record player firm for loading and starting. Also that amplifier controls at the right are convenient to the player. Framework is secured to bookshelf with screws through the top rail. Material for frame is solid walnut, inside and out; doors, walnut-veneer.

longer cares for her simple portable phonograph, nor her strictly, stridently amplitude-modulation radio, night table size. The origins of this displeasure, and the resulting wish for a hi-fi outfit of her own can be laid to her piano lessons as well as to the floods of disc, tape and FM music pouring out of a three-way speaker system morning, and we guess noon, and certainly night, to which this nine-year old has been exposed. *Drenched* is the word for it, really, in the closeness of a very tight city apartment. So there it was, the beginning, as yet unnoted particularly, of the junior hi-fi powerhouse deal. For the time had come to consider what price hi-fi peace at home, and *very* mind the cost. Like a time for orthodontia, Brownies, booster shots, anti-polio vaccine, and so on—all valiantly faced and put behind (in spirit and *gelt-anschaung*)—so comes a time of pre-adolescent sophistication with which family elders must variously negotiate at the summit to sue for peaceful co-existence. (Thus spake Spock!)

Shopping the Field

The decision to do something about pleasing the young psyche with hi-fi satisfactions though affirmative, was made with the reservation of getting upstairs quality at a downstairs price. So, with the median system behind us, we went back ashore to do some snooping and shopping among the ship-chandlerish delights of the hi-fi agorae. Such profusion! Such variety! Such claims! Such beguilement! Were you to whisper "esoteric" fast, we'd be inclined to say a "yup" right back to you. Insidish, specialish, like ordering your first suit in Savile Row (this, we can only imagine), that's how your hi-fi shopper usually sets the jib of his mood. But hold it, son. That kind of starry-eyedness can but lead to starey-eyed letdown when totting up the final cost. Especially when a *second* hi-fi system is to be shopped. And so we thought to explore first the case-goods or all-in-one cabinet hi-fi offerings, looking for the bargain buy.

In short, here is what we happened to find as we went gaily forth to inspect packaged hi-fi offerings at department store and record shop, chain store and service-installation spots. We sampled table model and semi-portable phonos at just under a hundred dollars, and automatic phono plus AM-FM tuner, amplifier and multiple speakers all in one cabinet, at a tempting less than three hundred dollars or just over that. Neither did we overlook some imposing case-goods items offering AM-FM, short-wave and phono combos plus speakers at around five hundred dollars; one without short-wave at just under three hundred dollars; another, with short-wave only at under three hundred dollars; and a phono (only) console at just under two hundred dollars. Not to mention a console housing an accessory-studded phono only with separate speaker cabinet for close to one thousand dollars. And for the same price, about, another maker's offering of a combination radio-phono with three-way plus cross-over speaker system.

It was not exactly comparison shopping. We didn't mean it to be, but it came to the same thing in the end. There had been the notion that something good and hi-fi could be found in tuner- and record-player equipped consoles at about two hundred or two fifty. Find it we did, as reported just above. But it was our impression, and a difficult one to shake, that the component audio parts of a few of the offerings in the affordable price group were in some way stowed, or stacked or strangulated to fit into rather tight console situations. But it is quite possible that, given the extra floor space, one or another of the console offerings, especially in the around three hundred dollar bracket, could have been made do as a second hi-fi system. (Their components and specifications seemed to be on the excellent side). What with one thing and another, more likely rightly than wrongly, we finally came back full circle to a shopping procedure that, as far as we can tell, has been and continues to be peculiar to the hi-fi industry, wherein the shopper is known to prefer picking the ingredients himself. For his version of a *bouillabaisse* of hi-fi components, he would rather point a finger at the "makings" rich with promise than wrap his fist around an all-in-one deal, good as that may be in its way. He knows that he can weld the individual makings together to suit his plain or fanciest fancy, and within a given framework of cost, naturally.

Shopping the second system thus became a matter of selecting ingredients of good repute available currently, but not without first a quick look at the right hand figures of the menu. Then correlating the cost with the most compatible quality factors, turning up finally with a roster of quite wholesome and we believe as durable components as can be found anywhere in today's catalog of hi-fi merchandise for the devotee of at home with audio, old or young.

Hi-Fi Repertory

In alphabetical order the second hi-fi system installation includes the following seven items of well-known brand

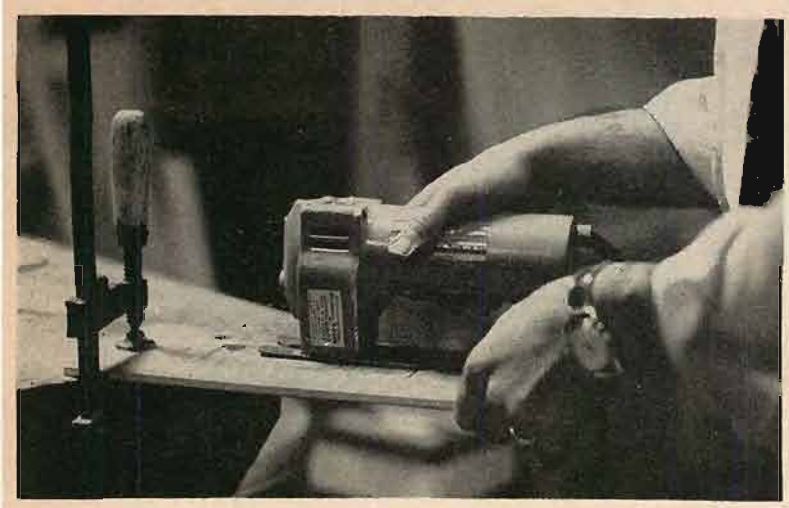


Fig. 7. Power jig-saw is used for precision cut-out on clamped down panel for component controls. For you, a stickleback saw will serve the same purpose. (See page 29, at home with Audio, April 1954, for list of woodworking and other tools).

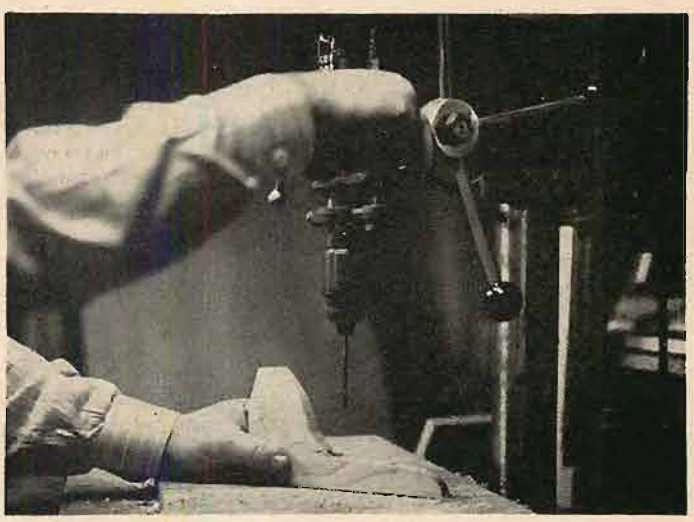
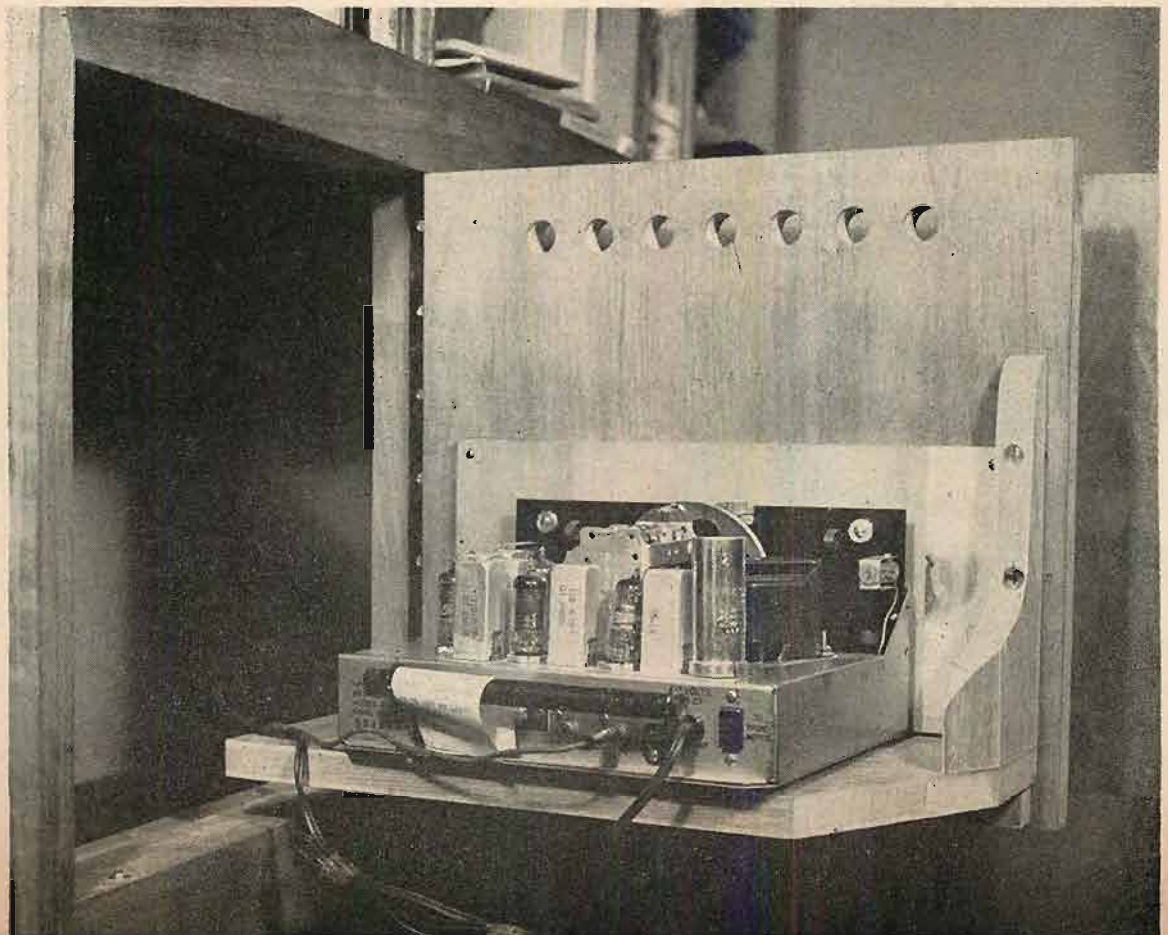


Fig. 9. Precision tools were used for the smallest detail. For you, the hand drill shown in Figure 4 can be used to prepare the brackets (as here) for screwing to the backs of the doors. The holes are pre-drilled and then reamed out so the screw-heads will set flush, and the job a neat one.

and anguished wails over poppa's devoted big-earing of the full-throated big affair in the living room corner, with a corresponding sickness at poppa's otherwise hi-fi proud heart? Precisely because of its excellencies as a purveyor of musical and other sound, does a good hi-fi system, usually a feature exclusively of poppa's living at home—with audio, among other things—bring to the surface in mom and the kids come of the more divergent undergrainings and *la differences* due to their own listening preferences, listening times, listening instrumentation. One can cope with and become almost deaf to howls of turn it down! it's noisy! too loud! turn it off! *must* you, *now?* and so on. Just step on that 100-watt amplifier and blast it, man, blast it! And . . . dare you?

As a matter of fact, most of us hi-fi poppas tend to be placative, if anything, suing for peaceful co-existence on any terms, even at the price of a *second* hi-fi system. The elements of such a situation can be innocent enough. The old man's hi-fi has so charmed a daughter, an impressionable junior below-teen-ager, with its superior sound, that she no

Fig. 8. Door-hidden and door-held and protected, the tuner is secured to a removable thin plywood panel; the chassis is held firmly to the shelf with screws. Shelf, and supporting bracket have been cut on a bias to clear past door frame when opened up for inspection or servicing. Note spring-loaded catch in lower rail, to hold door firmly closed. Functional ventilating holes are arranged in symmetrical, well-balanced pattern. Interior of shelf, back of door opening, is clear of obstructions, for thorough airing of equipment.



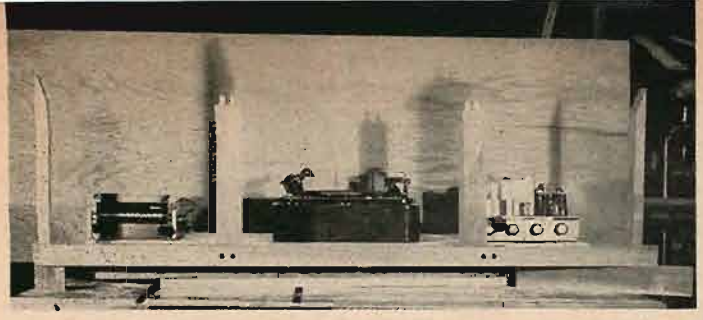


Fig. 3. "Mockup" of framing shows components in their assigned spots; also dowels in center posts, mitre-cut side posts, to assure all-around rigid, twist-free hi-fi load-bearing frame.

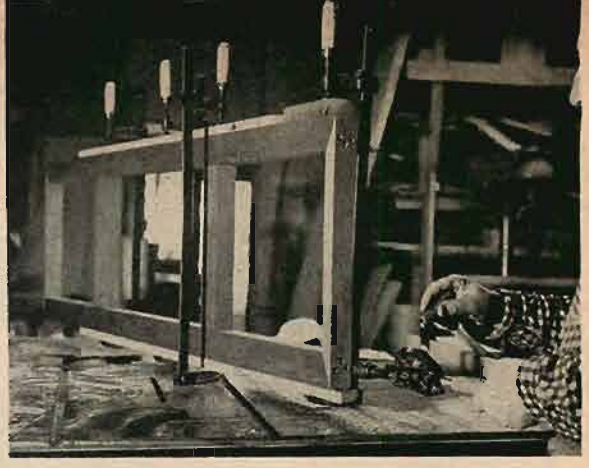


Fig. 4. The frame in process of being c-clamped to set the dowelled and mitred jointings. Note three-screw head pattern at mitred corners, pre-bored and reamed out for flush set-in of brass wood screws.

THE POSSIBILITY has always intrigued us that there may be other cabinetry solutions than adaptations of egg-crate or kitchen stove, steamer trunk or flour-bin, drum-table or ottoman, as feasible manifestations of the will-to-live at home with Audio. Something a little quieter seeming, say, than furniture with doors ajar, drawers agape and cascading, as it were, all over the place. Cabinetry acting by itself as a modest conversation-piece when closed, becomes an eloquent mouthpiece when opened up for business with decibel and watt, cycle and microvolt. Something other, in short, than a pastry-dish array of components more for display (conspicuous consumption idea) than for "feasting."

The subject of this month's essay happens to be the "frame for hi-fi" type cabinetry, suggested particularly where spare floor-space is scarce and where sizable book-shelves are the permanent wallflowers. But perhaps you may not be inspired, as we were, to solve a hi-fi housing problem (a subject contained in the agenda of this department) by going in for building a sort of triptych enclosure for your system. What happened is this: one day our three-year old asked her standing "look-in-the-book" question, "What they doing?" while paging through a book of art reproductions* (it happens). And looking her way we saw a triptych altarpiece painted by Hans Memling (*Fig.* 1). There, quickly, was the framing answer to a question framed in our mind in an effort to solve a family problem with, until that moment, no palatable answer. But here was answer enough, it would seem. For our lengthwise dimensions we followed the proportions of this triptych, applying the narrow end stiles, the heavier top and bottom rails and middle supports of its framework to form our junior-hi-fi powerhouse. A year-end undertaking, reaching well into the Yuletide season, the junior powerhouse and its vari-functioned family of senior hi-fi components (what else?) has been declared for official unveiling come Christmas day.

Having recently sent the median-cost hi-quality hi-fi system down the ways (see AT HOME WITH AUDIO, October 1955), a system, as you may remember, that was housed in a hi-fi "powerhouse" cabinet of our design, it was to be expected that a follow-up discussion of a lower-cost but nonetheless hi-quality system might also report its containment in a powerhouse-junior cabinet, or its equivalent. A junior version, yes, but not necessarily a cut down copy of its median forerunner. In truth and in fact, it was no copy at all, yet functionally deserving of its powerhouse identity, as seen in *Fig.* 2. And we say this in a spirit far and away this side of idolatry. For that matter it is highly probable that there would have been no "junior" sequel at all, with its hunt for wantable and affordable components, presumably pared-down cabinetry, and all. At least not so soon after senior's "birth."

Family Entrance

The blame, or credit, must be laid to family living, with or without hi-fi: striated, laminated, basically a form of existence criss-crossed with innumerable grainages of temperament, mood, and inclination—these, rarely synchronized—like a many-layered plywood, held the more firmly together (oddly enough) by virtue of these contrary grainings. *Vive-la-difference!* of course; what's more fundamental as a cohering force in the long run? And what, on the contrary, so invidious, in any day's run, as the distaff protests

* Art Treasures from Vienna. Copyright 1949, Europa Verlag A. G., Zurich.

Fig. 5. Preview of components placement and checkup of radii cut in equipment shelves and brackets to clear frame when swinging component-bearing doors out for servicing. (Design of Junior Powerhouse Cabinet copyright 1955, Lewis C. Stone.)

Fig. 6. Record player and amplifier-preamp are paired off for conveniently joint operation. With player door opened, amplifier inputs and level controls are easily right-handy. Note accessory 3-way plug attached to inner face of upright, powered from outlet in amplifier, and providing convenient, uncluttered hook-ins for tuner and record player power cords.

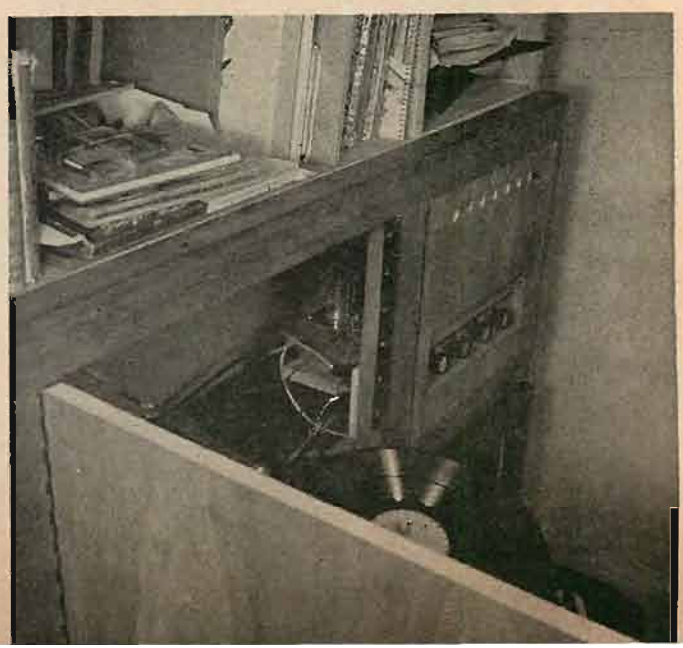


Fig. 1. Triptych altarpiece after Hans Memling. Symbol of the holiday season, it is also the pattern for design and proportioning of junior powerhouse for second hi-fi system.

at home with AUDIO

LEWIS C. STONE

Hi-Fi Give-Away

Stuffer for a child's Christmas stocking is family's second new hi-fidelity system

Fig. 2. Bookshelves, long a wallflower feature of the children's room, are glamorized with three-door panel for new hi-fi system of their own. Tuner mounted in left door; amplifier in right door, to be handy to operate control when middle door bearing record player is opened for use. Speaker cabinet (left) is bass reflex, holding a 12-inch full-range speaker.

ment of the groove (recording level). The wavelength γ traced at any given point of the record is equal to the linear velocity V of the groove at that point, divided by the frequency f of the signal delivered to the recording stylus. Thus *(1)* can be written:

$$r = \frac{V^2}{4\pi^2 F^2 D} \qquad (2)$$

For minimum tracing distortion it is necessary that $r \geq r_{eff}$, where r_{eff} is the effective radius of the reproducing stylus tip and equals tip radius time $\cos^{\alpha}/_{2}$, where α is the total groove angle. For $\alpha = 90°$, $r_{eff} = \frac{tip\ radius}{\sqrt{2}}$. Thus the following relationship exists in place of *(2)*

$$r_{eff} = \frac{V^2}{4\pi^2 F^2 D} \qquad (3)$$

The new seven-inch records are designed for use of a quarter-mil reproducing stylus tip radius. For commercial phonographs with somewhat limited frequency response, a 0.3-mil tip radius is adequate.

The ratio of groove displacement for the conventional LP and the new records (XLP) will be determined by app'ying formula *(3)* to both types of records.

LP $$r_{1eff} = \frac{V_1^2}{4\pi^2 F^2 D_1} \qquad (4)$$

XLP $$r_{2eff} = \frac{V_2^2}{4\pi^2 F^2 D_2} \qquad (5)$$

from *(4)* and *(5)* follows that:

$$\frac{D_2}{D_1} = \left(\frac{V_2}{V_1}\right)^2 \frac{r_{1eff}}{r_{2eff}} \qquad (6)$$

The inside grooves of the new records after forty-five minutes playing time follow a diameter of 3.93 inches and V_2 will be 3.42 ips. For standard LP records 8.75 ips is the value for V_1 corresponding to an inside diameter of 5 ins;
also

$r_{1eff} = .001/\sqrt{2} = .00071"$ and $r_{2eff} = .00025/\sqrt{2} = .000178"$.

Thus

$$D_2/D_1 = 0.61.$$

Therefore, for equal amounts of tracing distortion the maximum groove displacement (recording level) for the new records should not exceed 61 per cent of the standard LP records.

Actually a recording level of approximately 6 db below LP records is employed, corresponding to a 2.5 cm/sec lateral groove standard at 1000 cps. Tests have shown that though the signal output from the new records is roughly one-half that of the LP records, the signal to noise ratio remains substantially the same. This is apparently due to the lower stylus force (2 grams) and the smaller contact area (.25 mil tip radius) as well as to the lower linear speed.

The use of low stylus force also results in reduced stylus wear even though the stylus pressure has theoretically increased. Life tests carried out with sapphire stylii on the new records showed less wear after the same number of hours' playing time than the 1-mil-radius styli with 6–8 grams pressure, playing standard LP records. These paradoxical results could be explained by the "size effect" described in a paper of Prof. F. V. Hunt.[2]

It may be interesting to determine what performance the new records are capable of at the maximum outside diameter of 6.625 ins. in terms of the equivalent diameter of a standard LP: from equation *(6)*,

$$\left(\frac{V_2}{V_1}\right)^2 = 0.61 \frac{r_{2eff}}{r_{1eff}} = 0.152 \qquad (7)$$

Substituting for V_2, $\frac{\pi d_2\ 16,6}{60}$; and for

$$V_1, \frac{\pi d_1\ 33.3}{60}$$

where d_2 is the diameter of the outside groove of the new records and d_1 the diameter of the standard LP groove with the same performance quality in terms of tracing distortion.
Now *(7)* can be expressed as

$$d_1 = 1.28\ d_2 \qquad (8)$$

and for $d_2 = 6.625$ in., d_1 will be 8.5 in.

Thus the tracing distortion in the new seven-inch records during forty-five minutes of continuous playing between the diameters of 6.625 and 3.93 ins. will vary as the tracing distortion on standard LP records between the diameters of 8.5 and 5 ins.

When recording speech, each side of the new records is capable of carrying one full hour. The inside grooves for one hour duration correspond to a diameter of approximately three inches. At that diameter, the linear groove velocity is decreased over the inside groove velocity for music and from *(3)* the frequency for which the minimum radius of curvature equals the effective stylus tip radius can be expressed as follows:

$$F = \frac{V}{2\pi}\sqrt{\frac{1}{D\ r_{eff}}} \qquad (9)$$

Now substituting for the linear velocity $V, \frac{(rpm)\ \pi\ d}{60}$ inches/sec where d is the groove diameter and r.p.m. is 16.66, the resultant frequency will be:

$$F = 0.14\ d\sqrt{\frac{1}{D\ r_{eff}}} \qquad (10)$$

For equal maximum groove deviation D and effective stylus tip radius, the relationship of frequencies for 4- and 3-in. diameters will be

$$F_{(3")} = 0.75\ F_{(4")} \qquad (11)$$

Thus for speech records of one hour duration per side, the recording characteristic should be so modified that the amplitude excursions at frequencies above 2 or 3 kilocycles be limited to ¾ of the values used for music recording at the larger inside groove diameter. In practice it was found that because of the natural lack of high frequencies in speech, the above conditions are fulfilled automatically and thus the standard recording characteristic can be employed.

The new 7-in. extra long playing records designed for automobile use cannot be played on existing home instruments. There are several types of home phonographs on the market which contain the 16-2/3 speed but the relatively heavy pickup arm and the 1-mil stylus radius are not suited for playing the extra fine grooves.

In the car these records meet all the necessary criteria mentioned earlier in this article. During a two-hours program only one interruption is required, namely to flip over the record, and thus there will be no need for a record changer. The required storage space for the maximum playing time is at a very minimum, about 13 per cent that of the 45-rpm system or of a tape system. The manufacturing costs are reduced in about the same proportion. *Figure* 4 shows a commercial pressing of one of the new records, with Tchaikovsky's Sixth Symphony on one side (42 minutes) and a series of Russian Dances on the other.

The Player

Because of the small size of the record, it was feasible to design a compact player which, with the cooperation of the Chrysler Corporation, was fitted into their 1956 series of cars. In its current form the player is mounted on a base which can slide in and out of a metal container mounted underneath the dash, as shown in *Fig.* 1. When opening the door, the player can be pulled out a sufficient amount to drop a record onto the turntable as in *Fig.* 2.

The pickup and arm device represent a radical departure from existing practices. The distance between the stylus and the vertical arm axis is only 3½ ins. Between the vertical axis and the arm bearing there is a fluid of proper viscosity furnishing adequate friction to permit the arm to follow rapid torsional movements of the car, at the same time providing a virtually frictionless bearing for following the extremely fine groove pitch. Also this method helps to damp out area resonance.

Inside the arm is a cartridge assembly which pivots around a horizontal axis and is carefully balanced so that acceleration forces in a vertical plane are neutralized and will not displace the stylus from the groove. A small spring applies approximately 2½ grams force on the cartridge in the direction of the record, thereby assuring adequate track-

(Continued on page 63)

[2] F. V. Hunt "On Stylus Wear and Surface Noise in Phonograph Playback Stylus", *JAES*, Vol. 3, No. 1, Jan. '55

Fig. 3. The Highway Hi-Fi record player removed from its under-dash mounting. Note reversed pickup arm.

tages to consider. For instance, a particular section on a recorded tape would be quite difficult to spot unless some fairly elaborate and costly system were employed. Also the electrical output of the tape is low and requires considerable equalization which would necessitate the use of a preamplifier as part of the tape machine. Last but not least, the public has been accustomed to the use of records to such an extent that, unless some extremely foolproof and simple method were found to play tape, considerable inertia would be encountered from the very outset against its large-scale use.

The next medium which was investigated dealt with phonograph records. The 78-rpm type record is wasteful of speed, space, and time, and so the 45-rpm record was considered next. Its small size (7-in. diameter) and availability at least in the popular music field made it seem attractive at first glance. However, further investigations revealed that from the point of view of the automobile driver the mere fact that this record can be played on his machine (if he has one) at home does not offset some serious disadvantages. The maximum playing time on the current 45-rpm records is 8 minutes on each side (extended play) or 16 minutes per record.

Thus to provide two hours' entertainment, almost eight of these records would be required (7.5 exactly). This then calls for a record changer which has to be loaded with seven or eight records in their proper sequence, and for each hour the listener will get seven or eight interruptions. Clearly this is not desirable in a new system designed for many years to come. The manufacturing costs of putting two hours of program on seven or eight records would be of considerable extra expense to the ultimate customer and the storage of such stacks of records in the car represents a problem in itself. The space occupied by a record changer, even of the 45-rpm type, and its accompanying cost are also undesirable.

The next consideration was given to standard long-playing records which, as is known, turn at 33⅓ r.p.m. The maximum playing time per side of a 12-in. LP record is approximately 30 minutes, and does not fully satisfy the playing time requirements for the automobile. Due to the large diameter of the record, it would be difficult to design a shock-proof player mechanism without undue size and cost and the storage problem also could be a difficult one. It then appeared that the possibilities among the existing systems were exhausted and thus something entirely new and more suitable for the car had to be found. It would seem best to omit the trials and tribulations of the period of research that followed. The final outcome was a new record and record player, mated to each other, and described in the following.

The New Record

The record is seven inches in diameter, as shown in *Fig.* 4, turns at 16-2/3 r.p.m., and can carry up to forty-five minutes of music, or one hour of speech, on each side. The number of grooves per inch is approximately 550 (or twice as many as the conventional LP). The forty-five minutes of playing time per side does not take variable pitch recording into account. Its use would provide further leeway in the recording of long musical works. Economically this new record represents by far the least expensive method of reproducing music. With a maximum of one-and-a-half hours of music, or two hours of speech, this seven-inch record brings the physical manufacturing costs of music or speech reproduction to an absolute minimum. The basic design of the records is such that after complete mastery of the cutting and production techniques, they should give performance substantially equivalent to current LP records. In the following some theoretical considerations will be given which will serve to substantiate this statement.

There are many criteria which will influence the performance of a record, but among the important technical considerations one should consider these three, which determine its basic capabilities:

1. Frequency response
2. Signal to noise ratio
3. Tracing distortion

A close interrelation exists between these three items, and the last one is particularly dependent on the dimension of the reproducing stylus.

Linear groove velocity and groove deviation (recording level) for a given reproducing stylus radius are the chief factors determining record performance.[1] The inside grooves of standard LP records for maximum playing time lie along a diameter of approximately five inches and represent a linear velocity of 8.64 ips. Tracing distortion, one of the determinants of record performance, is primarily a function of the minimum radius of curvature of the traced waves as recorded on the disc, and of the effective reproducing stylus radius. Distortion increases very rapidly when the effective stylus radius exceeds the minimum radius of curvature of the traced wave.

The minimum radius of curvature of the traced wave on the record can be expressed as:

$$r = \frac{\lambda^2}{4\pi^2 D} \qquad (1)$$

where λ is the wavelength of the recorded signal and D the peak-to-peak displace-

[1] The Columbia Long-Playing Microgroove Recording System. P. C. Goldmark, R. Snepvangers, W. S. Bachman, *Proc. I.R.E.*, August 1949, pp. 923–927

Fig. 4. The new 45-minute XLP record requires a minimum of storage space.

Highway Hi-Fi

PETER C. GOLDMARK*

Bringing for the first time the facility of "Music you want when you want it" to the motorist—particularly the one who may want his own preference of music over that of some disc jockey's.

Fig. 2. The simplest of operations is required to change records.

As the automobile became one of the most prized and necessary possessions of almost every American family, the question was frequently asked why, with the amount of time spent driving, recorded music and speech is not available in the car?

The question is quite proper because driving nowadays in modern cars is so effortless that the driver's attention to road hazards is almost the only exertion required. It is a proven fact that listening to the radio while driving does not interfere with one's ability to drive safely—as a matter of fact it contributes towards the driver's alertness by preventing drowsiness. It would thus seem quite natural to provide the driver with a system of recorded sound, giving him a choice of programs most suited to the environment of his interests. Thus the CBS Laboratories and the Chrysler Corporation established a joint program in the area of recorded sound for the automobile with the purpose in mind of introducing this new medium to the motoring public if the result of the studies and subsequent technical development should warrant it.

The successful conclusion of this program has recently been announced to the public by the Chrysler Corporation. Under the name of "Highway Hi-Fi," Chrysler is making available in all their 1956 models (Imperial, Chrysler, De Soto, Dodge, Plymouth) a special automobile phonograph which is mounted under the dash and uses a 7-in. extra-long-playing record. The unit is shown installed in *Figs.* 1 and 2.

Prior to tackling this specific development by the CBS Laboratories, other methods were first examined. Everything else being equal, choosing a system already used in the home was considered to be a desirable goal. First, recorded magnetic tape was investigated since it appeared to be the most logical system for the car. The tape, for instance, could meet such basic requirements as very long play, up to two hours per reel if using double track and a speed of 3.75 ips. Long, uninterrupted play is an important factor in the car because driving offers the opportunity to listen to entire musical works, books, stories for the young and grown ups, travelogues, etc., and even the person who makes relatively short trips to and from his work (or shopping) can listen to recorded books or musicals, stopping the instrument when leaving the car and resuming listening when entering it again.

Another advantage of the tape system is that it can be made without undue complications to resist shocks, jars, and vibrations occurring in the automobile. Unfortunately the tape system has many disadvantages. The cost of the magnetic tape itself, compared with the cost of record material, is higher. The customary method of threading the tape would not be practical in the automobile, and so a self-threading cartridge with automatic take-up mechanism would be required for each individual reel of tape. The cost and the required storage space of these recorded works could then be quite excessive. There are still other disadvan-

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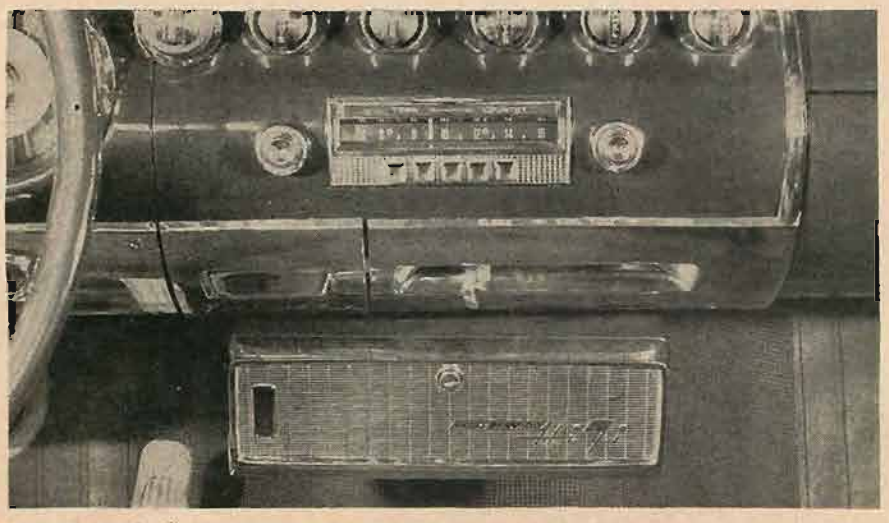

Fig. 1. Resembling a small auxiliary heater in appearance, the new XLP record player installs under the conventional auto radio.

lumped together on one chassis with many interconnections within the group. The Schober approach has been to keep them separate, so that each section is more easily understood (though theoretical understanding is not necessary), easily assembled, and easily serviced. This also makes possible purchase of the components in small "lots" so that little money need be spent at any one time.

2. *Extensive use of etched-circuit panels.* There are actually 130 "printed" circuits in the organ. Wherever used, they keep "wiring" uniform, minimize errors, mount all components in the open easily accessible for service and test, and vastly reduce assembly time.

3. *Detailed and thorough instructions.* The instruction sheets for assembly, adjustment, and service of the various sections are easily among the features of highest importance. With every step detailed in full—even to such points as which way to wind a wire around a particular tube-socket lug—the constructor has a hard time going wrong and is sure to finish with a duplicate of the original design which will work as intended. Instruction sheets—many pages—accompany each section kit and give theoretical explanations as well for those who are interested, together with many illustrations. In conjunction with the physical design, the instructions make it possible for entirely nontechnical people to do a perfectly satisfactory job of building an organ.

In the basic electrical design, there are several choices and the one chosen depends on which is felt to be most suitable both musically and for home construction. The Schober (like the Baldwin) is a "formant" organ which is an electrical analog of both ordinary orchestral instruments and the so-called "straight" pipe organ, the type which is musically the most resourceful. Unlike instruments of the Hammond and Estey type, the player does not have to learn entirely new registration or playing techniques; the stops are controlled by standard tablets, each engraved with the stop name. These, as well as other console features, can be seen in the photo of *Fig.* 1, which shows the completed organ.

The formant principle is based on the functioning of ordinary acoustic instruments. There is first a basic source of tone. In a reed instrument this is the variation in air pressure created by the player's breath and the opening and closing of the reed; in horns it is the "Bronx cheer" the player makes with his lips; in stringed instruments it is the small quick string movements caused by the coarseness of the bow. The frequency of primary tone is controlled partially by the resonance of some parts of the instrument—the horn length and cross-section, the string length and tension, or the air-column length. In all instruments, however, the basic tone is complex—composed of harmonics in addition to fundamental. In horns and reeds, as a matter of fact, the basic waveform is approximately sawtooth because of the nature of the lip or reed movements; in strings the basic waveform is a rather sharp spike because of the small, quick string movements caused by the minute coarsenesses of the moving bow.

It is after generation of the basic waveform that the formant character of each instrument imparts to its sound the quality that makes it recognizable. This formant is in effect a frequency-response curve caused by the fact that the

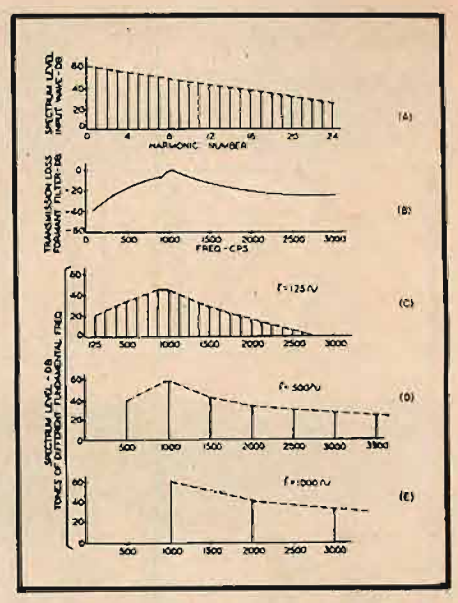

Fig. 2. How the formant affects the spectrum of an instrument.

instrument is actually a mechanical-acoustic filter. For instance, the length and cross-section shape of the horn are such that certain frequency ranges are emphasized and others attenuated, regardless of the frequencies originating at the mouthpiece; the shape and size of the bell further determine these factors. In a violin the nature, shape, size, and finish of the wood body as well as the same characteristics of the string cause certain frequencies to be radiated better than others. For each instrument, we can draw a curve of the audio spectrum, showing relative output amplitude of each frequency for a constant reed, lip, or bow energy input. These curves will differ for each instrument, and they are entirely responsible for the differences in sound among instruments.

Figure 2 shows an example, a curve of the spectrum of a hypothetical instrument. This instrument is so constructed that it tends to emphasize any tones occurring at and around 1,000 cps. Let us put into this instrument at the mouthpiece a sawtooth wave. Such a wave has a large progression of harmonics, each of which is inversely proportional in power content to its ordinal number; that is, the 3rd harmonic has ⅓ the power of the fundamental, the 7th has 1/7 the fundamental power, and so on. The harmonic content of this wave is shown in (A). In (B) you see the curve showing the shape of our instrument's frequency spectrum.

In (C) we have put in a sawtooth at 125 cps. Since the frequency of maximum emphasis in this instrument is 1,000 cps, our tone comes out with a strong eighth harmonic. In (D) we change the input frequency to 500 cps, and the result is a strong second harmonic. And at (E) with an input frequency of 1,000 cps, the most prominent

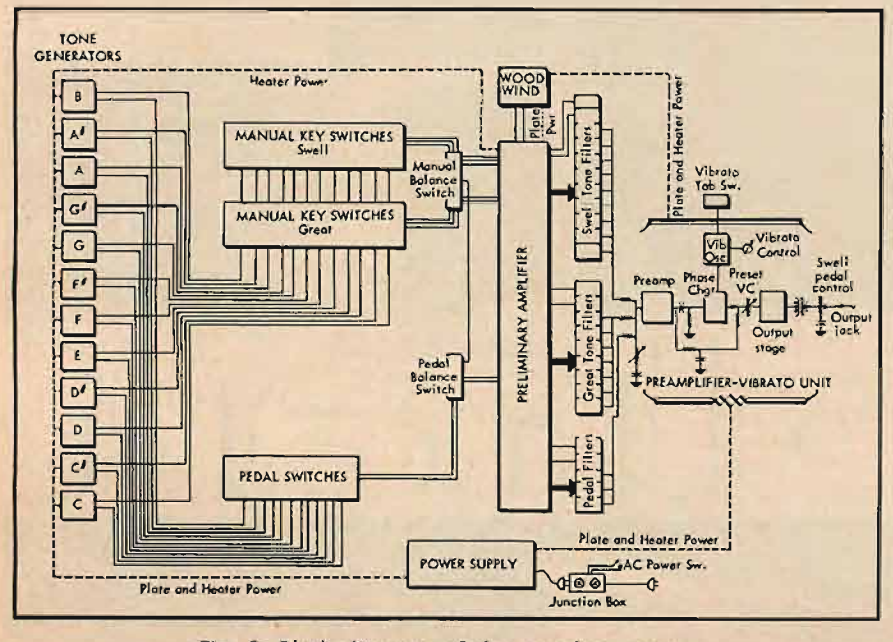

Fig. 3. Block diagram of the complete organ.

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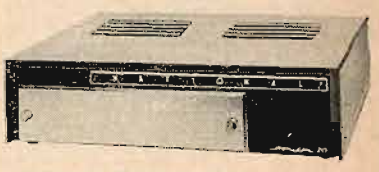
	HORIZON 20	HORIZON 10
Harmonic Distortion	Less than .3% at rated output of 20 watts	Less than .5% at rated output of 10 watts
Intermodulation Distortion	Not more than 1% at 20 watts	Not more than 2% at 10 watts
Frequency Response	20 cps—20 kc ± .1 db; 10 cps—100 kc ± 1 db	20 cps — 20 kc ± 1 db
Power Response	20 cps—20 kc ± .15 db; 10 cps—60 kc ± 1 db at 20 watts	20 cps — 20 kc ± 2 db
Sensitivity	1.6 volts for 20 watts output	.5 volts for 10 watts output

Horizon 10, 10 watt amplifier-preamp



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harmonic is the fundamental itself. In each case, the output tone will have the characteristic sound of that instrument, even though the actual harmonic distribution was different. What remains constant is the *spectrum shape*, which imparts the formants and identifies the instruments.

This system is contrary to the harmonic synthesis system used by Hammond and others, in which every note, regardless of fundamental frequency, has the same harmonic content for a given drawbar setting. The Hammond system does not yield many realistic organ tones, though of course many people like the new tone types which it does produce. The Schober Organ, however, functions solely on the formant system and can imitate to a startling degree almost any type of tone desired.

The way in which this is done electrically is extremely simple—by using an electrical analog or parallel to the acoustic factors in normal instruments. *Figure* 3 is a block diagram of the Schober which indicates how things are done. At the left are shown the 12 Tone Generators. Each of these generates 7 tones separated by octaves, so that one generator furnishes all the C's, another all the D's, and so on, for a total of 84 available tones. The waveshape of every tone is sawtooth.

The generated tones are connected to special switches under the playing keys of both manuals and the pedals. The generators operate constantly, so that when a key is pressed switches close and transfer the corresponding tones through a Manual Balance Switch (of which more later) to a series of Preliminary Amplifiers. The output of each amplifier tube is connected to a relatively simple audio filter composed of R, C, and sometimes L. Each filter is so designed as to produce electrically the same spectrum shape as the acoustic instrument produces mechanically, and there are 19 such filters, each creating the tone color of a particular instrument or group of organ pipes. The filter outputs are passed through a vibrato circuit, preamplifier, and pedal-operated volume control to an output jack from which a cable is connected to whatever power amplifier and speaker is used.

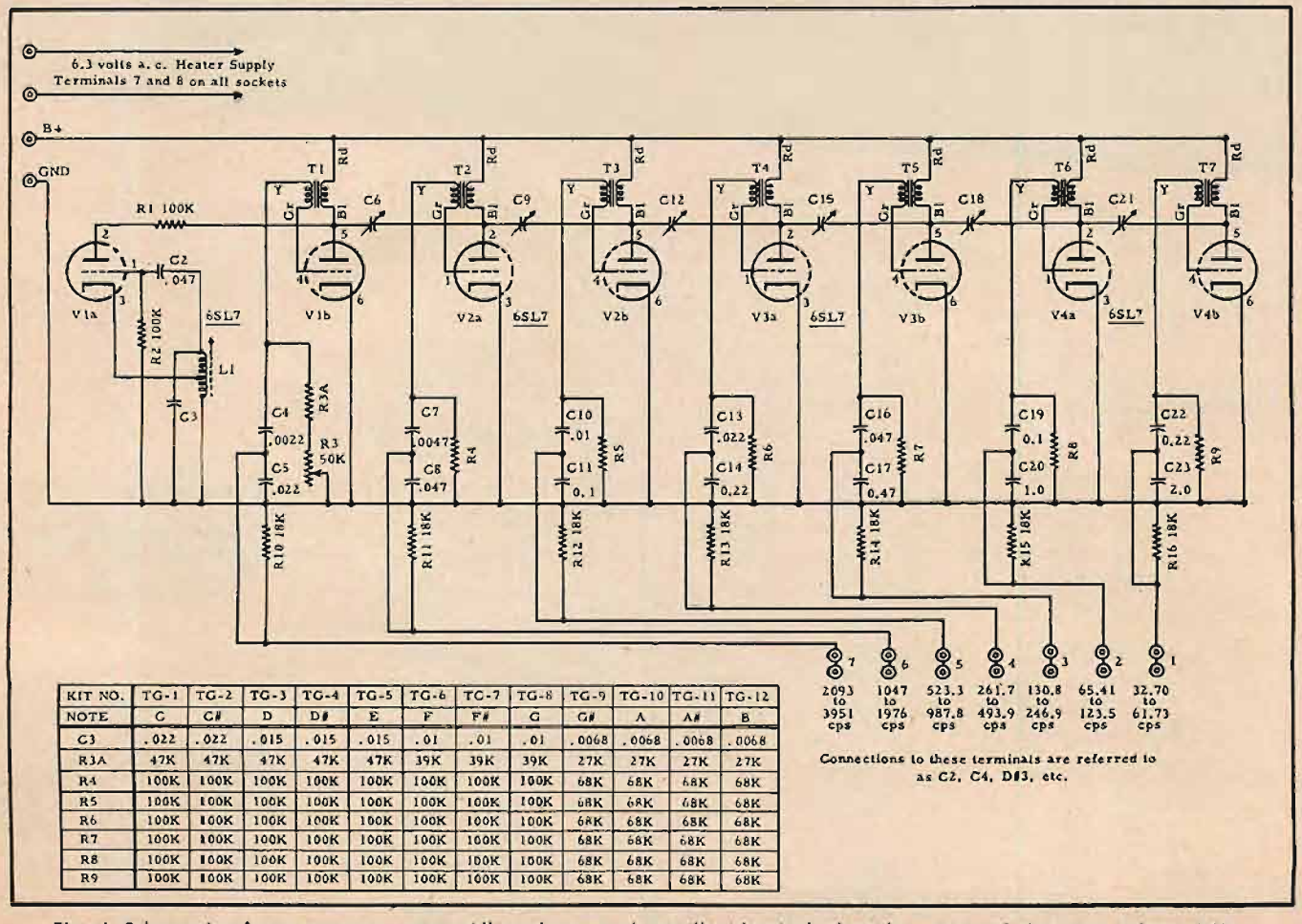
The block diagram cannot, of course, show all the sections adequately. The coupler system is interwoven with the Preliminary Amplifier so that tone can be coupled from one manual to another or to pedals, or octave tone may be had on each manual. The Woodwind Circuit transforms the sawtooth into a symmetrical waveshape to simulate certain instruments whose harmonic content is almost entirely odd. The Manual Balance Switch enables the player to make one manual predominate over another if he wishes regardless of the stops in use; the Pedal Balance Switch adjusts the volume of pedal tones relative to those from the manuals. A preset volume control is provided, so maximum volume can be set at installation time in accord with the amplifier, speaker, and room size. The power supply furnishes all power needed for the console.

Tone Generators

Figure 4 is a complete schematic diagram of one of the twelve Tone Generators, with a table of parts values for all of the twelve. V_{1a} is the master oscillator, a modified grounded-plate Hartley, which operates at the frequency of the hightest note and determines the tuning of all the notes on the chassis. The design is an exceptionally stable one so that once tuned, the organ will stay in tune for long periods.

The top note actually used for output and all the other, lower notes, are generated by locked frequency dividers consisting of the seven remaining triodes. This system is desirable because it means octaves will always remain in tune with each other and tuning the entire organ requires only twelve adjustments. Each of the seven stages is a blocking

(*Continued on page 61*)



KIT NO.	TG-1	TG-2	TG-3	TG-4	TG-5	TG-6	TG-7	TG-8	TG-9	TG-10	TG-11	TG-12
NOTE	C	C#	D	D#	E	F	F#	G	G#	A	A#	B
C3	.022	.022	.015	.015	.015	.01	.01	.01	.0068	.0068	.0068	.0068
R3A	47K	47K	47K	47K	47K	39K	39K	39K	27K	27K	27K	27K
R4	100K	100K	100K	100K	100K	100K	100K	100K	68K	68K	68K	68K
R5	100K	100K	100K	100K	100K	100K	100K	100K	68K	68K	68K	68K
R6	100K	100K	100K	100K	100K	100K	100K	100K	68K	68K	68K	68K
R7	100K	100K	100K	100K	100K	100K	100K	100K	68K	68K	68K	68K
R8	100K	100K	100K	100K	100K	100K	100K	100K	68K	68K	68K	68K
R9	100K	100K	100K	100K	100K	100K	100K	100K	68K	68K	68K	68K

Fig. 4. Schematic of one tone generator. All twelve are physically identical, though certain of the part values differ.

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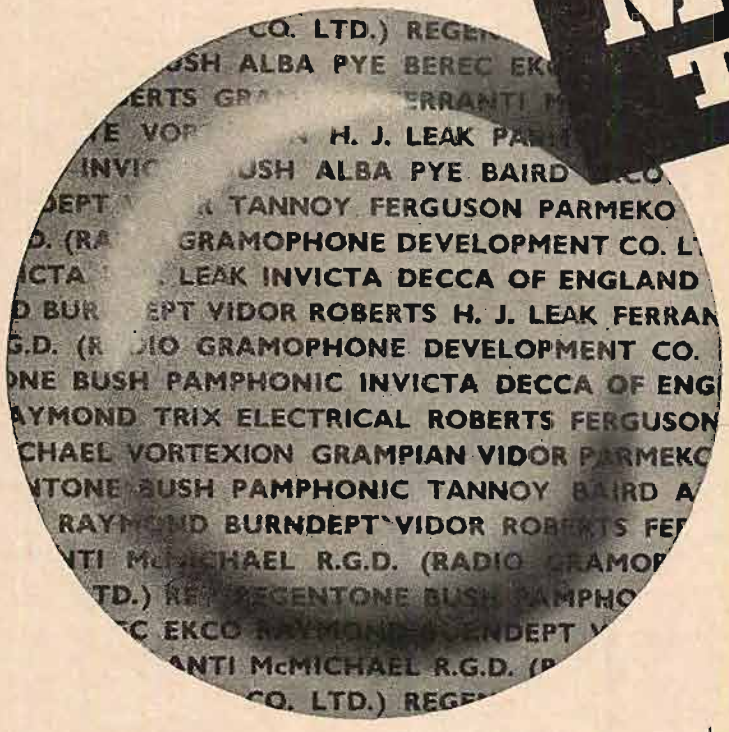

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? ? ? AUDIOCLINIC ? ? ?

JOSEPH GIOVANELLI

Some readers have welcomed this section—others didn't say.

Q. Why are tweeters so often used in high-fidelity speaker systems? Harry Davis, Utica.

A. A tweeter is used to raise the level of the high frequencies to that of the middle and low frequencies. This must be done, as it is extremely difficult for a single speaker to respond equally well to all of the frequencies necessary for good sound reproduction.

Q. What is the difference between AVC and AFC? Bruce Michaels, Chicago, Ill.

A. AVC stands for automatic volume control. The term is a misnomer; it should more properly be called automatic sensitivity control. It acts to reduce the sensitivity of a radio receiver to strong signals, and permits the receiver to operate with full sensitivity, or nearly so, on weak signals. AVC action performs three very useful and important functions:

(1) The reduction of sensitivity when receiving strong signals prevents the set from becoming overloaded, eliminating the distortion of the audio which would otherwise occur.

(2) It acts to hold the level of all signals more or less constant regardless of strength or fade conditions, since AVC action presents an insensitive receiver to strong signals and a more sensitive receiver to weaker ones.

(3) Noise interference with strong signals is reduced because of the receiver's decreased sensitivity under strong signal conditions, preventing the weaker noise bursts from being heard.

AFC stands for automatic frequency control. It makes tuning the receiver easier, for, as a station is tuned in, AFC locks it in place. It also reduces the common problem of drift in FM receivers.

AVC is used almost universally in AM receivers while AFC is gaining wide popularity in the more difficult to tune FM receivers.

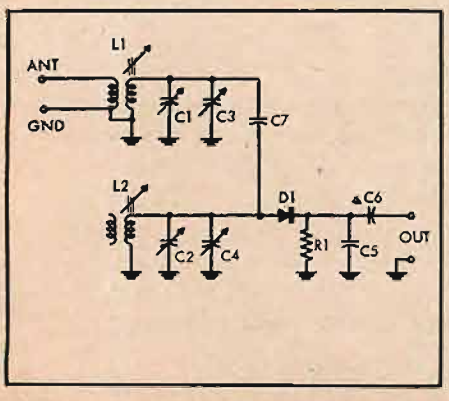

Fig. 1. A simple high fidelity AM tuner.

Q. Would you please print a circuit for a simple, low-cost AM tuner? James Stern, Camden.

A. Here is one designed by the author and used successfully by him for some years. It *is* simple and low-cost but yet possesses excellent fidelity. As can be seen from *Fig.* 1, this is nothing more than the old-fashioned crystal set with an additional tuned circuit to improve its selectivity. The output of the receiver is quite low, so it must be fed into a high-gain microphone input to obtain sufficent listening level.

Construction: The unit may be built into one of the standard aluminum utility boxes, easily obtainable from any radio supply house. Be sure that coils L_1 and L_2 are shielded from each other, so that coupling can exist only via C_7. It would be best to use coils which are already shielded; however, the shield can take the form of a strip of metal placed vertically between the two coils, and grounded to the box. Electrically insulate the variable capacitor, C_1–C_2, from the box. Run a piece of braid or bus wire from each wiper to separate points on the box. Make all ground connections for L_1 to the point where the wiper for C_1 is grounded; make all other ground connections to the point where the wiper for C_2 is grounded. C_3 and C_4 should be mounted directly across C_1 and C_2 if possible. C_7 is a capacitor made by twisting two pieces of insulated wire together. The gauge of the wire and the thickness of the insulation are not critical. One end of the pair is dead-ended, making sure there is no electrical contact between the wires. The other end of the twisted pair is connected as shown in *Fig.* 1. The twisted pair should be 6 to 8 inches long at the beginning of the alignment process.

Alignment: (1) Connect the antenna, ground, and amplifier to their proper terminals. (2) Locate a station at the high end of the band and adjust C_3 and C_4 for maximum output as heard through the loudspeaker. (3) Locate a station at the low end of the band and adjust the slugs of L_1 and L_2 for maximum output. (4) Repeat Step (2).

It may happen that C_7 is too large, which would cause excessively broad tuning and cross-channel interference. Reduce the value a little at a time by decreasing its length slightly with each new capacitance desired. After each adjustment of C_7, repeat Steps (2) and (4). As the coupling is decreased, the tuning sharpens, but the output decreases. A compromise, therefore, must be made between output and selectivity. Limiting the length of the antenna to between 20 and 30 feet also helps to improve the selectivity.

Interference Elimination: Night reception is often impaired by heterodynes from adjacent channels. This can be almost completely eliminated by the use of a suitable low-pass filter. If the amplifier to be used is not already equipped with such a filter, one can easily be installed. The Miller EL-58 Whistle Filter is an example of one that is easy to mount and comes with complete instructions.

Q. What are the principles of operation of a condenser microphone? Helen Bemis, Boston.

A. Such a microphone consists essentially of a condenser with one of its plates rigid and the other, the diaphragm, free to move when sound waves strike it. There are two commonly used methods of translating the movements of such a diaphragm into electrical potential: (1) The microphone is connected across a source of fairly high d.c. potential as shown in *Fig.* 2. The capacitor formed by the plates charges quickly to a maximum value. When a compressional wave strikes the diaphragm, it moves nearer the other plate, with a consequent increase in capacitance which causes the charge on the capacitor to increase, causing a current to flow through R_1, producing a voltage across it. When a rarefaction occurs, the diaphragm moves away from the fixed plate, resulting in a decrease in capacitance. This decrease causes the capacitor to give up a portion of its charge. Current flows through R_1, but, this time in the opposite direction, causing the voltage developed across it to become oppositely polarized. This a.c. voltage developed across R_1 is then passed on to vacuum tube circuits for amplification. (2) The capacitor formed by the diaphragm and the fixed plate is made a part of a tank circuit of an oscillator. Changes in the capacitance resulting from the movements of the diaphragm frequency-modulate the oscillator. Its output is fed directly into a discriminator which converts the frequency changes of the oscillator into a.c. voltages. These are then amplified.

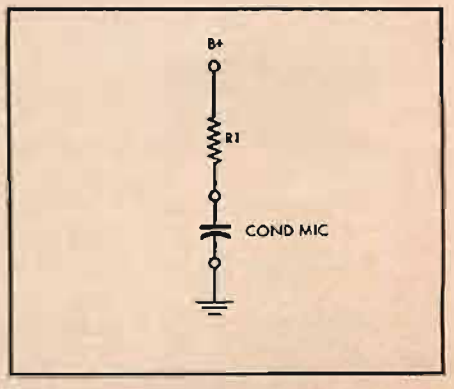

Fig. 2. Method for supplying DC voltage to a condenser microphone.

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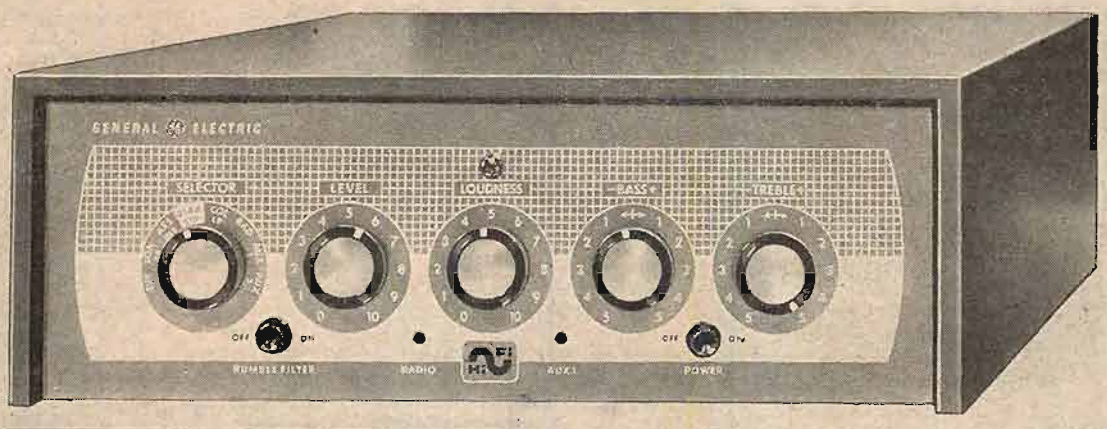

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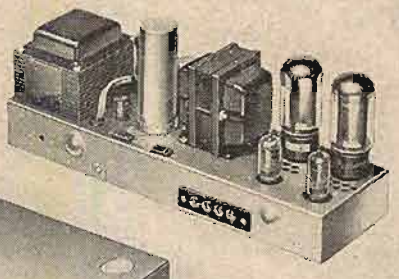

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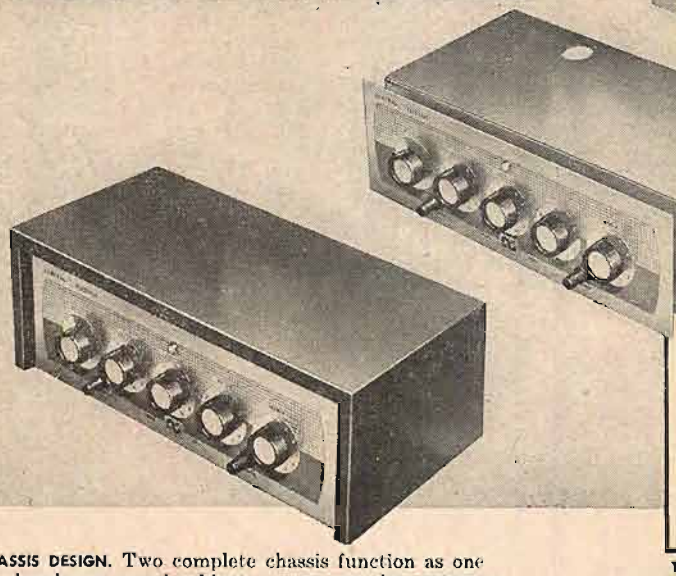
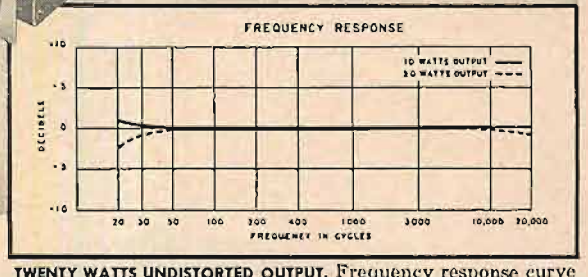


DUAL CHASSIS DESIGN. Two complete chassis function as one unit in a handsome metal cabinet . . . or may be custom-mounted separately. Plus 7 knob studio-type control panel.



TWENTY WATTS UNDISTORTED OUTPUT. Frequency response curve is flat all the way out. ± 1 db 20 cps to 20 KC at 1/10 power, and ± 2 db 30 cps to 15 KC at ½ power.

Exclusive Dual Chassis Design With Pure 20-Watt Output

Everything about this magnificent amplifier—the *Convertible*, is new. Exclusive dual chassis construction is an exciting G-E innovation. The amplifier and power supply chassis cable-connects with the separate pre-amp and control chassis. Both are mounted in a handsome metal cabinet; or, for custom flexibility each chassis may be mounted separately.

Most important, the *Convertible* is as dramatic in performance as it is flexible in design. The thrilling 20-watts of undistorted output is only part of its promise. New quality features include a 7-knob studio-type control panel, built-in rumble filter, 8-position selector/compensator, 5 inputs and 4 outputs for every audio need, and a power-on indicator pilot lamp. The remarkable new *Convertible* was truly designed for the pleasure of the discriminating audio fan.

See, but most important, be sure to *listen* to, the new *Convertible* amplifier by General Electric—at your hi-fi dealers' showroom. Or, write for more information to: General Electric Company, Radio & TV Department, Section R44125, Electronics Park, Syracuse, New York.

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Equipment Report

Presto "Pirouette" turntable—Electro-Sonic Laboratories' moving-coil pickups—PanaSonic speaker—Ortho-Sonic pickup arm.

One of the most difficult units to evaluate is the high-quality phonograph turntable designed for semi-professional applications. In the first place, most of those now on the market are of uniformly high quality, most have rumble almost too low to measure without laboratory equipment, and all are basically free from detectable wow or flutter. In fact, using practically available means, a measurement of rumble is likely to result only in a measurement of the rumble present in the test record used. As the manufacturer of tape machines for instrumentation once told us, it was possible to determine who made the tape used by a study of the flutter pattern caused by the gears used to drive the coating machines. So with the better turntables, it is impossible to make an absolute measurement of rumble of the unit itself without a soundproof room, an absolutely flutterless and rumble-less unmodulated disc, and a calibrated pickup whose response is known down to 2 or 3 cps.

On the other hand, relatively few listeners reproduce records under these conditions—most having to locate a turntable in a room in which the ambient noise level is of the order of 40 db. Furthermore, commercial records are not rumble-free. It is felt that our evaluation is adequate from the practical standpoint, even though it may not duplicate manufacturers' figures for the same equipment. Actually, few phonograph records have a signal-to-noise ratio of as much as 40 db, so any turntable that exceeds this value should be completely adequate.

As stated in earlier reports, Audio believes that the NARTB standard of reference—a stylus velocity of 7 cm/sec—is unrealistic, since by definition signal-to-noise ratio is number of db between the maximum level of the signal and the noise level of the system. The average maximum recorded level on current LP records appears to be in the vicinity of 20 cm/sec, and that is the reference figure used in these reports, a figure approximately 10 db above the NARTB standard.

The Pirouette, *Fig.* 1, is of simple construction, employing a mounting plate which carries the turntable bearing, the rubber mounted motor, and the shift plate. Three identical idler wheels are mounted on the shift plate, which is pivoted on a spring-loaded bearing. The plate has five positions—one for each of the three speeds and two off positions. As the operating knob is moved from an off position to any of the three speeds, the motor is started and the proper idler is engaged between the motor shaft and the inside of the turntable rim. The arrangement of the parts is shown in *Fig.* 2. A pressure adjustment nut, located at the right side of the mounting plate, permits accommodation for wear of the idlers, and since the idlers are all alike they may be interchanged to equalize wear, and a single spare serves as a replacement for all.

The turntable is cast aluminum, and weighs 4¼ lbs. for the 12-inch model, 7 lbs. for the 16-in. model. It is covered with a non-slip cork-neoprene compound which has become nearly standard for all professional models. The unit is mounted in a simple rectangular cutout 6 × 8¼ in. for the 12-in. model, 6½ × 9½ in. for the 16-in. model.

In operation, the Pirouette is easy to handle, quick in starting, and quiet in running. The speed selection knob is directly in front of the turntable, and moves easily into the desired position where it is held by detents. The turntable has a retractable center for 45 rpm records which is actuated by lifting the center pin and turning slightly.

Neither flutter nor wow were detectable on listening tests, and measured rumble level of 48 db below a recording level of 20 cm/sec was observed *under practical conditions*. The slight increase in speed commonly encountered with induction motors as they warm up was also noted, but this is not considered of importance to 99 per cent of users.

Suffice to say that the Pirouette is one of the professional-type turntables that would provide the listener with better-than-average reproduction, adequate stability, and comparative freedom from rumble, wow, and flutter. The advantages of the professional type of turntable are hardly observable unless the amplifier and speaker equipment are above average in performance, for the low rumble frequencies are not reproduced on any but the well baffled speaker that is capable of good reproduction down below 40 cps. One result of the use of a turntable of this type is the almost complete elimination of flutter, which is often noticed on players with a light weight platter which is often not mechanically true. Furthermore, idler bearings on other types of record players are rarely large enough in diameter or long enough to ensure smooth operation. In direct comparison with the average record player, the professional turntable invariably sounds much better.

For radio station use, the Pirouette should serve well because it reaches normal speed very quickly—about one-sixth of a revolution at 33⅓ rpm, and less than half a revolution at 78 rpm. D-16

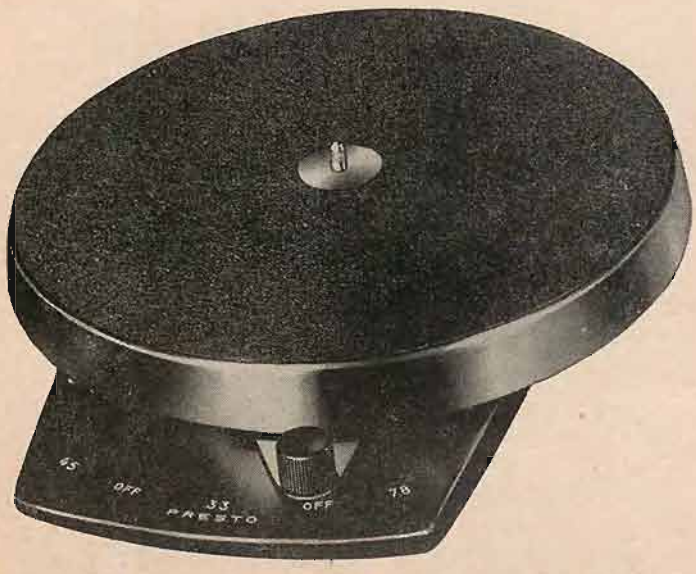

Fig. 1 (left). The Presto "Pirouette" turntable. Fig. 2 (right). The shift plate and idlers of the Pirouette mechanism.

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ELECTRO-SONIC LABORATORIES' MOVING-COIL PICKUPS

The moving-coil principle of pickup design is theoretically linear and free of inherent difficulties which tend to limit the practical performance of the device. All of the three models of the Electro-Sonic pickups employ this principle, which in this application consists of a tiny coil axially mounted in magnetic field and free to rotate back and forth in accordance with the undulations of the record groove, the motion being imparted by the stylus which is mounted on a "shoe" that converts the lateral vibratory motion into rotation of the coil. In effect the entire unit resembles a miniature d'Arsonval meter movement, and the coil moves in a uniform magnetic field at all times. This accounts for the favor in which many moving-coil pickups are held, although it must be admitted that there are many fine cartridges on the market which operate on other principles.

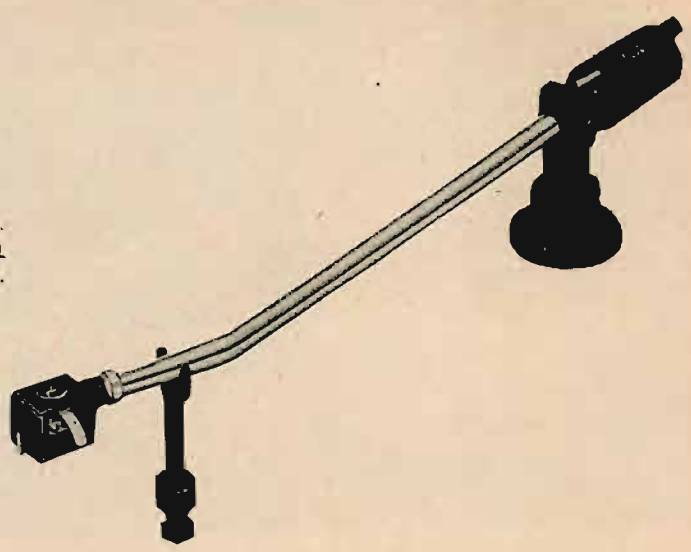


Fig. 3. The Professional Series ESL arm and pickup.

The leader of the ESL line is the Professional Series arm and cartridge—designed for use with high-quality turntables. The pickup works only with the ESL arm, which is 15¾ in. long and mounts approximately 12 in. from the center of the turntable in a 1 in. hole. This model, shown in *Fig.* 3, consists of the head, which plugs into the arm and locks with a threaded ring. The arm has an adjustable counterweight calibrated in grams of stylus force, and the unit tracks with 2 to 7 grams. Frequency response is flat from 16 to over 30,000 cps, and the manufacturer claims a compliance of 6.8×10^{-6} cm/dyne—higher than most cartridges available. The output impedance is 1.5 ohms and the signal output for a 5.5-cm/sec groove is 1 mv from the pickup, 7.5 mv from the secondary of the transformer when strapped for 50 ohms and 15 mv when strapped for 200-ohm output.

The Concert Series, shown in *Fig.* 4, is in cartridge form to work in conventional arms, although its compliance is considered too high for satisfactory operation in a record changer. Compliance, frequency response, and tracking force are the same as for the Professional model, but output is 0.7 mv.

The Standard Series is similar in appearance, but has slightly lower compliance —4.43×10^{-6} cm/dyne—so as to work satisfactorily in record changers. The frequency response is flat from 20 to 20,000 cps, and tracking force ranges from 3 to 10 grams depending upon the player.

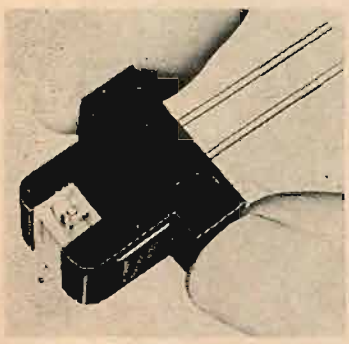
Two types of transformers are available, one with 50 or 200 ohms output impedance and normally used with standard preamps, and one with an output impedance of 90,000 ohms which provides an output of 0.2 volts. The low-impedance transformers are available unmounted, or on a small chassis for instant plug-in connection as shown in *Fig.* 6, and also on a chassis with a supersonic filter and switch.

The over-all appearance of the Concert and Standard models is similar, as shown in *Figs.* 4 and 5. Hum pickup is low, and the quality of reproduction of all models is considered excellent, with only a slight difference in apparent output quality, which is clean and crisp with intermodulation distortion of less than 1 per cent. In a field where excellent reproduction is common, the ESL line stands high in the list. Its high compliance results in a minimum of record wear, and the quality of reproduction leaves little to be desired.

The Professional unit—arm and pickup —was checked for tracking to determine the resonance of the arm. In order to give good tracking throughout the low-frequency ranges of the reproduction, the resonance of arm and pickup should be well below the lowest frequency to be reproduced. This can be checked by playing a sweep-frequency record designed for 78 rpm at the LP speed, thus lowering the bottom frequency to 5/12 of the indicated value. Thus for a record which goes down to 30 cps, the lowest frequency available at the lower speed is 12½ cps. By noting the output from the pickup and preamp, all the while monitoring on a 'scope, it is possible to determine the resonant frequency of the arm, assuming the record to be cut at a constant amplitude. As long as the output remains fairly constant, this is a valid assumption. This test showed no apparent resonance down to the 12½ cps end of the recording, and tracking was adequate at 3 grams, the output being a clean sine wave throughout. A similar test made with an LP test record with a swept frequency and played at a speed of 78 rpm will give a top frequency of 24,000 cps if the highest frequency on the disc is 10,000 cps. A clean sine wave was observed up to 24,000 cps, which seems to indicate that there is no pickup resonance up to that frequency, at any rate.

The compliance of the stylus shoe in the vertical direction is such that there is little chance of damaging the stylus even though the arm may be dropped onto the record, and the pickup is practically insensitive to any vertical motion.

Because of the low impedance of the pickup coil and the relatively high *power* output, these pickups are well suited to work directly into a transistor input stage. The low impedance also results in a minimum of high-frequency loss even though it may be necessary to run the leads for a considerable distance. D-17



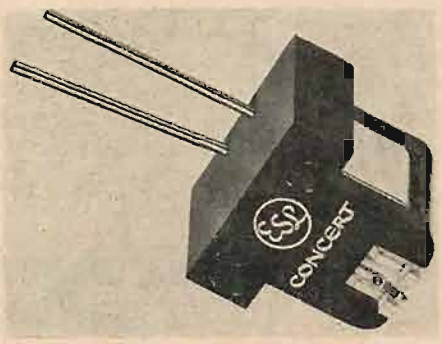


Fig. 4 (left). Top view of ESL Concert Series cartridge. The Standard Series is identical in appearance. Fig. 5 (center). Bottom view of Concert pickup showing stylus assembly. Fig. 6 (right). Transformer used with the ESL pickups mounted on a small chassis for instant plug-in use.

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This model represents the least expensive route to high fidelity performance. Frequency response is ±1 db from 20-20,000 cps. Features full 20 watt output using push-pull 6L6's and has separate bass and treble tone controls. Preamplifier and main amplifier on same chassis. Four switch-selected inputs, and separate bass and treble tone controls provided. Employs miniature tube types for low hum and noise. Excellent for home or PA applications. Shpg. Wt. 23 Lbs.

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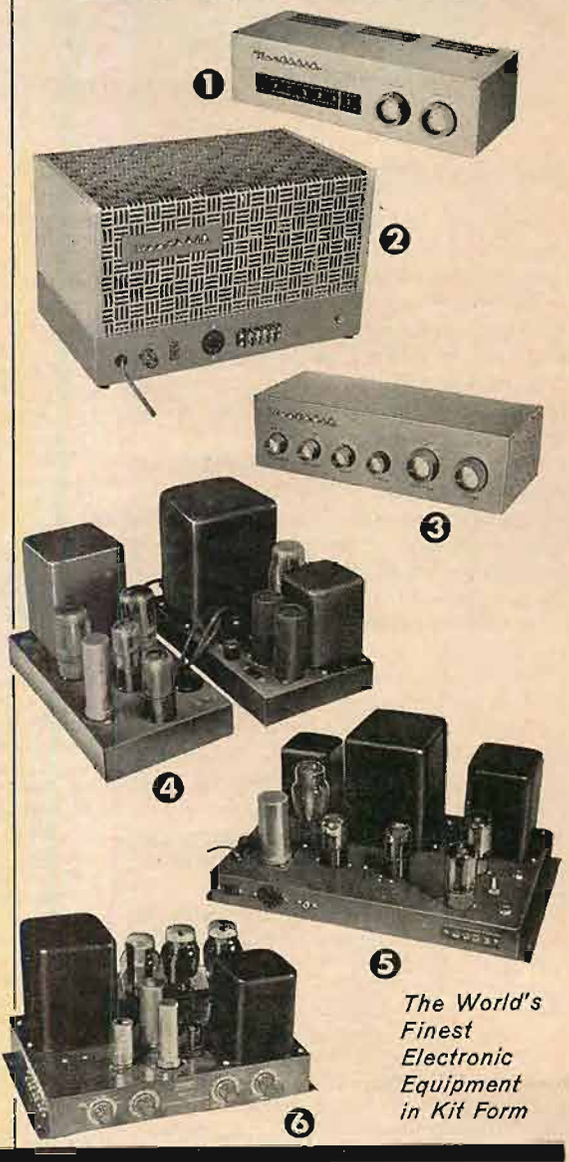

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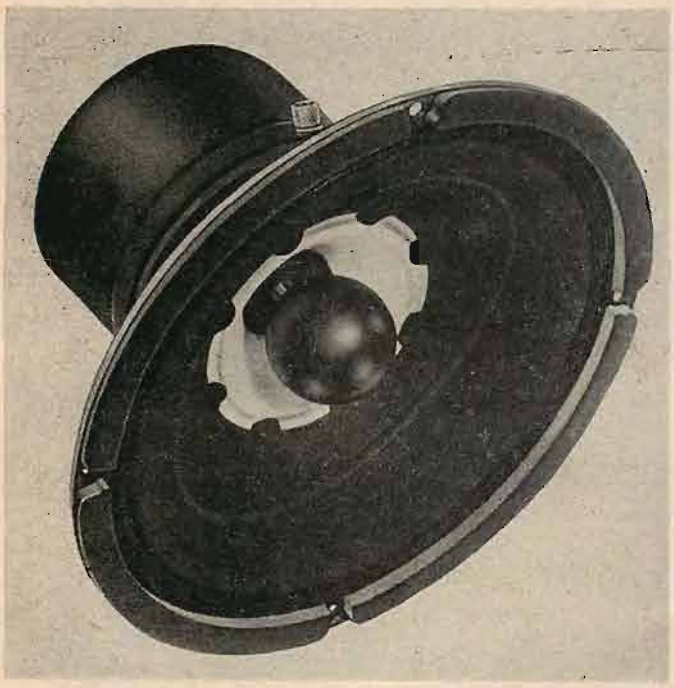

Fig. 7. The 8-in. PanaSonic loudspeaker, which offers some unusual features.

THE PANASONIC LOUDSPEAKER

Long noted for its excellence in optical products, Japan now sends us a loudspeaker which offers some unusual features —first among them being an extremely low resonant frequency. The two units tested measured 46 and 49 cps respectively in free air, which indicates that when placed in suitable enclosures they would be capable of response down to at least 35 cps. The cones are made with a tapered thickness ranging from a thick paper at the center to a much thinner rim, resulting in high compliance at the rim. Stiffening is provided by an elliptical ridge formed in the cone, the shape reducing the tendency to introduce a resonance of the cone structure.

For the high end, a small "piggy-back" cone of lighter paper is actuated directly by the voice coil, with suitable compliance being introduced between the main cone and the voice-coil former. Thus the high frequencies are reproduced mainly by the small cone. A spherical diffuser mounted in the center of the unit provides uniform distribution of high frequencies.

These units were tested in two types of enclosures—one a simple rectangular cabinet with distributed port openings (a standard General Electric cabinet for 8-in. loudspeakers) and the other a Cabinart Rebel V. Clean response was observed down to 40 cps, as indicated by the signal picked up by a Shure 300 microphone and reproduced on a 'scope. Some doubling began to be present below 35 cps, and the output fell off noticeably in the reflex cabinet. With the Rebel V, response held up well to 35 cps, being down only 6 db at that point.

At the high end, the response was relatively smooth up to 8000 cps, with a gradual falling off to a point 6 db down at 10,500 cps and 12 db down at 14,000 cps, which is considered fairly good in comparison with many 8-in. speakers. While the PanaSonic is not capable of handling the maximum output of a large amplifier, its output is completely adequate for the average living room when fed from a 10-watt amplifier.

When the PanaSonic speaker is fed from a clean source and is housed in a suitable cabinet, its performance is equivalent to many larger and more costly speakers. It is not to be compared to a coaxial or two-way system, but when the desire is for quality at a low cost, the PanaSonic should certainly be considered and its performance compared with other types before making a decision as to the choice of a speaker. D-18

BARD ORTHO-SONIC PICKUP ARM

While this unit is completely correct in theory, it is likely to raise some doubts as to the possibility of making such a device work satisfactorily. But a short trial with it will indicate that the Ortho-Sonic arm, *Fig.* 8, fulfills in practice what is claimed for it by the manufacturer. Since all records cut commercially are made with the recording head traveling on a radius, it naturally follows that the ideal way of reproducing the disc would be to have the pickup also traveling on the radius. The realization of such a requirement seems somewhat difficult, and it must be admitted that it does present some problems. However, all the tests to which this unit have been put show that it works, and extremely well.

The arm consists of a housing which carries a stainless steel rod in a line parallel to a radius of the record. The carriage rides on four ball bearings which roll along this rod, the carriage being counterbalanced to the required stylus force for any desired pickup. The entire arm rotates from its operating position so as to clear the turntable to permit changing records. Once a record is placed on the turntable, the arm is returned to its operating position, and the housing is tilted forward, lowering the stylus to the record. A rubber grommet on the steel rod may be moved so as to position the stylus over the lead-in groove of a 12-in. record, thus accurately locating the carriage every time. As the housing is tilted backward after playing the record, the stylus is *lifted* from the record without any possibility of scratching the surface through inadvertent shakiness of the hand. A scale on the housing is viewed through a magnifier, and serves as a guide to cue records to any desired point. The entire housing may be adjusted as to height to accommodate any type of pickup, and the carriage is equipped with a thumb screw and spring-loaded contacts so that most standard types of pickups are simply pushed into place and held by tightening the thumbscrew. A simple means for leveling the rod is also provided.

The most critical check of tracking seemed to be that known as the McProud test (see Letters, AUDIO ENGINEERING, August, 1951) which involves the use of a 45-rpm record placed on the turntable so that the edge of its center hole is against the pin. This gives an eccentricity of 1¼ in. Using a Pickering 260DD pickup with stylus force adjusted to 6 grams, tracking was continuous at 33⅓ rpm; for 45-rpm tracking, the stylus force had to be increased to 12 grams. This is a very severe test, and can not be met (at 45 rpm) by many standard pickup arms. The side thrust required to move the carriage is less than one-half gram, which is of the order of magnitude required to move a conventional arm. Tests with a 78-rpm sweep-frequency record running at 33⅓ rpm failed to show any resonance down to 12½ cps, and the inertia of pickup and carriage is great enough to permit perfect tracking down to that frequency.

Obviously, with the pickup moving along a radius, there can be no tracking error at all, thus eliminating any distortion from this source. With all of its features, the Ortho-Sonic arm seems to provide a satisfactory answer to several of the problems of satisfactory disc reproduction. D-19

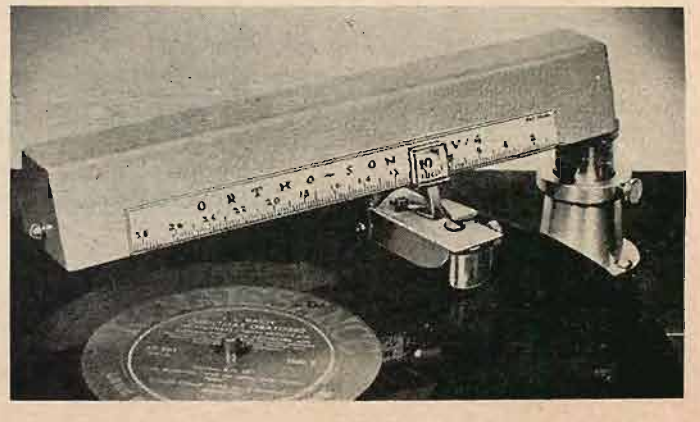

Fig. 8. The Bard Ortho-Sonic V/4 Pickup Arm.

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EDWARD TATNALL CANBY*

1. MOZART'S 200TH.

THE MOZART BICENTENNIAL (his 200th birthday) gets nearer and nearer, as 1956 approaches, and the record companies are out to do him honor to their utmost in accordance with our honorable preoccupation with the mystery of round numbers. 200! It's incredible that this little man whose personality is so astonishingly familiar to so many of us should be beginning his third century, dead or alive, as an Important Human Being.

And the strangest part of it is that Mozart, the person is enormously better known and appreciated and understood today than, say, a paltry 50 years ago, a few moments in his long "life." Back at his 150th, he was no more than a pretty, bewigged antique who had written pleasing, perfumed little pieces that only a few odd souls ever professed to admire for anything more than their decorative value. After all, didn't the great Beethoven "free" music from the bounds of Mozart's time?

Today little Mozart, he of the big nose, the receding chin and the startled popeyes (thyroid, no doubt) is widely taken as both a supremely serious and a profound composer, a man with fantastic reserves of musical hitting power behind what once was felt to be his glittering facade.

It glitters still, that facade; but we see through it today with the greatest of ease, straight into the depths beyond.

Mozart: Violin Concerti #2, #5 ("Turkish"). Arthur Grumiaux; Vienna Symphony, Paumgartner.

Epic LC 3157

Epic is running in the Mozart vanguard with its ambitious and thorough Mozart Jubilee, managed in Europe (via the parent Phillips Co.) by Herr Paumgartner of Austria. As this series progresses it is becoming evident that Paumgartner is a first rate man. His *conducting of* Mozart orchestral music and orchestral accompaniments in particular is for my taste just about ideal. There's nothing heady or showy about it, no virtuoso stuff, no arbitrary stylization but, on the other hand, neither is his work dull nor "musicological".

Above all he conveys an easy sense of naturalness, a complete freedom from the "pretty-pretty" attitude towards Mozart of too many conductors, plus a wonderful feel for good phrasing and unobtrusively careful detail work. Maybe the big-name conductors' work is more ear-catching; I'm pretty sure that this sort of man will bring you Mozart himself with the greater satisfaction in the long run.

These two concerti (and see two more on Epic LC 3060) are cases in point. All five violin concerti are earlyish Mozart and relatively light in weight, especially as related to the flamboyant concerti of a later age. But, as Paumgartner knows, these actually were pioneer efforts, big in their day, significant in a field then undeveloped; he plays them without the painful cuteness so often displayed in big-name playings of the same, with a sense of their bigness; even the acoustics themselves are geared to a bigger sound, though it is by no means heavy. Heifetz, Kreisler, *et al.* notwithstanding, this is the way they should be, I say.

A relatively simple violin technique and an unpretentious approach on Grumiaux' part too may at first seem to lack the required zip. Not true. His is merely a restoration of a kind of dignity and sanity to works that too long have been overplayed, over-cleverly, by fiddlers used to Tchaikowsky and Brahms. I like it.

Please (for reasons of space) apply all this to other Epic releases in the same series, as follows.

Mozart: Violin Concerti #3, K.216, #7, K.268. Christian Ferras; Stuttgart Chamber Orch., Munchinger.

London LL 1172

Two more concerti, from a different source. This is a serious kind of playing, very musical, that however seems to me to miss the point in the opposite of the usual manner—it isn't flippant enough! Searching for words of description, I said to myself—devotional, dedicated. That's how it sounds. The brilliant *tutti* passages are played down, there is little gaiety and fun.

Now if we have learned anything about Mozart, it is that he saw no contradiction between outward gaiety and inward profundity. Good Mozart playing recognizes both facets equally, adding strength through brilliance; better serious, respectful playing like this than the aforementioned "cute," patronizing approach of some virtuosi—but it still isn't right.

Incidentally, the concerto in E flat, K. 268, here labelled #7, formerly #6, is problematical. Seems that if Mozart wrote any of it, he merely sketched out parts of the first and last movement, then dropped the project out of sheer ennui (something else got his interest); whereupon, maybe, an enterprising lesser light, name of Eck, generously took the thing over and wrote a second movement all by himself. Oddly enough, the concerto was later sold off as *echt*-Mozart (that's a Canby pun, *echt* meaning genuine), to somebody's pecuniary profit. Wonder who. An interesting job and I leave it to you to savor the pleasure of guessing which parts are *echt* Mozart and which *echt*-Eck.

Mozart: Famous Concert Arias (tenor). Waldemar Kmentt; Vienna Symphony, Paumgartner.

Epic LC 3076

Mozart: Famous Soprano Arias. Hilde Zadek; Vienna Symphony, Paumgartner.

Epic LC 3135

Here are a pair, both containing unusual and top-ranking music of sorts generally not widely heard—in spite of the word "famous." The tenor disc is one of the most valuable Mozart records to come out in years, containing music of absolutely extraordinary Mozartian interest. The soprano disc is only slightly less interesting, with a few standard-item fillers on it, rounding out extensive selections from Mozart's seldom-heard "Titus" (Clemenza di Tito) and three of the concert arias, unattached, which make up the entire offering of the tenor disc. A good, but slightly wobbly and unathletic soprano, a good if not great tenor, both singing under impeccable stylistic direction, an absolutely superb orchestral accompaniment under Paumgartner (see above), plus excellent recording, are the physical qualities of these two records that bring the music through so effectively.

The so-called concert aria was a remarkable institution. In Mozart's day all opera was "modern," contemporary; new operas appeared every day, in Italian as a matter of course, wherever they were composed. Opera was so popular that the opera stage wasn't enough; separate arias, on typical bits of operatic Italian text, were widely composed simply as concert pieces, for singing. Mozart was always obliging with one or another of these arias composed for his singing friends, who valued them immensely. All operatic writing then, of course, was for specific singing voices, the music tailored expressly for the person intended to sing it. Nobody wrote arias just for soprano—any old soprano.

Moreover, the celebrated singers regularly went about wangling "private" arias from this and that composer for insertion in the middle of somebody else's opera, ad lib! This didn't seem to bother anybody and a number of Mozart's arias here are of that sort, for insertion into various non-Mozart operas. Good, healthy competition.

Mozart: Sonatas K. 306, K. 481, K. 11; Variations "Hélas, J'ai Perdu" K. 360. (violin and Mozart-period piano). The Amsterdam Duo.

Epic LC 3131

Mozart: Sonatas K. 301, K. 304, K. 378, K. 379. (violin and Mozart-period piano). The Amsterdam Duo. **Epic LC 3034**

This is a fascinating pair of discfuls of first rate Mozart. The Mozart piano, a new one, is here perhaps more "authentic" in sound than an actual piano of the time, restored. A restored instrument is bound to sound a bit ancient at 200-odd years even with the best of rebuilding, whereas a copy of Mozart's own favorite piano such as this (based on a Stein piano made in 1777, now in Salzburg) combines the sound of the old with the authenticity of a newly built instrument. After all, Mozart didn't use antiques; why should we?

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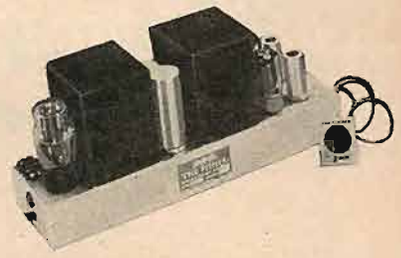

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The music is a revelation as played here. The old-type piano is brighter, tinnier, more highly colored than our much larger modern instrument; its tone blends to perfection with the violin, as ours decidedly does not in Mozart's piano writing; the piano parts sound full and well colored where on the modern grand they sound falsely thin and delicate.

Result: Even for the wholly untrained amateur ear, the Mozart sonatas are here very natural, much simpler to understand and enjoy, once the initial surprise at the hard, tinny sound of the Mozart piano wears off. I don't know when I've enjoyed two records more.

The Amsterdam Duo, husband-wife team, Nap de Klijn, violin, and Alice Heksch, Mozart piano, are excellent Mozart players, who perform very much in the easy, unaffected but warm manner of the director of this series, Bernhard Paumgartner, as mentioned above.

Mozart: Sonatas K. 454, K. 481. Szigeti, violin, Szell, piano.

Columbia ML 5005

Here we have big names, and good ones too, but even so I find this collaboration not nearly as rewarding as the Epic one preceding. (One of the sonatas appears in both recordings, K. 481.)

A bad tonal mixture, first. Szigeti's evidently failing physical powers allow him to play only with a sort of rubbery tone and a very noticeable slow vibrato, though his musicianship is as keen as ever. Against this almost pathetically softened delineation, Szell's somewhat hard and snappy Mozart brilliance is much out of place; a more lyric pianist (and a softer-toned piano recording) would have helped minimize the physical troubles of Szigeti's playing, as they should be minimized.

Both men are big musicians as well as big names. But in this special situation I am sure that you will find the much less celebrated Amsterdam Duo a more satisfactory Mozart medium, for home listening.

Mozart: Symphony #25 in G; Symphony #28 in C. Columbia Symphony, Bruno Walter.

Columbia ML 5002

If you want your Mozart in the symphony concert tradition, as played by one of the big conductors, you'll find Bruno Walter at the top, as he is when conducting in numerous of the world's concert halls.

The trouble is, for me at least, that I'm not at all sure that's what I want. Bruno Walter, for all his undoubted eminence as a sensitive conductor, his warm, modest personality, his eschewing of personal virtuososhiip, is of the older generation and reflects faithfully a way of playing that is faithfully bolstered by Columbia's big-auditorium sound. This, mind you, is no criticism! It is, rather, simply to say that the musical scene is changing fast and Mozart is very much in on that change; the big concert hall sound is, for much music including Mozart's, beginning to become an anachronism, unfamiliar to many listeners.

Rightly so. This sort of Mozart and, indeed, most Mozart, was not heard in the vast, formal spaces of our present and past concert tradition. Most Mozart was played closer-to, on a more intimate scale, with, I suspect, a more personal warmth. It's very hard to put a finger on the difference between these concert-style recordings and the type which is now replacing them, but I would be dishonest if I did not point out the change, now in process of happening.

Mozart's two early symphonies here, then, are beautifully tailored and played with utmost dedication. But the sound seems to my ears too distant, too big, too formal, the playing itself somehow of that Sunday-afternoon-symphony persuasion, just a bit (here and there) on the overly grim side. Horrors! Bruno Walter? Well, some of it may be no more than the distant-style Columbia recording. But not all. This is big-symphony playing, not small-symphony.

In the Gardens of Mirabell. (Music by Mozart) Columbia Symphony, Bruno Walter.

Columbia ML 5004

The intriguing title simply covers a group of assorted shorter items from the same series of recording sessions as the preceding symphonies. It neatly points out, I feel, the very inconsistencies mentioned above—for the Mirabell Gardens, near Salzburg, are a typically 18th century pleasure spot, indoors and out, full of drolleries and fantastic humor, formally laid out but with the utmost warmth; in these gardens there was undoubtedly much music-making (though no symphony concerts of our sort) and in them Mozart walked and dallied and perhaps played music too.

But what have we? First, "Eine Kleine Nachtmusik," ultra-familiar, played here as though it were a huge symphonic work, the vast sound reverberating at a distance, the strings seemingly of full orchestral massiveness. Three informal little minuets are given the same big-sound treatment, like pieces of symphony, along with a brace of the little German dances more at home in a beer parlor (and the Mirabell Gardens, too) than in any concert hall, recorded or otherwise. This is just plain not the "Mirabell" atmosphere that is claimed by the title!

Four Mozart opera overtures, played beautifully in concert hall style (but unlikely as garden pieces) and the superb "Maurerische Trauermusik," a funeral piece for a Mason (equally unlikely in anybody's garden) round the program out.

It's a nice program, all of it fine music, all well played. But it just doesn't sound like garden music.

Mozart: Thamos, King of Egypt, K. 345 (Incidental Music). Ilse Hollweg, M. Nussbaumer-Kniflach, W. Kmentt, Walter Berry; Vienna Chamber Choir, Vienna Symphony, Paumgartner; R. Boesch, narr.

Epic LC 3158

This imposing mass of incidental music to a play will remind you that plays were *really* done up with music in those days—witness Beethoven ("Egmont"), Schubert ("Rosamunde"), Mendelssohn ("Midsummer Night's Dream"), Schumann ("Manfred"), etcetc—all big collections of orchestral, solo and chorus music usually with some narration-to-music, as here.

The story is Aida-like, with massive temples-of-the-Sun, choruses of priests, maidens; obviously it was a Cecil B. DeMille spectacular of its day, an immense stage presentation, and Mozart's music is big and in his most impressive manner.

Mozart lovers will find, to their pleasure, that there is much of his Masonic style here, as of the more serious parts of that magic opera "The Magic Flute," itself full of temples and priests and sacred rites. (See also the poignant "Maurerische Trauermusik" in the "Mirabell Garden" recording preceding.) The choral writing is, similarly, like that of Mozart's more impressive sacred works rather than like any Mozart opera, "Magic Flute" excepted. Without any doubt (the music tells us) Mozart felt important symbolic meanings of a Masonic sort in this elaborate story and he composed accordingly. There are massive, wonderfully tuneful choruses, hymn-like against energetic, fast-paced string accompaniments, set into large and involved sequential structures one chorus running on into another, intermixed with solo passages, like the finales of Mozart operas (but they are generally all-solo); in between come important instrumental movements on a symphonic scale, as in Beethoven and Schubert. There is much of romantic drama here—in fact this is to all intents and purposes a work of the early 19th century, well ahead of its time in the mid 1770's when Mozart wrote it.

A fine collection of varied numbers and it will grow on you mightily as you get to know its many facets. The performance, Paumgartner again, is excellent and very much in the spirit of the work.

Mozart: Flute Concerto #2, K. 314; Horn Concerto #4, K. 495. Aurele Nicolet, fl., Winterthur Symph., Swoboda. Jan Zwagerman, horn, Netherlands Philh., Ackerman.

Musical Masterpiece MMS 87 (10")

A mail order contribution, budget-priced, to the Mozart 200th. Neither one has up-to-date recorded quality though both are easily listenable. The flute is good, the Swiss orchestra with it a bit on the logey side. The horn is as good as any horn can be in the somewhat preposterous role (as Mozart knew perfectly well) of concerto soloist; but his cadenza here is out of all proportion and should have been gently axed, via the tape editing block! Who wants to pay money for even a low-priced horn cadenza. The horn's orchestra (Netherlands) is livelier than the Swiss one.

2. MODERNS FOR AN ENTERPRISING XMAS

Schoenberg: Pierrot Lunaire (1912). Alice Howland, narrator; instr. ensemble, Winograd.

M-G-M E3202

This seems oddly to be the most enduring in the large public mind of all Schoenberg's mature works ("Transfigured Night" excepted) though it was radical enough in its day. As of now, more than 40 years later, it is one of the few Schoenberg works that seems to be emotionally understandable to an averagely curious musical ear—and this in spite of a wholly atonal idiom and the strange *sprechsstimme*, a voice that recites, half singing (according to a species of musical score) yet not on any exact pitch. There is an air of rightness and sense about this piece that—perhaps—presages the feeling we all may have in another quarter-century for Schoenberg's later 12-tone works.

This is an excellent presentation. Alice Howland "sings-speaks" the exciting narration in a wonderfully convincing and natural way; it seems no experiment at all as she does it.

The instrumentalists are distinguished, headed by that veteran of contemporary pianism, Edward Steuermann.

The story-line? Aha! That's the big feature. The poems—originally in French, I gather—are straight out of the now-familiar fantastic period of extreme French modernism that hit most of the Western world just before the First War. This is but another, more Daliesque version of "Petrouchka," the puppet; this is Surrealism in its most flamboyant early manifestation, full of nightmare symbolism! No wonder it goes down easily for us today. There are even—if you listen with it in mind—numerous musical bits that are not too far removed from "Petrouchka" in its more violent moments.

A further interesting comparison is with William Walton's early "Facade," which now can be seen as perhaps deriving from the earlier work of such as Schoenberg. "Facade" is wholly British and at first utterly unlike the present work—but listen again; there, too, is a form of *sprechsstimme*, expertly practiced by the authoress of the words, Edith Sitwell and (in the most recent version) Peter Pears, both of whom recite the poetry as fast as they can *against* the music. There, too, is the modern kind of symbolic, non-realist poetry, full of words and meanings that are so much nonsense to the immediate ear. (I never did figure out what Sitwell was talking about but I love the stuff.) There too, in Walton's music, is the same broken-up, fragmentary chamber orchestra accompaniment, dry, colorful, full of thin, wide leaps. Only the spirit is different —and that not so much, for there's a good deal of humor in "Pierrot" as well as in "Facade."

Schoenberg: Suite, Op. 29 (1926). Instr. Ensemble, Gunther Schuller.
Period SPL 705

A long-delayed mention of a worthy disc which might interestingly supplement the "Pierrot" preceding. It is played by seven instruments—violin, viola, cello, E-flat clarinet, clarinet, bass clarinet and piano, and the recording is satisfyingly hi-fi, which helps a lot in such music as this.

The Suite is one of the earlier of Schoenberg's true 12-tone works and, as no doubt has been said, carries the implications of "Pierrot" to a logical further systematization. All of which will not help to evaluate the sounds here inscribed! Tough music, doggedly uncompromising (*"I already feel the opposition I shall have to overcome,"* said Schoenberg earlier), rhythmically persistent to a point of exasperation for the neophyte, full of those squeaky, decadent little Viennese waltzes that return so frequently in the Viennese 12-tone tradition—the music will undoubtedly drive you nuts on first hearing.

But keep in mind that music which can so irritate you is strong music! Schoenberg was a strong man, musically looking for trouble, perfectly aware that he would be intensely disliked and ready to defy that dislike to the bitter end in the interests of his musical goal. We cannot avoid his personality—it would be foolish to deny it and, indeed, his music would be false if it did not express him. (Even moderns are human.) But we may, even so, be in the presence here of a really great innovator and it's at least worthwhile having him around, so to speak, for future reference —in case our individual and collective taste changes. It will, you may be sure. Always has.

Honegger: A Christmas Cantata. M. Roux, bar., Eliz. Brasseur Choir, Petits Chanteurs de Versailles, Lamoureux Orch., Sacher.

Distler: The Christmas Story. Netherlands Madrigal and Motet Choir, Voorberg.
Epic 4 LC 3153

Two interesting modern Christmas works. The Honegger, in the large-scale Swiss-French tradition, calls on the usual immense forces —including children's choir—that figure in his many Swiss-style festival works of this kind. ("King David," an early one, is the best known.)

Honegger is a big musical dramatist; the entire first section of this work is the an-

guished appeal of humanity, represented by the full forces involved, to the Saviour; the rest, fittingly, is the answer in the form of His coming, the Christmas story itself. The opening, almost inaudible, rises gradually to great climaxes over a pulsing march beat—a wonderful suggestion of the millions of humanity in torment. The pastoral Christmas story which follows makes rather lovely elaborations upon Christmas songs of numerous lands, superimposed upon one another. Among them you will hear "Lo, how a Rose," "Sleepers Awake" (*Wachet auf*) and, of course, "Silent Night." A splendid work this, of its supergrandiloquent type, and I found it very exciting to listen to.

The Distler, German from 1933, is wholly different but also very listenable. It is for unaccompanied voices with recitative solo, modelled directly on the "Christmas Story" of Heinrich Schuetz, 17th century German composer, a work that has gained very considerable favor over here in several recent recordings. This is a sensitive, reticent, reserved evocation of the past, in skillful modern terms, and its composer, oppressed by the Nazis, (he later committed suicide) had an extraordinarily acute sense of pitch and melody for the voice. It took a towering musical talent, paradoxically, to write this perfectly proportioned example of extreme artistic limitation and we can only be sorry that his genius could not have opened out more naturally into a truly modern idiom. We have precious little real choral music today.

Epic has made the mistake (perhaps budgetary) of not including printed texts for either of these works.

Britten: Saint Nicholas (Cantata), Op. 42. Peter Pears, tenor, D. Hemmings, boy soprano, Aldeburgh Festival Orch. and Choir, Britten.

London LL 1254

The title is a bit misleading—this is about Saint Nicholas himself who wasn't always the Santa Claus he now seems to be. Principal story about him has to do with the three little boys who were pickled by the butcher (during a famine) and served up to Sant N. and friends, whereupon he restored them to life and returned them to their anxious families.

This is a really lovely work, though not all of an even goodness, which seems to be characteristically Britten. Superb choral parts, appealing music for boys' choir, for girls' choir (a new distinction of tone color I don't remember hearing featured before), for boy solo—and for the superbly authoritative tenor of Peter Pears, who has sung most of Britten's music and for whom most of its tenor parts were clearly written. Here is the best of the British tradition for vocal music as projected by the finest talent in the field today, and there's not a thing difficult about it, though it rises to greatness, I'd say, in many spots.

Britten: Winter Words, Op. 52; Seven Sonnets of Michelangelo, Op. 22. Peter Pears, tenor, B. Britten, pf.

London LL 1204

Here are the two again, composer and performer, and this makes a fine supplement to the above, if you want to add a bit. The Hardy texts are wonderfully set and easily understandable in spite of no printed "libretto"; the Italian words are much too much for me without printed aid. (I keep looking inside the folder, hoping a leaflet of texts will fall out—but no.)

3. OLD CURIOSITY SHOP

Stravinsky: Symphony #1 (1906-07). Vienna Orchestral Soc., F. Charles Adler.

Unicorn UNLP 1006

For anybody who knows Stravinsky beyond the Fire Bird—here's an oddity. The music is his first big student work done, most expertly, under the tutelage of old Rimsky-Korsakoff. It reeks of everybody of the time, Rimsky included (also bits of any Russian you can mention from Glinka to Tchaikowsky and Borodin, plus plenty of Liszt, Wagner,

Scriabine and so on.) A big, long, colorful work and you can fool your friends and relations no end with it. Who'd a thunk . . . .

Elgar: Enigma Variations; Cockaigne Overture; Serenade for Strings. Royal Philharmonic, Beecham.

Columbia ML 5031

A convenient tuneful and authoritative collection, placing the "Enigma" along with Elgar's two other best known works (not counting "Pomp & Circumstance"). The distant recording emphasizes, somehow, the modestly derivitive Romanticism of this ultra-British musician. His is sweet, lyric, honestly appealing music but it runs to milk toast much of the time.

Chabrier: Une Education Manquée (operetta). Christiane Castelli, Caudine Collart, sops., Xavier Depraz, bass, Orch. Symph. de Paris, Bruck.

Vanguard VRS 460

Not too late to try this highly amusing little comic opera, pseudo-18th century, three characters and a small orchestra, which makes lovely fun of two innocent newlyweds in a time-immemorial way. One soprano, 18th c. style, is young hubby, the other is wife; the basso is the school teacher who doesn't seem to have taught them the right facts of life. (Too much Latin, not enough s-x.) Complete libretto; excellent French singing makes things easy to follow.

Chopin: Waltzes. Artur Rubinstein, piano.

RCA Victor LM 1892

Here's another in Rubinstein's felicitous new series of solo recordings, in most of which he seems to have returned to a less powerhouse, less "concert tour," more musical kind of playing, almost as though, having reached the top in concert billing, toured the world and toured it again, he has come to feel that, after all, real musical expression is the end of a life such as his, even after and beyond the ultimate in fame.

The waltzes are crisply played, for the most part beautifully too and with a fine close-up look, for us, at a prodigeous technique. It is not surprising to find that the less familiar waltzes are the most expressive, the war horses tending towards a bit of the old Rubinstein concert flashiness. Still in all, a fine job and worth anybody's attention. Lovely cover, too. Degas.

Bach Organ Recital (Prelude and Fugue in E Mi., Fantasia in G, Passacaglia and Fugue in C Mi.). Anton Nowakowski, Organ of the Klosterkirche an Soro, Denmark.

Telefunken LGM 65030 (10")

The superb Danish organ sings out like a Strad and is the main feature, along with Bach, of this little disc. What rich, exquisitely balanced sounds came out of the old "Baroque" school of organ building! The organist here is of the modern persuasion, tending towards rapid, fairly rigid tempi but choosing his organ color with skill and good contrast. His Passacaglia makes an interesting comparison with the slower, more stately and architectural version by Schweitzer in his recent Columbia album.

Haydn: Symphonies #88, #101 ("Clock"). Vienna Philharmonic, Munchinger.

London LL 1199

This is an excellent "Clock" where so many performances are routine or even patronizing. Munchinger in Stuttgart (see Mozart Violin Concerti) is one thing and Munchinger in Vienna another, evidently, for there is no more than a slight Viennese softness here to diminish the brilliance of these Haydn scores, and that could well be attributed to the Vienese musicians themselves. Tempi are a bit slower than the usual whirlwind symphonic versions we hear hereabouts, and the music is the better for it.

Both sides have the same shiny, steely recorded brilliance, the strings close-up, overall liveness ultra-realistic.

Bartok: Violin Concerto; Sonta for Unaccompanied Violin. Ivry Gitlis; Pro Musica (Vienna), Horenstein.

Vox PL 9020

Among a number of recent Bartok recordings this is the only one I would recommend for general-interest listening. Two big, late works, and Gitlis strikes me as extraordinarily musical in his playing of them. The Concerto will make a good addition to any collection that already includes the now-familiar Concerto for Orchestra; this is almost as easily accessible though an outwardly complicated fiddle part requires a bit more aural penetration. Exciting orchestral playing from Horenstein.

The solo sonata, for violin alone, is nominally the kind of thing most people steer away from. In another recording than this I would agree; but Gitlis makes such potent and musical sense out of the work I suspect many general music lovers will, after a few tries, discover to their amazement that they like it. It's a big, rewarding work, solo or no.

Fine fiddle recording, but in the concerto the violin is pretty close, the orchestra at some distance. Not an ideal balance.

4. REPERTORY FOR THE XMAS LIST

Bruckner: Symphony #1. Vienna Orchestral Soc., Adler.

Unicorn UNLA 1015

My Scout #2 says this is an excellent performance, bringing out a "youthful sweetness," especially in the first two movements; the last part gets pretty noisy. Good recording too.

Bruckner: Symphony #7; Overture in G minor. Vienna Symphony, Hague Philharmonic, van Otterloo.

Epic SC 6006 (2)

Scout #1 feels that this one isn't up to the competition from another Dutchman, van Beinum with the Amsterdam Concertgebouw, on London. (That was before Epic signed up the Concertebouw, I guess.) He thinks this new version is "paced a bit too deliberately." (If so, it must be awfully, awfully long.) He likes the G minor Overture better, with van Otterloo's own home orchestra.

Brahms: Violin Concerto. Heifetz; Chicago Symphony, Reiner.

RCA Victor LM 1903

For all-around values, this is the peer of all LP recordings to date of the work, says Scout #1, and I can add that this one combines RCA's notable values uniquely—the superb Reiner series, the equally superb Heifetz series, going back many years, and the best of the New Orthophonic recording technique for super hi-fi. Highly recommended.

Tchaikovsky: Symphony #5. Pittsburgh Symphony, Steinberg.

Capitol P 8325

Seems a bit controversial, this one. "Clear, clean and beautifully disciplined," says Scout #1, but he feels, a lifeless, unexciting performance.

You may interpret that as meaning that here is one of those modern-style, updated playthings which avoids the lushness of the Old School conductors—and perhaps thereby also avoids the intention of the music itself, which comes from a pretty lush period, after all. No final decision can be made on such a performance; if you like your Tchaikovsky clean and held back, if you abhor the old-fashioned, all-out tearing of hair, then you'll likely enjoy the Steinberg version, which without any doubt at all is authoritative and of a high order, in its category.

Tchaikovsky: Piano Concerto #1. Conrad

Hansen; RIAS Symphony, Sawallisch. **Remington R-199-197**

Got to keep your eyes on Remington. Every so often this low-priced label brings out a disc to compete with any in musical value, if not in big-name allure. Scout #1 is enthusiastic about this, likes the big-sound, grand-manner piano as well as the complementary orchestra. Good sound, too.

Strauss: Till Eulenspiegel; Death and Transfiguration, NBC Symphony, Toscanini.

RCA Victor LM 1891

Scout #2 likes the Toscanini fireworks—the "snazz"—that go into "Till Eulenspiegel," making it a *tour de force* of orchestral display, which does it no harm. He thinks that "Death and Transfiguration" has interesting values here, bringing out that late-German sick-to-death quality that is probably its most important expression. (It would take an Italian conductor to do that!) But he feels that the old Toscanini dramatics, highlighting *everything*, subtly exaggerating each effect, leads to the same intensity all the way through and thus, paradoxically, to a kind of monotonous *tour de force* effect that merely highlights the weaknesses of the music, losing the solid values in the gorgeous playing. Gorgeous—but nothing more. Hi-fi stuff, of course.

Beethoven: Symphony #1; "Jena" Symphony. Warwick Symphony; Janssen Symph. of L. A., Janssen.

RCA Camden CAL 241

Scout #2 has a mild fit over the very early "Jena" symphony, saying how much he enjoys hearing Beethoven "all dewy-eyed and Haydnish," for which fine phrase I must commend Scout #2! He doesn't have my slightly disturbing memory that the "Jena" is not entirely clear as to authorship and, just maybe, isn't by Beethoven at all. No matter (and I won't bother to look it up) ; the music stands on its own and is charming, "dewy and Haydnish," whoever may have written it.

The First Symphony, he feels, is exaggeratedly rough and boisterous, as the Warwick Symphony (wonder what orchestra that *might* be . . .) plays it. I add that the First does, in truth, have much of the later Beethoven in it, but should never be played pretentiously on that account—nor should any Beethoven, for that matter. I'd recommend this reissue for the "Jena", with the First thrown in as, perhaps, an interesting contrast to other interpretations.

Beethoven: Symphony #5; Fidelio Overture. Vienna Philharmonic, Furtwängler.

LHMV 9

One of the final His Master's Voice RCA releases of last season, this brings an old-line performance of impressive dimensions that will probably annoy many listeners. Furtwängler played his Romantic music (including Beethoven) very slowly and with much monumentality ; his is of the sort that seems draggy while you listen, then becomes overwhelmingly powerful—after it is over. That is, of course, typical of 19th century procedure in composing as well as conducting—take a Wagner opera, for instance—and so may be considered more than usually authentic, in spite of our present-day streamlined tastes.

On the basis of Scout #1's report I'd say this would be well worth having if you like to study the great interpretative traditions. Recording is not of the super-hi-fi sort, though musically adequate.

Verdi: Rigoletto (Concert Version). Soloists, Chorus, Netherlands Philh. Orch. Goehr.

Mus. Masterpiece MMS 111 (2 10") (Mail order)

Budget mail order opera (also, I gather, issued through the affiliated Opera Society), this one is reported by Scout #1 as excellent in over-all concept, "vibrantly accented and neatly phrased." Individually the soloists are

so-so on the average but are carried along to good things by the excellence of the whole.

That, I should say, has been the really important virtue of MMS opera so far and I myself am much impressed by what has been done with intelligence and imagination, though the solos may be less than stellar. The Mozart "Serraglio" on this label, which I heard recently, was excellent and in the very same manner—i. e.—a fine, rightly styled, humorous performance that carried along with it to success a couple of soloists who could have been really bad—without such inspired direction. This is recommended as good competition to the fanciest versions on regular LP.

Berlioz: Symphonie Fantastique. Boston Symphony, Munch.

RCA Victor LM 1900

This one, brand new, has been widely hailed and our Scout #1 went along and liked it, though he felt that RCA's earlier Monteux-San Francisco version (78's, I think) had a bit more warmth and plasticity. Out of curiosity I tried it. Maybe so . . . but this version just doesn't come up to the ancient one I'm speaking of. More polish, plenty of sheen, super-hi-fi; but the highly personal electricity isn't there. Not for my ear.

SOUND SYSTEM

(*from page 26*)

keeps low-frequency noise called "rumble" out of the final sound.

The groove variations are sensed by the *needle,* or *stylus,* which in high-quality systems is jewel tipped; it is made of sapphire, or much preferably, diamond. The needle must have an unmarred, smooth surfaced, hard tip, normally of spherical shape. It must also be designed so that it does not bend, but faithfully communicates the exact groove modulations to the generating mechanism of the pickup.

The *pickup* is an electric generator (usually either of the piezo-electric, variable reluctance, or moving-coil type) whose function is to translate the mechanical vibrations of the needle into electrical oscillations of the same wave forms. It must do this with minimum distortion of the wave form, and must not allow resonances of its own to influence its output voltage significantly. It is also an advantage for the pickup to impose as little work as possible on the needle. The greater the force required for the groove to displace the needle from side to side (the less the *lateral compliance* of the pickup) the greater the vertical bearing force of the needle on the record will have to be to maintain proper and constant stylus-groove contact, and the greater the wear of both record and needle.

The *tone arm* holds the pickup in place over the groove, and must provide sufficient freedom of motion so that the pressure of the groove walls alone can make the needle move across the record, following the recorded spiral. The tone arm must hold the pickup approximately tangent to the groove being played, must provide the proper vertical force for

the pickup, must not allow its own resonant behavior to influence the system, and must not generate other lateral forces of its own (either "side-thrust", usually in towards the record, or lateral resistance due to binding friction at the pivot. When the pivot resistance is in the form of viscous damping, however, the two above mentioned forces can be balanced against each other).

The electrical output of one type of pickup, the piezo-electric, is usually fed directly to the amplifier. It is of the order of ½ volt or more, and is a fairly accurate replica of the recorded sound. This is so because the characteristic frequency response of the pickup is more or less the inverse image of the frequency characteristics "built in" to the record. (This last subject will be taken up in detail later.)

The reluctance and moving-coil pickups, however, produce a much smaller amount of electrical energy. The output voltage of these pickups (which are classed together as *magnetic* types) runs well under one-tenth of a volt, and may be as low as a few hundredths of a volt. Furthermore the characteristic frequency response of the magnetic pickup does not compensate for the way in which the frequency characteristics of the recorded sound has been doctored. Therefore the pickup output must be passed through a *preamplifier* before it enters the amplifier proper.

Amplifiers

The preamplifier may be mounted on a separate chassis, on a chassis with the main amplifier control sections (volume and tone controls), or on the same chassis as the main amplifier. In any case its functions are to increase the output voltage of the pickup, and to compensate accurately for the frequency characteristics of the record so that the sound is not deficient in bass and heavy in the treble. Since different record companies have made records with different characteristics the preamplifier often allows the operator to choose between several types of frequency compensation, each of which is appropriate for records of particular companies. The need for such control, which is called variable record equalization, may disappear in the future with increasing standardization of recording technique.

The control section of the amplifier allows the operator to regulate the volume, and, in most cases, to either accentuate or attenuate ("boost" or "cut") the bass and treble portions of the reproduced sound independently. The primary function of tone control is to compensate for deficiencies in associated equipment or program material, and to compensate for acoustical conditions of the room in which the music is heard.

The main amplifier receives the elec-

trical signal as it is finally shaped, and releases another signal, ideally identical in all respects except power. The power amplification may be tens of millions of times, from a fraction of a microwatt (one millionth of a watt) to dozens of watts.

Although the demands on the amplifier are very great, and although it appears to be the most complicated of the system components, it is the least imperfect of these components. The percentages of harmonic and intermodulation distortion, the irregularities of frequency response, and the extraneous noise introduced by an amplifier built according to the best current design practices, and without regard for cost, are such that they are not limiting factors in the fidelity of the reproduced sound. Amplifier designers are now seeking to extend the control of the amplifier to help regulate deficiencies in associated equipment (for example: disc recorders are used which work in conjunction with a "feedback" electronic circuit), and of course have ample room for advance in the field of reducing cost without sacrifice of quality.

Loudspeaker

The final component of the sound system is the loudspeaker system, which consists of the speaker mechanism itself and the speaker enclosure. The loudspeaker converts the alternating electrical output of the amplifier into mechanical vibrations of a cone or diaphragm. But the cone vibrating by itself cannot, for reasons that will be discussed further on, produce adequate bass energy. It must be mounted in an enclosure or baffle of some sort, which gives the vibrating surface the "bite" of air that it needs to radiate low-frequency sound.

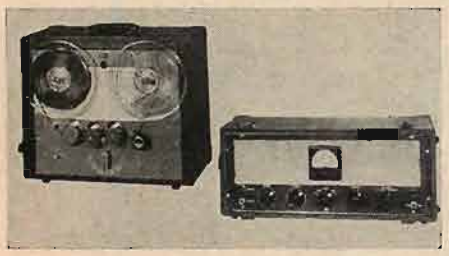
The speaker and its enclosure, like the amplifier, should introduce as little distortion and frequency irregularity into the signal as possible. Typical speaker deficiencies are irregular frequency response, poor transient response (hangover), and harmonic and intermodulation distortion.

Two other components are shown in *Fig.* 4–3. The *tuner* is a device which converts AM or FM radio signals to audio signals that can be handled by the audio amplifier; the tape transport mechanism, with its associated preamplifier, provides a signal of the same nature as that coming from the tuner or phonograph pickup.

The system of sound reproducing components is often referred to as a "chain" of components. This term is very appropriate: the fidelity of the chain cannot be greater than that of its weakest link. The futility of concentrating on the perfection of one component, while disregarding any of the others, should be obvious.

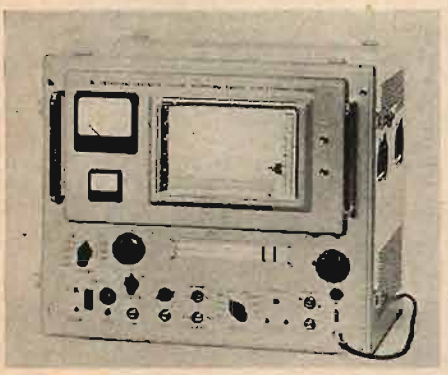
NEW PRODUCTS

• **Presto Tape Recorder.** Intended especially for the growing market for high-fidelity equipment in the home, the new Presto two-speed tape recorder embodies many design features of Presto professional models. Designated as Type SR-27, the unit consists of a tape-transport mechanism and a 10-watt amplifier, each supplied in a separate carrying case. The SR-27 transport mechanism employs three motors, one of the hysteresis synchronous type for capstan drive, and two of the standard induction type for driving supply and takeup spools. Three separate magnetic heads are used to record, erase, and play back tape on standard 7-in. reels at 7.5 and 15 ips. Specifically



designed brakes are self-adjusting and self-aligning. The A-920B amplifier contains preamplifiers for microphone and playback, power supply, and two small speakers for low-level listening or monitoring. Microphone inputs of 50 or 250 ohms and a bridging input are provided. Although intended primarily for home use, the SR-27 will produce recordings which conform to NARTB specifications. When operated at 15 ips the unit has a frequency response up to 15,000 cps, signal-to-noise ratio is better than 50 db, and flutter is approximately 0.15 per cent RMS. Further information is available from Presto Recording Corporation, P. O. Box 500, Paramus, N. J. **D-8**

• **Audio Frequency Wave Analyzer.** Designed strictly for professional application, the Type FNA Wave Analyzer is one of the most elaborate instruments of its kind ever to be introduced to the American market. Its function is to separate a complex waveform into its spectrum components and to measure and/or record the amplitude of each frequency. The unit is outstanding for its extreme selectivity and very steep transition of the attenuation characteristic between pass band and stop band. A broadband facility permits rapid checks to be made with reduced discrimination. Inherent distortion of the



FNA is exceptionally low, permitting accurate measurement of low-distortion communication systems or high-quality audio components. Frequency range is 30 to 20,000 cps and sensitivity range is 1 microvolt to 100 volts. Response is logarithmic or linear, with a five-inch-wide easily read chart permitting accurate measurements of vibration rates at individual frequencies. A highly-detailed catalog sheet on this instrument is available from the Instrument Division, Federal Telephone and Radio Company, Clifton, N. J. **D-9**

• **Heathkit Hi-Fi Tuner Kit.** Impressive circuit improvements and attractive physical design are featured in the new Heathkit Model FM-3 FM tuner kit, which matches in color, styling, and size the Heathkit Model WA-P2 preamplifier. A self-powered unit, the FM-3 incorporates automatic gain control, a highly stabilized oscillator, and a tube line-up which af-

fords excellent gain. I-F and ratio transformers are pre-aligned as is the front-end tuning unit, which is also pre-assembled. The kit is supplied with full wiring instructions, including picture diagrams, which make construction easy for even the most uninitiated novice. Further information will be mailed on request to The Heath Company, Benton Harbor, Mich. **D-10**

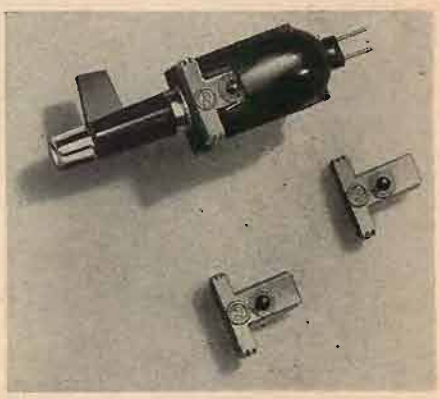
• **Audax-Garrard Adapter.** Users of both Audax cartridges and Garrard record players will find interest in the new plug-in adapter which permits instant connection of any Audax cartridge to any Garrard changer or single-playing turntable. Designed primarily for the Garrard Model RC-80 and RC-90 record changers, and for

the Model "T" turntable, the Audax adapter is precision-made to maintain the correct stylus-to-groove alignment. No soldering or wire handling is required for installation. The Audak Company, 500 Fifth Ave., New York 36, N. Y. **D-11**

• **Harmon-Kardon Ten-Watt Amplifier.** Employing printed circuits throughout, the new Harmon-Kardon Model PC-200 amplifier, although low in price, contains many features normally found in amplifiers considerably more expensive. Known as the "Prelude," the amplifier incorporates a dip-soldered copper-clad laminated phenolic board which is used for all wiring, yet is so arranged that mechanical disassembly can be accomplished whenever necessary. The Prelude incorporates

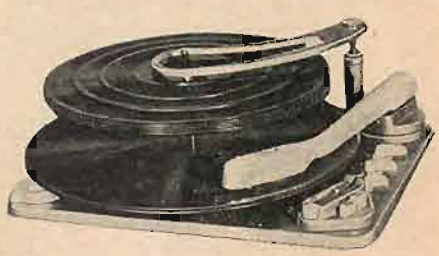
a versatile preamplifier with inputs for phono and tuner, also a tape input which provides correct equalization for tape recorder heads. Full record equalization with separate roll-off and turnover controls, a 4-position loudness contour control, bass and treble controls, and a rumble filter, are all standard features. The amplifier is handsomely styled in burnished copper and satin black. **D-12**

• **Pickering Magnetic Cartridge.** Among its design features the "Fluxvalve," the new wide-range pickup recently introduced by Pickering & Company, Inc., Oceanside, N. Y., includes a new type of stylus which has extremely high compliance, making it exceptionally well-suited for low tracking force in the range of two to five grams. The vibratory mass has been reduced to such a degree that pickup response is virtually flat at 30,000 cps on ordinary vinyl. A turnover-type cartridge with easily replaceable styli, the Fluxvalve is so designed that it meets the



demands of all presently envisioned developments in the field of recording, including records which call for less than 1-mil stylus radius. Electrical characteristics of the cartridge include frequency response flat to well beyond 20,000 cps, negligible intermodulation, and output of 25 millivolts at a normal recording level. Output impedance is medium, requiring a termination of 47,000 ohms. The entire magnetic circuit, including the magnetic gap, is completely encapsulated in plastic. The unit is supplied with a mounting clip which adapts it to all standard arms, and also acts as the bearing for the turnover action. **D-13**

• **Automatic Record Changer.** There is hardly any feature to be desired which is not incorporated in the new Dual Three-Speed Changer. Manufactured in the Black Forest region of Germany and distributed in this country by United Audio Products Division of United Optical Mfg. Corp., 202 E. 19th St., New York 3, N. Y., the Dual intermixes records ranging in size from



7 to 12 ins. A pause switch makes possible intermissions of one to four minutes between records. Pause duration, as well as speed of the change cycle, is entirely independent of turntable speed setting. Unique is the changer's automatic glide mechanism which works as follows: after the start button is pressed, the tone arm moves toward the center of the turntable, sets down on a feeler and moves gently to the edge of the record. Upon touching the edge of the record, the feeler retracts and exposes the stylus which sets down in the run-in groove. Wow and rumble of the Dual are reduced to a practical minimum. After the last record has been played, the tone arm returns to a locked position and the motor is shut off. Additional specifications will be mailed on request. **D-14**

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Model 80-T $199.50

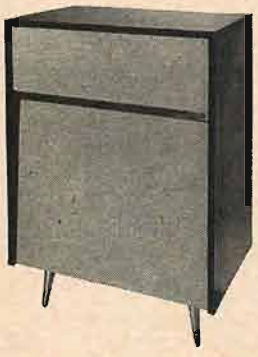
Model 80-R, same as above, but 13 tubes, for use with external audio control. $169.50

New

Stan White

Model 4330

THE 'HI-FI'



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Edward Tatnall Canby

1. For Xmas—One-Piece or Two?

As XMAS COMES sailing up, in the ocean of time, you'll find that considerably more than the usual month-by-month interest is displayed in phonograph-radio equipment Suitable for Giving. Hi-fi components are sold on an Xmas basis far and wide, but I think it would be unrealistic not to observe that around this Xmas end of the year people's fancies turn to packages—especially nice, ribbon-bedecked packages that can be opened with one rip and a swipe, under the X-mas tree, and be put to work two seconds later. People buy a lot more one-piece sound reproducers around Xmas, I'd guess.

(Now that is an unchallengeable statement because it's a lovely Dangling Comparative. More than when? *More than ever,* of course! That's the standard answer to such inconvenient questionings.)

And therefore I'm thinking at the moment of two rapid developments that are changing the "hi-fi" picture significantly this year. Since it's the season for buying, not talking, I'll merely point 'em out to you, for watching, in case you haven't.

One is strictly American in concept, the other as strictly European, and they couldn't be more different in the fundamentals. But both developments, within the "package" hi-fi field, seem to be doing very well.

First is the new and strong U.S. tendency to sell dual-unit machines, the loudspeaker separately housed from the rest of the equipment. I couldn't be happier, myself, and am heartily in favor of this constructive compromise, for in this fashion the commercial, mass production type of machine is able to come closer, in fundamental ways, to some of the basic virtues of separate-unit component equipment, notably in its hitherto weakest aspect, the speaker system. A separate loudspeaker cabinet almost necessitates an improved acoustical set-up. For what use a separate cabinet if it is merely another hollow open-back shell, or (alternatively) a cramped and ingeniously compressed trick-bass enclosure system, about as big as a square basket ball?

If you're going to remove the speaker to its own freedom, you might as well do a good job on it—or shall I say, vice versa, if you want respectable loudspeaker performance, you must, as has been said a million times, remove the speaker into its own cabinet.

Numerous big-outfit and smaller-outfit hi-fi systems are out now with this dual cabinet feature. It has much attractiveness for the décor-minded person, once the idea is accepted. Two cabinets, matching, are always an asset in looks, giving a sense of intentional pattern to a room design that one cabinet never provides—unless you match it to something else already there. No less a biggie than RCA Victor, for one, has gone into this field; Columbia also has separate speakers. Custom outfits like, to cite one that has just turned up in my press-release mail, the Bohn True High Fidelity Phonograph-Radio (G. Schirmer, N. Y.) are proliferating. Generally speaking, I suspect that the idea of two cabinets for your home machine will be pretty well accepted before long by a good slice of the former one-cabinet trade. And I don't think there is an engineer or salesman or buyer who will not be happy, to a point, over this improvement in fundamentals—as far as it goes.

BUT look, too, at the great European Invasion of one-piece sets, Norelco, Telefunken, Grundig. They seem to be mainly Dutch-German and they are of a type that has been more or less standard for years all over Europe. I was looking at them in 1953 on my last trip Over There (I dallied in the Paillard head office in Switzerland, one day, trying to get Moscow or something just out of curiosity on several gorgeous, gleaming, super-table models of that firm, precisely like those now on display in many stores in the U.S.)

These are one-piecers with a vengeance, all the way up to the enormous floor models that stores like Macy's in New York now sell en masse. They look utterly unlike any sets made here. They are expensively stylized, with vast numbers of radio bands, on the whole rather forbiddingly professional compared with our simplified radios. Some are just radios, some radio-phonographs, some have everything—except TV. Foreign-language directions on their faces add an exotic touch of incomprehensibility. Rather terrifying machines, when you get down to it. Yet they seem to be selling very, very well.

Why? I'll throw out two good reasons. First, like many European products they are carefully and solidly made, to last, for the use of—in Europe—a relatively few well-to-do individuals who, presumably, will be ready to fuss with multidials, who are enterprising and/or intelligent. There is little big, mass-market thinking in Europe, as here, and industrial product designing is profoundly different from ours. We find this in European cars, too. I have one (Austin) and wouldn't trade it for a U. S. piece of high-powered, fall-apart showstuff even if I could get anything for it. European radios have a sense of class and are built to more solid, conservative, lasting specifications, less brilliantly, but often with more built-in life. They have to be. They cost too much over there and they are bought to keep. Not so much a virtue as a necessity.

Second these same machines are quite amazingly cheap for us, with our big dollars, our import power and our higher paid labor. Paradoxically, what we can't afford

to make we can easily afford to buy.

And so the European-type radio, with or without phono, is making a remarkable invasion and brings with it to us a certain nostalgia for ye olden days, too.

Nostalgia? What I mean is that these one-piece European machines are essentially brought forward from the pre-war period. They represent, with modern improvements inside, the type of machine we used to make before hi-fi came along.

Remember our old-time radio-phonograph? (see below.) That's what these are. Radios, basically, with phonograph attached. One-piece cabinets, glorified with colored lights and pushbuttons, containing the good old open-back speaker systems that were 99 per cent standard hereabouts before the war. Midwest, Majestic, Zenith, —I remember 'em all, over here.

This is merely European outward conservatism, of the sort you'll find in many products. We move fast and recklessly, they move slowly and with caution, changing reluctantly to new ways, new styles. We do brilliant designing, engineering, they do lustrous work in top quality conservatism. (My Austin, 1953, was upstyled the year before to a body design that is, shall I say, late thirties and early forties.)

And so, inside these ultra-conservative pre-war-style European radios you'll find some pretty fine works and some very good sound, of its type. Never forget that for some years now, many of the small and large European radios have had electrostatic speakers with quality reproduction in the high end well ahead of our efforts. Remember, too, that a few years back we over here were all excited about highs—but hadn't thought much about lows.

The continental machines, as far as I can see, simply ignore the low lows, as we used to. Lows, yes, but not really. They concentrate on middle-and-high superiority and even the machines without electrostatic speakers have a peculiarly pleasing high register, to my ear.

Thus the European one-piecers, unlike our old-time boom-boxes, now seem to run to a rather special kind of trebleness, which, decidedly, sells sets to American ears. We aren't *that* educated to big bass yet. And never forget that poor bass, or no bass, never physically hurts, but poor treble grates and slashes at the ear. Could it be that these well-bred, well-trebled continental imports are going to force an agonizing treble reappraisal in our one-piece table model area?

For old readers, I recall the fabulous small radio, unidentified, that I mentioned back in 1953, overheard somewhere in Europe. Such naturalness of voice reproduction I had never encountered and I wondered what sort of equipment this midget could be. Without the slighest doubt it was an electrostatic speaker that I was listening to, my first, in one of the same type radios that are now being sold in this country. It was my initial experience with the modern breed, and I liked it.

2. Gracious Living

If anybody dangles another gracious plum before me in regard to what is called "gracious living"—that hyper-hypothetical state of bliss dreamed up by some unholy publicity agent of the devil himself—I shall pop, as the saying goes. In fact I'm about to pop right now, as graciously as I can! This time it's the gracious life aboard an airliner:

"The ancient minstrels' dreams of wafting their listeners along with melody is a modern reality, dramatized by the announcement this month that United Air Lines is installing Travel Muzak in its fleet of forty two spanking new Douglas C-47 Mainliners."

Ugh. That's my reaction. No trace of reflection on Presto, whose tape equipment was chosen for this rather difficult job and in whose magazine, *Presto Recorder*, I read this item. Just a general reflection on our utterly zany ideas of graciousness in living and our too-foggy notions of personal freedom. Suppose I just don't care to live graciously—I just want to get somewhere? I can imagine nothing more utterly ungracious, myself, personally, than having to sit hour after hour chained by two ears to a steady stream of music I don't want to hear one little bit and generally dislike rather intensely—with no more gracious way of avoiding the noise than to bury my head in a pillow, or take a gracious jaunt to the gentlemen's lounge. (But they'd probably have an outlet for gracious music there too. Maybe the baggage compartment would be better, tho' unheated and unpressurized.)

No, no, I'm not saying that my musical taste—or anybody's—should determine what is and what isn't gracious music. Far from it. I don't doubt that a lot of people want exactly what Muzak gives them; otherwise the company wouldn't be in business. They've got this sort of thing well figured out as a matter of course and they are enthusiastic in telling you about it. But I'm not Mr. Statistical Average, nor are you. We all of us still have a few traits of individuality left; we aren't yet Majority Robots.

"United uses Travel Muzak to set the mood for travelers as they come aboard (Ugh, I say), *during dinner and cocktail hours* (more of the same) *and before landing.* (At that point I'm usually deaf and it won't matter one way or another.) *Muzak has designed two distinct types of programs for United's flights. For long distance, . . . popular numbers, semi-classics, and a healthy sprinkling of tunes from the latest Broadway musicals. . . . However, for United's DC-7 flights between Hawaii and California, Muzak has built programs which include typical Hawaiian selections played by outstanding Hawaiian groups. Soothing hulas, serenades, and dances are carried, to put travelers in the languorous mood of the exotic Islands."*

Now d— it, I don't want to be soothed by any hula! And yet maybe, one of these days I'll just have to go to Hawaii, and somebody's going to grab me by both ears, graciously, and soothe me willy-nilly hour after hour. Languorous? I'll be ready to shoot at sight when I get there. Suppose I want some gracious sleep, lulled only by the fine, steady bone-shaking rhythm of four large power plants? Not allowed. Got to listen to that hula and might as well do it with good grace.

I'm reasonably serious about this. I honestly mean that I do not, myself, like this sort of music and I object vigorously to any move that, like one of those trick riders to a bill in Congress, attaches an unwanted compulsory "benefit" that can't be dodged.

I can turn off my radio or TV. I don't yet have to buy records I don't like. I can pick and choose my restaurants for their audible qualities, musical or otherwise. But when I must travel, for purely non-musical reasons, I see no reason why I should have to put up with any sort of musical living that is ungracious as far as my own ideas are concerned. Nor should you.

I would not recommend a program of Bartok, Beethoven, and Schoenberg to Muzak either, though it might well make my own trip a lot more interesting and more gracious. Other people would feel imposed upon, and quite rightly. Maybe I'm an egghead—ostrich egg—for having my own ideas as to what I'd like to hear or not to hear, but I believe it is my honest right, and yours too. Sure, I'll take a free cocktail on the house if my plane stewardess offers it to me—but only because it is a pleasure to know I don't *have* to take it if I don't want to. That's really gracious living! They can give all they want of that kind.

But please, Miss Stewardess, don't grab my head with a half Nelson and spill that cocktail down my throat by sheer force. That would be most ungracious of you, now, wouldn't it.

* * * * *

I might add that, graciousness aside, the Presto account of the equipment used for this service in the United planes is technically quite interesting. See the *Presto Recorder*, August 1955 (Presto Recording Corp., Paramus, N. Y.)

3. She has a Hi-fi

Lady first cousin of mine came up the other day, after no-see for a couple of years. She had a vague notion of what my business is—hers is being a housewife and her husband sells shirts. They always buy all the newest manglers, automatic washers, get a new Pawntiac every year and TV for the kids, don't know one note from another musically.

Anyway, first thing she said to me was —and she was going to show me that they were really right up to the moment, even in my own field—*"WE'VE got a hi-fi!"*

So she has a hi-fi. It seems, I now realize, that the Amurrican langwitch changes faster than I had thought. Not a hi-fi anything; just a plain hi-fi. A nice term, following an ancient tradition, like a bus (for omnibus)—it used to be spelled 'bus —or an auto, for automobile. Or the super, formerly known as the superintendent.

I can see how it happens, and happened this time. "Hi-fi" is catchy as an adjective. Everybody remembers it now, though I remember in the days of my earliest hi-fi youth (several years back) when people would say "Is that one of those high-frequency things?" Now, hi-fi is adjectivally secure in the language and the credit or blame can be easily fixed upon the copy writers who have so successfully applied the adjective to, shall we say, Everything and Anything, including lipsticks.

But, by golly, I don't think any copy writer thought of making "hi-fi" over into a *noun*, unattached! That was done by the People, the folk; that was pure folklore in operation. Publicity could not ever rise to such a supremely simple stroke of linguistic slangitude, and publicity can now do no more than take up the idea for all it's worth, with humble gratitude for the superior intuition of the Folk when it comes to slanguage.

Hold it! They have, already. Here's a headline in *Popular Science* for November, 1955 (out in early October according to standard magazine calendaring) which says:

HIGH-BRACKET HI-FIS DO EVERYTHING BUT DANCE. . . . Here are a few of the newest hi-fis, fully assembled in fancy cabinets . . . etc.

So there we go. First we had the Talking Machine, then the Phonograph (trade name, become unofficial public property), and then the Victrola (trade name, become unofficial public property) and, still later, there was the Radio (remember the days of "rah-dio"?). After this, there was a merger and the result was the Radio-Phonograph; but folks didn't like that one much—too many syllables—and so it became the Combination. You got a new Combination for Xmas. And when things got even more complicated after the war (FM-AM, or is it AM-FM?) there was an inspired attempt to begin all over again with a new tack, the Home Music System, or Music Center. My own perennial book has that very proper term in its title: "Home Music Systems" (Harper, 1955).

But I think when I get to my next edition I'll go along with the popular current and follow the linguistic pressure-tendency: I'll name it "How to Pick a Hi-Fi." Not bad.

4. You Never Felt it Like This

While I'm at it and speaking of well-intentioned publicity, I'll mention an odd quirk in a recent RCA Victor ad for the huge "Mark I" super phonograph ($1600) which includes everything from AM-FM to tape recorder under one roof. (Nope, they don't yet call it a hi-fi.) This ad will give engineering-minded readers a distinct jolt: picture of a lady leaning heavily with one arm on the top of "Mark I," looking sweetly into space. ". . . You've never *felt* music like this . . ." says the caption, italics being RCA Victor's, not mine.

I really did a quick double-take on that one. There she was, in plain sight, *feeling* all sorts of pin-prickling sensations right through that sensitive right arm of hers, and she was obviously real gone about it! Put chills down my spine, until I began to think (couple of seconds later) . . . what sort of cabinetry is this, which transmits musical vibrations so blissfully? "Never *felt* . . . ??"

As for me, I always thought that a good cabinet is non-resonant and does *not* vibrate heavily with the music going on inside it. (Remember the glass of water poised on top of the first R-J demonstration speakers, to prove that the cabinet didn't vibrate?). Dear me, thinks I, has somebody at RCA scrambled the fundamentals? Surely they can't mean Mark I vibrates *that* hard?

At which point I took a second look at that gone expression, and decided, as will you, that the lady's pleasure was purely internal. The arm wasn't feeling a thing, just a photographic accident. She never felt music like that before—through her ears. Nevertheless, next time RCA takes her picture I suggest she put *both* arms behind her back, not just one of them.

P. S. As a matter of fact, the Mark I commendably separates the speaker cabinet and the rest of its system into two units, as per my discussion above, for this very reason—vibration. The lady's arm, it happens, is on the equipment cabinet, not the speaker, so she couldn't pick up very much at best. As said above, I heartily approve of the tendency to put the speaker off by itself in the newer models of what were recently "one-piece" machines, now gone two-piece.

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And so, following *current* liguistic inflation a bit further, may I urge upon you all a superbly ultra-merry Xmas and an utterly divinely happified New! Year.

AT HOME WITH AUDIO

(*from page 22*)

view of this mounting technique is shown in the close-up of the tuner (*Fig.* 8). The amplifier is mounted in the same way, but the close quarters prevented its being photographed at the time the other pictures were taken. Note the seven holes drilled near the top of the door, for adequate ventilation. A quarter-inch space at the bottom rail, where it rests on the cabinet-base, creates the desirable chimney effect to keep the components cool. The tooling of the mounting brackets is illustrated in *Fig.* 9.

The mounting panels are fitted behind oblong openings in the doors, each 4 inches high by 12 inches wide—a size sufficiently near standard to accommodate most units in or near our price level and capacity requirements. Control knobs, shown in the edgewise view of the tuner (*Fig.* 10) are set flush within these openings, to keep them from getting in the children's hair (literally, for they are about that tall now)—a use-factor it might be called—which just happens to check in with the setback insertion of the disposable control panels described above—or the function-factor, if you will. As *Fig.* 10 shows, the record changer is secured to its door with two brackets bolted to each side of the factory supplied base, which is left open at the bottom. Only the record player door has to be swung open to use. This unit is held firmly in open position for loading by means of a brass-plated, elbow-jointed friction drop-lid hinge, secured to the door and to the underside of the top rail, locking rigidly when in full out position.

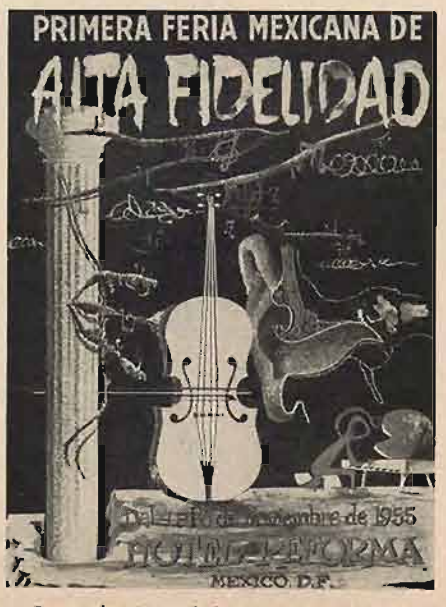
Far be it from us to urge a doityourself stint on any of our readers. Fact is, as reported (*Look*, November 29 issue) someone (actor Tom Ewell) claims to have formed a Don't Do It Yourself Club, saying (and we quote): "There's a certain joy in letting others do for you what you could do for yourself because they inevitably can do it better." Is this hi-fi powerhouse frame maybe too simple for you to bother with? Then take a tip, man, and have it done, even as above star The-Seven-Year-Itch Ewell counsels. There may be a minimum board feet of lumber needed, but a lot of precision in layout and execution must go into the job. Reckon the cost: about three full days' labor, about 15 dollars for lumber and fixings if white pine; twice that if (as here) in walnut and walnut veneer. Includes hardware. Ourself, at the moment a Ewell-disciple (but not quite a convert) we "had it done"—as before, by Modern Furniture Craftsmen, New York. And evidently a fine job it is.

HIGH FIDELITY FAIR IN MEXICO

(from page 23)

through the corridors. As a matter of fact, we were tremendously impressed throughout Mexico by the politeness of the people. The words that we heard more often than any others were "por favor" (if you please) and "muchas gracias" (many thanks).

As for the dress of the visitors, there were no "native costumes" and, in general, it appeared that almost everyone who came was dressed in his or her Sunday best. They came to the Audio Fair, I would say, very much in the spirit of people who would go to a good art exhibition. In fact, this was regarded as a cultural event and that people came almost as they would come to a museum to see a collection of sculpture. It was as if one of the museums had borrowed from many other museums a group of pieces which they were putting on display, or as if the Museum of Modern Art had taken two floors for an exhibit in Hotel Pierre! Nevertheless, however, we were told that a great many high-fidelity units had actually been sold at the Fair. Like ourselves, the manufacturers do not actually write business at the Show. However, each manufacturer invariably had in his rooms a representative of one or more of his dealers and these people were permitted to take actual orders for the equipment. This is perhaps easier to accomplish in Mexico than it would be, for example, in New York, by reason of the fact that there are far fewer distributors in Mexico. Each distributor works in a carefully circumscribed area and the normal chain of distribution, that is manufacturer to to distributor to dealer to consumer, is carefully preserved. As a result, many of the distributors present were "exclusive" distributors within their own areas. Consequently, there were no conflicts of interest.



Reproduction of the program cover.

As for the displays themselves, they were much more subdued and in keeping with the cultural nature of the event and, I think, more costly than those we use in the United States. I would say that the display stands and display racks were specially artistic in their conception, many of them carefully handcrafted of very fine woods, hand-polished and altogether beautiful in their appearance. Significantly, they stayed that way throughout the Show.

Although we could understand very little, if anything at all, of the Spanish conversations between visitors and exhibitors, it was quite clear that the questions asked were being seriously put and seriously and satisfactorily answered. The young men in attendance were very pleasant, and almost all of them spoke English as well as Spanish. They not only appeared to be extremely well-informed regarding their products, but they certainly were genuinely anxious to be helpful to visitors. Incidentally, we were pleasantly surprised at the amount of English which was spoken at the Fair, as well as throughout Mexico City in general. In retrospect, we cannot think of a single room we visited where we failed to have quite satisfactory conversations in English, with the exhibitors or with the exhibitors' personnel.

The records played were roughly 50 per cent typical classical records of exactly the same nature as are used at Audio Fairs in the United States. The other half consisted of records which were purely local and indigenous, having been created in Mexico and, to the best of our knowledge, offered for sale only in Mexico. These latter records were conspicuous by their softness. The music that the visitors seemed to like best, and played most, are the "soft" recordings, largely vocals and accompanied as you might expect, by violins and guitars.

Other than the completed sets on display, there were no components which were truly Mexican in origin, although some were assembled in Mexico. Most of the names of the components were entirely familiar, being either American or British in origin.

Unlike our country, high-fidelity components are generally sold in Mexico side by side with fully packaged sets, which carry brand names we would generally recognize, and offered in beautiful cabinet styling. These products and

high-fidelity components go into the finest Mexican homes. By temperament, the cultured families are so interested in music that when it comes to things musical, they want the very best. In light of this, it is understandable it is an almost universal practice to install the high-fidelity components in cabinets of distinctive design and workmanship . . . seldom in bookshelves or other informal arrangements, where the cabinetry may be subordinated to the equipment, as is so often the case in our country. We noticed a great respect for craftsmanship in the attitude of the visitors, who studied and examined the various mechanisms with perhaps less than the average American understanding of the electronic characteristics, but with great regard for precision and finish in metal parts and careful wiring in circuits. In fact, the Mexico City Audio Fair was the first time we had ever seen visitors ask exhibitors of completed sets to actually take out the component parts for inspection!

Even though this was the first High Fidelity Fair, the entire undertaking was handled with the greatest efficiency and with surprising smoothness. It was most interesting to see how seriously the Mexican Government took this entire project. On the evening prior to the official opening of the Fair, there was a nation-wide radio broadcast from the hotel, and among the speakers was the Minister for Education and a number of other high Government officials. In other words, the Mexican Government accepted this as a *bona fide* trade exhibition, to which they gave their full and whole-hearted support.

We really had no idea what to expect of this Fair when first we started out for Mexico, but we can certainly say that it was, in every respect, a most impressive event. We would like to acknowledge with thanks the many kindnesses shown us, as a visitor from the United States, by Srs. Gibbon, Alonso, and Morales, as well as by Sr. Manuel Angel Fernandez, president of the sponsoring Asociacion Mexicana de Impulsores de Alta Fidelidad, and the members of the organizing committee—in particular, Sres. Jorge Martinez, Jr., Victor Misrachi, Francisco Araiz C., and Adolpho Rodriguez, Jr. Senor Araiz is to be commended especially for the fine program booklet that was given to all who came to see and hear.

SCHOBER ELECTRONIC ORGAN

(*from page 32*)

oscillator. Assuming for a moment that neither R_1 nor C_6 is connected to the plate of V_{1b}, we can easily explain the action.

The transformer T_1 is a special pulse transformer with low inductance; it is so connected that a positive pulse at the plate will put a negative pulse on the grid and *vice versa*. When the circuit is first turned on, a small random positive signal may appear on the grid. Because of the high tube amplification this will result in a much larger negative signal on the plate. This, fed back to grid by the transformer, increases the grid's positiveness and this action builds up so fast that the result is a very sharp and high-amplitude positive grid pulse. This makes the grid draw a large, sharp pulse of current. The current passes through the resistance of R_3 and R_{3a} in series, creating a large voltage drop across the resistance, with the negative end of the voltage at grid. The negative voltage charges up the two capacitors C_4 and C_5 in series, and the negative grid voltage resulting cuts off the tube. This fast negative capacitor charge corresponds in time to the "flyback" or vertical position of our sawtooth wave. Because of the high tube amplification the negative charging pulse is very large and narrow so that practically no time is required to charge the capacitors. This affords a very steep flyback.

The tube is now cut off. The capacitors can discharge only through the resistors, and this takes a definite time; it is relatively slow and corresponds to the diagonal part of the sawtooth wave.

As soon as the capacitors have discharged sufficiently to take the grid voltage above the cutoff point, the whole action begins again and another sawtooth wave is created. The sawtooth waves exist across the two capacitors in series. Output is taken from between them. Since the lower one C_5 is 10 times the value of C_4, it has only one-tenth the reactance, so that the output impedance is relatively low and at the same time the output lead is well isolated from the tube grid. Isolation is so good that the output lead may be almost shorted to ground without any material effect on operation of the generator.

So far, we have described the generator stage as free-running—constantly

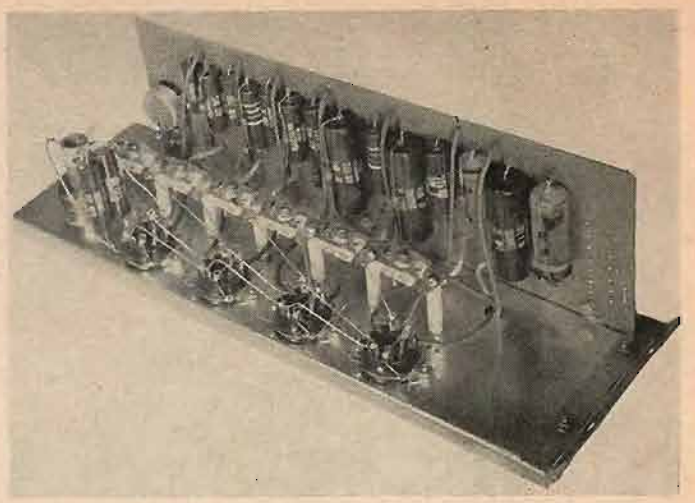


Fig. 5. "Inside" of completed tone generator chassis.

oscillating at a frequency determined by the values of resistance and capacitance (because they determine how soon the capacitors will discharge). What we actually want is to synchronize the frequency of this first blocking oscillator to that of the master oscillator so that both will run at the same frequency, with the master oscillator controlling. This is done simply by feeding d.c. to the master oscillator plate through the plate winding of T_1, and setting the R and C of V_{1b} for a free-running frequency somewhat below the final frequency desired. When a negative oscillator pulse passes through the winding it adds to the negative pulse beginning to build up because of the blocking-oscillator action and fires the blocking oscillator. Since the blocking oscillator fires once per master oscillator cycle, the frequency outputs of the two are identical.

The next blocking oscillator V_{2a} operates in the same way as the first with two exceptions. First, its R and C are chosen for a free-running frequency slightly less than half of the first stage. Second, synchronizing pulses are fed to its plate capacitively from V_{1b} through C_6 This stage, therefore, produces a frequency exactly half that of V_{1b}, or one octave below it. The other blocking oscillators divide in the same way.

Selected components are impractical for kit construction since in order to make the selection the generator would have to be assembled before shipping. All the components, therefore, are standard values—10 per cent tolerance resistors and capacitors and normal production tolerances on tubes and transformers. The necessary adjustment for the first blocking stage is provided by R_3, which adjusts the free-running frequency until the stage locks in with the master oscillator. For the remaining stages the variable factor is the amplitude of the sync, for which the trimmers C_6, C_9, C_{12}, C_{15}, C_{18}, and C_{21} are used. If the free-running frequency of a stage is far below that desired, more sync is obtained by tightening the trimmer; if it is almost correct, only small sync is required and the capacitor may be nearly open. This system has the additional advantage that future corrections may be made for resistors and capacitors which change value with age, as well as for changing tube characteristics, without major surgery. Such adjustments are rarely needed normally, but the fact that they can be made solves a possible problem. The design also cheapens the kit since perfectly standard parts can be stocked and shipped with no labor necessary for special selection.

The 18,000-ohm resistors R_{10} through R_{16} merely place a constant load across the output so that the changes between no load and that imposed when a tone is keyed will make minimum difference in the circuit and lower-frequency tones will not be affected. They also serve to keep the capacitors discharged so that they will not cause clicks or pops when the tones are keyed.

Figure 5 shows the inside of a completed generator chassis. There is a metal chassis to hold the tubes and transformers and a large etched-circuit panel mounted on it at right angles to hold almost all the other components. There is a hinge on the bottom of each so that it can be lowered for inspection or adjustment without being disconnected. A screw and thumbnut at the top holds each in place in normal operation.

The organ is tuned with the variable iron core of each of the twelve master oscillator coils, and the generators need not be swung out on their hinges for the purpose. To facilitate initial adjustment the coils are furnished pretuned. Final tuning can be done by anyone, either with a simple system given in the instruction sheets for final assembly or with the aid of the company's demonstration record which most constructors will have and which contains twelve recorded tones on one side especially for this purpose.

In next month's article we shall describe other sections of the Schober Organ Kits.

HIGHWAY HI-FI

(from page 17)

ing of the stylus in the groove. The arm assembly is also counterbalanced around its vertical viscously damped axis. This prevents the development of torsional forces around the vertical axis of the pickup arm which would produce acceleration components in a radial direction of the record.

Figure 3 shows the player when pulled out from its housing, detached from the car.

To start the record, one presses a tab protruding from the left side of the pickup arm, thus disengaging the arm from its resting position, and moves the arm to the right until it hits a stop. Now the pickup is automatically set down on the lead-in spiral of the record, and the turntable starts to rotate automatically too. This mode of operation makes it possible for the driver, once familiar with his instrument, to place a record on the turntable and start playing it without having to take his eyes off the road. The record cannot be damaged by sliding the arm across it because the arm is rigid in a vertical plane and the only force asserted by the stylus against the record is the spring pressure of 2½ grams, which will not produce an audible scratch on the record.

The player mechanism is mounted on a specially-designed rubber shockmount system which has a sufficiently low natural period to filter out harmful shocks and vibrations, at the same time preventing these from being translated into torsional components in the plane of the record. The most vehement acceleration or deceleration of the car, or driving over bad road conditions will not cause the stylus to leave the groove or create any audible effect.

A great deal of attention had to be paid to the constancy of speed. The possibility of wow has been eliminated by the type of drive applied to the turntable, and variations in speed due to supply voltage changes have been taken care of by the use of an a.c. induction type motor and a 60-cycle vibrator which provides substantially constant turntable speed for primary voltage variations from 10½ to 16 volts.

The player contains a half-inch-high record storage compartment for six records (equal to a maximum of 12 hours listening) in the bottom of the player where a spring and pressure plate insure that the records will stay flat, even under the maximum temperatures encountered in the car (such as when parked in the sun with windows closed). A separate storage compartment for an additional 25 records will also be made available.

The cartridge employed has been spe-

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cially developed for this use in cooperation with Shure Brothers, and is of the ceramic type. The frequency characteristic of the cartridge is such that when playing the new automobile records through a flat amplifier, the resulting response will be substantially uniform between 50 and 10,000 cps.

The output of the ceramic cartridge is sufficient to play it through the audio portion of the automobile radio without need of a preamplifier. The audio section of the automobile radios for all 1956 Chrysler Corporation cars have been modified to take advantage of the record player fidelity and are also provided with a five prong jack for connection to the record player.

Acknowledgment

The author wishes to express his gratitude for the untiring assistance given him by his associates in the CBS Laboratories, especially John W. Christensen, Rene Snepvangers, Daniel Doncaster, Wilbur Clade and Thomas Broderick; by his associates in the Columbia Records Division, William Bachman, Al Ham, and Herbert Greenspon, and in the Chrysler Corporation Engineering Division by Phil Kent and Robert Stinson. Special appreciation is due to James Conkling, President, and Goddard Lieberson, Executive Vice President of Columbia Records for their continuous encouragement and cooperation. I also wish to thank Peter Goldmark, Jr. for his advice concerning elastic suspension and his helpful assistance during the many test drives.

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PROFESSIONAL DIRECTORY

IN MEMORIAM
IRVING GOLIN

The Recall of an Executive

On Friday night, November 4th, 1955, Irving Golin, President of University Loudspeakers, Inc., passed away.

Irving Golin was more than merely a successful businessman . . . he was an Executive worthy of the title, a man who could lead others and remain unchanged by the experience. He was a young man, only 46; but he led a full life. He had gained recognition from his fellow man and the love and respect of his family. One could count only friends among the acquaintances of this man whose shadow crossed the paths of many.

Irving Golin was an unassuming man. It is doubtful whether he appreciated the stimulating effect of his personality upon others. He was a reservoir of strength to many; an inspiration to all who had the good fortune to know him. His trademarks, a broad, winning smile and homespun philosophies, never once left him during the last and most trying year of his life. Always tolerant of the problems and troubles of others, he carried his own with dignity and in silence.

His imprint in the affairs of his community and the philosophies of his business is indelible. Those who knew him will never forget him; those who loved him cannot.

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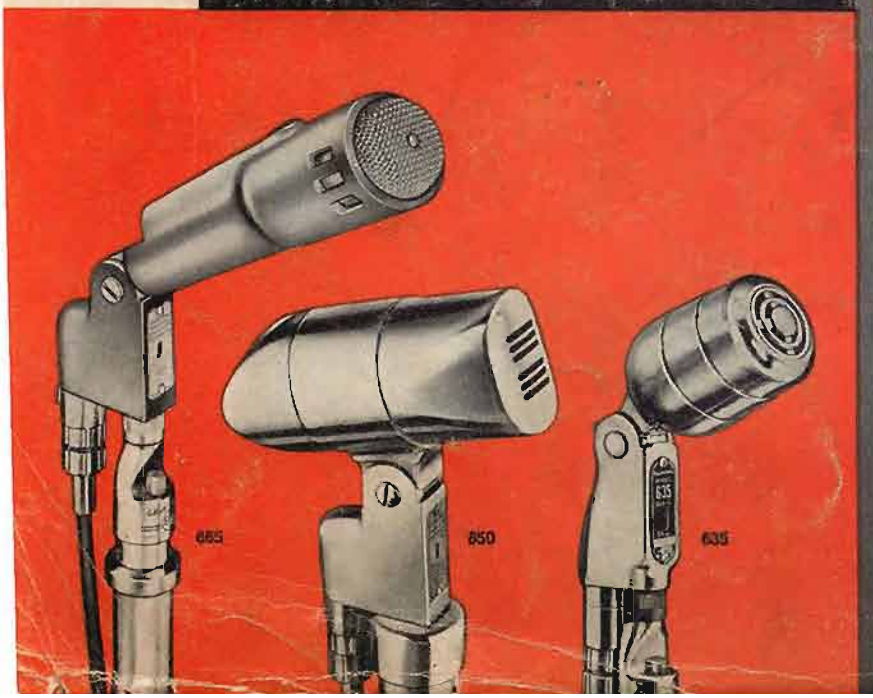

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