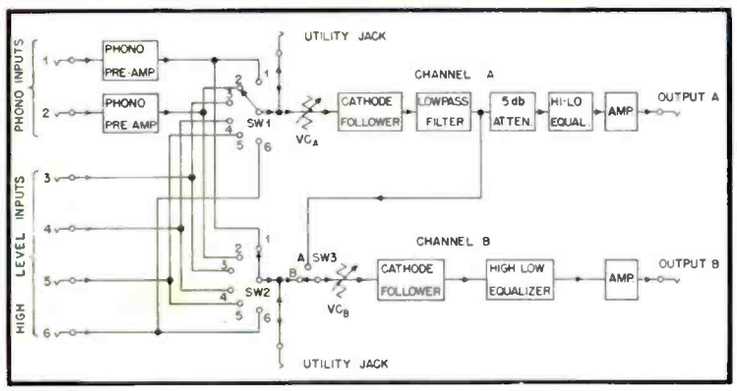
AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

MAY, 1954

50c



A control amplifier which can be used as the input section of a complete stereo system or which serves equally well for dually-distributed single-channel sources is described thoroughly by one author. *See page 17.*

Hi-Fi-Manship—or how to be an audio expert with a minimum of real knowledge. For example, you can confuse most of your musician friends with 'scope-reproduced music. *See page 20.*

DUAL-CHANNEL CONTROL AMPLIFIER FOR STEREO

THEORY AND PRACTICE OF HI-FI-MANSHIP

BUILDING YOUR OWN HI-FI FURNITURE

NOMOGRAPH FOR BASS-REFLEX ENCLOSURE DESIGN

WHAT'S *new* IN TAPE RECORDING

Here's a professional magnetic sound recording tape that offers a new high in *permanence* and durability. It can be used and stored under the most extreme conditions of temperature and humidity without any ill effects. For all practical purposes, it is virtually *unbreakable*. Now available on 1, 1½ and 2 mil Mylar*, in standard sizes from 600 to 2,500 ft. Write for Bulletin No. 201.

The new EP Audiotape provides the *extra precision* that is so important to *dependable* magnetic data recording and reproduction. It is especially produced to meet the most exacting requirements for uniformity and freedom from microscopic imperfections. Available in ¼" to 2" widths, 1,225 to 5,000 feet. Write for Bulletin No. 207.

Audiotape, now available on green, blue or brown plastic base — and Audiotape reels in red, yellow, green, blue and clear plastic — provide *instant identification* that can simplify your cueing, filing, recording and playback problems. Write for Bulletin No. 209.

AUDIO DEVICES, Inc.

Dept. A1, 444 Madison Ave., New York 22, N. Y.

Export Dept., 13 East 40th St., New York 16, N. Y., Cables "ARLAB"

THEY SPEAK FOR THEMSELVES

MAY, 1954 VOL. 38, No. 5
Successor to RADIO, Est. 1917.

AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

CONTENTS

AUDIO (title registered U. S. Pat. Off.) is published monthly by Radio Magazines, Inc., Henry A. Schober, President; C. G. McProud, Secretary. Executive and Editorial Offices, 204 Front St., Mineola, N. Y. Subscription rates—United States, U. S. Possessions and Canada, $3.00 for one year, $5.00 for 2 years; elsewhere, $4.00 per year. Single copies 50c. Printed in U. S. A. at Business Press, Inc., 10 McGovern Ave., Lancaster, Pa. Entered as Second Class Matter February 9, 1950 at the Post Office, Lancaster, Pa. under the Act of March 3, 1879.

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

AUDIO PATENTS

RICHARD H. DORF*

THERE MUST BE a great many devices and circuits which I don't need but which other people do. I know the reverse is true; I am always doing some kind of development work calling for circuits, tools, and materials which apparently no one has ever thought would be necessary and which are therefore unavailable. In fact, it seems that almost anything I need falls into this category. Probably some day some philosopher-engineer will develop a theory to cover it, in the nature of a sequel to the POIO (Perversity Of Inanimate Objects) theory so ably expounded some years ago in, I believe, *CQ*.

So I have no hesitation in reporting a patent on a circuit which has all the earmarks of being extremely useful, even though I can't personally think of a great many uses for it. It is a signal level indicator which shows when a signal is equal to a reference voltage. The patent, No. 2,658,167, is the brainchild of James S. Harris and it is assigned to RCA.

The circuit of the invention is shown in *Fig.* 1. It is a differential amplifier with neon lamps in the plate circuits. The normal way of indicating whether a signal is equal to a reference signal uses substantially the same circuit, except that neon lamps N_1 and N_2 are replaced by load resistors and a zero-center meter is connected between the tube plates. When the d.c. signal on the grid of V_1 is equal to the reference signal selected for the grid of V_2 with the movable arm (in practice usually a potentiometer across the B-supply) the plate voltages are equal and the meter reads zero.

Some expense is entailed in using a meter and it is subject to burnout. Neon lamps can burn up too, but they are much cheaper. So the inventor uses neons and the circuit works as follows.

The input signal is in the form of d.c. of positive polarity with respect to ground. It may be obtained by rectifying the a.c. signal whose level is to be monitored. Or it may simply be a d.c. voltage the value of which is to be watched. The reference voltage applied to the grid of V_2 is that which the signal voltage is supposed to equal at optimum indication.

If the signal voltage is zero, the positive voltage on the grid of V_1 causes large V_1 plate and cathode current. Both cathodes become very positive and V_2 operates like a grounded-grid amplifier. Its cathode being very positive with respect to its grid, its plate current is very small or cut off entirely. The latter is usually true because the positive reference voltage is usually several times the value of the negative cutoff voltage for a tube of the type. The gain of V_2 as a cathode follower (R_2 is usually rather large) is enough to transmit a large portion of this reference voltage to V_1 as negative bias.

In sum, therefore, if the signal input is zero, V_1 is cut off and N_1 does not light. V_2 is, however, conducting the maximum current allowable by the positive grid voltage selected and N_2 is burning brightly.

When the signal input applied through current-limiting resistor R_1 rises, it causes gradually increasing plate current through V_1. This is also cathode current through R_2, causing both cathodes to go more positive. Now V_2 acts as a grounded-grid amplifier and the increased positive cathode voltage caused by conduction of V_1 makes the V_2 grid more negative and decreases V_2 conduction. Note, therefore, that any change in either reference or signal voltage not only alters conduction through its own triode, but causes an opposite-sense change in the other tube. That is why this is a *differential* amplifier; it "accentuates" the effects on plate voltages of differences between the grid voltages.

When the signal, then, comes close to the same value as the reference voltage, each tube begins to affect the other equally. The plate voltages are then more or less similar and both lamps light at medium brilliancy. And as the signal goes more positive than the reference, the increased V_1 conduction causes enough decrease in V_2 conduction to darken and then extinguish N_2.

The condition where signal is equal to reference is indicated when both lamps are alight with equal brilliancy. If great accuracy is not important, the mere simultaneous firing of both lamps can be taken as the indication, since neons will not fire at all below a certain voltage. The range to either side of actual signal-reference equality over which the lamps will both light can be adjusted in design. It is narrowed by using high-mu triodes, since the extra gain heightens the differential action. It is also narrowed from the percentage standpoint if both reference and signal are as large as possible, since the firing voltage of the lamps remains constant.

When the reference voltage is large (several times cutoff), the tubes tend to act as constant-current devices so that the fairly large differences normally found between the impedances of neon lamps even of the same type are of little importance and currents through the tubes are determined almost entirely by the signal level. This also tends to minimize differences between the firing voltages of the lamps and renders the whole action repeatable and accurate within the desired limits without special selection of lamps.

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

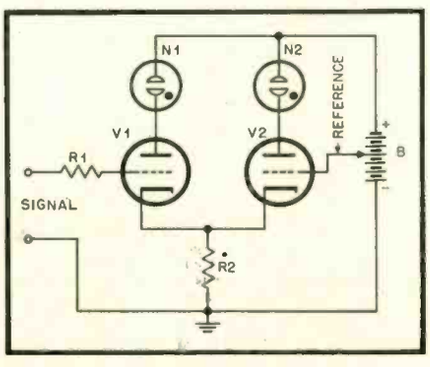


Fig 1

Outstanding Value

PRESTO SR-11 STUDIO CONSOLE TAPE RECORDER

For the first time . . . a precision Presto tape recorder complete with amplifier in studio console cabinet for less than $1000. Here are the facts about this amazing value:

The R-11* Mechanism Here is the smooth operating, sleekly designed tape transport unit that drew engineers acclaim when it was introduced last year. Embodies the exclusive Presto capstan drive unit where pressure pulley and solenoid are mounted on a single sub-assembly for easy maintenance. Capstan and motor are interconnected by a belt. Two torque motors, each including its own brake system (external contracting type) assure smooth, positive action without the usual hazard of tape breakage. If tape does break, an automatic safety switch instantly stops the mechanism.

The Amplifier Actually there are two separate chassis for amplification. One contains the recording and reproducing channels. The second is the power supply located at the base of the console. This arrangement reduces noise and keeps operating temperature down.

The Console Cabinet Presto's designers have given particular attention to accessibility of every part of the SR-11. The top panel swings upward on a sturdy hinge to expose the underside of the tape mechanism, while the amplifier opens from the front and turns over on gimbals for access to tubes.

Ask your Presto distributor to order your SR-11 today. You'll never match it in value or performance.

*formerly RC-11

- Three triple shielded magnetic heads
- Frequency response: 50 to 15,000 cps. (15"/sec.)
- 55 db signal to noise ratio (at 2% distortion)
- Flutter: less than .15% (15"/sec.)
- Push button function switches
- Will accommodate reels up to 10½"

$995 COMPLETE with amplifier in console cabinet

PRESTO RECORDING CORPORATION

PARAMUS, NEW JERSEY

Export Division: 25 Warren Street, New York 7, N. Y.
Canadian Division: Walter P. Downs, Dominion Square Bldg., Montreal

WORLD'S LARGEST MANUFACTURER OF PRECISION RECORDING EQUIPMENT AND DISCS

The patent specifications give variations on this basic circuit for use when the signal is very large and where different and specified accuracy limits are desired.

A Little Relaxation

This is the forty-seventh consecutive month of appearance of the Patents articles in AUDIO (né Æ) and I have so far refrained from describing a patent of my own. However, I strongly suspect that even audio people relax sometimes, so here comes a description of a game I invented some time ago which is ideally suited for construction by people handy with a soldering iron. The patent is numbered 2,562,179 and it is so far unassigned (this is a gentle hint to any interested manufacturer).

It is (don't hit me, Mother) a quiz game of an unusual type calling for trigger reflexes. The diagram is in *Fig.* 2. Three relays are provided, one for each player, with a lamp connected across each relay. Each player (A, B, and C) operates a bank of four switches, and a master player operates a 4-position selector switch. The master switch is hidden from view so that nobody but the master player can tell what position it's in. Here's how the thing works.

The master asks a question and gives four possible answers, having previously set his selector switch on the number corresponding to the right answer. The first of the three players who decides which is the right answer hits his switch corresponding to the number of the answer. That energizes his relay and light. But note that current from the negative end of the battery reaches each relay only through the normally closed contacts of the other two relays. So, when one player's relay is energized, its contacts open, and no other player can thereafter energize another relay and light. It's simply a "lockout" circuit, which automatically determines which of the three answered first, even if he was only a fraction of a second sooner than the others.

The first answerer, of course, has to have the *right* answer, which he signifies by closing the proper switch. If he closes the wrong one, nothing will happen because the master's selector switch channels battery-plus voltage only to the correct switches on the three player positions.

The game can be played any number of ways in addition to using the straight multiple-choice question technique. You can leave the master switch on position 1, for instance, and turn on the radio to a drama or news show. Then the first player to push his No. 1 button after the speaker says, for

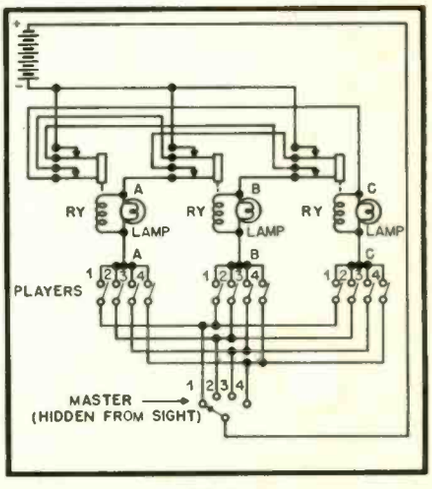


Fig 2

the NEW HARMAN-KARDON HIGH FIDELITY FM-AM TUNER

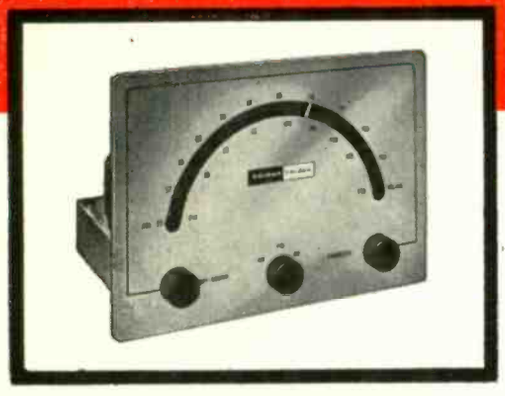
A magnificent high fidelity instrument at a sensational price

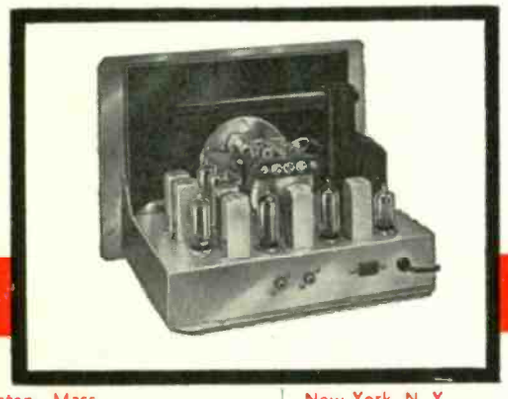
$49.50

MODEL A-100

CHECK THESE OUTSTANDING FEATURES:

- Separate AM and FM Front Ends
- Low Noise FM Front End Using Grounded Grid Amplifer
- Automatic Frequency Control
- AFC Defeat Switch Combined with Tuning Control
- FM Sensitivity Comparable With Most Expensive Tuners
- Foster-Seeley Discriminator
- Exclusive "Shaft Of Light" Dial Pointer
- Precision Flywheel Tuning
- Rotatable High Efficiency AM Loopstick Built-In
- Built-In Power Supply and Bottom Plate
- Simplest Possible Cabinet Installation
- Decorator Styled Front Panel: Brushed Copper With Wrought Iron Black Markings





This new FM-AM tuner, the product of Harman-Kardon, Inc., New York provides performance and operational features normally found only in the most expensive equipment

MODEL A-100

SENSITIVITY: FM 8 microvolts for 30 db quieting. AM 100 microvolts per meter

SELECTIVITY: 6 db down at 200 kc Discriminator peak to peak separation 400 kc

FREQUENCY RANGE: FM 88-108 MC AM: 530-1650 KC

TUBES: (Total 7) 2-12AT7, 1-6BE6 1-6BA6, 2-6AU6, 1-6AL5 Plus selenium rectifier

AUDIO OUTPUT: 1 VOLT

HUM LEVEL: 65 db below rated power output

FREQUENCY RESPONSE: ±.5 db 20-20,000 cps

POWER CONSUMPTION: 25 watts

AUDIO DISTORTION: Less than 1% at rated output

FM DRIFT: ±20 KC (Maximum)

DIMENSIONS (Including Escutcheon): 7¾" H, 11" W, 7½" D

A product of HARMAN-KARDON, Inc.
52 WEST HOUSTON ST., NEW YORK 12, N. Y.

Nationally Advertised

Boston, Mass.
RADIO SHACK
Corporation
167 Washington St.
LAfayette 3-3700

New York, N. Y.
HUDSON RADIO & TELEVISION Corp.
48 West 48 St.
CI 6-4060

Chicago, Ill.
ALLIED RADIO
Corporation
100 N. Western Ave.
HAmarket 1-6800

Philadelphia, Pa.
RADIO ELECTRIC SERVICE CO. OF PA., Inc.
709 Arch St.
LOmbard 3-7390

New York, N. Y.
LAFAYETTE RADIO
100 Sixth Ave.
RE 2-8600

Pasadena, Calif.
HIGH-FIDELITY HOUSE
536 South Fair Oaks
RYan 1-8171

Washington, D. C.
ELECTRONIC WHOLESALERS Inc.
2345 Sherman Ave.
HU 3-5200

New York, N. Y.
LEONARD RADIO
69 Cortlandt St.
COrtlandt 7-0315

San Francisco, Calif.
EBER ELECTRONIC SUPPLY
160 Tenth St.
MArket 1-4333

MAIL TODAY FOR INFORMATION

Harman-Kardon, Inc., Dept. A-5
52 West Houston Street
New York 12, N. Y.

Gentlemen:

Please send literature on the Model A-100 Tuner and the other Harman-Kardon products.

Name_____

Address_____

City_____ Zone____ State_____

example, a proper name (or a numeral, or a geographic location, etc.) gains the point.

However you play it, it's not for people with weak hearts. There's a strong tension all the time because each player is using his mind and simultaneously keeping himself keyed up physically so he can hit that button first!

The whole thing can be built into a shallow box about 18 × 10 or 12. I used ordinary flashlight batteries (four of them) in a model, and 6-volt d.c. relays with 6–8-volt radio pilot lamps. The contacts for the players were old relay springs and metal screwheads, while the master switch was four screwheads on the panel and a relay contact which swiveled on a screw. Relays and wiring were in the box under the panel, with lamp bulbs poking their noses up through holes in front of the players.

Playing this game for a couple of hours can make a nervous wreck of you and your friends (or children), but it may give the power tubes in your new amplifier a chance to cool off for a while.

COMING EVENTS

May 3–14—British Industries Fair. Olympia and Earls Court, London, and Castle Browmwich, Birmingham.

May 3–5—75th Semiannual Convention of the Society of Motion Picture and Television Engineers, Statler Hotel, Washington, D. C. Fifty technical papers are scheduled, including fifteen covering the history of the motion picture art—cameras, projectors, films, etc.

May 5–7—IRE Seventh Region Conference and Electrical Exhibit. Multnomah Hotel, Portland, Ore.

May 7–8—New England Radio Engineering Meeting, IRE. Sheration Plaza Hotel, Boston, Mass.

May 25–27—Eighth NARTB Broadcast Engineering Conference. Palmer House, Chicago, Ill.

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

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

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

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

Oct. 13–16—The Audio Fair, Hotel New Yorker, New York City.

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

BEAM

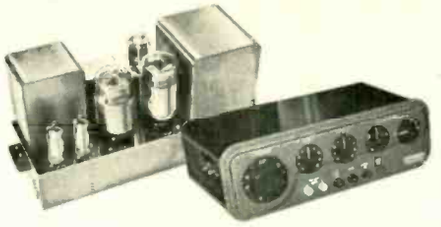
BRINGS YOU THE FINEST

QUALITY, VALUE and PERFORMANCE

ACOUSTICAL

QUAD II

AMPLIFIER & CONTROL UNIT



Finest in appearance . . . efficient in design . . . superb in performance and workmanship . . . this is the British-made Acoustical Quad II Amplifier and Q.C. II Control Unit.

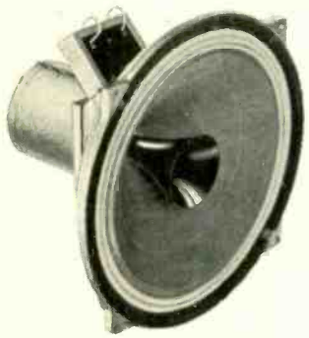
The Quad features high sensitivity from 1.5MV., full-range fidelity, 10 to 60,000 cps., within ½ db; independent harmonic filtering, freeing bass and treble controls for setting *perfect musical balance* without distortion or loss of harmonics; push-button equalization and channel selection; plug-in matching to your choice of pick-up, automatically correcting for *best sound, least noise;* adjustable bandwidth and slope of roll-off; stable balanced feedback throughout, and a full 15 watts of audio output 20-20,000 cps. from the 14 section output transformer.

Add the graceful, richly finished styling – the most functional in high fidelity today – and you have good reason to see and hear the QUAD at your earliest opportunity.

System Complete . . . . . $237.50 net
Quad II Amplifier alone . . . . . $130.00 net
Q.C. II Control Unit alone . . . . . $120.00 net

W/B †STENTORIAN®

FULL RANGE SPEAKERS



Full-range high fidelity loudspeakers in a wide range of types and sizes, for every audio purpose – these are the British-made W/B Stentorian speakers. Never before has such superb response, dynamic realism and high magnet sensitivity been achieved in a speaker anywhere near the Stentorian's prices. No speaker at *any* price has all the exacting precision features of the Stentorian Duplex Twin-Concentric 12" and 10" models: patented LF diaphragm of impregnated uncured cambric; die-cast chassis; phase-matched high frequency horn formed by machined magnet center pole; frequency response 20 to 20,000 cps; bass resonance 35 cps.; and built-in crossover network. 12"• Duplex model, (20-20,000 cps), *15 watts,* $99.50. 10"• Duplex model, (30-16,000 cps), *10 watts,* $44.50. All W/B Stentorians are beautifully finished in crackle gold. All voice coil and input impedances are 15 ohms.

†Leaders in loudspeaker manufacture for over 30 years

Send for complete literature on these superior audio products

BEAM INSTRUMENTS CORPORATION

350 FIFTH AVENUE, NEW YORK 1, N. Y.

STENTORIAN HF TWEETERS

3,000-20,000 cps. Hear the difference. T-10, *5 watt,* $17.95 T-12, *15 watt,* $45.00

CROSSOVER NETWORK

Crossover at 3000 cps. 15 ohm input and both output impedances. **$7.25**

BEAM HIGH FIDELITY ENCLOSURES

Corner and wall bass reflex types. Gibraltar canstruction, superb finishes, perfect acoustical designs from **$89.50**

STENTORIAN 18" WOOFER

Giant of pure LF sound, 2½" voice coil, 25-6,000 cps. Die-cast chassis. *30 watt* rating. Crackle gold finish. **$139.50**

Beam also brings you a complete line of extended range, high fidelity Stentorian direct radiators; all with the new patented W/B diaphragm. Audition and compare them for price and performance to prove their outstanding value: Model HF 12135*, 25-14,000 cps, 12", $39.50, *15 watt;* HF 1012*, 30-14,000 cps, 10", $14.95, *10 watt;* HF 912*, 40-13,000 cps, 9", $11.55, *7 watt;* HF 810, 50-12,000 cps, 8", $8.95, *5 watt;* HF 610, 60-12,000 cps, 6", $6.95; HF 510, 100-12,000 cps, 5", $6.55.

*Precision Die-Cast chassis.

LETTERS

Cross-Coupled Inverter

SIR:

Several articles have appeared in AUDIO extolling the virtues of the cross-coupled phase inverter. The "Golden Ear" amplifier and the "Powertron" amplifier both use this inverter in a circuit that, in my experience, is less than satisfactory.

The high-frequency response of this inverter is considerably inferior to the split-cathode type. Working with the cross-coupled phase inverter, I have used both high- and low-mu tubes with plate-loaded resistors ranging from 220,000 to 22,000 ohms. In all instances, the response began to droop at 10 kc, and from there on continued down at an increasing rate. These results were borne out in square-wave analysis. At 5 kc considerable deterioration of the square wave was noted. At 10 kc the original waveshape was almost unrecognisable. It seems illogical to design an amplifier with extreme bandwidth and then to use this inverter.

The excellent low-frequency response of the cross-coupled phase inverter seems to be its chief advantage, coupled with its provision for perfect dynamic balance. However, when this inverter is direct-coupled to the driver tubes and negative feedback is used, serious trouble is experienced with the biasing of the drivers. The feedback injected at the grid of one of the phase-inverter amplifiers upsets the dynamic balance of the circuit. This unbalance seems to be proportional to the feedback factor. Dynamic balance can be restored by the balance control, but only at the expense of the static balance of the entire circuit. Since the drivers obtain their grid-bias voltages from the plate circuits of the phase-inverted tubes, serious distortion results. It is impractical to compensate for this, since this bias shift is in a negative direction on one tube and positive on the other.

On an amplifier using this circuit, the following results were noted. As the feedback factor was increased from 0 to 20 db, dynamic balance held constant, the bias on the driver tubes changed from −7 volts on both tubes to +2 volts on one and −16 volts on the other. This bias-voltage spread increased as the balance control was reset and as feedback was increased. An amplifier using this circuit exhibited 3 per cent intermodulation distortion at 10 watts without feedback. With 10 db feedback the intermodulation was down to 0.75 per cent, but from this point the distortion increased with each increase of feedback. At 10 watts output with 20 db feedback, 18 per cent intermodulation was noted. As an experiment, the feedback was injected at the unused grid of the cathode follower in the cross-coupled phase inverter. Considerable improvement was noted. Feedback could be increased to 18 db with approximately 0.2% IM distortion at 10 watts. Increasing feedback from this point on gave a repetition of previous findings. The amplifier used on these tests was completely stable at all times and checks were made for dynamic balance during all tests. IM was tested with 60 cps and 4 kc in a 4:1 ratio.

As a double check, the cross-coupled phase inverter was replaced with the Williamson-type split-cathode inverter. Distortion could be decreased considerably by increasing the feedback factor to 25 db. It was noted, however, that there was a serious loss in low-frequency stability at all degrees of feedback.

GEORGE VARKONYI
116 Pinehurst Ave., New York 33, N. Y.

L Versus C

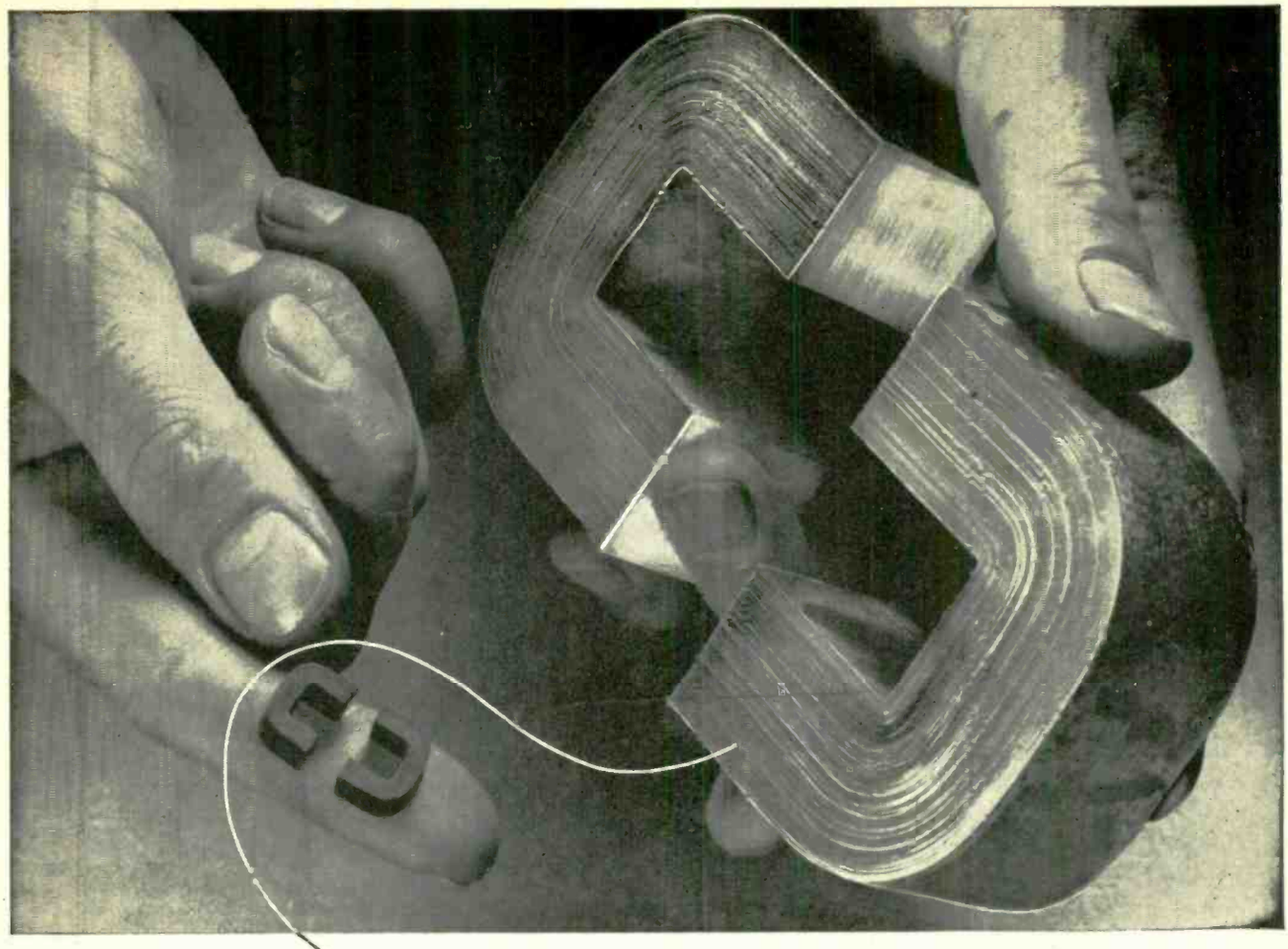
SIR:

Mr. Barber's article in the March issue on the variable low-pass filter mentions "serious disadvantages" of circuits using inductors. I think these disadvantages are overrated.

Hum pickup is purely a problem of correct location of the inductor in the circuit and on the chassis. Ringing is a function of the curve shape; when inductive circuits are proportioned to have the shape of Mr. Barber's slopes they do not ring any more than his do. Transient response is identical with capacitive and inductance curves of the same slope.

Possibly the only really valid criticism of inductive circuits is that they are much harder for the home constructor to work with since procuring inductors with just the right inductance and Q is both difficult and expensive. However, in commercial designs, a part of the development and production engineering process is quite normally the determination of exact values and procurement, without special expense, of specially made inductors for the production run. Inductive circuits are used with complete success—and, in fact, superior versatility and effectiveness—in a number of commercial units.

I. A. KOOL
137 Circle Road
Ile Bigras, P. Q. Canada



SILECTRON C-CORES... BIG or LITTLE

...any quantity and any size

Wound from precision rolled oriented silicon steel strip as thin as .00025"

W&D 4363

For users operating on government schedules, Arnold is now producing C-Cores wound from ¼, ½, 1, 2, 4 and 12-mil Silectron strip. The ultra-thin oriented silicon steel strip is rolled to exacting tolerances in our own plant on precision cold-reducing equipment of the most modern type. Winding of cores, processing of butt joints, etc. are carefully controlled, assuring the lowest possible core losses, and freedom from short-circuiting of the laminations.

We can offer prompt delivery in production quantities—*and size is no object, from a fraction of an ounce to C-Cores of 200 pounds or more.* Rigid standard tests—and special electrical tests where required—give you assurance of the highest quality in all gauges. ● *Your inquiries are invited.*

THE ARNOLD ENGINEERING COMPANY

SUBSIDIARY OF ALLEGHENY LUDLUM STEEL CORPORATION

General Office & Plant: Marengo, Illinois

DISTRICT SALES OFFICES . . . New York: 350 Fifth Ave.

Los Angeles: 3450 Wilshire Blvd. Boston: 200 Berkeley St.

London Letter

RICHARD ARBIB*

A GRAMOPHONE or, as you call it, PHONOGRAPH, specifically designed to be heard above the whine of shells and rifle bullets would hardly be thought to be connected with the pressing of nine million LP records, yet there is a direct connection.

E. L. Lewis, Managing Director of the English Decca Record Company, has just announced that since the introduction of LP records by his Company in England they have pressed nine million. The history of the Decca Record Company is indeed a romance, and goes back more than a hundred years. About 38 years ago Barnett Samuel, a musical instrument maker in the City of London, realised that the only portable gramophone that was then on the market was difficult to hear in the dug-outs of the trenches in France in the 1914–18 War because of the noise of the constant bombardment.

The first gramophones had, of course, external horns, and when (about 1912) the first hornless models were produced by taking the horn into the cabinet, quality of reproduction had been sacrificed to achieve good appearance. The early portable was merely a table model with a lid thereon. and in order to produce a reasonably compact machine the horn was reduced to minute proportions, for the spring driven motor occupied most of the case.

In setting himself up a a gramophone manufacturer Barnett Samuel had the bright idea that by making the lid of a portable machine double the depth of the body a much larger horn could be incorporated in the lid than the other manufacturer was placing in the body. He called the new portable "Decca," and in the latter years of the First Great War the greatest prize which an English officer could take back to the Front was a "Decca" gramophone, for the volume produced by it was at least double that of any other portable machine.

In the gramophone boom of 1929, when the shares of a new gramophone or record company were listed on the London Stock Exchange nearly every week, an enterprising stockbroker called Lewis launched as a Public Company the then Barnett Samuel family business. Calling it the Decca Record Company he claimed that its interests would be expanded by making records as well as machines. When the crash came in the early 'thirties, and the various gramophone companies folded up as quickly as they had been formed, Lewis took over the personal management of the Decca Company, and despite the dismal prophecies made by the Trade generally, he gradually established the sales of Decca records. A few years later he started the American Decca Company, but during the 1940–45 War it had to be sold to provide much needed dollars for the British Treasury.

First FFRR Records

At the close of the War, in 1945, Decca brought out what was claimed to be the first high-fidelity record, which was termed ffrr—full frequency range recording. In America the records could not be issued under the "Decca" trademark, and they were therefore sold as "London" records. The position at the present time is that the bulk of the records sold in the U.S.A. under the "London" trademark are pressed in Decca's two English factories, one of which is strategically placed near Southampton so that the records can be easily shipped on board the trans-Atlantic liners. Excellent relations exist between the English and American Decca Companies, and American "Decca" records are now pressed in England by the English Decca Company and sold in this country under the "Brunswick" trademark. Decca are also responsible for issuing the American "Capitol" records.

In 1950 the prophets once again said that Lewis had made a mistake by issuing the first English long-playing records. Nevertheless, they were confounded, with the result that two years later the great E.M.I. Combine had to try and catch up the leeway they had lost, and they too commenced to market LP records. The two years, however, enabled Decca to establish their brand among high-fidelity enthusiasts in England, and in consequence at the present time many more Decca LP records have been issued than all other British makes combined. It must be remembered that when Decca started issuing LP records in June 1950 they had tremendous odds to fight against, for EMI phonographs commanded the bulk of the sales of machines, and these were not fitted with three-speed motors and E.M.I. resolutely refused to market three-speed machines until 1952. But for the business Garrard had been undertaking in the U.S.A. in record changers and players, and the fact that they made their three-speed machines available in the Home market (and were closely followed by Collaro), it is doubtful whether Decca would have made the progress they have achieved in the last four years.

The ex-stockbroker, E. L. Lewis, can therefore be justly proud of his Company's achievement in pressing nine million records in under four years.

1. The industry's biggest, heaviest and finest magnet, 10½ pounds of Alnico V metal, providing the highest possible fidelity and efficiency.

2. Center pole piece, a special alloy of low-carbon dynamo steel; makes the fullest use of the power of the magnet.

3. Phasing plug—indispensable for improving high-frequency response.

4. The pressure-type high-frequency tweeter is mounted coaxially through the woofer pole piece.

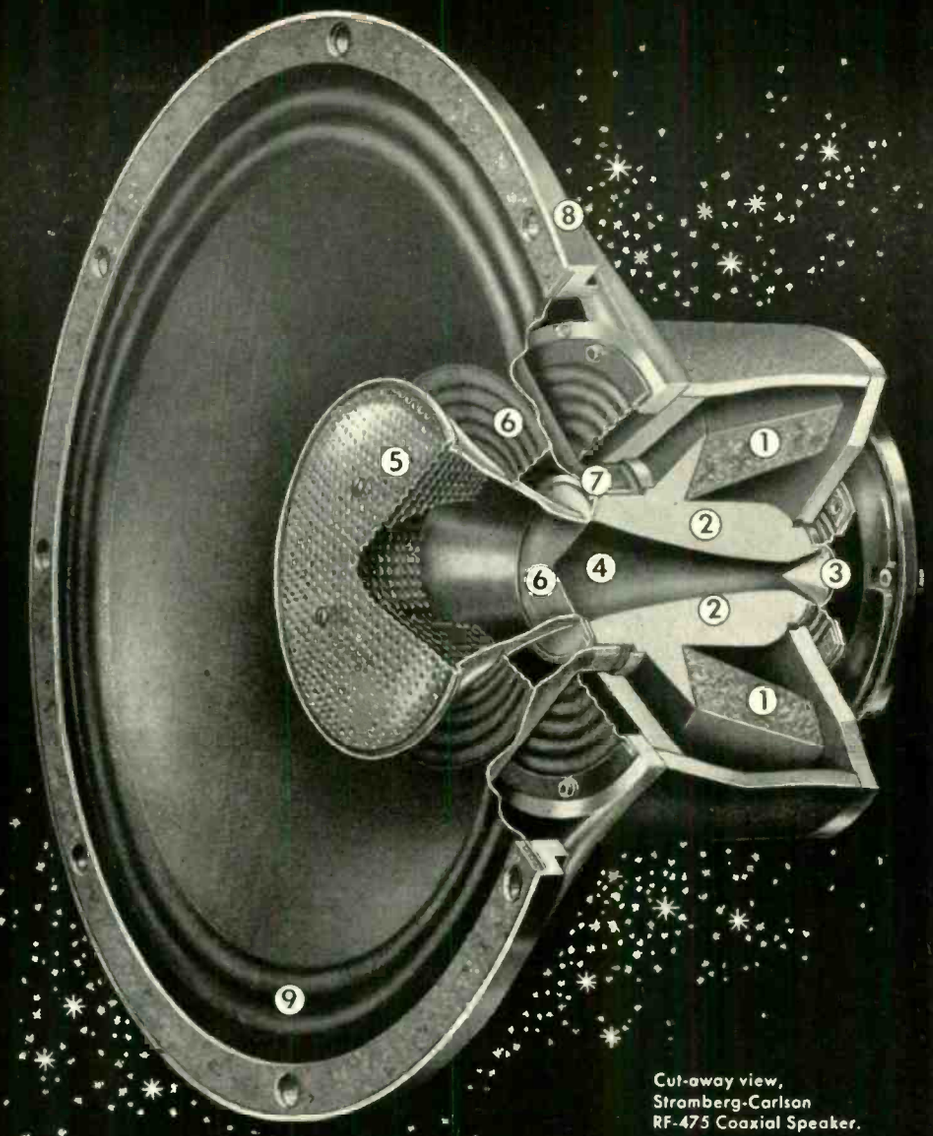
5. 10-element acoustic lens of non-resonant plastic material. Enables the speaker to transmit the highs with a 90° angle of coverage in all planes.

6. Plasticized dust screens—far more protective and efficient than felt or similar materials.

7. The 3" voice coil is mounted on aluminum for high heat dissipation and better handling of more power. Unaffected by temperature or humidity.

8. High-strength, cast aluminum frame (basket), with the rigidity necessary to hold the extra-heavy magnet.

9. The double-rolled edge is treated with Geon vinyl plastic for smoothest frequency response with minimum distortion. "Fatigue" cracks are completely eliminated, and the double edge allows increased cone travel.



Cut-away view, Stromberg-Carlson RF-475 Coaxial Speaker.

learn the inside story of...

the World's Finest coaxial speaker

If *you* were a highly skilled combination of toolmaker, machinist and jeweler, you could build yourself no finer coaxial speaker than this 15-inch masterpiece.

Built to jewel-like tolerances, it is, at the same time, so rugged that extreme overload conditions and even mishandling are all in the day's work.

Do see it and *hear* it, at any Stromberg-Carlson Hi-Fi dealer's. Until you do, here's an audiophile's eye view of the features which make it superb. Complete specifications—in bulletin SED 3.40—will be sent on request.

Stromberg-Carlson

SOUND DIVISION • 1219 CLIFFORD AVE.
ROCHESTER 21, NEW YORK

Although the sales of British sound equipment in America can be only a fraction of U.S.A. manufacturers' sales, this fraction is indeed important to the British firms as a means of earning much sought-after dollars. This has been made particularly evident during the past month with the introduction in the U.S.A., prior to England, of two British hi-fi equipments.

New Leak Amplifier

The new Leak T.L.10 amplifier was announced in New York nearly two months before English enthusiasts heard about it. Visiting Harold Leak in his 500-year old house at Gerrards Cross, I learnt that although his new amplifier costs less than two-thirds the price of the one which established the Leak name on the American market, its performance is identical as far as quality of reproduction is concerned. The 2-watts less output would not be noticed in the majority of homes in which it would be used.

The new Leak pre-amplifier has a number of additional switched inputs, and also has much more convenient arrangements for connecting the various inputs. I understood from Harold Leak that Leonard Carduner (President of the British Industries Corporation who import the Leak line into the U.S.A.) has been so impressed with the prototype model of the amplifier and pre-amp. that he had placed what is probably the largest initial order which has ever been received by a British manufacturer for amplifiers for an Export market.

The other piece of new equipment is being made by a firm who enjoys the reputation of being probably the only organisation in the British Audio world who have created both a noun and a verb which, if they are not already in the English dictionary, have been used much more frequently than many other words that are in the dictionary. Practically every Royal Air Force station, and many of the war-time ships, had public address equipment installed bearing the 'Tannoy' trademark. During the War this name became as well-known for identifying sound equipment as 'Kodak' for cameras. If an officer wanted to broadcast an announcement he would ask his assistant to "Tannoy it," whilst pilots awaiting instructions to man their 'planes referred to hearing messages "on the Tannoy."

The Tannoy organisation is a family business founded by Guy R. Fountain, whose firm has recently broken British tradition by equipping the re-built House of Commons with a complete sound system, and the same design was also used by the Company for the Ottawa Parliament.

Dual Concentric Loudspeaker

Their first wide-range dual loudspeaker system was introduced as long ago as 1933, but it is only in the last year or so that they have re-entered the high fidelity market and produced a Dual Concentric Loudspeaker, which in its 15-in. size is now incorporated in a special horn-loaded enclosure which enjoys the name of the "Guy R. Fountain Autograph Enclosure." It is claimed that the effective source size varies with frequency, below 200 cps the low frequency diaphragm of the Dual Concentric is horn loaded both front and rear. From 200 to 1,000 cps the front loading only is effective, this giving a reduction in apparent source size. Above 1,000 cps the horn loaded high-frequency unit takes over giving all of the advantages of a small yet

(Continued on page 52)

BIG NEWS!

HERE'S AN AMPEX FOR YOU

THE NEW AMPEX 600

This is the design triumph that high fidelity enthusiasts everywhere have been awaiting. The unmatched performance of an AMPEX is now available to you in a recorder of modest size and price.

WEIGHS ONLY 26 POUNDS

And you can transfer it easily back and forth between its portable case and its place in your custom high fidelity installation. In either place it can operate horizontally or vertically.

COSTS LESS THAN ANY AMPEX BEFORE

But every major component has been "life tested" for an equivalent of more than 10 years normal use. It's smaller and simpler, but it's all AMPEX and still the best.

PERFORMS LIKE A TRUE AMPEX

- Full fidelity range, 30 to 15,000 cycles at only 7½ in/sec.
- Three separate magnetic heads (erase, record, playback).
- Meter for positive record and playback level control.
- Built-in mixer between line and microphone inputs.

For full specifications on this exciting new AMPEX, write today to Dept. B-1698.

AMPEX
CORPORATION

SEE IT AT YOUR AMPEX DISTRIBUTOR ON MAY 22
(listed in the "yellow pages" under "Recording Equipment")

934 CHARTER STREET • REDWOOD CITY, CALIFORNIA
Distribution in principal cities;
Canadian distribution by Canadian General Electric Company

EDITOR'S REPORT

I R E SHOW RECAP

WITH EACH AND EVERY exhibit that is scheduled in the radio-audio-electronics category, those who are responsible for advance publicity are given to glamorous statements as to the number of people who are expected to attend. In practically every instance, those who have witnessed these industries for a period of years are likely to yawn slightly and observe—with a calloused air—Oh, Yeah! Such optimism is to be expected from promoters of such shows and exhibits.

But in practically every instance, the official figures for attendance exceed the estimates of those who offered the prognostications in advance of the actual registration hours. For example, the recent I.R.E. Show which occupied Kingsbridge Armory for a four-day stay was touted as expecting an attendance of 35,000; the final figures for attendance indicated that 40,108 people registered—an increase of 12.4 per cent over 1953.

With 604 exhibitors at the show this year, and with the forty thousand visitors who were registered, it begins to be obvious that electronics and its related arts have become of extremely great importance to the country. One of the accepted definitions of an electronic engineer was that he (or she) is a person who who performs miracles with vacuum tubes *but who uses as few tubes as possible.* In this day of transistors, this definition should be modified, we suppose, but the idea remains the same.

In any case, may we express the hope that the City of New York completes an exhibit hall sufficiently large to accommodate IRE Shows—and Audio Fairs—before they completely outgrow any of the present facilities.

WHAT IS AN EQUIPMENT REPORT?

At occasional intervals it is desirable to evaluate the performance characteristics of any commercial product —toaster, lawnmower, toothpaste, or a magazine. And in so doing, one often turns up information that is interesting.

For example, it is not generally clear, we found, that Equipment Reports appearing in AUDIO are actually the result of measurements made by our own staff. It would be far easier to simply take the information put out by the manufacturer, rehash it slightly, and pass it on to readers. But that is the function of any catalog or the descriptive literature covering any type of product.

We have, therefore, established a policy of making our own measurements on equipment and reporting faithfully the results of those measurements. The reports are in a uniform style, and the response curves offered by the phono equalization circuits and the tone controls are presented in a standardized manner. IM distortion curves for the power amplifier, for example, cover the range from 1 watt output to the maximum of which the amplifier is capable.

When loudspeakers are reported, the tests are not offered as *absolute* measurements—that type of measurement is only valid when performed in an anechoic chamber, and tells the user very little about how it would perform in his living room. Instead, we take a high grade system which is recognized as being of excellent quality and make direct comparative runs between it as a standard and the "unknown" unit. Such measurements are presently made using the ten-point method and averaging the results to provide a curve which reasonably well eliminates the effects of standing waves. Room dimensions do influence the performance of any loudspeaker, but since the test results are offered as a comparison with a speaker of "known" quality, any peculiarities will appear in both. This also applies to microphone characteristics, although a broadcast-quality unit is used for all measurements.

Frequency response measurements are made with an accurately calibrated oscillator and a sensitive voltmeter. These measurements are made at the 1-watt level, and have proven to be consistent. Distortion measurements are made with a standard intermodulation analyzer, using frequencies of 60 and 7000 cps, with a 12-db difference—that is, with a 4 to 1 ratio between the low and high frequencies. Comparison measurements between two different IM analyzers have shown consistent repetition of figures.

Square-wave response is observed on a 'scope, and only when the patterns are unsatisfactory is that observation recorded. Sensitivity measurements on FM receivers have so far been judged only on a comparison basis, using one receiver of known sensitivity as the standard. Facilities will be available shortly to make absolute measurements on receiver sensitivity.

Most of the measurements made in the course of preparation of Equipment Reports are done with a single instrument which was designed just for this job. The instrument, called the Audiolab, consists of an a.f. wattmeter, a sensitive a.f. voltmeter, a power-consumption measuring circuit, an oscillator which provides sine, square, or IM signals, and an IM analyzer. All of these units are built into one cabinet, and the arrangement was planned for just one use—the preparation of Equipment Reports.

It will be noted that these reports do not depend on listening tests—for as Sir Isaac Newton said, when you can express something in numbers, you know something about it. With sufficient experience, a trained obesrver can approximate the frequency response of an entire system fairly well, but this is not adequate for our purposes.

For our tests, manufacturers submit their equipment; we make the measurements, and the results are published without any "editing" by the manufacturer. The official schematic is usually published, but in every instance it is checked with the device as actually constructed.

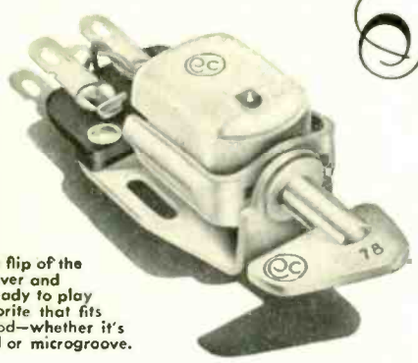
In offering Equipment Reports to our readers, we believe that all of the pertinent information is shown, and we are willing to stand behind our measurements as factual and reliable. Space does not permit presenting every piece of equipment that is available, but because there are so many amplifiers, loudspeakers, and other components of hi-fi systems, we are increasing our coverage beginning with this issue. We trust readers will continue to benefit from these reports.

Quality is an elusive thing. Engineers measure it . . . copywriters glorify it . . . salesmen describe it. But the final test is actual performance. If a product is the best in its field, those who know quality will accept no other.

That is the story of Pickering's new 260 Turnover Cartridge.

Introduced only months ago, it is already a leader among magnetic cartridges. It has won that position because it is the nearest thing to perfection yet produced. Here are the combined advantages it offers:

The nearest Thing to Perfection



A simple flip of the handy lever and you're ready to play any favorite that fits your mood—whether it's standard or microgroove.

1. HIGHER OUTPUT—*Better overall signal-to-noise ratio.*
2. LOWER OVERALL DISTORTION —*Less intermodulation distortion with wider frequency response.*
3. MINIMUM TRACKING FORCE —*Lowest practical tracking force for both microgroove and standard recordings.*
4. HIGHER COMPLIANCE—*Compliance of moving elements is the highest practical, consistent with best-quality transcription arms and changers.*
5. LOWER MOVING MASS —*Lowest of any comparable magnetic cartridge.*
6. TWO DIAMOND STYLI—*For longer record and stylus life and greatest economy.*

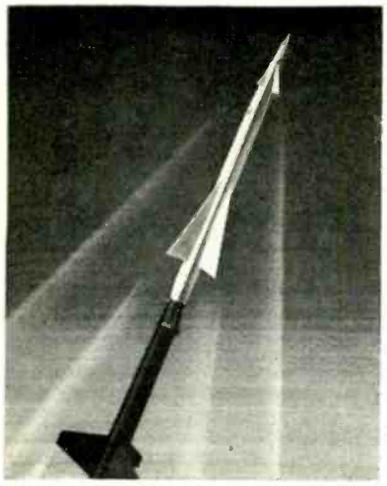
These design features have real meaning to those who understand that quality reproduction depends on components which meet professional standards. If you want the best that high fidelity can offer, ask your dealer to demonstrate the new 260 Turnover Cartridge. You, too, will hear the difference!

PICKERING ***and company incorporated • Oceanside, L.I., New York***

PICKERING PROFESSIONAL AUDIO COMPONENTS

"For those who can hear the difference"

. . . Demonstrated and sold by Leading Radio Parts Distributors everywhere. For the one nearest you and for detailed literature; write Dept. A-4



TELEPHONE SCIENCE GUIDES A PUNCH NO ENEMY CAN DODGE

(Upper left) — Nike's missile climbs to destroy an enemy, under guidance of complex electronic controls. A radar is shown at right. Nike (pronounced Ny'kee) is named after the Greek goddess of Victory.

BELL TELEPHONE LABORATORIES

Is it possible to guide an anti-aircraft missile so that it will track down and destroy a rapidly maneuvering target? No one knew the answer for sure when the U. S. Army put this question to Bell Telephone Laboratories in 1945.

The special skills and techniques developed to create the nation's communications network uniquely fitted Bell scientists to answer this question. They recommended a new system, Nike, and then worked to bring it into being with engineers from Army Ordnance, Western Electric Company and Douglas Aircraft Company.

The first Nike installation has been made, and more will follow. Thus, America's defenses grow stronger through a new extension of frontiers in the communications art. It is a proud achievement of the knowledge and skills first developed at Bell Telephone Laboratories to make the nation's telephone service ever better.

Improving telephone service for America provides careers for creative men in scientific and technical fields

A Dual–Channel Control Amplifier For Stereophonic Music Systems

WAYNE B. DENNY*

This control center affords facilities for either genuine two-channel (binaural or stereophonic) use or for what the author terms pseudo-stereophony—meaning distribution of a single-channel source to several speakers through two channels.

READER'S OF AUDIO ENGINEERING are probably well acquainted with the principles and advantages of the stereophonic reproduction of music. Those who had the opportunity to hear demonstrations of stereophonic reproduction at the Audio Fair will testify to the enhanced realism of stereophony over the usual single-channel reproduction. Recently a few stereophonic discs have appeared on the market and it appears likely that more will follow. A few radio broadcasters have employed their AM and FM outlets to provide 2-channel pick-ups of studio programs, and those listeners who have separate AM and FM receivers have been able to enjoy two-channel stereophonic reproduction. Response to these experimental programs has been excellent.

Pseudo-Stereophony

Long before the advent of practical stereophonic reproduction there existed a group of listeners who preferred to hear their music reproduced *via* a multiplicity of loud-speakers. This "multiple source" school is to be contrasted with the "point source" school. The writer belonged to the former group and, to the extent that he must be content with single channel audio, he still does. When high-quality program sources are available he uses as many as six loudspeakers situated at various points in the listening room. Sometimes a single power amplifier was used for all speakers. At other times two and even three power amplifiers have been used to drive the various speakers When two or three amplifiers were used it was possible to tailor the signals to the individual speakers by changing the volume and frequency response to provide what may be termed "pseudo-stereophonic" reproduction. Such reproduction takes on some of the characteristics of genuine stereophonic reproduction but the two must not be confused. Pseudo-stereophonic systems are essentially single-channel systems despite their use of separate amplifiers and speakers. Genuine stereophony employs a multiplicity of channels which are completely separate from microphone to speaker. However, many who have employed a pseudo-stereophonic system will testify that it *seems* to be far superior to the usual single-channel, single-speaker system. For them, the concept of the "hole in the wall" point source does not provide the necessary realism. The pages of this publication are probably not the place to indulge in the metaphysics of space perception. Yet, in a matter of this kind the reader is entitled to know the particular (and, perhaps peculiar) prejudices of the writer, so that due allowance can be made for them. Like true stereophonic sound, pseudo-stereophonic sound has to be heard to be appreciated. It is *not* the equal of stereophonic reproduction and it is manifestly inferior to true binaural reproduction. But in the opinion of many who have heard it, pseudo-sterophony is definitely superior to single-channel point source reproduction.

Early experiments with two or more speakers operating from a single channel showed rather conclusively that it is not sufficient to connect the voice coils in series or in parallel and hook them to a single amplifier. The results obtained from such an arrangement are better than from a single speaker but are not all they might be. What is needed is separate control of volume and frequency response for each speaker. Resistance networks could, perhaps, accomplish the former but not the latter. What is required can best be provided by two complete amplifying channels, each with its own volume control and equalizer circuits. This is unfortunate because such a system is, admittedly, a complex one. In fact, it is essentially the same as a true stereophonic system as far as speakers and amplifying equipment are concerned.

Thus, one of the major difficulties with either true or pseudo-stereophonic reproduction is the multiplicity of equipment required. Two sources—phonograph pickups, radio receivers, or tape reproducers—are required for the former. In addition two complete amplifying systems and two complete loudspeaker systems are required. More than two channels can be used, provided only that the required signals are available. Such a system is expensive and it is complicated to adjust. The multiplicity of controls serves to scare off all but the most hardened audiophile. Such a system, though technically excellent, is hardly suitable for use by Aunt Minnie!

These are some of the difficulties which confronted the writer. Was it practical to install a system which would be suitable for either single- or double-channel operation? Would it be too expensive? Could it be engineered to the point where it was suitable for use by the nontechnical listener?

There seem to be at least three solutions. The simplest, though not the best nor the least expensive, is the purchase of two complete music systems. Each system would require the usual components—a phonograph preamplifier, a control amplifier with selector switches. volume, and equalizer controls, a power amplifier, and suitable speaker with enclosure. To this outlay must be added a stereophonic arm with suitable cartridges, a good turntable, AM and FM

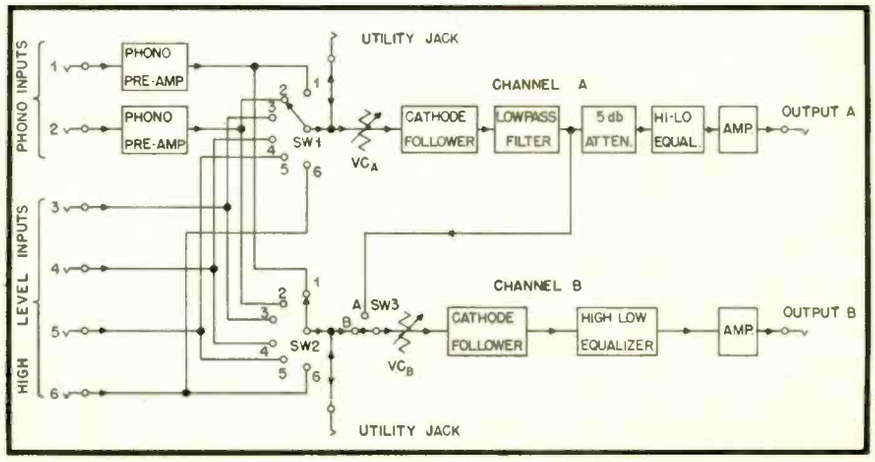


Fig. 1. Block diagram shows what the dual-channel control amplifier contains. The switches are shown in the positions required for dual-channel stereophony from phonograph records.

* *Grinnell College, Grinnell, Iowa.*

tuners. The worst feature of this first alternative is the complexity of connections and controls. It is likely to lack flexibility unless the user will tolerate the use of temporary connecting cables. Aunt Minnie would hardly appreciate this kind of installation. It looks too much like the pilot compartment of a jet bomber. Its wires and knobs, completely unintelligible to the uninitiated, do not favor relaxed listening.

Another alternative would employ a switching panel wherein each signal source could be routed to one or more output channels. Each signal source might terminate in a key switch by means of which connection to channel A or channel B is made. Satisfactory adjustment of such a system requires separate control of the volume of each input source. But those readers familiar with the type of audio equipment used in broadcasting will notice the similarity of this possible system to the standard audio mixers which grace the control rooms of radio stations. Clearly such a mixer, while perhaps adequate for the purpose at hand, is hardly a practical solution to the problem as stated.

The Practical System

A much better and thoroughly practical solution is shown in *Fig.* 1. A glance at this functional diagram shows that this system will handle a total of six input sources. Two are low-level inputs provided with equalized preamplifiers suitable for use with variable-reluctance phonograph cartridges. The four high-level inputs are suitable for AM and FM tuners, television audio, crystal cartridges, and tape recorders.

Two output channels, A and B, are provided. Each output channel has its own selector switch to connect it to any one of the six possible inputs. Each channel has its own volume control (VC_A and VC_B in the figure), its own equalizer, and its own voltage amplifier for raising the level to a value suitable for driving a power amplifier. Channel A contains a low-pass filter for suppression of needle scratch and intercarrier radio noise and it also contains a resistance network providing about 5 db loss inserted between the filter and equalizer. channel B contains neither filter nor fixed attenuator for reasons to be discussed later. In each channel the volume control is succeeded by a cathode follower. The cathode follower in channel A isolates the volume control from the filter and it also provides a low-impedance source for the filter. In channel B the cathode follower isolates the volume control from the equalizer and provides a low-impedance source for the equalizer.

In addition to the main features of the system there are two gimmicks which require explanation. The first of these is the inclusion of two utility jacks, one for each channel. Each utility jack is connected directly to the arm of its selector switch and *ahead* of the volume control. Any signal fed to either channel is thus available for operation of a recorder. Further, if the switch is turned to an unused position, the utility jack can be used for temporary connection to an additional input source.

Although only six input sources are normally provided for, the selector switches are actually 12-position units. Only taps 1, 3, 5, 7, 9, and 11 are used but in these positions are consecutively numbered from 1 to 6. The increased spacing between live contacts materially reduces crosstalk. Crosstalk may be further reduced by grounding the unused terminals.

Another item of interest is the inclusion of switch 3. When this switch is thrown to the B position each channel functions independently. However, when it is in the A position channel B is bridged across channel A. This is a convenience when the system is used for pseudo-stereophonic reproduction. Under this condition the volume control VC_A regulates the gain of both channels. Further, switch 1 selects the single signal source. During this type of operation switch 2 serves to connect its utility jack with any one of the six inputs. This permits recording from one source while listening to another, a useful feature.

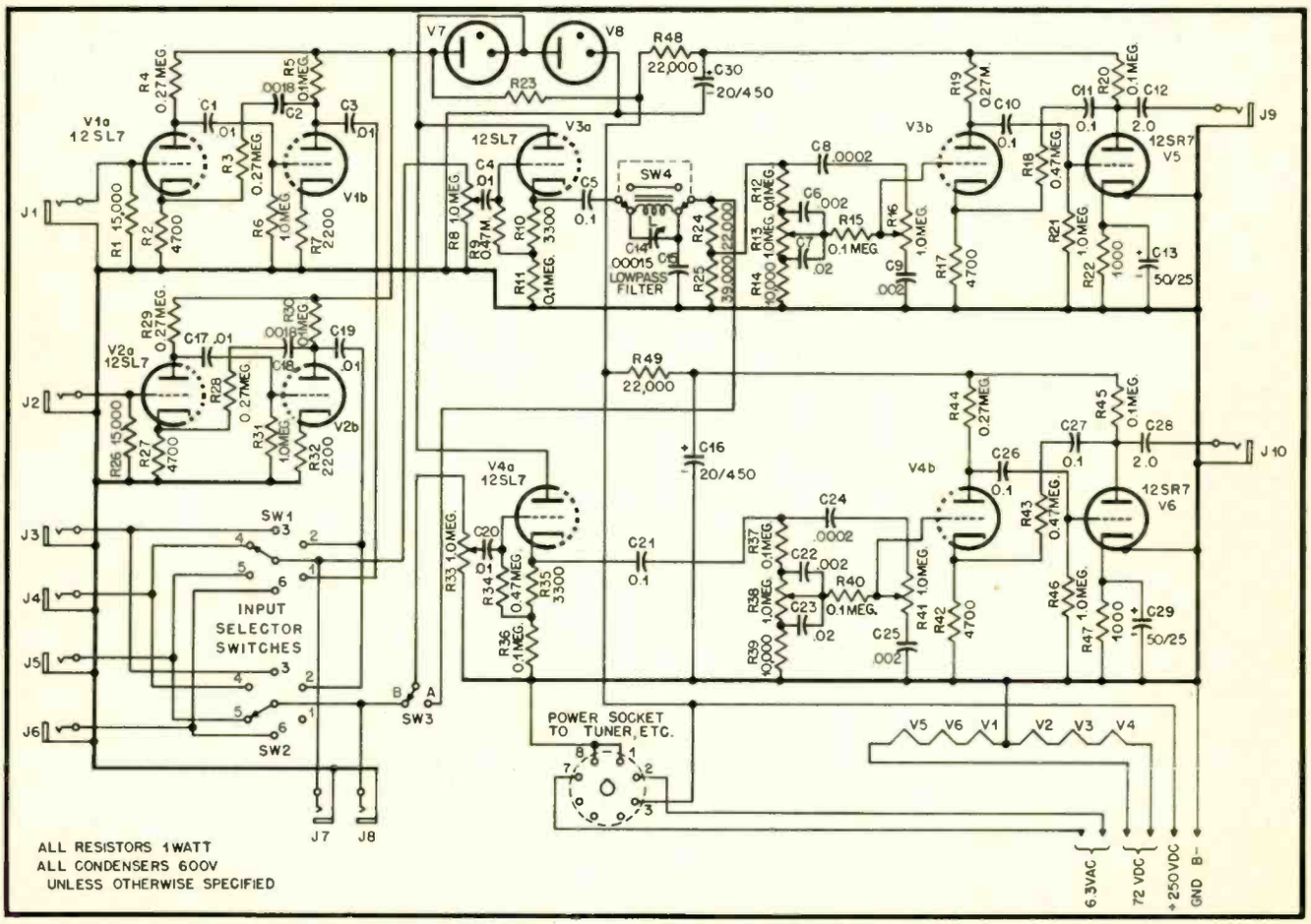


Fig. 2. This is the complete schematic diagram. The separate elements of the systems are conventional, with the switching the unique feature.

Now comes the other gimmick. Examination of *Fig.* 1 shows that the lower volume control VC_B is included in channel B at all times, even when switch 3 is thrown to the A position. It will be seen that under this condition the gain of the upper channel is about five db lower than the gain of the lower amplifier channel as measured from switch 1, provided VC_B is turned full on. Consequently, VC_B acts as a balance control; it serves to adjust the relative signal levels of the two outputs and has a margin of gain adjustment from zero to +5 db. As stated earlier, some means of balance adjustment is a requirement for proper operation of a pseudo-stereophonic system. Note that the filter, if used, operates on both channels in this type of operation.

Pseudo-stereophonic reproduction is also possible with switch 3 thrown to the B position. Here, both selector switches are connected to the same signal source. Again, the maximum gain of channel B will be about 5 db higher than the gain of channel A. However, operation of the equipment is simplified when adjusted according to the preceding paragraph because selection of the input signal can then be accomplished entirely through adjustment of switch 1. In either case, channels A and B are separately equalized. In this respect the system is different from a commercially available control amplifier designed for single- or 2-channel use. But experience has shown that separate equalization, together with balance control, is desirable for best results.

It should be emphasized that when switch 3 is thrown to the A position, the operation of the system is rather similar to that of any other high-quality home music system. Even if Aunt Minnie doesn't balance the two outputs correctly the results can be no worse than those of an ordinary single-channel system. When it is intelligently used, the results can be very much superior.

This is a good place to take a tip from one prominent manufacturer of communication receivers. This manufacturer was well aware that many of his communication receivers—complete with selectivity controls, crystal filters, beat-frequency oscillators, bandspread dials, etc.—were often used by Mrs. Amateur for regular broadcast listening. To simplify the operation of the receiver in the hands of the lady of the house, this manufacturer indicated the proper settings of all controls by little colored dots. When each control was set so that it pointed to the appropriate dot the receiver was correctly adjusted for broadcast reception. There is no good reason why this same technique cannot be used for relatively complicated home music systems. Set each knob to point to the colored dot and the system is correctly adjusted for ordinary single-channel operation. In this way, Mrs. Audiophile can enjoy good music during the hours when her husband is away at work. The system may not be in optimum adjustment but it won't be too far off. Then, when Mr. Audiophile returns from work he can twiddle the knobs to his heart's content while trying to squeeze the last decibel of "fidelity" out of the speakers.

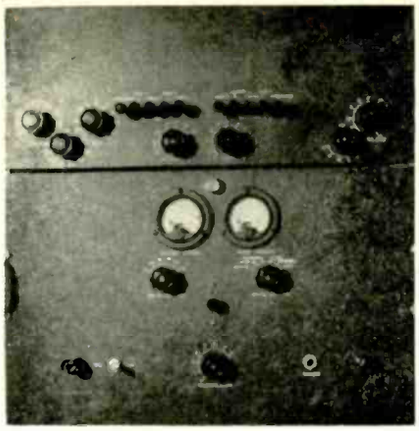


Fig. 3. The control amplifier is mounted on a chassis 11 × 17 × 3 inches. Probably a smaller one could be used.

The Circuit

The system whose functional diagram appears in *Fig.* 1 has been engineered into practical form. The schematic diagram appears in *Fig.* 2. The individual elements of the system are entirely conventional. Only the inclusion of two channels, the switching arrangements, and the gimmicks mentioned earlier make this system different from other more conventional systems, in principle at least.

Two power supplies (not shown) are required. One furnishes about 72 volts at 150 ma for six heaters connected in series. This power supply is *not* grounded. The heater string is grounded between V_1 and V_8 which are the two tubes operating at the lowest signal level. The other power supply furnishes about 250 volts d.c. for the plate supply. It is entirely conventional but should include plenty of filtering. The writer found a 2-section choke-input filter to be entirely satisfactory.

More than ordinary attention to lead dress is necessary to guard against crosstalk between channels. Inspection of *Fig.* 3 will indicate that no attempt was made to crowd apparatus. The chassis is large; it measures 11 × 17 × 3 inches and these dimensions are somewhat greater than those of the usual control amplifier.

It was found that the plate-supply filtering shown is adequate to reduce crosstalk between channels provided the input signal levels are all comparable. The writer's AM tuner produced signals higher in level than any other signal source (when measured at the selector switch) and there was some riding through of AM signals under certain conditions. This was corrected by inclusion of an attenuator in the tuner itself. Another alternative is to provide level controls (screwdriver adjusted) in all six input circuits as is done in some commercial units.

Two voltage-regulator tubes in series are used instead of electrolytic capacitors in one part of the plate-supply filter. The available plate-supply voltage *under load* should be about 250 volts. V_7 and V_8 should be OB2's (108 volts) or OC3's (105 volts). This arrangement permits about 210 volts for the preamplifiers. Resistor R_{23} should be rated at 10 watts and its resistance should be such that the current through it is at least 10 ma. A value of 4,000 ohms works out well for two OC3's and a 250-volt supply. Other combinations can be worked out for different supply voltages. However, make certain that the power-supply voltage is at least 30 volts higher than the sum of the nominal voltage ratings of the regulator tubes. Filters using voltage-regulator tubes are superior to filters using capacitors, particularly at low frequencies. (*Caution:* Do not shunt regulator tubes with a filter capacitor. This causes oscillation.)

The plate supply for the cathode followers is obtained from the junction of the two regulator tubes. This is permissible because the cathode followers normally operate at very low signal voltages in this unit. Further, the inverse feedback inherent in the cathode follower reduces distortion to extremely low values. Incidentally, it will be seen that every amplifying triode is included within a feedback loop. This feature contributes to the very low distortion of the amplifier which is a necessity if the full benefits of available high-quality power amplifiers are to be realized. Comparison of this unit with its predecessors, which did not employ as much feedback, gave immediate evidence of the lowered distortion. Intermodulation measurements using 60 and 7,000 cps, 4:1, indicate that the distortion is never more than a small fraction of 1 per cent with normal signal levels.

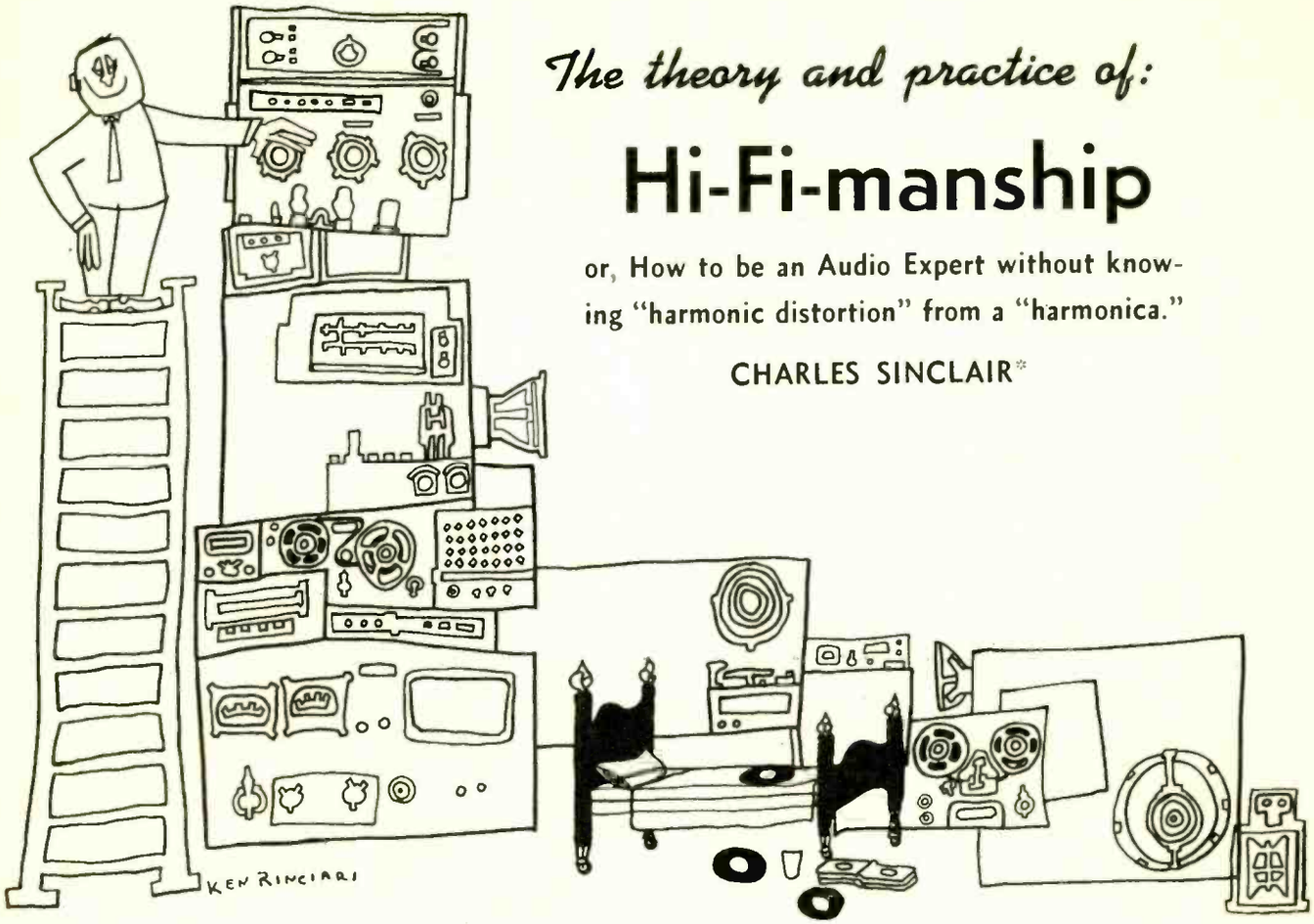
Design Details

The equalizers are conventional in every respect; the values of the components are similar to those used in commercial equipment of comparable quality. It will be noticed that only a single transition frequency is used in the preamplifiers. Previous preamplifiers built by the writer provided for a choice of three or four transition frequencies but experience shows that only the one corresponding to the AES curve was ever used to any extent. Anyhow, in a unit like the one described here the number of controls should be reduced to a minimum. Of course, the purist may, if he so desires, introduce more flexibility if he is willing to tolerate the added complexity of operation.

Ordinary volume controls are used in preference to loudness controls. The latter could be used but the bass boost available from the equalizers is sufficient to provide a close approach to the Fletcher-Munson curves at the volume levels normally used.

Examination of the photographs shows that there are six variable resistors and two selector switches, all operated by pointer knobs. Each channel requires a selector switch, a volume control, a bass control, and a treble control. Two toggle switches and two jacks also appear on the panel. One

(*Continued on page 61*)



The theory and practice of:

Hi-Fi-manship

or, How to be an Audio Expert without knowing "harmonic distortion" from a "harmonica."

CHARLES SINCLAIR*

ONE AFTERNOON LAST fall I suddenly discovered an uncomfortable fact: I—and probably thousands of other ordinary Americans like me—had an electronic inferiority complex. With no defense mechanism, either.

I was standing at the time in the Audio Department of a large New York store, staring dumbly at what looked like the insides of dozens of radio sets sitting mutely on shelves around the room. It was my first visit, and my first real contact with hi-fi.

A salesman came over. He smiled. A cat-like smile it seemed to me later.

"May I help you, sir?" he inquired smoothly.

"I'm thinking of buying a high-fidelity set," I managed to stammer.

"Certainly, sir," he replied, taking out a small pad and jotting down something I couldn't see. "What kind of amplifier did you have in mind?"

I felt like a swimmer who had put down his foot expecting to touch bottom and had discovered he was over the Tonga Deep. Amplifier? I tried to remember a name. Any name. Finally I recalled the chance remark of a friend who was a hi-fi fan.

"A . . . A Williamson, of course," I answered with a show of bravado.

"A very good choice, sir," the salesman said. I relaxed. I didn't notice that the salesman's smile had become more cat-like. That was my big mistake.

"What particular make of Williamson-circuit amplifier," asked the salesman, "did you have in mind?"

The Beginning

That evening while getting back to normal I took from a bookshelf a set of three favorite slim volumes. Their author: Stephen Potter, noted British wit, writer, and BBC lecturer. Their titles: *Gamesmanship, Lifemanship,* and *One-upmanship.*

Months passed. Meanwhile I was learning a good deal more about the subject of hi-fi sound reproduction. I read my way through articles, books, audio catalogs and sales brochures on the subject. I listened eagerly to the often-conflicting advice of electronic engineers and fellow hobbyists the way a new recruit listens to the sage words of a Veteran Master Sergeant. Hi-fi parts salesmen and clerks in record stores winced when they saw me coming for I was now an incurable hobbyist.

My friends refused to play their radios and record players when I was in hearing range, knowing they would only get another lecture on why most commercially-made sets have no response above 5,000 cycles.

But an idea was now in my mind, slowly taking definite shape.

"If you can win games without *actually cheating,*" I finally asked myself, "is there any reason why you can't become an expert on the subject of high-fidelity—without *actually* knowing anything about electronics or music?"

When the answer came, I felt as Copernicus must have felt when he first figured out that the earth went around the sun.

"No, there isn't!"

Thus was born a new form of polite psychological warfare guaranteed to cure any signs of an electronic inferiority complex while at the same time establishing you as a leader among audio enthusiasts—Hi-Fi-manship.

Hi-Fi-manship Basic

Defined in its simplest terms, Hi-Fi-manship is "The Art of Being an Expert on Hi-Fi Without Actually Knowing

* *67 Riverside Drive, New York 24, N. Y.*

Harmonic Distortion from a Harmonica, or a Tone Poem from a Tone Control."

As in Gamesmanship the Hi-Fi-man gets "one-up" on his fellow human beings by the adroit use of "ploys" and "gambits." (A "ploy" is roughly a general method of bluffing your way out of a tight spot as one might in poker while trying to fill an inside straight. A "gambit" is a subdivision of a "ploy" and is a particular type of bluff.)

The primary purpose of Hi-Fi-manship as it now exists, is of the noblest order: To provide a painless set of highway directions for the average man in the bewildering, wired-for-sound world of high-fidelity.

However before we get down to practical situations let's run through the three basic rules of Hi-Fi-manship:

Rule I. What your *own* hi-fi rig does, or what your record collection is composed of, is *not* important. What really matters is what people *think* about them. Skillful use of Hi-Fi-manship will convince either the layman listener or the informed expert by various forms of hypnotic suggestion that *your* hi-fi set, *no matter how bad it is,* represents the greatest engineering triumph since the invention of the wheel and that *your* musical taste is the hottest thing since Toscanini's. At the same time, you can persuade the non-Hi-Fi-man that *his* rig is as dated as a hand-wound Victrola and that he couldn't pick tunes for a juke box.

Rule II. Learn to speak hi-fi-ese, and the sooner the better. Nothing stamps you faster as a hi-fi expert than sprinkling words and phrases like "NARTB curve," "Twelve-tone scale," "Push-pull," "Dissonance," "High vertical compliance," "Melodic minor," and "Inverse feedback" casually but frequently in all of your conversations dealing with sound reproduction. Read the latest technical articles on the subject, too, and quote them at length. But remember! To the skilled Hi-Fi-man, the primary purposes of engineering and musical data are *not* to improve his rig or his musical knowledge but to prove his point.

Rule III. Acquire correct hi-fi "props" as quickly as possible. When paying a social call on a fellow audio fan always bring along a slide rule and manipulate it frequently in a theatrical manner while discussing any phase of audio which involves even the simplest numbers. When entertaining in your own home even more striking results can be achieved by playing all your records silently through an oscilloscope, occasionally turning to your friends during certain peak passages and remarking "How's *that* for response?"

When you have mastered these simple basic rules, you will then be ready to take up the study of the two primary areas in which Hi-Fi-manship is applied:

(1) Audioship, which has also been described as "The Art of Not Building An Amplifier," and

(2) Musicship, known more generally as "How to Torture Listeners and Alienate Musicians."

Ready? Let's examine the first of these.

Audioship

Actually, Audioship is based on the adroit use of a single Hi-Fi-manship tactic: the "Divide-and-Conquer Ploy."

"D-and-C", as veteran Hi-Fi-men affectionately call it, has its roots in the fact that the hi-fi fan today is faced with a staggering choice of audio components. Indeed, there are as many ways to construct a workable hi-fi rig as there are recipes for the perfect Martini.

The purpose of D-and-C therefore is to convince the layman even if he's something of an audio expert that whatever set of components has been purchased for a hi-fi rig is absolutely the wrong choice.

Here's a simple example:

In order to reproduce music from a disk recording, it must first of course be played on some kind of turntable, pickup assembly and tone arm. Two basic forms of this arrangement exist—the record turntable and the record changer. There are excellent models of both on the market and each arrangement has many merits. But this very fact allows the D-and-C ploy to be applied easily to this situation. The Hi-Fi-man, we will assume, has been invited in to inspect a new rig put together by a layman, or non-Hi-Fi-man. Being a good sportsman at all times, Hi-Fi-man's first act is to inspect the phonograph portion, and then say:

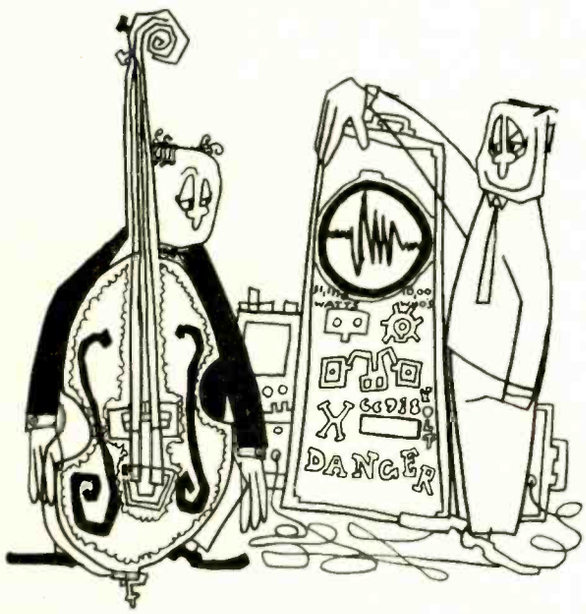
"Nice! *Very* nice!"

Layman, flattered, will undoubtedly drop his guard.

Then, you spring the trap.

(*Continued on page 44*)

Basic Hi-Fi-Manship: The "Divide and Conquer" Tactic



With Musicians: Main objective in Hi-Fi-manship is to get "one up" on fellow audiophiles by confining all hi-fi discussions to something they know nothing about. With music lovers, best tactic is to play full-length opera through oscilloscope.

With Technicians: If your guest has mastered the intricacies of audio engineering, chances are he hasn't had time to learn much about musical fine points. Play recordings on antiquated equipment for him; discuss "flatted fifths," not flat response.

at home with AUDIO

LEWIS C. STONE

The solution of one reader's problem reduced to its simplest terms—in other words, a simple preamplifier and control unit which anyone can build with relatively little effort or experience.

HERE IS an undertaking for that audio workbench, suitable and timely if (let us say) your not-so-new record playback equipment happens still to be without means of compensating for the recording characteristics of today's makes and varieties of discs.

You are far from being alone in this situation. Many phonographs acquired as recently as two years ago are deficient with respect to having facilities for bass compensation, treble roll-off and sufficient voltage to drive the power amplifier to full output.

If you have been thinking about this, but are at a loss as to how to go about improving your phono equipment along these lines, then what we report in this, our second communication in "at home with AUDIO," may be of decided help. A quick answer would be, of course, to buy a manufactured preamplifier unit with the desired features. There are many excellent ones made today, at fairly moderate prices. But if price is still something you must watch, the only course

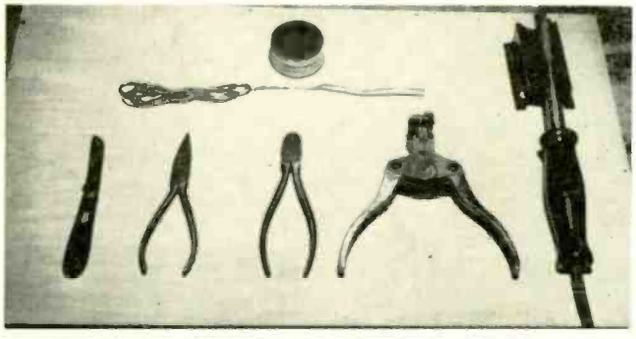


Fig. 1. The basic complement of tools needed to engage in any audio construction work.

open to you is to make your own preamplifier unit. And you can do it with only those of your tools pictured in *Fig.* 1. The cost, as reported to us in the following communication from one of our readers, can be below a total of twenty dollars, as compared to a manufactured unit of equal features costing close to a hundred.

Enter the Preamplifier

Just about two years ago, an audio experimenter of our acquaintance got himself an AM-FM tuner, speaker, power amplifier, record player, and TV set into one combination custom-built cabinet. About two months ago this man took the tuner apart—nay, took it out entire, AM-FM bands, controls and all—and replaced it with an FM tuner, added a preamplifier. And at the very moderate cost mentioned above, he has got himself a fully modern array of record playback equipment.

The elements of the changeover are summarized in the two block diagrams, *Figs.* 2 and 3, and are described in some detail further on. The AM band of the former tuner was rarely used, so there was no point in retaining it in the new set-up. Addition of the preamplifier brought up to date, equipment which may have been the last word in its time, two years gone. The AM-FM tuner had only bass and treble controls, one fixed compensation, and no equalization; furthermore, it could not provide the 2 or 3 volts necessary to drive the basic amplifier to its full 10-watt output.

Why, then, did he not scrap the whole deal, cabinetry and all, especially in this day of handsomely cased, compactly

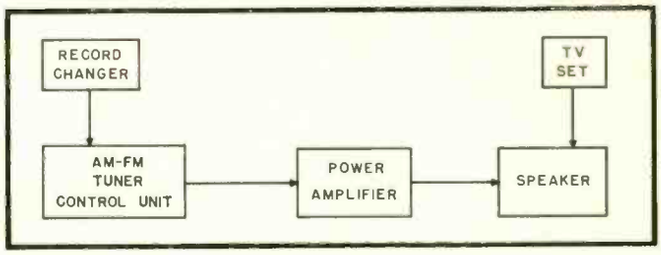


Fig. 2. The reader's system before the change—dissatisfaction with controls on the tuner prompted him to start over with a new plan.

made components? An abiding love of a handsome functional hunk of furniture, confessed our reader, maketh a man (and his spouse, no less) to balk at any thoughts of giving it up. It was kept in spite of the fact that the so-much desired supplementary equipment did not come ready to hand in any sizes that would fit a compartment originally spaced out to take less. Willingly, it must be, your dedicated audio experimenter walks a path of travail and trial to reconcile (if possible) a *so-so* spatial accommodation with a *just-so-big* control apparatus, especially when it will show on the very front panel of said cabinetry.

On Going Modern

The original tuner was approximately 14 inches long, fitted into a cabinet compartment 16 long by 8 high and 20 deep. Placement of the new FM tuner 10 in. long, in this location, left a scant 5 to 6 inches of space for a preamplifier. As there is no commercial preamplifier available to fit this kind of space, the tussle, with the situation yielded up one answer—make it yourself.

This meant that circuits and components ordinarily distributed horizontally for a space of from 10 to 12 in. wide by 4 in. high, had to be compacted, snugged and confined in a space some 5 in. wide by 7 in. high—half the usual length and nearly twice the usual height of commercially made units. In fact, the disparity in size is even more marked, as the Fisher 50CM Master Audio Control of which the new preamplifier is essentially an adaptation, measures almost 16 in. long, over 4 in. high, as against the above mentioned squeeze accommodation available alongside the new FM tuner.

This feat (it can be called that) of adaptation and condensation was made somewhat easier by omitting the loudness control, the power supply, individual input level con-

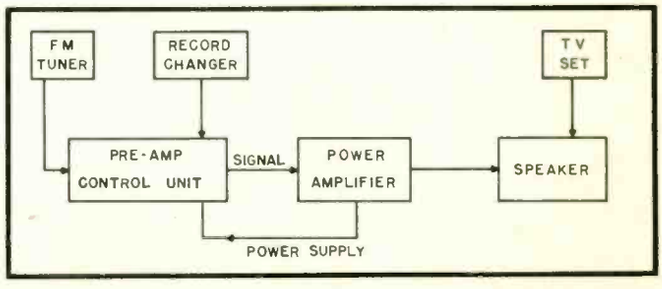


Fig. 3. After —. The tuner selected was devoid of any tone-correcting controls, which were perforce concentrated in the control unit.

Fig. 4. The new tuner panel—containing both tuner and control unit. Compact, yet it works to the owner's satisfaction.

trols, recorder output. Added was one roll-off position 20 db to attenuate high-frequency distortion and scratch. Our condensed version of the Fisher apparatus became a front end with six controls, in two vertical banks of three each, as seen in *Fig.* 4. They are marked, with self-applied decals: selector switch; bass; treble; volume; bass turnover; treble roll-off.

Although the recorder output has been left out of circuitry, this is no deprivation, in the sense that eventually there will be added a Concertone tape recorder. This apparatus comes with built-in provision for switching the tuner output directly to the preamplifier input for recording and playback.

The chassis of the preamplifier is a frame 5 by 7 by 2 deep, the face of it in crinkle black finish. To the back of it was added a rigid 5 by 2 sub-chassis, mounted across the width and about 3 in. from the top, to carry the three twin-triode tubes. Two are 12AX7's, of which one is for phono preamplifier and record equalization, the other for tone control. And a 12AU7 tube is for cathode follower output. *Fig.* 5 shows a rear view of the unit in place.

The *melange* of wires, resistors, capacitors, sockets, spaghetti, and all the other components (see list) was inserted layer upon layer as it were, some parts projecting beyond the chassis frame, most lying (and how!) snugly within it. (Note to our amateur friends: This *melange*—don't be

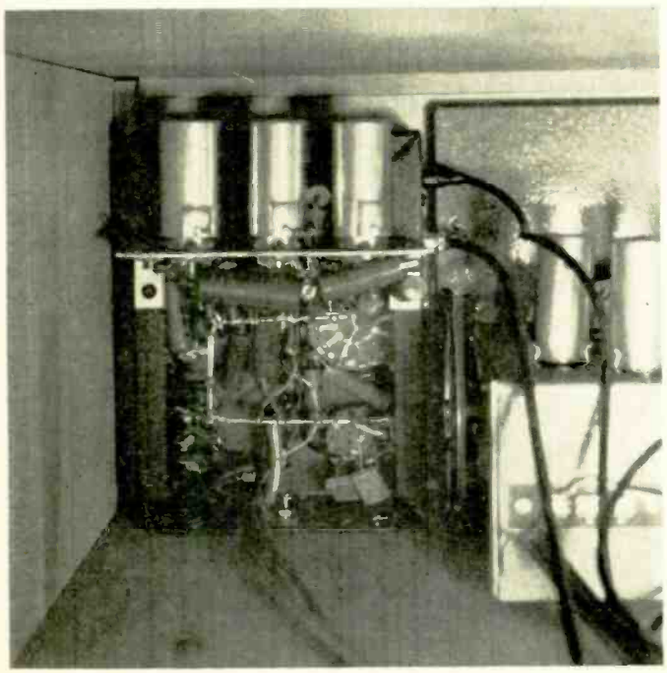


Fig. 5. Rear view of the control unit in place alongside the tuner. Note solid ground bus wire in shape of a reclining U.

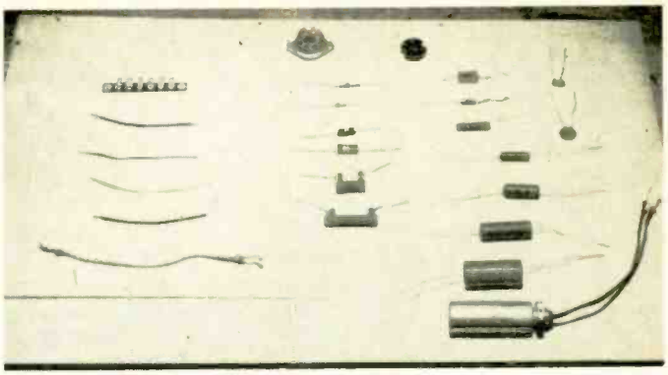


Fig. 6. A few of the components used in assembling the control unit. But this isn't all—see the parts list on page 60.

confused by it. It is built up point by point, part by part. Like the Great Barrier Reef, it is an accumulation of many miniscule parts. And when it gets to look like this photo, you've *done* it!)

All of this chassis work has to be carried out with systematic and orderly procedure. And again, we report how this can be done in "how to" fashion for a clearer statement (see *at home with* AUDIO, April 1954)

How to "Fill" a Preamplifier Chassis

First of all, put in the parts: the switches, tube sockets, potentiometers, pilot light, terminal strips, phono jack, etc. Most of these are shown in *Fig.* 6, as well as some of the electrical components.

Then do the elecrtical wiring operations in the following suggested sequence, using the schematic *Fig.* 7, as a guide.

1. Put in filament heater wiring from input of d.c. power source (in power amplifier) to every tube.
2. Put in ground wiring. This is buss wire, visible as a U-shaped arrangement in *Fig.* 5, parallel to and below the tube mounting bracket.
3. Wire in the three input plugs.
4. Put in selector wiring.
5. Wire in the resistors, which are identified by 3 bands of different colors. (The meaning of the color code is known by heart to every serviceman and audio technician. But that doesn't rule out the amatuer audio constructor learning it, if he takes the time to study *Fig.* 8, which explains the coding for both resistors and capacitors).
6. Wire in the capacitors.
7. Hook up plate circuit wires.
8. Wire in the output plug (*Fig.* 9). This is an octal plug and accommodates wires for:

   a) a.c. switching 110-volt (use zipcord)
   b) d.c. heater current (use #20 wire)
   c) B-plus voltages—205 volts and 185 volts (use #20 wire).
   d) ground to chassis (use #20 wire)
   e) Preamplifier output (use shielded wire #22)

In these operations, proceed clockwise around tube sockets. Remember, say some technicians, to keep all grid leads to short lengths; mount capacitors off chassis; keep your a.c. near to, and preferably in a corner of, the chassis.

Solder all connections. Use soldering iron instead of the gun, as heat should preferably be constant, there are so many soldering points close together to de done.

The Pay-Off in Playback

The six-control front end now turns in a playback performance with a range of 20 cps to 15,000 cps. It correctly compensates for all recording curves; AES, NARTB, London, FFRR, HMV, LP, British Columbia, etc. With the new equipment the owner can get a change to let his ears determine best how much compensation is needed to produce the most pleasant tone from any of the available recordings.

The new front end also provides greater output to drive the power amplifier (which has been left intact). In fact, two to three times greater, with no noticeable increase in distortion. It is to be noted that the fixed bias in the power

Building Your Own HI-Fi Furniture*

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

In Three Parts—Part 1

Considerable money can be saved by the build-it-yourself method, but it is necessary to have some knowledge about the materials used in cabinet construction to do an intelligent job of designing and putting your equipment in an attractive and workmanlike enclosure.

TODAY THE AVERAGE MAN-OF-THE-HOUSE is a qualified Mr. Fixit. He owns a set of tools and can cope with almost every handyman task. The majority of these *home-craftsmen,* for some reason, seem to be gifted best of all with a natural talent for woodworking and cabinet-making. On many occasions, the authors have had the opportunity to look at some of the hi-fi enclosures constructed by these music-lover-woodworkers, and on the whole, the results were good. However, most of the cabinets lacked the professional touch, and botches showed up in almost every phase of cabinet work. They ranged from improper selection of woods to improper methods of finishing. The reaction to this honest and constructive criticism was always. . . . "If I'd only known *that* before" . . . or . . . "I didn't have *that* type of tool" . . . and then these famous last words. . . . "Where can I get the right information about these things?" . . .

The purpose of this article is to provide just such information. Though written for the woodworking music lover, those who find themselves to be all thumbs will find that this infrmation will serve as an invaluable guide.

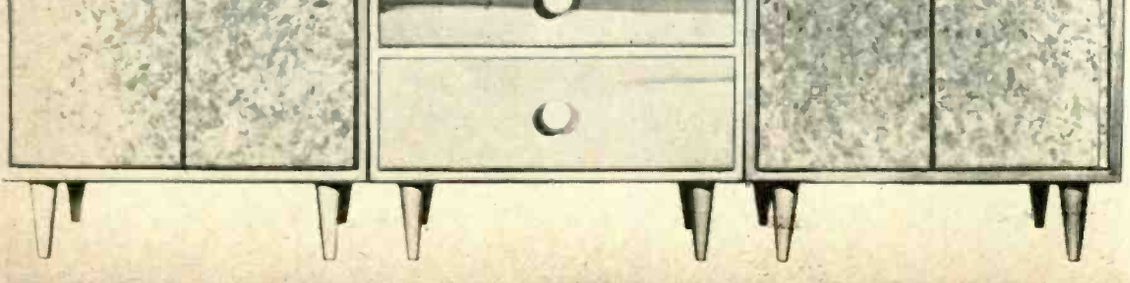


Fig. 1. An example of how Novoply can be used to construct an attractive wall unit. This structure uses Birch hardwood plywood, and the solid hardwood legs have been lathe turned.

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

** 17-49 166th St., Whitestone 57, N. Y.

*** 170 Twin Lane North, Wantagh, N. Y.

Wood—The Principal Ingredient

Plywood and lumber are both used in the construction of cabinets. The woodworker-hobbyist will find that plywood offers the greatest flexibility, economy, and ease. It provides the greatest latitude for planning and the least amount of waste.

Plywood consists of several thin layers of wood bonded together under tremendous heat and pressure. These plies are arranged so that the grain direction of each ply is at right angles to the ply above and below it. Because of this, the plywood panel has great structural strength in all directions. Proof of this is readily apparent if one attempts to bend a one foot square piece of ¼-in. plywood over his knee.

There are two main categories of plywood available—Douglas Fir Plywood, and hardwood plywoods. Douglas Fir Plywood is used more popularly, and has great structural strength. Manufactured principally for sheathing, under-flooring, and siding in the construction of homes, its economy has made it popular for use in constructing built-ins and other units which are to be painted rather than grain finished. The music lover who builds his own enclosures realizes a saving in material costs, and the manufacturer of cabinet kits keeps his selling price down by using Douglas Fir Plywood. Even if the more expensive hardwood plywood is used for making the cabinet, Douglas Fir Plywood is used for the speaker baffle board, speaker enclosure backs, cabinet bottom boards etc., effecting a measure of economy in the over-all cost.

The decorative furniture woods are the *hardwood plywoods*. They are perhaps, of greater interest to the music lover for use in the construction of enclosures for home music systems. Although more expensive than fir plywood, a panel of walnut or mahogany plywood is relatively inex-

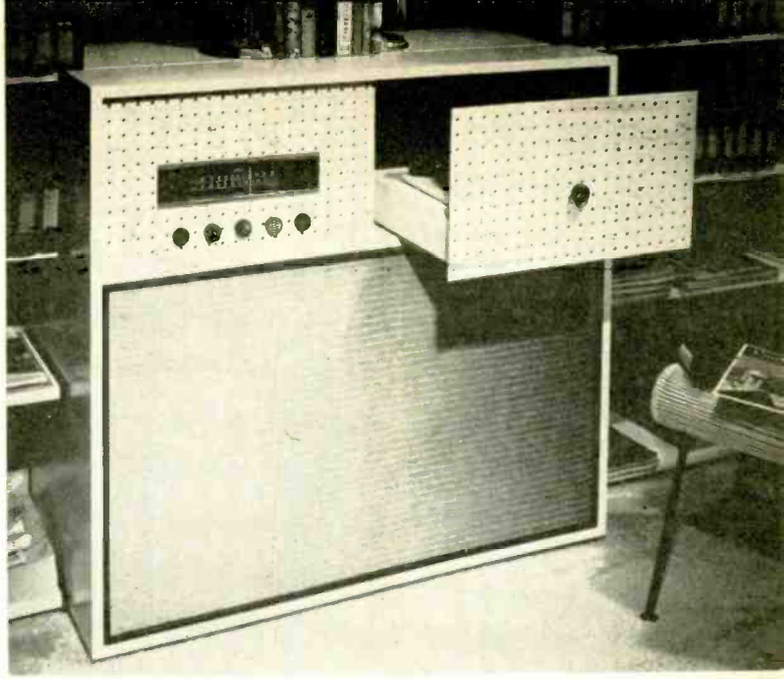


Fig. 6. An attractive console using perforated hardwood for the tuner panel and record player drawer. This enhances the smart lines of the enclosure and provides ventilation at the same time.

pensive *compared* to the cost of solid walnut or mahogany lumber of *comparable quantity*. The reason is this; in plywood, only the outermost ply or veneer need be the expensive wood, selected for grain beauty and other quality characteristics. The inner plies or core is made from less expensive woods such as Poplar, Gumwood, Birch, or Basswood, etc. Furthermore, plywood has the advantage of being obtainable in large panels. It is often quite impossible to obtain large widths (16 to 20 in.) in most types of furniture grade solid woods.

Hardwood plywoods are available in a large variety of wood species. Among the most popular in the cabinet field are: Oak, Korina,* Birch, Maple, Elm, for light colored woods and Walnut and Mahogany for the darker woods. Even some of these can be sub-divided into categories according to the manner in which the veneers were cut from the log. Hence, we have *Plain Sliced Oak,* which has a fairly prominent undulating grain pattern. *Rift Oak,* on the other hand, has a straight parallel grain pattern. The manner in which the veneer is cut from the log determines the grain pattern. This is easily understood from *Fig. 2,* which explains the types of veneer cuts and their figure characteristics.

Many types of woods have different prefix designations to signify their type and point of origin such as Honduras Mahogany, Philippine Mahogany and African Mahogany. These woods are of the Algoma grade* hardwood plywoods and are considered the best grade of plywood for furniture work. The economical grade for panels is Craftsmen grade* Weldwood, which is available only in ¼-in. three-ply panels of standard veneers such as Birch, Elm, Korina, Oak, and

*Korina, Algoma Grade, Craftsmen Grade, Novoply, and Weldtex are registered trademarks of U. S. Plywood Corp.

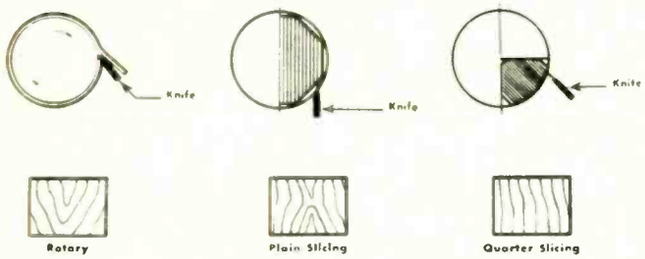


Fig. 2. Veneer patterns differ because of the method of cutting the veneer from the log. In the Rotary cut, (left), the log is mounted centrally in the lathe and turned against a razor-sharp blade, like unwinding a roll of paper. Since this cut follows the log's annular growth rings, a bold variegated grain marking is produced. Rotary-cut veneer is exceptionally wide. In Plain or Flat slicing, (center), the half log or flitch is mounted with the heart side flat against the guide plate of the slicer and the slicing is done parallel to a line through the center of the log. This produces a variegated figure. In Quarter slicing, (right), the quarter log is mounted so that the growth rings of the log strike the knife at approximately right angles, producing a series of stripes—straight in some woods, varied in others.

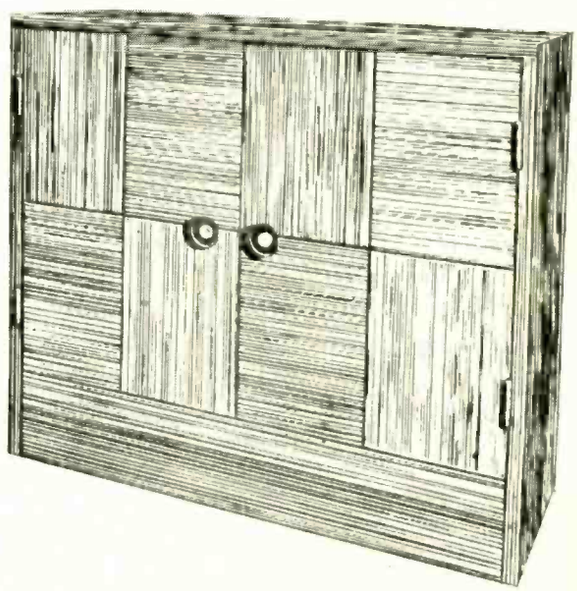
Walnut. Fancy woods with odd and distinguished grain patterns can be obtained on special order if desired. Some of the many types available in the Algoma grade are: Rosewood (from Brazil), Teakwood, Zebrawood, Avodire, Ribbon Striped African or Philippine Mahogany, and Duali. Although there are a number of different species in Mahogany, the grain pattern runs similar except for special cuts). For instance, Philippine Mahogany has a tendency to be of a lighter red (toward the pink side) than African Mahogany or the more expensive Honduras Mahogany.

Fig. 3. A console hi-fi cabinet made from Weldtex. In this cabinet, the grain direction was alternated for a striking effect.

Specialty-Type Wood Products

Several specialty type wood products may be of extreme interest to the home-craftsman. The first of these is Novoply* which is a wood product with a gleaming Mosaic-textured surface. It can be painted or stained in a host of finishes that are ideal for specialty types of installations. Where Novoply can be used in construction work, the builder will realize three important features that are to his advantage. (a) Made from pressed wood chips and flakes, it is practically warp-proof because it does not have a grain direction. (b) It is a good two-faced panel. (c) It is attractive in its variegated texture surface which is available in two wood species—light pine and California Redwood. Novoply is especially recommended for doors where warpage is a problem, this feature has prompted the manufacturer to use Novoply as a core material with the more expensive wood face veneers such as Walnut or Mahogany. Novoply is available in ¾" as well as ⅜" so that the constructor can make the body of the cabinet and use a matching panel for the escutcheons and controls of the equipment. The sliding door panels at the right and left of *Fig.* 1 are of Novoply.

A second specialty effect is achieved with a Weldtex,* a striated panel, *Fig.* 3, available in Fir or Southern Gum and Philippine Mahogany. It can be stained, natural-lac-



quered, or furniture-finished. Fir Weldtex is sometimes given a limed or transparent finish. Weldtex is available in 5/16-in. panel, and can be used as a veneer over Douglas Fir Plywood—the added thickness providing the total thickness required for speaker enclosures. Elsewhere the panel can be used as is, with suitable framing.

A third type of material is Micarta,[1] which provides a damage-proof surface that withstands considerable abuse. Its most interesting feature is the large variety of finishes available—Truwoods, natural grain finishes of actual wood veneers; Trugrain, printed wood veneers; Linen; and many other colors and patterns. Micarta is available in 7/8-in. factory glued panels for simple construction, but for special

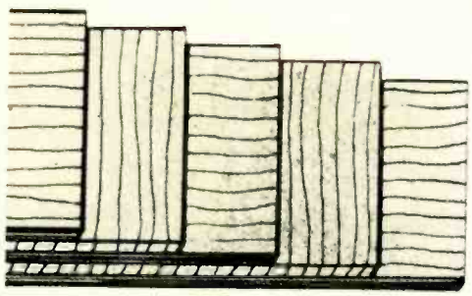


Fig. 4. Faces, crossbands, and core veneers are always laid in odd numbers. The faces are 1/28 in. thick and the crossbands 1/16 in. thick. The grain directions of adjacent plies are generally at right angles to each other. This is a standard method of plywood construction which is less costly, but which cannot be doweled as easily as lumber core. If panel edges are exposed, the end grain of the plies is revealed.

requirements, the more advanced craftsman can laminate the Micarta to any other surface desired, since 1/16-in. Micarta sheets are available.

All three of the specialty plywoods are easy to work with in constructing cabinets, and they all have another feature which is advantageous to the home-craftsman—they may be nailed or drilled close to the edge without fear of splitting. This is particularly important in speaker enclosure construction where many screws must be used to secure a back to a cabinet.

Plywood Panel Sizes

Plywood is generally available in the following thickness: ¼", ⅜", ½", ⅝", ¾". The most popular thickness for general cabinet work is the ¾-in. panel, with ¼-in. sheets being used for the equipment panels. Plywood is sold in panels. If the home-craftsman doesn't have a power saw to *machine* the sections of the cabinet from the large panel, his source of supply can do this at an additional charge. The most readily obtainable panel size is the 4 × 8 ft. module. In many woods, panels of 4 × 6 and 4 × 7 ft. are available. Fir plywood is generally available in a far greater selection of panel sizes than decorative hardwood plywood. Sometimes a supplier may have odd widths such as 36 or 42 in., but do not calculate your requirements on any panel size except the three modules 4 ft. wide by 6, 7 or 8 ft. long, until you have checked your supplier's stock.

For general cabinet work, especially in speaker enclosures, ¾-in. thickness in plywood is essential. It is used for the tops and sides of cabinets and built-ins. Two types of core construction are available in ¾-in. plywood, *veneer core* and *lumber core,* see *Figs.* 4 and 5. They differ in the number of plies used and the characteristic of the plies. The seven-ply veneer core is made up of plies that are of equal thickness, hence does not lend itself as easily to drilling for dowels or for use as doors where many screws to hold the various types of hinges have to be used. Also, seven-ply veneer core plywood is somewhat difficult to finish on an exposed edge. The five ply lumber core veneer in ¾-in. plywood is more popular for cabinet work. It consists of a core made from sawn lumber edge-glued and electronically bonded, laminated between layers of thin veneer, the outer veneers being the expensive beautifully grained wood. These solid lumber cores are usually Basswood or Poplar because they have a very even texture and are easy to work. Having a solid wood core makes this type of plywood ideal for cabinet doors and other surfaces that have to lend themselves to special techniques, machining for special hardware such as the Soss hinge and effecting special joints. The cost of lumber core panels runs about 10 to 15 per cent higher than the veneer core of the same size and wood species, however, the difference is small compared to the added convenience and advantages it offers.

Selecting Plywood

Prices of plywood, depending upon the type of wood faces involved, generally vary considerably. Hence, where economy is a factor, Fir Plywood would be recommended as the least expensive. Next, Gum would offer added flexibility in finishing at low cost. The more attractive woods, in order of cost, are: Elm and Birch, Mahogany, Oak, Walnut, and the fancier aristocratic veneers such as Brazilian Rosewood and Duali. When calculating materials, the builder need not figure all of the material to be of the expensive hardwood plywoods. He can make full use of inexpensive Fir Plywood for interior framing, partitioning, bottom panels, back panels etc. He can also make use of Weldwood Perforated Hardboard for trim and equipment face panels as illustrated in *Fig.* 5 which will also keep the cost of materials down. Another measure of economy in material cost is to make use of Fir Plywood shelves and record storage separators in cabinets. They can be painted or lacquered. If desired, the edges of the fir shelves can be fitted with hardwood strips to match the veneer finish of the cabinet, providing a handsome contrast that is quite effective.

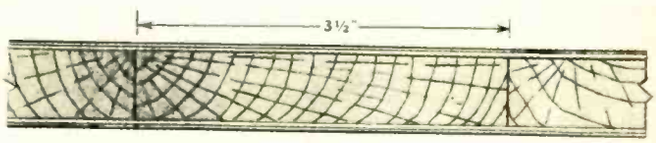


Fig. 5. Lumber Core construction is the cabinetmaker's standby, and consists of a heavy core of sawn lumber with crossbanding and face plies. The heavy core permits doweling, splining, and dovetailing. Face veneers are 1/28-in. thick, and the crossbands—of Basswood or Poplar—are 1/16 in. Woods of uniform texture, such as Bass and Poplar are also preferred for the core, which normally consists of strips 3½ in. wide or less, edge glued and clamped until the glue has set. The strips are then placed in a high-frequency core gluing machine where the resin glue of the core strips is cured electronically without inducing excess moisture into the carefully dried lumber.

When buying plywood, it is important to know the standards of grading. The Douglas Fir Plywood industry has established standards which are as follows: A panel of Fir Plywood with one good side only would bear the designation A-D. Where A denotes the good side or face, and D the back face. The D face has knots, blemishes etc. Hence a panel designated as A-A would have two A faces or good sides.

(*Continued on page 62*)

[1] Micarta is a registered trademark of Westinghouse Electric Corp.

THE *GREATER* TRi-PLEX

BY JENSEN

The new TRi-PLEX is the result of further research directed toward the enhancement of all the qualities for which this famed Jensen 3-way system has been noted.

Musicians, record collectors, sound engineers and laymen contributed to the concept and participated in the five years acoustical research and exhaustive psychoacoustic tests. Even the slightest false coloration effects have been eliminated—there is no raucous tinkle or exaggerated percussion, stridency is missing from the violins. And there is an extreme smoothness of response and a precisely adjusted intra-range balance—the individual instruments stand out in true dimensional separation. The vocalist steps out in front of the musicians. You're bound to agree that here is fine listening indeed.

At **$312.70** net the TRi-PLEX in mahogany factory assembled complete with individual certificate of performance—in korina blonde **$316.80** net. Jensen back-loading improved bass cabinets only—Model BL-220 (12-inch speakers) mahogany **$89.50** net, korina blonde **$92.50** net—Model BL-250 (15-inch speakers) Mahogany **$128.00** net, korina blonde **$130.90** net.

Burton browne advertising

Jensen

MANUFACTURING COMPANY
DIVISION OF THE MUTER COMPANY
6601 S. LARAMIE AVENUE, CHICAGO 38, ILLINOIS
IN CANADA: COPPER WIRE PRODUCTS, LTD., LICENSEE

Fig. 1. Acoustical QUAD II control unit (above) and main amplifier.

Equipment Report

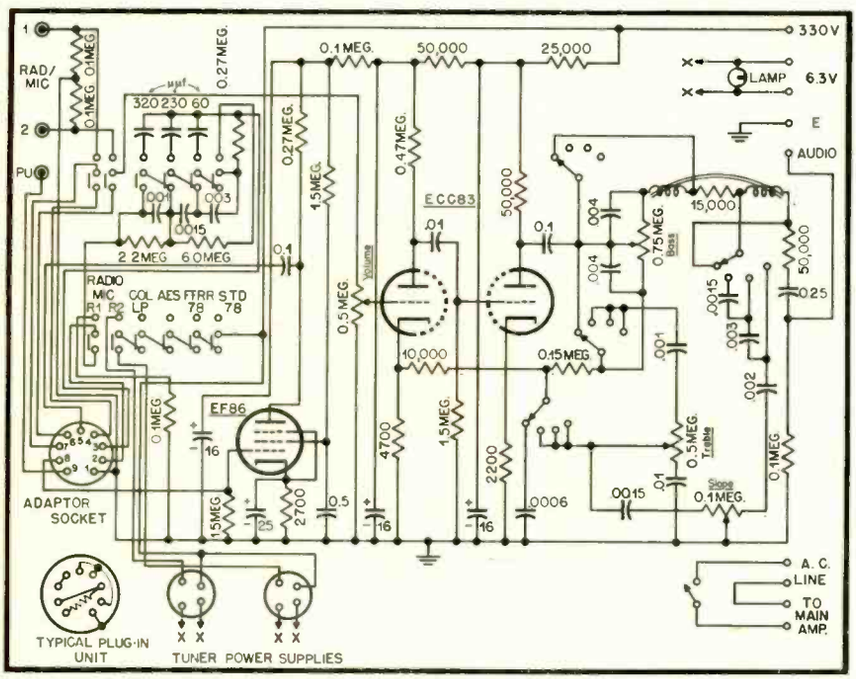
QUAD II—Freed-Eisemann P-717—Harman-Kardon Tuner Fisher 50-F Hi-Lo Filter

OPERATIONAL and performance features of the Acoustical Manufacturing Co's. QUAD II amplifier and control unit place it well up on the list of quality hi-fi equipment; although those same features contribute to a relatively high price, the critical user will find them definitely desirable. The amplifier consists of two chassis—the control unit, which contains two tubes (one a dual triode), and the power amplifier with five tubes. The units are shown in *Fig.* 1.

The control provides for one phono input, with sufficient gain for low-impedance dynamic pickups without the usual matching transformer, and a choice of either two low-gain (radio) inputs or one low-gain and one high-gain (for microphone) inputs simply by changing the plug-in network. Four compensation curves are available directly with separate push buttons; three others may be had by pushing two or three buttons simultaneously.

Bass and treble tone controls work in a feedback circuit, and provide the gentler curves common with British-made amplifiers. One of the most valuable features is the variable-slope low-pass filter, which has three cut-off frequencies—10, 7, and 5 kc—controlled by the right knob. One position of the control is marked CANCEL, and in this position *all* tone controls *and* the filter are out of the circuit, resulting in flat frequency response. When the switch is at 10, 7, or 5 kc positions, and the slope control (second from right) is in the LEVEL position, response is essentially flat except for a droop beginning above 10 kc, resulting in a sharp cutoff above 20 kc. As the slope control is rotated from 1 to 50, the filter becomes increasingly sharper, as shown on the performance curves, *Fig.* 4. Curves for all cut-off frequencies are essentially the same except for being moved to the left; only the sharpest slope is shown for the 7 and 5-kc positions. *Figure* 2 is the schematic.

The power amplifier is compact—measuring 13 by 4¾ by 6½ in. high—and is constructed like the proverbial battleship. Circuitry, *Fig.* 3, is simple, and differs from most conventional amplifiers in the feedback winding in the cathode circuits of the output tubes. Voltage feedback around the transformer is also employed. From the performance curves, *Fig.* 4, it will be seen



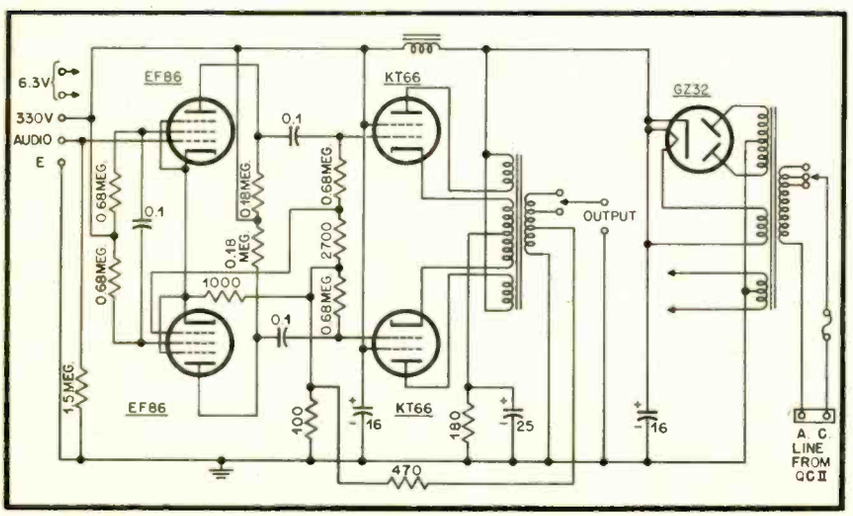


Fig. 2 (above). Control unit schematic. Fig. 3 (below). Main amplifier schematic.

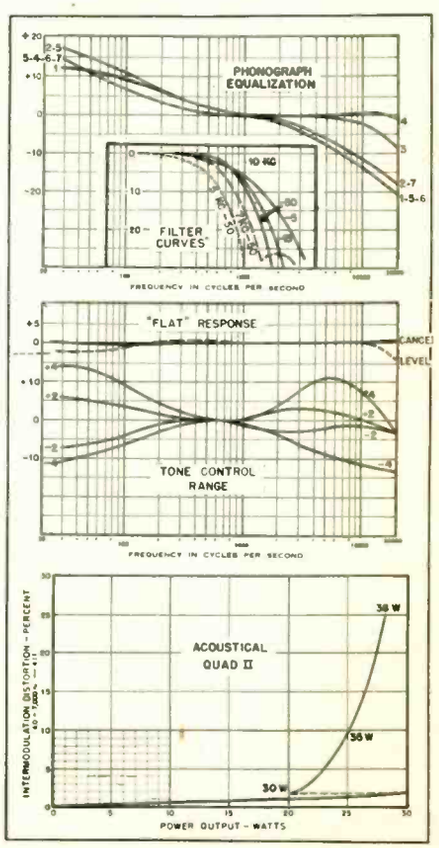
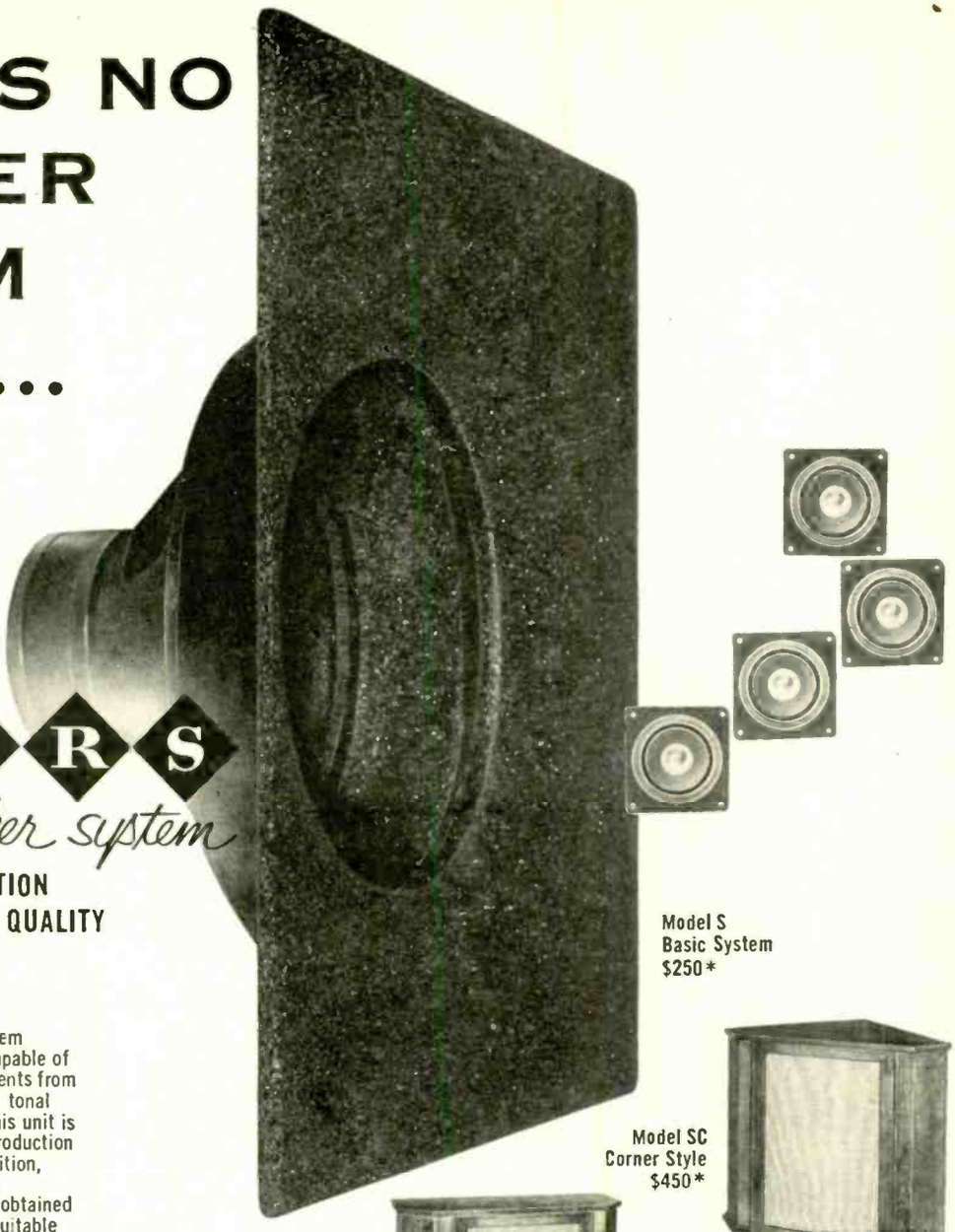


Fig. 4. QUAD II performance curves.

THERE'S NO SPEAKER SYSTEM LIKE IT...



the deMARS Loudspeaker system

AUTHENTIC BASS REPRODUCTION AND GENUINE CONCERT HALL QUALITY IN A COMPACT DIRECT RADIATION SPEAKER SYSTEM.

"I have developed a new loudspeaker system incorporating the "Styrocone" speaker, capable of reproducing the sounds of musical instruments from the lowest bass notes through the entire tonal spectrum, into the highest frequencies. This unit is distinguished by naturalness of sound reproduction and resulting excellence of musical definition, which permits listening at concert volume without fatigue. These characteristics are obtained in a unit so compact that it is eminently suitable and practical for home use."

Paul A. deMars

Model S
Basic System
$250*

Model SC
Corner Style
$450*

Model SW
Wall Style
$450*

Basic system is mounted on wooden baffle board 22" x 32".

Enclosures are custom-built of finest, genuine solid furniture woods, all hand-finished in mahogany, walnut, or blonde, to your preference.

*FOB Lawrence, Mass.

Q. What is the deMars speaker system?

A. A multi-cone system with a single voice coil mechanism, supported by an array of very high frequency direct radiators.

Q. What kind of loudspeaker system is the deMars?

A. It is a direct radiation system as distinguished from acoustic coupling devices, such as horn types or acoustically baffled systems.

Q. How does the deMars system achieve better reproduction?

A. Through the multi-cone principle, which presents the optimum vibrating surface for each area of frequencies over the tonal spectrum.

Q. Why was this new type of direct radiation system required?

A. To obtain authentic bass response in the home within acceptable sized enclosures, and independent of location in the living room.

Q. What is the opinion of the critics?

A. The new deMars system has been tested under many and varied room conditions. Critics have been unanimous in their enthusiasm.

Q. What distinguishes the deMars system from all others?

A. It incorporates a new device, called the "Styrocone", which enlarges the vibrating surface beyond that of any other single multi-cone type unit known today . . . much larger than any other direct radiation system on the market.

Q. What is the advantage of a direct radiation system, such as the deMars?

A. It performs better than other types of speakers, except when they are coupled with horns or baffles of prodigious size . . . and, it is much more flexible and practical for economical installation.

Q. Is the deMars system available, and what does it cost?

A. Yes . . . it is available now, in three models, each built under Mr. deMars' personal direction. The basic system comes pre-assembled and mounted . . . can be installed quickly and without difficulty by simply connecting 2 wires.

deMARS ENGINEERING & MFG. CO. · 360 Merrimac Street · Lawrence, Mass.

— MAIL COUPON TODAY —

deMars Engineering & Manufacturing Co.
360 Merrimac Street,
Lawrence, Mass.

Gentlemen:
Enclosed is my check ☐ — money order ☐ — for style.....
☐ Send me your illustrated literature on the deMars Speaker System.
☐ Send information as to where I can hear the deMars Speaker System.

Name_____
Address_____
City_____ Zone____ State_____

AE-4

that the output power is quite high for a pair of KT-66's, with distortion remaining below 1.5 per cent at 30 watts (the unit is rated at 15 watts). Hum and noise from the main amplifier is 84 db below rated output. Output impedances of 7 or 15 ohms are available—the change being made by reconnecting a lead on the output transformer.

The control unit supplies 330 v. at 30 ma for tuners which may be connected to outlets on the chassis, power being switched to one or the other as the RADIO/MIC buttons are depressed. A total of 2.5 amps is available at 6.3 v. at the two tuner sockets. The control unit is mounted by removing the shield cover, inserting the chassis through a 3 × 10 in. opening in a panel, and replacing the cover which is tightened against the panel. For applications requiring up to 30 watts, and complete flexibility in the controls, this unit should satisfy the most critical. Input signals for 1-watt output are: main amplifier, 0.38 v.; radio or mic positions, .023 v.; phono positions, approximately 6 mv.

FREED-EISEMANN P-717 RECEIVER

The rapidly expanding hi-fi market has resulted in the application of a radio-type engineering approach to the solution of a problem which is sometimes considered real by the uninitiated, but which is not a problem at all to the *afficionado*. By this is meant that of installing a number of separate pieces of equipment into a suitable cabinet. In the Freed-Eisemann P-717, most of these difficulties have been assumed by the manufacturer, for this unit consists of a sensitive AM-FM tuner, a phonograph preamplifier with adequate control flexibility, tone and volume controls, and a 10-watt amplifier all on a chassis which is less than 15 in. long and only 10 in. deep.

The entire unit employs only 11 tubes, but many of them do double or even triple duty. For example, the FM limiter also serves as

Fig. 5. Freed-Eisemann P-717 Receiver.

the phono preamp—a logical approach since to be a good limiter, the plate supply is fed through a high-value dropping resistor—in this case, 0.1 meg. This resistor therefore becomes the plate load resistor for the pentode preamp stage, which is a 6AU6. Similarly, a 6T8 serves as the FM discriminator, diode AM detector and a.v.c., and first audio amplifier. The phase inverter is a 12AX7, which drives a pair of 6V6's as a beam-power output stage.

The tuner employs a 6CB6 as an r.f. stage on both AM and FM; a 6U8 as mixer and oscillator; another 6U8 as AM and FM i.f. amplifier and FM a.f.c. tube, and two 6AU6's as FM i.f. amplifier and limiter respectively. Using a large loopstick, satisfactory AM reception was heard over 300 miles; on FM, sensitivity was judged to be around 5 microvolts for 30 db quieting.

Three phonograph equalization curves are

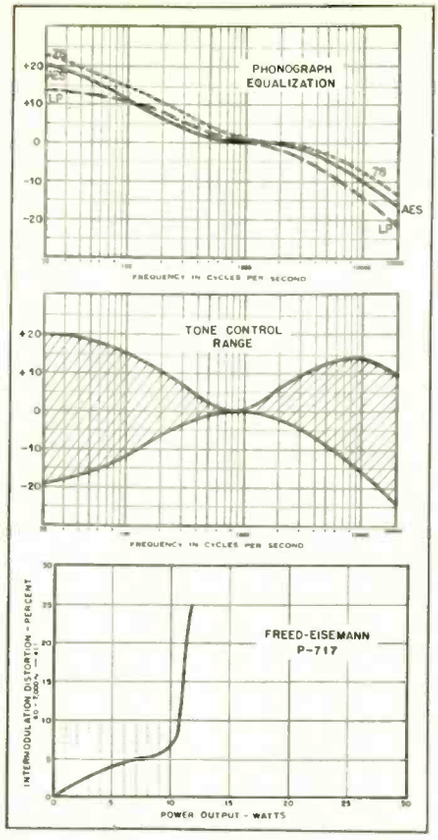


Fig. 6. Performance curves for the Freed-Eisemann P-717.

provided, which will suffice for most records encountered if some recourse is had to the tone controls for exact correction. Sensitivity with maximum volume control setting is approximately 2 mv for 1-watt output. On the AUX input at lower gain, an input signal of .086 v. is required for the same output. IM distortion is approximately normal for 6V6 output tubes, and power handling ability is down 3 db at 25 cps on the low end, holding up well to over 20 kc.

This unit is especially suitable for those who have limited space and who want good quality and convenience of operation—and above all, installation.

Power consumption for the P-717 is 98 watts, and an outlet is provided on the rear apron for a phonograph motor. Input impedance for the phono pickup is 47,000 ohms; for pickups requiring lower load resistances, a shunting resistor may be mounted on the changer or at the pickup arm. Output impedances of 4, 8, and 16 ohms are provided. The chassis is shown in *Fig.* 5, with performance curves appearing in *Fig.* 6.

HARMAN-KARDON A-100 AM-FM TUNER

Skeptical audiophiles may have doubts as to the possbiility of building an AM-FM tuner which would come up to the requirements of a astisfactory hi-fi system for the low price tag which appears on the Harman-Kardon A-100 Tuner shown in *Fig.* 7. However, let it be said in all fairness that there is no reason for such skepticism, for the tuner performs well and with satisfactory characteristics on both AM and FM.

This tuner has all the features expected in more elaborate models—self-contained AM lookstick, an r.f. stage and a.f.c. on FM, a.f.c. defeat switch, flywheel tuning control, switch-controlled a.c. receptacle on the rear apron for phono motor or for the main amplifier, and accommodation for phono pickup switching—from a crystal or ceramic pickup directly, or from a magnetic pickup with an external preamplifier.

Following new decorator trends, the panel is finished in heavily lacquered copper, with the illuminated dial pointer visible through a semicircular slot. Trim is jet black, which sets off the copper panel attractively. Although the entire tuner is relatively small, the panel is rather high, and requires a cutout 10 in. wide by 7¼ in. high. Mounting in the normal position (with the panel vertical) is best done on a flat shelf; for horizontal positioning, the panel carries the entire weight of the tuner, and fastens directly from the front. This makes for easy mounting for chairside cabinets; in fact, this tuner is exceptionally well suited to any conver-

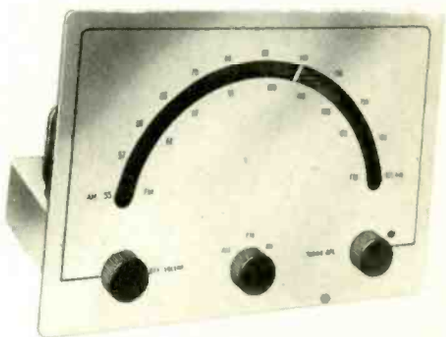


Fig. 7. The Harman-Kardon A-100 AM-FM tuner.

sion job where an older radio set is being replaced by new hi-fi equipment in an existing console.

The loopstick is mounted so as to be rotatable for best AM reception. FM a.f.c. action is excellent, and stations "pop" in and out as the tuning knob is turned. To defeat the a.f.c. circuit, the tuning knob is pushed in slightly to permit critically accurate tuning. In every department, the A-100 belies its low cost.

FISHER 50-F HI-LO FILTER

While wide-range response is desirable in a high-quality system, many broadcast programs and many phonograph records actually sound better with a cutoff somewhere between 5 and 10 kc, depending upon the degree of high-frequency distortion or noise present in the program material. Similarly it is often noted that turntable rumble is disturbing—either from the reproducing turntable or from the turntable on which the original record was made. Also, some remotes on radio circuits have a high hum level which is unpleasant on a system which has good low-frequency response.

These troubles can often be eliminated by the use of the Fisher 50-F Hi-Lo Filter which provides cutoff frequencies of 10, 6, and 3 kc on the high end, and of 30, 60, and 120 cps on the low end. Thus distortion and noise can be reduced appreciably without too much loss of the musical content of the program (since the low-pass filters are quite sharp), and hum and rumble can be decreased with an over-all improvement in musical quality. The filter unit is housed in an attractive plastic case 4-7/16 in. high, 5-⅜ in. wide, and 5 in. deep, and two lever-type switches extend through a brushed brass panel. The unit is self powered, using an isolating transformer and selenium rec-

(*Continued on page 51*)

Nomograph for Bass-Reflex Enclosure Design

JOSEPH F. SODARO*

FROM THE THEORETICAL ANGLE, the tuned speaker baffle is designed from three factors—enclosure volume, resonance frequency, and port area. Frequency and either of the other two factors may be the starting points, with the remaining factor the unknown. The conventional formula which expresses the relationships is based on the Helmholtz resonator and is applicable to cabinets whose maximum dimension is small in comparison to a wavelength of the lowest desired frequency. The formula is

$$A = \frac{V^2 f^2 \times 10^{-6}}{6}$$

where A is the port area in square inches, V the cabinet volume in cubic feet, and f the frequency of resonance. For this formula to be valid the port area should be limited to a figure between 0.5 and 1 times the speaker cone area and the cabinet should be approximately cubical.

The two possible design procedures are outlined as follows. First, assume a cabinet volume which is suited to the room and will house the speaker. Determine the desired cabinet resonant frequency from the speaker resonant frequency (the two should be identical). This information generally is available from the speaker manufacturer. Finally, determine the port area.

The second procedure allows the designer to assume a tuning port area which is well proportioned to the speaker opening (between the limits mentioned). Once more resonant frequency is determined from the speaker specification. From these data determine cabinet volume.

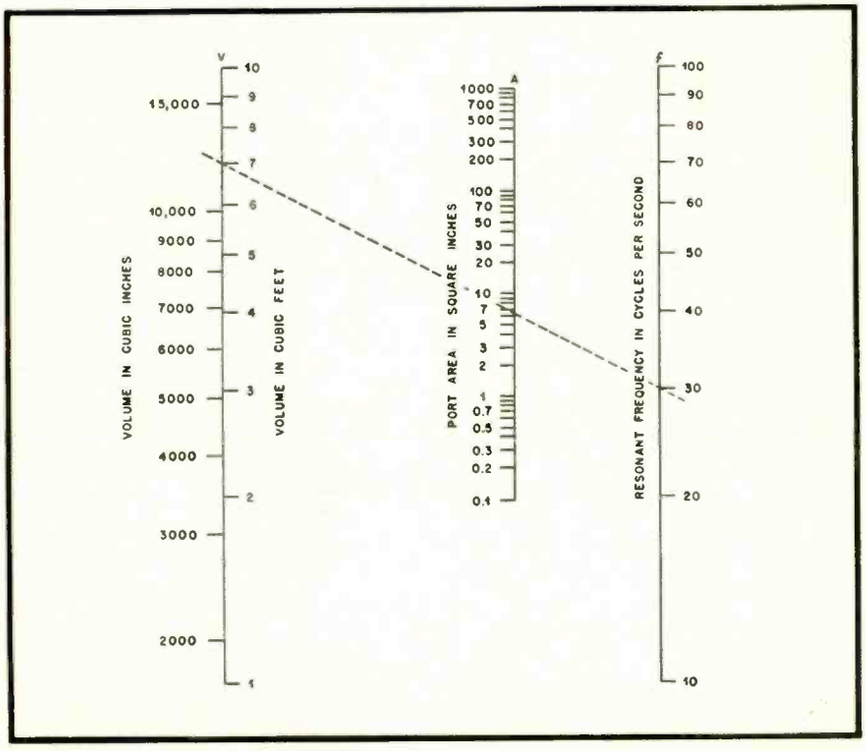
The nomograph shown herewith has been prepared to facilitate the design procedures by simplifying the calculations. To use the nomograph in the first case, select cabinet volume in cubic feet (or cubic inches) on the V scale. Select resonant frequency on the f scale. Join the two points by a straight line. Read port area in square inches at the intersection of this line with the A scale.

In the second case select port area on the A scale and resonant frequency on the f scale. Join these points with a straight line and extend the line until it intersects the V scale. Read the required cabinet volume at this intersection.

As an example assume that a 7-cubic-foot cabinet is to be resonated at 30 cps. Determine the port area. From 7 on the right side of the V scale to 30 on the f scale construct a straight line. Read 6.4 square inches at the intersection of this line with the A scale. An opening of $2 \times 3\ 1/4$ inches could be used.

The V scale can also be used as a conversion scale between cubic inches and cubic feet. For example, find the volume of a cabinet with inside dimensions of $25 \times 20 \times 20$ inches. By multiplying these dimensions together we obtain a volume of 10,000 cubic inches. Locate 10,000 on the left side of the V scale and read 5.8 cubic feet on the right side.

* 2924 Selby Ave., Los Angeles 64, Calif.



Nomograph can be used to find either port area or volume when the other is assumed. The enclosure should be cubical and port areas should be between 0.5 and 1 times the speaker cone area.

NEW 666 VARIABLE-D* CARDIOID

OUTPERFORMS ALL OTHERS

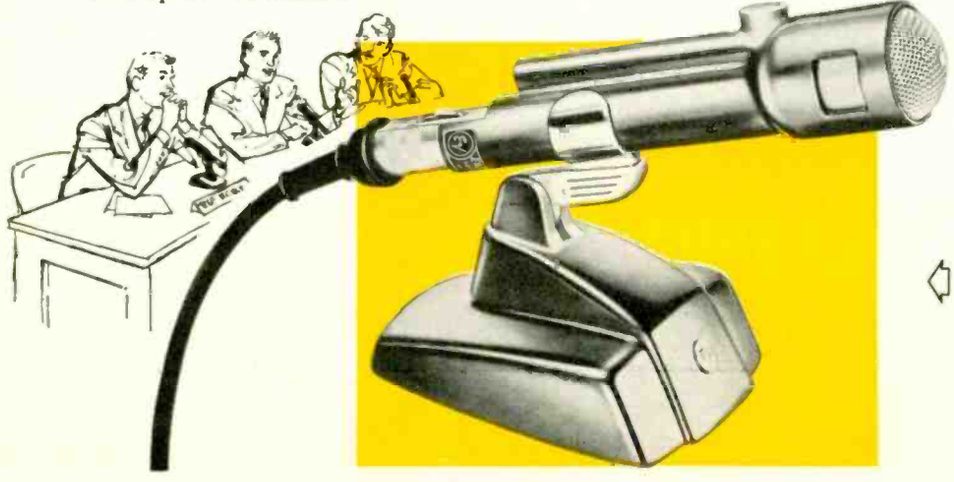
Significant UNIDIRECTIONAL *Advance*

New E-V* VARIABLE-D ***Acoustic Principle Provides High Front-to-Back Discrimination Plus Wide-Range Response, without Proximity Effect —in a small, Light Weight Dynamic Microphone that is Extremely Rugged and Versatile***

Here, for the first time, is a completely new cardioid microphone that meets the exacting requirements of present-day telecasting and broadcasting . . . a microphone that readily solves the many vexing problems of daily operation.

Designed in cooperation with network engineers, the E-V "666" combines the ruggedness of a single dynamic element with a new acoustic principle that assures smooth, extended wide-range response . . . and high, uniform discrimination against sound impinging on the back hemisphere . . . with virtually no proximity effect.

The new E-V "666" is especially useful in eliminating pick-up of ambient noise, unwanted reverberation, and movement of equipment. Closely matches existing high quality pressure microphones, such as the famous E-V "655", and thus permits easy fading from one microphone to another.



***PRINCIPLE OF OPERATION**

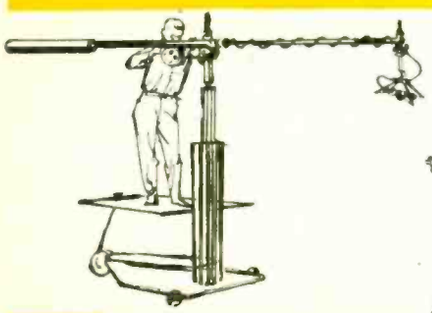
Exclusive E-V VARIABLE-D (for variable distance) provides three back sound entrances at different fixed distances. These entrances each possesses a phasing network which operates with the other entrances to provide effective front-to-back spacing which varies inversely with frequency. As a result, optimum front-to-back discrimination is obtained at all frequencies.

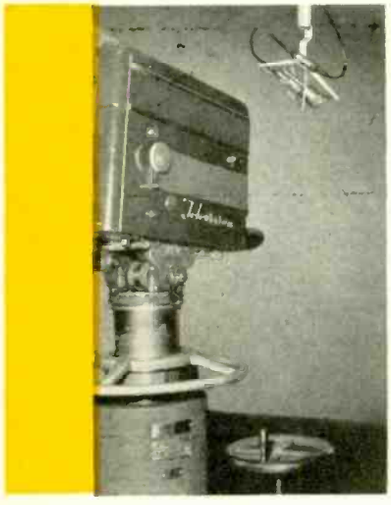
*E-V Pat. Pend.

VERSATILE DESK OR TABLE USE

Model 420 stable desk mount and clamp permits easy use for quiz shows or fixed position emceeing. Microphone simply slides out of clamp for other use in hand, on stand or boom.

DYNAMIC
FOR TV and BC





IDEAL FOR BOOM WORK

Small size, light weight, high resistance to shock, and consistent performance greatly simplify boom or fish-pole operation... allow fast pans on boom shots, without worry about mike shadows. Unique E-V Model 366 Boom Shock Mount is optional (extra).

EASY STAND OPERATION

Spring-type, cushioned-slide, stud-clamp permits instant stand mounting or removal (without marring surface). Smooth swivel allows proper placement and firmly holds microphone in desired position.

THESE E-V FEATURES MAKE THE BIG DIFFERENCE

Frequency Response: Uniform response 30-15,000 cps. Individual laboratory control insures conformity to the highest fidelity standards.

Polar Pattern: Average front-to-back discrimination 24 db.

Power Rating: Output level -57 db. Provides excellent signal-to-thermal noise ratio.

Magnet Structure: Alnico V and Armco magnetic iron. Provides flux density and signal sensitivity previously found only in microphone heads many times the size of the "666".

Impedance Adjustment: Supplied wired for 50 ohms. Can readily be changed to 150 or 250 ohms on terminal board inside case.

Acoustalloy Diaphragm: Exclusive E-V formulation provides the proper elasticity to complement the acoustical requirements of the "666". Promotes smooth, wide range response. Practically indestructible under all types of operating conditions.

Blast Filter: Acoustical screen protector minimizes wind and breath blasts, and traps iron fillngs.

Microphone Case: Made of aluminum and finished in durable TV gray. 7¼" long x 1½" diam. Weighs only 11 ozs. Uses detachable clamp-on stand adapter for ⅝"-27 or ½" pipe thread. Swivel provides for tilt up to 90°.

Cable and Connector: Comes with 20 feet of 2-conductor broadcast-type cable, and Cannon UA-3-11 connector on microphone end.

Try the E-V "666" Now

Prove to yourself the superiority of the "666". No obligation. Normal trade discount applies.

Model 666 Microphone.....List $245
Includes Model 300 Stand Coupler.

Model 366 Boom Shock Mount. List $40
For easy attachment to standard booms. Weighs only 6 ozs. Has adjustable rubber band shock absorbers.

Model 300 Stand Coupler.....List $10

Model 420 Desk Stand.....List $20
Heavy cast base finished in matching TV gray. With microphone clamp.

Available at Authorized E-V Distributors

Write for Technical Data Sheet No. 39

Electro-Voice

ELECTRO-VOICE, INC. • BUCHANAN, MICHIGAN

Export: 13 East 40th St., New York 16, U.S.A. Cables: Arlab

EDWARD TATNALL CANBY*

THE FAMED LONG-TIME SPECIALIST label in out-of-the-way recording, L'Oiseau-Lyre (Lyre Bird) was once before launched on LP in this country, under another company's sponsorship. The music then was interesting, but the technical quality was unfortunate. I suspect that those earlier LP's were transferred from disc originals made on pre-war type recording equipment; the LP copying was not extra-good either.

You will be pleased to know, then, that the new L'Oiseau-Lyre series under the sponsorship of London records brings fully up to date quality to the label—the recordings evidently are new and from tape and the processing, done by London in England, is exemplary. So give the Lyre Bird a new chance.

Bach: Trio Sonata in G for Flute, Violin and Continuo. Flute Sonata in E mi. Trio Sonata in D mi. for Flute, Oboe and Continuo. Collegium Pro Arte.

The new L'Oiseau-Lyre series presents an odd mixture of performing ensembles, some typically French (below), some British presumably due to the London connection, and some imported German, as here, recorded in Paris. This group knows its Bach and plays beautifully, and the music is the best and most accessible of the smaller and highly colored ensemble forms used by Bach. The typically contrasted tone colors of the flute, the oboe and the violin and the "edgy" mixture color of the harpsichord are combined in a nice variety of ways here. Bach, as we now are realizing, was very much a musical colorist, always making a point of interesting color combinations, even exotic ones—which is just fine for today's hi-fi systems.

An interesting engineering point here. The harpsichord on one side of the disc, that beginning with the sonata for violin is poorly balanced too loud and too close. On the other side, which begins with the Trio Sonata for flute and violin plus harpsichord, (a cello plays the bass line with the harpsichord in all of these) the keyboard sound is neatly and correctly balanced. I'm wondering whether this was a sheer accident—the violin and flute took up more room and so the mike was shoved away, further from the harpsichord—or whether it was a deliberate adjustment. It might even have been—horrid thought—the other way around; perhaps somebody wanted more harpsichord.

If so, in my opinion, somebody was wrong. I'm the first to insist that the recorded medium has its own laws, for recorded balance and for listening. But how far does one go, when there is still the original musical intention to consider? I know very well what the live harpsichord accompaniment should be like and I am sure that a similar sound is desirable on records—i.e. a sharp but modest and low-volume effect, with a minimum of the thumping, heavy percussion that occurs when you stick your head inside the harpsichord's works. You can tell immediately when a harpsichord accompaniment has been milked too close—there's a solid, fat, stuffy quality about it, mechanical, metallic, with too much middle. At the correct distance the sound is suddenly light-bodied, subtle in color, only the top overtones showing clearly above the rest of the music. The bass reinforces, but should not be consciously in the forefront. Souffle sound, not chocolate pudding.

Try these two sides and hear the difference—and remember, in case you have decided you don't like the harpsichord, that far too many recordings of the instrument have it too close and too thump-ridden. It can be beautiful.

Pleyel: Fifth Concertante Symphony. Dittersdorf: Three Wind Partitas. French Wind Quintet. **L'Oiseau-Lyre OL 50014**
Mozart: Quintet for Piano and Winds in E flat, K. 452; Cassazione (Cassation) for Oboe, Clar., Horn, and Bassoon. French Wind Quintet, R. Veyron-Lacroix, piano. **L'Oiseau-Lyre OL 50016**

Here's an odd one, with several points of special interest. First, these are French players and not only is French playing quite unlike that of any other "Western" nation, even to this day, but even their instruments are differently constructed, notably the French "French" Horn. (The German "French" Horn isn't called that in Germany, probably because it never was French.)

This is brilliant, but cold-blooded playing to my mind—as so often happens when French performers tackle German music. The higher winds, especially the oboe, are superb. The whole has a virtuoso sound that backs up the French reputation for superior woodwind playing. But the horns! They are smaller, of a different shape than the horns used elsewhere and they are played with a vibrato, which is unthinkable in other parts of the musical world. Don't ask me why—it would seem to be strictly a matter of choice. But, for my ear in any case, these French-type horns are just plain objectionable and the vibrato makes them sound like rather sickly baritone saxes. The best word I can find to describe the tone quality is braying. They bray. (Am I going to get it in the neck from certain Francophiles.)

As for the music, there's a most interesting difference, all within the same general "Mozart" style between the true Mozart and the contemporary works by Ditters von Dittersdorf (that's right) and Pleyel, founder of the famous piano company. Those two gentlemen both wrote highly competent and expert music and were well known in their day. But to my ear and I am sure to yours, it seems tuneful, well written, but utterly slack. It doesn't get any where, it doesn't say anything, it has no tension.

And at this point I could, but won't, move on into a disquisition on tension in music, which is as much the essence of its expression as tension in drama, or tension in today's tension-based building construction. Tension comes from the progression of harmonies, keys, and from the shaping of melody. It can be diagnosed very neatly, contrary to what you may think; I am reasonably sure I could point out to you specific lacks of tension in these two works in a hundred places, as one could pick out flaws in a badly designed bridge.

You probably don't know the technical vocabulary of music well enough to follow such an argument—but, strangely enough, you can hear the lack of tension if you've had even a slight experience of this sort of music, of the Mozart period. Just try the real thing, Mozart. Try this Symphonie Concertante for Winds and then sample M. Pleyel's; outwardly similar, inwardly as different as black and white. Or just compare these two discs.

Henry Purcell: Suites for Harpsichord. Isabelle Nef. **L'Oiseau-Lyre OL 50011**

An excellent disc, the harpsichord well miked, for close but reasonably natural solo listening. Again, a rather French interpretation of the very British Purcell—but then, Purcell himself was deeply influenced by the great burgeoning school of French music of his day, and so the playing is not too out of style. The music itself is tremendous—the melodies as tense, as wry, as potent as the Dittersdorf and Pleyel were casual and lax. Purcell doesn't throw it at you, but there isn't a normal human being who won't begin to hear the extraordinary intensity of these works after a few playings. A very great composer.

Be sure to keep the volume level fairly low. The harpsichord is not a power instrument, though its voltage-intensity can run very high.

John Blow: Venus and Adonis (opera). Margaret Ritchie, Gordon Clinton, et al., L'Oiseau-Lyre Ensemble, Anthony Lewis. **L'Oiseau-Lyre OL 50004**

This could have been a superb record—an early British opera in the style of the much-beloved "Dido and Aeneas" of Purcell, full of humor and rich expression with the strong rhythms and unusual chromatic harmonies of lusty 17th century Restoration England. But though a good part of it gets through in this English-performed version, there is a lack of stylistic understanding (on the part of the conductor, Mr. Lewis?) that takes the glitter and the joy quite out of it. The whole has a mushy, rounded sound, restrained where it could be boisterous, slow and dragged where vigorous tempi are crying need. This is British restraint at its worst for it doesn't make sense.

The singers sing most earnestly and scarcely a word can be understood; Adonis is a drooling idiot, if you'll pardon my strong language, and Venus, though considerably more convincing (Margaret Ritchie) is just too coy for any Restoration comedy that I know of. It was a lusty age and this is a musty performance.

Purcell lovers can still get the delicious sense of it, even so. Miking is good, except that the singers could be a bit closer for the sake of diction and clarity. Some delightful child singers do a sort of spelling lesson, as little cupids learning the fundamentals from Cupid himself. (He is the son of Venus, in case you'd forgotten.) Somebody ought to do this right.

Bach: Prelude and Fugue in G; Toccata, Adagio and Fugue in C; Prelude and Fugue in E mi.; Fugue in D; Chorale Prelude "Ach, Bleib bei Uns." John Eggington (organ). **L'Oiseau-Lyre OL 50012**

(Continued on page 42)

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

"in music, listening quality is everything

and the Audax CHROMATIC has it to a degree not equalled by any other pickup . . ." (*Says David Sarser, the violinist, Toscannini's NBC Symphony*)

Some place all emphasis on the means of playing rather than the desired end-results—Good Music. But—as Sarser says . . . mere highs and lows do not add up to "Listening Quality".

The revolutionary new records contain so much music that almost any pickup is bound to give some results . . . but it takes a magnetic reproducer of the highest order, one sensitized to the *nth* degree . . . an Audax CHROMATIC—to bring out every subtle shading, every nuance so essential to good music.

But . . . ONLY You can tell what sounds best. Therefore, HEAR the Audax CHROMATIC and—YOU BE THE JUDGE. Yet Audax costs no more than ordinary pickups.

A microscope will show a tiny flat on any diamond (much sooner on sapphire) after 50 or so hours of play—yet the jewel is in normally good playing condition. Hence, it is not the flat, but detection of damaging cutting edges that is of vital importance. This makes a microscope ($15 to over $100) useless to an untrained. He can see, but he cannot judge.

Now YOU know when to change the stylus

Audax

STYLUS-DISK

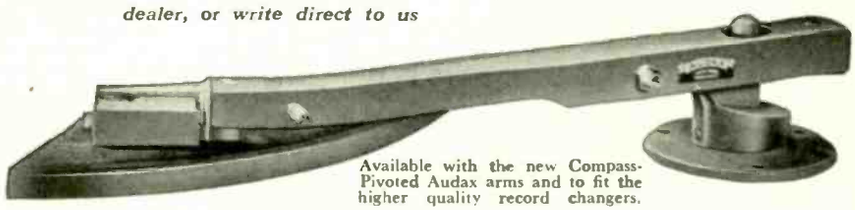
Pats. Pend.

1. Gives VISUAL indications of incipient record erosion.
2. Test, AT HOME, any needle, in any pickup, at any speed, in a jiffy.
3. Neither needle nor pickup need be removed.
4. STYLUS-DISK grooves used over and over until worn needle scrapes grooves. STYLUS-DISK should last for years. $3.90 net, at your dealers. (add 35¢ if shipped from N. Y. City)

STYLUS-DISK available at leading dealers. Write for information

CAUTION: Because a jewel point (be it diamond or sapphire) has only a limited playing life, replaceability—at home—is of great importance. Only Audax provides replaceability—at home—of either stylus, independently of the other.

FREE "ELECTRONIC PHONO FACTS" *at your dealer, or write direct to us*



Available with the new Compass-Pivoted Audax arms and to fit the higher quality record changers.

AUDAK COMPANY

500 Fifth Avenue Dept. A New York 36, N. Y.

Creators of Fine Music reproducers for over 25 Years

"The Standard by Which Others Are Judged and Valued"

AUDIO ETC.

Edward Tatnall Canby

SMALL ENCLOSURES

FOR THESE PAST MANY MONTHS I've been trying to assemble a representative batch of small speakers and their boxes to see what I could hear—but each time I'm set to go, somebody comes out with another one. That, by the way, is wholly typical of this year's frenetic audio. The energy of the entire industry seems to have gone into expansion, into competition. A new amplifier, new speaker line, new record player every other minute, and in the year-long run, the really significant new developments, as the editor has elsewhere suggested, have not been great. My problem has been to find something—anything—in audio that I can, so to speak, stretch my arms around. Take one speaker, you have to try at least a gross of its immediate competitors too.

Anyhow, rather than say nothing, I'm reporting now, interim-wise, that the general prediction of this column some years ago that the RJ small enclosure ("Bull Frog Bass," as it was then described) would start a new trend towards more bass in less space has been abundantly fulfilled. (Indeed I had a time persuading the RJ people, back then, that the smaller sizes were the most significant.)

Everybody and his sibling is now putting out small speakers and enclosures. Most of the new HF table phonographs (to use the proposed new AES terminology) make use of some sort of enclosed space, too, along with new small speakers, in a similar move towards a better space-bass compromise at the various levels. The whole thing is a major trend, and for the best of reasons—perfection and the ideal speaker enclosure are all very well, but what people need is a better compromise for practical living. When a man really finds a better compromise, he has a lot more than a mouse trap.

Well—I've been listening and as yet I have only some general conclusions to offer. I've had in use already a batch of the new systems, the Jensen Duette, the Permoflux Diminuette, the Kelton, the Kingdom Sound Combination and the Sound Corner, both with German Lorenz eight-inch speaker and plastic cone tweeter (also a separate set, for use in other enclosures), and still to come are an enclosure from Tru-Vox and a system from Utah; as a comparison to all of these I've got on hand a couple of older devices, the RJ eight-inch enclosure and the smaller Electronic Workshop eight-inch modified bass reflex, still the smallest of any of the systems in size; also in the way of separate speakers in addition to the Lorenz, a Permoflux eight-inch Royal and one of the new Super-Royals, a Wharfedale Eight with cloth suspension—and phew!—I can hear the clamor arising already: you've missed this and you've skipped that and you haven't even mentioned the best one of all, etc. etc. Can't help it, I'm doing my best.

Just as a double check, I'm also using my big fifteen-inch system and, at the other end, I bought a nice little 3-inch woofer for $1 last week and have mounted it in a cardboard bass reflex (port *not* tuned) measuring about 5" by 8" by 2". It sounds good, too.

Agreeable Boominess

All this and record reviewing too! My preliminary conclusions are these. Most of these new systems offer basically a compromise in bass response, somewhat "rigged" to achieve the maximum listening balance between low and high end. In most of these new enclosures the bass is full rather than low, and tends towards an agreeable boominess.

I put it that way deliberately. Those of us who have big equipment and who have listened for a long while are sensitive to boominess as the general public is not. The musical ear responds far more quickly to an over-all unbalance of bass and highs than to the more subtle non-linearity of the slightly boomy bass. Indeed, many people will prefer the boomy bass to the genuine flat article, claiming that it is louder and more incisive rhythmically. It's not for nothing that the deliberately rigged juke box has made billions of dollars out of boom!

Under the special considerations that go into these small enclosures, then, it is possible to argue that a better over-all musical impression may be given with a slightly rigged bass than with a clean bass. That, decidedly, is what seems to be the current thinking on the matter, though I suspect that there is much still to be done towards having this little cake and eating it as well—with bass that is both low and flat, in an enclosure of small size.

Middles and Highs

A more specific drawback in a number of these enclosures and one that is scarcely arguable, is the lack of sufficient interior padding or other means of avoiding standing wave trouble, a direct result of economy

measures carried dangerously far. It seems to me a poor decision to save a bit of cash here at the risk of affecting the entire sound of the system, speaker, enclosure and all. The lack of padding affects the middle sounds and, in listening terms, contributes towards a kind of hollow, ringing effect, as though inside a large barrel. Not pleasant, and it also tends to reduce the sense of immediacy and presence and call attention to the speaker itself, where that device should by rights be a "transparent" opening, a window, into the imagined sound situation. More padding, please, even at added cost. (Or add your own, if you have reason to suspect deficiency in your present enclosure.)

As to highs, we have an interesting array of opinion expressed in this equipment, and a good choice of methods to match the choosy ear. Cone tweeter, horn tweeter or no tweeter—take your choice.

For many musical listeners the newer full-range eight-inch speakers give plenty of highs for the average room situation and most listeners who incline towards this type of small system will be quite satisfied without any tweeter. A matter of individual taste, and I merely suggest that those who give these systems listening tests in stores keep in mind the qualities of their own home rooms. Most show rooms are much more "live" than home living rooms. Brilliant highs become screetchy, inadequate highs may sound adequate. The several eight-inchers I have on hand provide plenty of highs to balance the excellent bass which is inherent in them. (Note that many eight-inch speakers still lack the all-essential low cone resonance that makes use of these small enclosures possible. Some have no proper low bass at all. Be sure to check on this if you are exploring the eight-inch field. The speakers used in the complete eight-inch systems may be assumed to have reasonably good bass.)

But a tweeter may have its points. A good deal of opinion evidently favors one to supplement the new accession of low bass in the smaller systems, in spite of the extra cost and complexity. If you want a tweeter, you'll find two types, cone (direct-radiator) and horn-and-driver. Permoflux, Kelton and Kingdom-Lorenz all use variants of the cone type whereas the Jensen Duette uses a horn.

As I listen I can't escape the feeling that the cone tweeter is the answer for the small system—if a tweeter is to be used. The reason, I'd guess, is inherent in its cost. You can make a better cheap cone tweeter than you can a horn. But it may go further, for there seems to be a swing towards the direct radiating type even in more expensive equipment. The RCA LC1A has long been an outstanding example of direct-radiating high production with its concentrically mounted cone tweeter.

This general feeling is borne out by my present listening. The cone-type tweeters seem to have a smoother and more natural sound, less strident, less beamed (I haven't measured—just listened), above all less metallic. Their sound blends more easily with that of the associated woofers. Kelton uses a large one (six inches, I think), Permoflux a three-inch baffled tweeter and the Lorenz is a tiny two-and-a-half inch miniature with clear plastic cone. Together with

its small 5000 cps crossover network, the pair selling at a low price, I find it an intriguing gadget easily adaptable to various systems—I've even tried it on my big outfit, which has an 800 cps horn tweeter to which it plays a nice super-tweeter.

The little Lorenz is strictly portable and will sit in one half of its little cardboard box, pointing any way you like including up. The crossover network allows for a rise in the upper end from about 2000 cps on up, ostensibly to compensate for the dropping-off in most speakers. I haven't tried the Permoflux cone tweeter outside the Diminuette enclosure (it's separately available) but assume it will operate similarly. I recommend these low-priced cone tweeters to those who may not be satisfied with the quality or brilliance of their present lower-priced speaker installations.

Point Source and Boost

There are several intriguing aspects about these new small enclosures that are worth a bit of discussion, finally. Two of them feature, for example, a type of mounting that aims the speakers directly at you—and the implication is that this improves listening pleasure. In the Permoflux Diminuette this is done in a very mild way, via a slightly tipped front panel, which aims the sound somewhat upwards or downwards depending on the installation. But the Lorenz Sound Corner goes all-out.

It is a fine idea to mount a speaker up on a wall out of the way, and perhaps an even better one to fix it ingeniously in a corner, using the junction of walls and ceiling as an extension of the horn effect. Indeed, this Lorenz device rates as a highly ingenious one all the way around—except for one thing. To my ear at least, the point-source effect, overhead, inescapable and undiffused, is very disturbing to say the least. Lorenz has thoughtfully increased the effect via a handsome appliquéd triangle of grill cover which neatly centers the wandering eye upon the exact source of the sound! An ultra-convenient and very good looking speaker arrangement, but by opinion is against the "point source" for music.

I wonder whether the advantages of this arrangement couldn't be retained and a better sound distribution achieved, perhaps by aiming the speaker overhead, or even upwards into the corner, and by reducing the visual point-source with a bit of decorative camouflage? Well worth trying.

Jensen's Duette, with eight-inch woofer and inset horn tweeter, applies a new and arguable principle towards bass reproduction that stems from the long familiar method by which we get bass off of phonograph records. Jensen's little speaker operates best with a bass boost of a few db over flat in the input signal. A kind of equalization, replacing the tricky and easily humped acoustical lower bass with a more reliable electrical one.

Now I'm not the one to get into an acoustical argument as to what can be gained by this novel approach. It ought to work—for it's well enough known that bass response likes to roll off, and that it must somehow be propped up, like a sagging clothesline, by every ingenious expedient we can muster. It might be a fine idea, for all I know, to let 'er sag, evenly and

(*Continued on page 57*)

ABOUT MUSIC

HAROLD LAWRENCE

What Comes After "Concert-Hall Realism"?

SINCE THE ADVENT of LP, recording companies have spawned an alphabet soup of audio symbols and catch phrases. All of these, shorn of their colorful verbiage, can be boiled down to the words, "concert-hall realism." After more than five years of tape recording and microgroove techniques, the industry has made enormous strides. Not all the problems have been licked—not by a long shot. But many recordings have succeeded in capturing the acoustical will o' the wisp, that elusive quality that lends "presence" to sound reproduction.

In our concentration on the "you are there" aspect of recording, several important musical byproducts have generally been overlooked. But first, let's re-examine the expression "concert-hall realism." Aside from its obvious benefits, it covers a multitude of acoustical sins. Hall resonance, like salt, is necessary in just the right proportion to draw out the full flavor of an orchestral concert. Given too little, the sound is flat, two-dimensional; too much, and waves of overtones lap over each other like calls in Echo Valley. Proper balance, another factor often missing in "live" concerts, can depend on the position of one's seat in the hall. There is nothing more frustrating than sitting near the percussion section during a performance of something like Bartók's "Music for Strings, Percussion and Celesta." The activity of the percussion player is distracting enough, the imbalance devastating. A stretch of water in the Pacific called "The Zone of Silence" because it is acoustically dead, has its counterpart in the concert hall. Where sirens or warning bells fail to penetrate this area off Vancouver Island, the triangle, harp, or entire *pp* passages just never reach certain dead spots in a theatre. In addition, there are the effects of humidity and a host of other variables which can detract from the ideal performance.

Working under some of the above acoustical conditions, the recording director would be as handicapped as an acrobat turning somersaults in a broom closet. While we are tolerant of the acoustical shortcomings of a theatre, we are most critical of the same defects when found in a recording. With proper mike placement, disposition of musical forces, drapery, etc., much can be done to transform the sound characteristics of any given room. Sound-conscious Leopold Stokowski has on several occasions tried to extend these recording-studio techniques to the concert hall. His last effort failed. Describing a set of rich velvet draperies covering a motion picture screen in Constitution Hall as a "good thing in the wrong place," Stokowski delivered an angry seventeen-minute lecture to an audience attending a concert of the National Symphony Orchestra on January 6th. The Daughters of the American Revolution, however, were more interested in appearances than acoustics and refused to undrape what they called "the most beautiful headquarters built by women." Thus we have a case of "beauty" versus "sound."

Apart from the acoustical refinements wrought by sound engineers, the art of recording has, without benefit of publicity, added new dimensions to music on records. Aided by the microphone and abetted by the recording director, some orchestral instruments have come into new prominece one a solo or semi-solo plane. Take the Columbia recording of Castelnuovo-Tedesco's Guitar Concerto. Without an acoustical spotlight, all but the most vigorous pluckings of Mr. Segovia would have been engulfed even by the small orchestra for which the work was scored. In spite of the focus of attention on the soloist, the results do not stretch the imagination. On the other hand, in a recently-released Mandolin Concerto by Hoffman, the solo all but drowns out the orchestra in the opening bars. Other instruments that have come up in the world via the microphone include the harp, bassoon, and let's not forget the triangle, without which any "hi-fi" record would be incomplete.

Inner dynamic contrasts of a rather subtle nature, frequently lost in the concert hall, can be faithfully captured on disk. Orchestral detail can be brought out with startling clarity. It is possible for eight-part, or even ten-part, *divisi* string writing to emerge with lucidity. In the new London recording of Britten's "Young Person's Guide to the Orchestra," one can actually follow each instrumental voice in the rousing fugal ending. Monteux' kinetic performance on Victor of "The Rite of Spring" reveals each orchestral part with the clarity of a Picasso line drawing.

Clarity (that is, "brilliant" clarity) in certain works is not always desirable. In the music of Delius it can even detract from the composer's intentions. For this reason

the Capitol release featuring Felix Slatkin and the Concert Arts Orchestra misses the mark. Its lucidity should have been edged with a fringe of mist. Instead, the gentle English countryside of Delius becomes a Southern California town on a lazy summer day.

The crackle of castanets, the soft brush of cymbals, a fleeting bit of harp embroidery, a counter-melody on the violas—all these effects that may escape the concert-goer, are thrown into sharp focus by means of the finest recordings, but are sometimes thrown out of all musical proportion in others. To a few record companies, high fidelity recordings still means a "holiday for highs." In their scheme of things, the percussion and brass sections are going to "sell" their records. Musically and commercially, this is a fine idea—fine for German military band music. For Ravel, Rimsky-Korsakov and Copland, etc., it is disastrous.

Through the science of recording, chamber music has been restored to the setting for which it was originally designed—namely, the home. And for those of you with a house in the country and a loudspeaker facing the terrace, Mozart's delightful serenades, cassations and divertimenti can be enjoyed under the sky and the trees—all this without the danger of a sudden breeze blowing away sheets of manuscript paper from the musicians' stands. A Schubert string quartet, a Mozart duo for violin and viola, Ravel's "Introduction and Allegro"—these are works that blossom more in an intimate atmosphere than on the stage of a concert hall.

The sensitivity of the latest microphones combined with the increased frequency range of magnetic tape, combine to make chamber music the most satisfying form of music on records from the viewpoint of "realism."

The finest recordings in the above category, however, can be too realistic for comfort. In the London version of Bach's Suites for Unaccompanied Cello, the soloist Enrico Mainardi can be heard sucking in huge lungfuls of air between phrases. If you can train yourself to inhale and exhale in the same rhythm (thereby "masking" Mainardi's breathing), you may find yourself enjoying the performance. If recording directors had their way, breathing during "takes" would be strictly forbidden to soloists and chamber groups. Hugo Fiorato, violinist with the WQXR String Quartet, recounts how he and his colleagues adjusted their breathing to the dynamic rise and fall of the Franck Quartet. During sustained soft passages—and there are many in this quartet—their air intake was about equal to that of a small mouse.

An unimaginative pianist often reminds us rudely of the fact that the piano is a clever piece of machinery made up of (among other things) hammers, hoppers, dampers, strings, pins, pedals, and keys. Close-miking can do the same thing—and it doesn't discriminate between calibers of interpreters. Take Denis Matthew's sympathetic recording of Haydn's Piano Sonata No. 49 in E Flat (English Columbia). The action of the hammers is so faithfully reproduced that each thud is heard a split second after each note. During *forte* scales or fast passage work, the effect is analagous to seeing "ghosts" on a TV screen.

Close-miking on a harpsichord is an even worse musical offender. Damping, a change in register, or loud chordal sections resemble something approximating the sound of a knight being unhorsed at a jousting tournament—crash of armor, lance, shield and all.

Through the alchemy of sound reproduction, quartets emerge as string orchestras, clarinets as French horns, lyric tenors as Wagnerian *heldentenors,* and triangles as fire-bells. It is up to the recording director to keep in mind at all times the framework within which he is to operate. Experiments in sound are all right so long as they serve the music.

To sum up, recording techniques at their best accomplish at least two musical objectives. First, they make possible a balance and clarity of detail not always enjoyed in the concert hall, except in a few choice sections. Second, by means of expert mike placement, new dimensions in instrumetal and vocal combinations have been achieved.

RECORDS

(*from page 34*)

An English organist, I presume, who plays here on a French organ in a church in Poitiers. This is not unlike the earlier Schweitzer recordings, solid, serious, earnest playing, nicely paced if a bit on the heavy side, not at all brilliant in registration (as are so many of the new "Baroque" or "Classic" organ records) but entirely clear in detail. Many will like the forthright presentation of the big Bach works, and the organ has a solid bottom, to exercise your woofers.

Marc-Antoine Charpentier: Mass and Symphony "Assumpta est Maria." Soloists, Choir of Jeunesses Musicales de France, Martini. **Vox PL 8440**

Here's another French-made recording of music from the same period released by Vox from French Pathe originals in a tie-up not unlike London's with L'Oiseau-Lyre. Pathe, of course, is veritably an ancient name in the film and audio business in France. Charpentier (not the one who wrote the opera "Louise") was a leading 17th century French composer over-ridden by the famed Lully, who managed to get all the attention for himself, both at the time and later. Now, Charpentier Societies are resurrecting this interesting music.

The Mass, for solos chorus and instrumental ensemble, is more modern sounding than either Purcell or Blow, nearer to Bach and Handel. There are the characteristic 17th century colorful harmonies and short, quickly shifting sections, but the color is less marked, the sound more straightforward according to our ears, trained to accept the later 18th century harmony as "natural." I wouldn't recommend this for an uninitiate but for anyone who has listened to or, better, sung in any sort of earlier choral or vocal music this is a fine record. The very long reverberation time of the church is nicely managed in the miking, so that details are clear, the music natural sounding, well balanced, the constant interchange of soloists, chorus and instrumental music keep interest alive. Excellent diction, always clearly understandable.

(Note that an earlier Charpentier recording by this same group was issued on the Haydn Society label. I don't have it for direct comparison, but at the time I was not enthusiastic. I reserve second judgment on that one, but meanwhile recommend the present Vox disc, as above.)

Late Strauss—and Early
R. Strauss: Four Last Songs (1948).
A. Lisa Della Casa; Vienna Philharmonic, Bohm. **London LD 9072 (10")**
B. Eliz. Schwarzkopf; Philharmonia Orch., Ackermann. Also: **"Capriccio" (1941); final scene. Angel 35084**

Old Strauss, dead only five years, was an extraordinary musical figure. Back from the mid-eighteen-eighties until roughly 1910, he was the bad boy of music, climaxing his brash and shocking "modernism" with those highly potent operas "Elektra" and "Salome," now taken as classics by most of us. His earlier tone poems are still the pompous and blown-up giants of the standard orchestral repertory and hi-fi has benefited plenty from his virtuoso orchestral effects. But all that was a half century and more back.

After 1910 or so Strauss was displaced as the leading modern but far from ceasing, he continued to compose right through until the year 1948, and his operas by the dozen, not to speak of a vast quantity of other works, kept right on being performed, though they did not become more modern—rather, the style in a way went backwards, as Strauss delved deeper into his own musical personality, putting aside entirely the developments that followed his own earlier period. The late Strauss music is now beginning to get around quite widely (he was "written off" as a composer many long years ago—too soon) and it is most interesting.

For in this music, the last of which is from his 85th year, every trace of the old bombast and blatant noise is gone. True, it is far less strong, less driving, but how could it be honestly otherwise from an old man? Instead, there is a concentration of seventy-odd years of know-how and an utter humbleness that combine to make these works extraordinarily appealing. Styled superficially in a late-Wagner idiom, they are none the less good for it, and indeed these four songs easily equal the five that Wagner himself composed, the Wesendonck songs, back in the mid-19th century.

Two recordings to choose from and both are acceptable, both excellent technically. But for my cash Schwarzkopf's version is extraordinary whereas Della Casa's singing is merely good. Schwarzkopf, a successor in a way to the great Lotte Lehmann, has a perfect understanding of German song from which these works indubitably spring—its passionate sincerity, the immense importance of the words and the vocal phrase. Della Casa sings beautifully, but she merely sings syllables. Her orchestra, similarly plays with less of the long line, the emotional sostenuto, that rings so true in Schwarzkopf's.

"Capriccio," a light opera, Strauss' last, shows convincingly how far from the immediate world this old man was—for in 1941, the great war year, its plot is concerned with an 18th century countess and her aristocratic companions who playfully attempt via a drama within drama, to decide which is most important in opera, the poetry or the music! The last scene, with the countess singing to herself in the mirror, casts an unspoken and lovely vote for music, in almost Mozartean terms. A really gorgeous disc, this.

Strauss: Concerto for Horn (1882-3). H. Lohan; Radio Leipsic Symph., Wiesenhutter. **Mozart: Clarinet Concerto K. 622.** E. Koch; Radio Berlin Chamb. Orch. Haarth. **Urania URLP 7108**

This ultra-Romantic and highly listenable big concerto for horn was composed when Strauss was eighteen—almost seventy years before the songs listed above! You'd never know this was Strauss, for it sounds like the most joyous of Schumann works, padded out, to be sure, to typically Straussian lengths, but utterly sure and skillful in its technique. Strauss' father was a famous horn player and this was a gift for him. (Papa S., though he thought Wagner much too modern, had helped in giving final form to the famous horn passages in Wagner's opera music.)

A fine, big recording, low in distortion though it is probably another of Urania's prolific radio broadcast series, with a big liveness exactly suited to the music. Coming before the famous Strauss tone poems and operas, this makes a fine comparison with the late Strauss above.

The Mozart on the reverse is notable for an expressive clarinet soloist who makes the most of one of Mozart's great scores. The orchestra is tastefully in style and plays mostly very well, with a few weak moments (radio performance?). Easily in the top quarter of recorded Mozart, even so.

Hi-Fi Sound

Vaughan Williams: The Wasps; Old King Cole. Philharmonic Promenade Orch., Boult. **Westminster WL 5228**

One of Westminster's new British series, super-hi-fi, with a sharp close-up edge, big bass, big liveness, wide dynamic range. Broad, easily listenable British music, nothing of great importance but fine for listening on big systems. See also The Planets of Holst and Belshazzar's Feast of Walton in the same new super-hi-fi series.

Balakirev: Tamar (Symphonic Poem). Rimsky-Korsakov: Ivan the Terrible; suite. London Symphony, Fistoulari.
M-G-M E 3076

Less spectacular than the above, but good hi-fi stuff too, the miking more distant for an over-all effect (one-mike?) without fancy "edge." The music is "more of the same"—colorful, not very important Russian stuff of the sort you've heard a thousand times, and excellent for hi-fi systems. Look out for off-center pressings—mine is bad on the Rimsky side.

Employment Register

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

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

• **Sales Engineer:** Over 7 years experience in sales and engineering, most recently as assistant sales manager of leading electronics firm. Well known in the electronic parts, high-fidelity, distributor field. Seeking position of responsibility with manufacturer or representative. Box 501, AUDIO.

HI-FI-MANSHIP

(*from page 21*)

To Layman-with-new-phono-turntable, you say:

"Of course, I wouldn't have a plain turntable in *my* rig."

Layman: (Startled) "Oh? Why not?"

Hi-Fi-man: (Gentle smile) "Too much trouble. All that lift-the-arm-off, put-the-arm-on-the-record stuff. How can you enjoy music that way?"

Are you getting the general idea? Do you see how, with a rapier-like thrust, Hi-Fi-man has sown the seed of doubt in Layman's mind? Now let's examine the approach taken with Layman-with-new-record-changer:

Hi-Fi-man: "Of course, I wouldn't have a changer in *my* rig."

Layman: (Startled) "Oh? Why not?"

Hi-Fi-man: (Gentle smile) "Obvious. If your turntable has to spin the record *and* operate all those cams and levers and things at the same time, can you *really* be sure that you're getting a constant speed?"

The D-and-C ploy will take care of almost any average situation in Audioship, but there are limits. For example, what would you do when confronted by a rig in which there has been installed

both a record changer *and* a transcription turntable? Obviously, a switch in tactics is called for. The best approach in these cases therefore is to use the "Things-To-Come Ploy."

To the layman-with-both-record-changer-and-turntable, say:

Hi-Fi-man: (Obviously amused) "Great Scott! Don't tell me you're still playing *records* . . ."

Whereupon you engage your friend in a brisk and faintly supercilious discussion of the latest developments in the field of tape recording, with careful stress on the idea that all of his brand-new phonograph equipment is already obsolescent.

Musicship

The guiding ploy in Musicship is that of "Harmonic Harassment" which is based in turn on the Law of Diminishing Musical Knowledge.

A. *Electronic engineers, generally Speaking, know little about the finer points of music.*

B. *Musicians, generally speaking, know little about the intricacies of electronics.*

(NOTE: This basic fact can be charted on graph paper to produce a result which looks like a set of recording curves overlaid on a set of playback curves. The "cross-over" is usually somewhat between Beethoven and Gene Autry on the "music" curve, and between General Electric stylii and Klipschorns on the "electronic" plotting.—C.S.)

The basic purpose of "Harmonic Harassment" is therefore to strike, in the classic military tradition, where your opponent is weakest. To engineers, in other words, you talk in learned musical terms. To musicians, on the other hand, you speak as though you'd just stepped out of the Experimental Section of Bell Laboratories.

Now, for a practical application. You have, let's say, been asked at different times to hear two identical hi-fi rigs. All other conditions are approximately equal. The same recording is to be played in both cases.

The big difference between the two listening sessions however is this: One rig is owned by a hi-fi fan who is a nut on the subject of music but who knows little about audio engineering. The other is owned by an informed electronic expert who knows little about music. We will call them Layman #1 and Layman #2.

The owner starts the recording. You settle yourself to listen.

But in both cases, somewhere around the middle of the *second* side of the recording, you smile suddenly ("Mona Lisa" gambit) or scowl heavily ("Wagnerianship") as though you had just heard something that wasn't quite right. You do not, however, say anything until the performance of the recording is concluded, and your host speaks.

Layman: "Well, what do you think of it?"

This is your cue to go into action on one of two lines, depending on where you have pre-judged your host's knowledge to be the weakest.

If Layman #1 knows little of electronics, you say, thoughtfully:

"Very interesting." (Pause) "Would you mind playing part of that second side again?"

Layman #1: (His curiosity aroused) "Certainly."

You wait until the playback has begun again. Then, you rise from your chair, cross the room, and lower the volume until the sound is just a whisper. You kneel down on one knee before his speaker cabinet, and, putting your *right index finger in your right ear,* proceed to wag your head back and forth like a hound dog examining a rabbit hole meanwhile pursing your lips and making clucking noises.

Layman #1 will begin to exhibit signs of definite uneasiness. You, however, say nothing, but proceed to turn up the volume control until it is as high as it will go and fiddle a bit with the tone controls. Then, you cross the room to the corner *furthest away from the speaker.* There, you put your *left index finger in your left ear* and proceed slowly to walk in a small circle, occasionally feeling the surface of the walls which intersect in the corner. Finally, you cross the room again and switch the set off.

You turn to Layman #1 and say, giving him the Acoustical Uppercut:

Hi-Fi-man: "Thanks, old boy. I think I know what your trouble is."

Layman #1: "Trouble?"

Hi-Fi-man: "Yes, I'm convinced of it. Of course, I might be wrong, but don't you feel your volume control isn't correlated *properly* with your tone controls? I mean . . . are you sure you're getting the proper reciprocals of the Fletcher-Munson curves?"

If your little drama has been properly staged, it will be weeks before Layman #1 will be able to enjoy his music again.

A different tack, somewhat less complicated but still requiring correct timing, should be taken with Layman #2, the electronics bug.

As before, you state that the performance was very interesting and would he mind playing part of that second side again? You listen for a few moments, and then say:

"Thanks, old boy. I think I've got the trouble spotted now."

Layman #2: "Trouble?"

Hi-Fi-man: "Well . . . don't you think that in the twelfth bar of the second movement the oboist *anticipated* the tonic chromatic discord? That is, of course, before the augmented eleventh had resolved into the melodic minor?"

Since Layman #2 would probably guess under normal conditions that an augmented eleventh was a substitution in the Notre Dame backfield the effect of this gambit, the Bartok Blockbuster, is usually devastating.

"Old Hans"-manship

A recently-developed ploy, "Old Hans"-manship has moved rapidly ahead to become one of the finest combinations of Musicship and Audioship to be found in the list of approved tactics. Much of the credit for its development goes to such sterling Hi-Fi-men as Fred Ganci, Arthur Mellor, and Al Grundy of New York's Orfeo Music Shop; Murry Harris of the A. C. Nielsen market research firm; Hank Eisner of Goody's Record Store and Pete Farb of the Cunningham & Walsh ad agency.

If you are faced with the double problem of (1) impressing a guest with your musical knowledge, *and* (2) covering up for the deficiencies in your hi-fi-rig, there are few solutions better than "Old Hans"-manship. The ploy is performed in the following manner:

When your guest insists on hearing a recording played on your rig you produce with much show a Telefunken platter of organ music, preferably something like the *Toccata* from the *Fifth Symphony* of Charles Marie Widor.

If possible, the recording should be: (a) recorded at 78 r.p.m., (b) without a single word of English on the record label and (c) pre-war. This stamps you instantly as a connoisseur of rare music.

This impression is aided considerably if you say in slightly condescending tone of voice:

"I picked this up in the Gramophone Shop. They keep a small supply tucked away for their best customers." or "These early Telefunkens vary a bit, of course, but you seldom get a complete dud."

Now you turn on your rig, and place the recording on your phonograph. Now, you're ready to make full use of the "Old Hans"-manship Ploy.

When the first sustained chords of the Telefunken (or other suitable recording) come through your speaker and the wows of your turntable become apparent to even the most untrained ear, you merely smile indulgently. You also shake your head from side to side a few times while muttering gently, "There goes 'Old Hans' again."

After a few repetitions of this mysterious business, while your rig creaks way, a noticeable uneasiness will come over your guest. You repeat your "Old Hans" line once more.

Dialogue thereafter usually takes this form:

Layman: (Over the music) "I beg your pardon?"

Hi-Fi-man: (Over the music) "I said . . . There goes 'Old Hans' again."

Layman: "I don't understand. Who's 'Old Hans'?"

Hi-Fi-man: "Eh? Sorry . . . I forgot. You've never climbed in the Bavarian Alps, have you? Ah! The sight of a windswept *couloir* . . . the crunch of the *champons* in the snow. . . ."

Layman: (An edge in his voice) "No, I've never been there. What about 'Old Hans'?"

Hi-Fi-man: "I'm coming to him. Well, this particular recording you're listening to now was made in a little church—the Josef Kirche—near Schmetterling-am-Main. Dates back to the early part of the 16th century. Believe it or not, they still have the original church organ. The air pressure comes from a hand pump, naturally. . . ."

Layman: (Getting exasperated) "But what about . . ."

Hi-Fi-man: "'Old Hans'? We all called him 'Old Hans.' Now there's a real character for you! He must be 90 if he's a day." (Dramatic pause at this point as Layman glares. You then drop the bomb.) "'Old Hans' pumps the handle on the organ, you see. Of course, his arm is getting a little tired these days—rheumatism, you know—and you get those fascinating tonal variations in the longer chords." (Chuckle) "You know, they sound just like turntable wows don't you think?"

Counter-Hi-Fi-manship

No report on this subject would be complete without a word concerning what to do when you are confronted by a hi-fi fan who is thoroughly briefed on both music and audio knowledge, and whose equipment is above criticism.

In such a case, it is best to drop any attempt at Hi-Fi-manship and simply state:

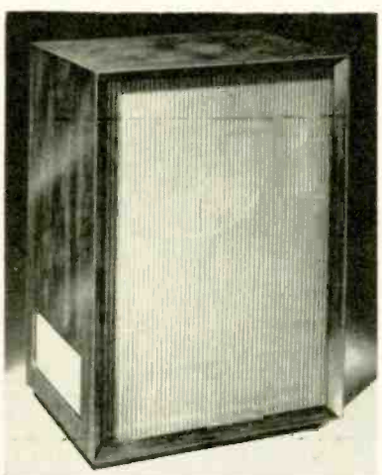
"To me personally a hi-fi rig, after all, is just something that *reproduces* music. I really prefer to do *my* music listening at a live concert in Carnegie Hall."

NEW PRODUCTS

• **Preamplifier Kit.** Along with remarkable economy the new Heathkit Model WA-P2 preamplifier-control unit offers a measure of performance which is unexcelled by many commercially-built counterparts. Three high-level and two low-level inputs are provided, with individual level controls for each. Frequency response is within ± 1.0 db from 25 to 30,000

cps. Both harmonic distortion and intermodulation are negligible. Low-impedance cathode-follower outputs permit long cable runs between preamp and power amplifier. Controls afford complete facilities for record equalization, including the recently adopted RIAA recording characteristics now being used by major companies on recent releases. Separate output is provided for tape recording, independent of volume and tone control settings. Gain is sufficient for even the lowest output magnetic cartridges. The WA-P2 is supplied with an attractively styled enclosure finished in satin-gloss gold enamel. Heath Company, Benton Harbor, Mich.

• **Fisher "50" Horn Speaker Enclosure.** This latest addition to the Fisher line of high fidelity audio components provides compactness together with conspicuously fine performance and tasteful appearance. Air loading of the bass output is more than four times that of an infinite baffle enclosure, thus reducing speaker distortion and increasing power handling capacity. Designed for use with any 12- or 15-in. speaker—single, dual, or coaxial—the "50" enclosure permits smooth response to below 30 cps. It substantially extends the bass range of any speaker with which it formance professional microphones. Its



is used. Dimensions are 37"h x 25"w x 20⅛"d. Descriptive sheet obtainable from Fisher Radio Corporation, 41 E. 47th St., New York City, N. Y.

• **Condenser Microphone.** The new Schall-Technik condenser microphone, model CM-51 offers a new advance in life-like sound pickups. It represents the most economical microphone system available in high-per-

frequency response is uniform throughout the range from 30 to 18000 cps. It is extremely insensitive to moisture, temperature, and mechanical accelerations, and experienced personnel in the U. S. assure prompt and efficient service. Both cardioid and non-directional patterns are available, depending on the head capsule which is used. The unit has high output and can be operated at considerable distances from the mixer without impairing the frequency response and with freedom from inductive pickup in the cables. For further information, write Reeves Equipment Corp., 10 East 52nd St., New York 22, N. Y.

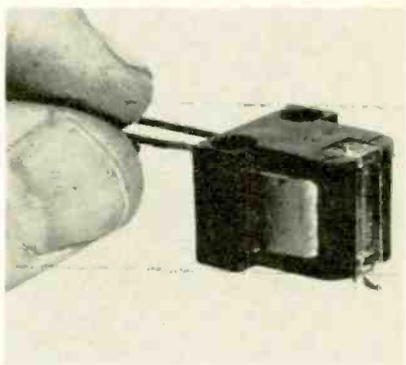
• **Electronic Megaphone.** Said to be the most powerful single-unit electronic megaphone ever developed, the "Audio Hailer" has an acoustic output of 112 to 115 db to five feet and permits effective speech transmission up to 3000 feet. An outstanding feature is the virtual elimination of accoustic feedback. The unit is completely self-contained with batteries and three-

stage vacuum-tube amplifier in the main housing. It is small and light, being just over one foot long and weighing slightly more than five pounds. A pistol grip handle incorporates a trigger-type press-to-talk switch. Audio Equipment Company, 805 Middle Neck Road, Great Neck, N. Y.

• **Dual-Voltage Genemotor.** Suitable for operation on either six or twelve volts, the Duovolt Genemotor incorporates two separate six-volt input windings, each having its own field. It is designed to meet the need for a dual-voltage power supply created by the trend toward 12-volt electrical systems in modern automobiles.

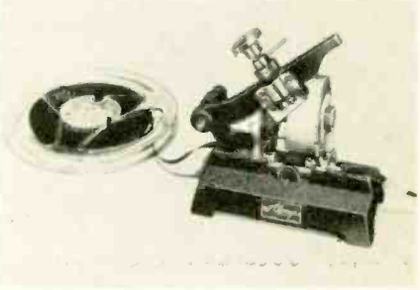
Duovolt-powered mobile equipment may be transferred from one car to another, irrespective of battery voltage, without any impairment of operating quality and without modification of wiring. Six- or twelve-volt operation is obtained simply by connecting four input terminals in series or in parallel. Efficiency is the same at both voltages. The unit is ⅞ in. longer than standard Genemotors. For mechanical and electrical specifications, write Carter Motor Company, Dept. 6, 2648 N. Maplewood Ave., Chicago 47, Ill.

• **Dynamic Pickup.** Similar in construction to a D'Arsonval meter movement, the new Electro-Sonic phono cartridge is of the true electrodynamic type. Output is virtually flat from 20 to 10,000 cps with a slight rising characteristic to 20,000 cps. The motor assembly consists of a tiny loop of fine wire wound on a Permalloy armature which is mounted between the



pole pieces of a small Alnico magnet. To one end of a supporting shaft is attached a light arm about 3/16 in. long, the free end of which holds the stylus. As the stylus rides the grooves of the record it causes the armature to move radially within the magnetic field. Because the field is uniform the output of the cartridge is essentially flat. In order to achieve a low effective mass of .003 gram for the moving system, styli are permanently fixed. Available with either diamond or sapphire. Electro-Sonic aboratories. Inc., 3215 36th Ave., Long Island City 1, N. Y.

• **Tape Splicer.** Completely non-magnetic in construction, the Alonge splicer is claimed to be the fastest-acting precision unit available—paying for itself in time saved. The device has three knives mounted on the cutting arm—the center arm being pivoted so as to cut splices at either 90, 67½, or 45 degrees, while the side knives cut the splicing tape to the exact width of the recording tape. Spring



pads hold the tape firmly in place during the operation, and two bronze springs neutralize any static induced in handling the tape. The machine operates with ¾-in. splicing tape, and holds the roll in readiness on a support at the rear of the casting. For further information and prices, write Alonge Products, Inc., 163 West 23rd St., New York 11, N. Y.

(Continued on page 56)

HARVEY
the House of Audio

MARANTZ
AUDIO CONSOLETTE
Control Preamplifier-Equalizer

An unusually high quality instrument, designed to act as the central control for music systems of the highest calibre. Every possible, desireable function has been incorporated, and only the finest components have been employed in its construction. Power supply is built in, furnishing dc to all heaters.

Nine front-panel controls provide the Marantz with the utmost flexibility in performance: **SELECTOR SWITCH** with 7 input positions. **VOLUME CONTROL. BASS CONTROL,** continuously variable boost and attenuation, up to 20 db. Turnover frequency at 375 cycles. **TREBLE CONTROL,** continuously variable boost and attenuation. Turnover frequency at 3000 cycles. **BASS EQUALIZER** for magnetic record pickups, has 6 turnover positions plus 'flat'. **TREBLE EQUALIZER** for all recordings, has 6 roll-off positions plus 'flat'. **LOUDNESS COMPENSATOR,** a continuously variable control, designed to maintain frequency response constant at all listening levels. Compensates for Fletcher-Munson curve. **LOW-PASS FILTER** permits sharp cutoff of high frequencies above 5000, 7000, or 10,000 cycles, to reduce noise and high frequency distortion. Employs high-Q toroidal choke. **ON/OFF SWITCH** also connects to extra line outlets for use with other equipment in the system.

The **INPUT SECTION** has 3 positions for low- and high-level magnetic pickups, and microphone, and 4 positions for tuner, tape, TV, and other high-level program sources. The **OUTPUT SECTION** feeds from a cathode follower which permits fairly long lines without frequency discrimination. A recorder output, completely isolated from the control circuit, permits feeding to tape, disc, or other recarders. **FREQUENCY RESPONSE** extends from below 17 cycles to 50,000 cycles, ±1 db. **HUM** is inaudible with gain set 'full', on all inputs.

The Audio Consolette has a soft, mat gold finish, and is set in an attractive metal cabinet with stained, hand-rubbed, wood end-blocks.

Complete with tubes and cabinet..... $155

McINTOSH
50 Watt
AUDIO AMPLIFIER
Model 50 W-2

A novel and unique circuit design is employed to provide 50 watts of continuous power (100 watts peak) with amazingly clean, distortion-free reproduction. Frequency response extends from 20 to 20,000 cycles, ±.1 db, and from 10 to 100,000 cycles, ±3 db. Distortion is less than 1% over the entire audible spectrum at full 50-watt output. Phase shift is negligible. High damping factor and other features contribute much to the outstanding listening quality of the 50 W-2.

Complete with tubes..... $249.50

GENERAL ELECTRIC
High Fidelity BATON TONE ARMS

Designed for broadcast and professional use, as well as for fine music systems in the home, General Electric has developed two high quality tone arms: **Model A1-500** for records up to 12 inches diameter, and **Model A1-501** for records and transcriptions up to 16 inches.

Both arms are constructed of strong, lightweight aluminum. Counterbalanced, cartridge pressure is quickly and accurately adjusted by means of a sliding weight. Stylus pressure is shown in grams on a calibrated scale. Maximum lateral and vertical compliance is attained through the use of virtually friction-free ball bearings. This provides outstanding tracking ability, and a minimum of tone arm drag.

Baton arms are easily installed, and are adjustable for turntable heights, up to 2 inches.

Model A1-500 with 1 G.E. cartridge slide..... $31.95
Model A1-501 with 2 G.E. cartridge slides..... 35.50
Model RKP-012 — extra cartridge slides..... each 1.95

THE NEW REL
Precedent
FM TUNER

Unquestionably the finest FM tuner ever made. This successor to the famous 646B incorporates every important advance developed in the art of FM reception. Sensitivity is 2 microvolts for better than 40db quieting. Frequency response is 30 to 40,000 cycles ±1db. Waveform distortion is less than .5% for 100% madulation. Provides 2-volt output to high impedance, and .2 volts to 600 ohms. Front panel includes slide-rule dial, tuning meter, signal strength meter, tuning contral, radio frequency and audio gain contrals, and power switch. Power supply is self-contained. Supplied complete with tubes.

Chassis only (for custom installations)..... $325.00
Relay Rack Model..... 335.00
Cabinet Model (Mahogany, Walnut or Blonde)..... 360.00

The New
ELECTRO-VOICE
Model 15TRX
TRIAXIAL 3-WAY REPRODUCER

The 15TRX is EV's latest contribution to the advancement of high fidelity sound. It is an effective 3-way speaker system with the added advantage that each of the repraducers are concentrically mounted and provide the smoothness of response associated with a single saurce. Frequency response extends from 30 cycles to 15,000 cycles. Two crossover paints are employed: one is mechanical at 2000 cycles, and the other at 3500 cycles utilizing an electrical network. The free-air resonance point is 38 cycles. The entire unit weighs 44 pounds and its rated impedance is 16 ohms.

Model 15TRX complete with 'Brilliance Control'..... $135.00

Visit the HARVEY AUDIOtorium

If you want to See and Hear the finest . . . the widest selection of high fidelity equipment . . . be sure to visit the HARVEY AUDIOtorium. It will thrill you.

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

HARVEY RADIO COMPANY, INC.
103 W. 43rd Street, New York 36, N. Y. JUdson 2-1500

TOPS IN HI-FI POPS

ROBERT SYLVESTER

BACK IN THE DAYS before the words High Fidelity were known and, indeed, back when the electronic recording process was just about being accepted as an improvement on singing into the horn, there was a recording star who overpowered all competition. His name was Gene Austin. Maybe you don't remember him. If you don't, ask dad—he knows.

Austin was a Texan who could handle a ballad or a sentimental song in a way that made everybody swoon dead away. He had superb taste, he had tricks which were far ahead of his time, and he had a natural style which was a pure killer. From 1925 through 1929, or maybe even a little later, he was the big thing. Then a new entertainment gimmick called radio gave us a Rudy Vallee and an even newer gimmick called talking pictures developed a singer named Bing Crosby. As a recording artist only, Austin was hemmed in, snookered and left by the wayside.

For the first time in, surely, 20 years or more, Gene Austin is back on records. Victor has issued a new LP release on which he combines some of his great hits and touches upon many another song which brought him fame. The record is not a reissue—it is a recording of Austin as he is today. Even as he is today, he still has tricks which many a famed singer has appropriated and he still has ideas which many a young singer could profitably copy.

Austin's most famed song was Walter Donaldson's memorable *My Blue Heaven*. Old record buffs will always remember the way he used to slide into that "my blue-hooo" turn. On the back of his new LP, Victor proudly reminds us all that "Heaven" set sales records and popularity records which have since been attained. And here he comes again—30 years later.

Austin's style hasn't changed. And he hasn't been stubborn about musical background. What he has on his "revival" record is a small combo which is so modern it is practically bop. His voice—alas!—has changed. It gets a little thin when he jumps from one register to a higher one. There are moments when it is obvious that the old champ is "reaching" for just the right high note.

But in his work any square can find tricks which Billy Daniels has used to build a career upon. There are even resemblances to the veteran Tommy Lyman. And Crosby might be the first one to admit that he stole a vocal gimmick here and there from Austin.

If you're in those dangerous 40's, go buy this record. It will give you a big boot. It is a shame, however, that Victor didn't find a way of putting the current Austin on a platter with some of the, old original Austin. It would be. for instance, a kick to hear *My Blue Heaven* sung the way Gene did it in 1929 and the way he's doing it today.

Good Jazz

An outfit called Pacific Jazz Records has upped with a series of LP's which indicates, if it needs any indicating, that modern musical art is coming to us from the West, these days. One of the Pacific Jazz Records bits is the Gerry Mulligan Quartet. It's frantic man, frantic! So cool, so cold, you can freeze yourself right to death right there in your own warm living room. Mulligan himself is a baritone saxophonist who climbs up there somewhere and somebody else will have to find him because I just don't know where he went.

Mercy, Mr. Percy, Mr. Percy have mercy on me—as the cool cats say it.

Pacific Jazz Records also has an interesting bit in the Laurindo Almeida Quartet. Almeida and his helpers—Bud Shank on alto sax, Harry Babasin on bass, and Roy Harte on drums—have taken native Brazilian songs and put them into the bop idiom. Shank is particularly interesting on *Blue Baiao*. The boys also give a revolutionary treatment to *Carinoso, Nono Noctambulism, Tocata and Hazardous*.

Harris is Back

An old pro named Phil Harris is with us again, this time on a Victor LP called *You're Blaze*. The title song is his first one and Phlip Phil treats it as usual. You have to listen real close or you'll miss the jokes and the innuendo. And you have to listen real attentively or you'll miss all the tricks. Mr. H. is fooling you with.

For some reason, it has taken years for Harris to be appreciated as the hep expert he is. On his new record he juggles with *Stars Fell on Alabama, Sleepy Time Down South, Black and Blue, Guess I've Got to Change My Plans* and *Goo Buy Song*. If you'll just read *those* titles again it will give you an idea of this fellow's range. And I don't mean vocal range.

Miscellany

There are times when it is nicer to be wrong than right—if you know when you're wrong. I was wrong about Frank Sintra's *If You're Young In Heart.* I heard it and said right in these pages that the boy did it carelessly. He has some careless phrasing in it but, listening to it again and again and *again* via the juke boxes, it must be immediately admitted that it is a superior song and that Nice Old Frankie does it excellently, all things considered.

Vera Lynn, who seems to be the only star whose records are sent over here by London Records, has another apparent winner in *If You Love Me.* It's a straighter, less dramatic but more melodic version of the tune Edith Piaf first introduced.

Billy Eckstine, possibly the most mismanaged singer in the business and the one who suffered most by losing the musical background of Hugo Winterhalter, is on an upbeat with *Lost In Loneliness.* Why MGM, the Eckstine owner, doesn't use a little more imagination with this lad, who is surely the best of the modern stylists, is a thing that nobody seems able to answer.

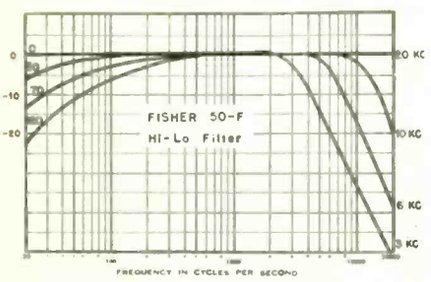
Just before the war, when Hugh Martin and Ralph Blane did the score to *Best Foot Forward,* it seemed as though these lads couldn't miss being our next great songwriters. They have gone from second rate to fair to dull to awful. Blane's recorded score of his *French Line* movie music is about as bad as anybody would want to buy.

Singing the oldie *Life Is Just a Bowl of Cherries,* the unknown and oddly named singer Jaye P. Morgan gives evidence that she may soon make the bigtime. And incidentally, wouldn't it be nice if we had more gay songs like the last mentioned?

EQUIPMENT REPORT

(from page 30)

tifier with suitable filtering. IM distortion was measured at less than 1 per cent at 2 volts output, the unit being designed for insertion between a control unit or a tuner with preamp and the main amplifier.



Response curves for Fisher Hi-Lo Filter

Some control units include a low-pass filter section, but apparently none has a built-in high-pass filter, which is often desirable. It is felt that the Hi-Lo filter unit would improve at least half of the existing hi-fi systems in use at the present time.

Notes on the Preamp with Presence

Numerous readers have indicated that the 0.45 H choke listed in the original data for the Preamp with Presence (Jan. 1954) was unobtainable. Since toroids with inductances of 0.4, 0.5, and 0.6 H are regularly available, the following table indicates values for the low-pass filter section for use with inductances of these values:

	INDUCTANCE		
Component	0.4	0.5	0.6 H
C_{22}, C_{26}	.0012	.001	.00082
C_{23}, C_{27}	.0018	.0015	.0012
C_{24}, C_{28}	.0033	.0027	.0022
C_{25}, C_{29}	.006	.005	.004
R_{25}	11,000	15,000	18,000
R_{26}	10,000	12,000	15,000
R_{27}	7,500	9,100	11,000
R_{28}	5,600	6,800	8,200
R_{29}	10,000	13,000	16,000
R_{30}	10,000	12,000	15,000
R_{31}	9,100	11,000	13,000
R_{32}	6,800	8,200	10,000
R_{33}	5,100	6,200	7,500

The design voltage for the preamplifier was 275 volts, but satisfactory performance should be obtained with any voltage between 250 and 300.

LONDON LETTER

(*from page 12*)

non-directional source. The result of this form of loading is that while full orchestral works enjoy a sense of spaciousness and breadth, chamber music and solo vocal music have that very necessary intimacy.

The only snag with this system is the old one of size but, once again, it seems essential that if one is to enjoy to the full the technical achievements of recording engineers it is necessary to allocate a portion of one's home to sound equipment.

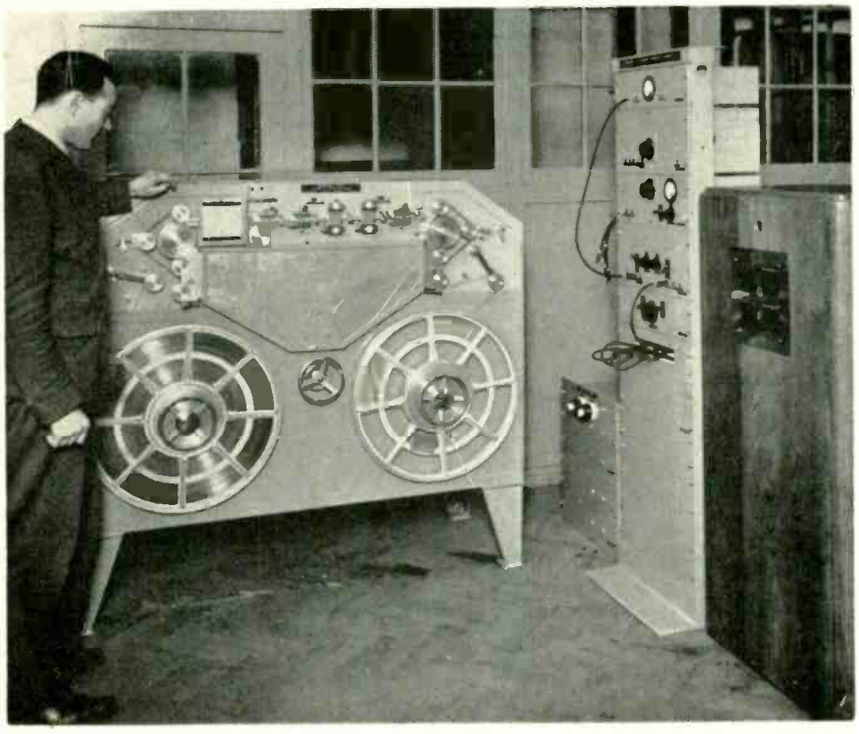
After I had heard some specially imported test records reproduced in the Tannoy demonstration studio Guy Fountain revealed to me that by the next New York Audio Fair he hopes to have in production a new power amplifier, pre-amplifier and pick-up.

A London Hi-Fi Studio

U.S.A. visitors to England during the summer could hear all the British high-fidelity equipment at a radio store in the centre of London which has been serving the needs of "hams" for more than a quarter of a century, and now has a well equipped high fidelity studio. Just off London's Oxford Street, and near Soho which abounds with Continental restaurants, is Webb's Radio Shop at 14 Soho Street, managed by E. J. Pickard with the assistance of H. W. Stanley. The audition studio is equipped with about ten different makes of amplifiers, six makes of pick-ups, eighteen loudspeakers and five different brands of tape machines. Although the control panel enabling any of the above components to work with the other is not as elaborate as some of those that can be seen in New York, nevertheless direct comparisons can be undertaken between the various pieces of equipment dear to the heart of high fidelity enthusiasts.

A special department deals with the servicing of U.S.A. as well as British equipments, and special arrangements are made for the few items of high fidelity which are subject to Purchase Tax to be acquired by U.S.A. visitors without tax.

TAPE RECORDER WEIGHS A TON



Whilst U.S.A. visitors are in London they may think it worth-while to inspect Britain's Science Museum in South Kensington. Housed in a modern building are thousands of examples of British and Overseas science, ranging over several hundreds of years, including the first steam locomotive and a replica of the first aeroplane. In the section of the Museum devoted to sound reproduction they can see what is probably the largest tape recording and reproducing machine ever constructed. Used by the B.B.C. in the early 'thirties, and before the advent of the present type of recording tape, the Marconi Stille apparatus used 3,000 feet of Tungsten steel tape, 3 mm. in width and 0.08 mm. thick, having a frequency range of 50 to 6,000 cycles. As each reel weighed 25 lbs. it can be well imagined that the engineers were not very keen to change the reels. The equipment was used principally by the B.B.C. for reproducing later in the day a sporting or other programme which had been transmitted whilst the majority of listeners were at work and away from their radio sets. The tape passed through the machine at a speed of 90 metres per minute which is approximately 60 inches a second. It was wound on two spools designed to accommodate a sufficient length of tape for half-an-hour's continuous programme. Five heads were provided, one wiping head and duplicate recording and reproducing heads. The design of all the heads was similar and the recording and reproducing heads were electrically interchangeable. The wiping head was, however, provided with a larger number of turns. The heads were arranged in two halves to facilitate the threading up of the machine. When the two halves were closed together, a groove was formed through which the tape travelled between the pole pieces which were made of Stalloy in the recording and wiping heads and of Permalloy in the reproducing heads. These pole pieces were inserted in slots in the centre of the open heads and were held in contact with the tape by spring loaded plungers. They were in both the upper and lower halves of the wiping and recording heads but the reproducing head carried only one pole piece located in the lower half. The machine had three independent mechanical drives; one operating the feed reel; one maintaining the speed of the tape through the head constant and the third driving the take-up reel. The tape was passed through reservoirs, one of which was located between each spool and the heads and loops were formed in these reservoirs so as to ensure that there was no drag in either direction on that part of the tape travelling through the constant speed portion of the machine. The size of the loops was automatically governed by an electronic arrangement which was actuated by contacts made and broken by the tape itself, so controlling the winding and unwinding motor speeds. Naturally, the B.B.C. have now changed over to the conventional tape machines, and they have presented the original Marconi Stille apparatus to the Science Museum so that posterity will be able to see one of the world's first tape machines. It is interesting to note that a modern portable tape recorder and reproducer weighing about 40 lbs. will give better reproduction than this museum piece which weighed over a ton.

NEW LITERATURE

• **RCA Engineering Products Division,** Camden, N. J., lists the company's latest line of sound equipment in a new 20-page illustrated catalog. The booklet is divided into sections dealing with such items as microphones, amplifiers, speakers, intercom equipment, television Antenaplex systems, and unit-built cabinets and racks. Each section in turn presents a list of products designated to meet needs ranging from those of portable systems to large permanent sound installations. Request for copy should be addressed to Sound Products Section.

• **Herman Catalog Service,** 200 E. 37th St., New York 16, N. Y., fills a long-felt need of sound-equipment dealers and jobbers with a new "syndicated" catalog. Each dealer is permitted to choose equipment he wishes listed in his own edition of the catalog, which may be a book of up to 100 pages. All four cover pages are printed in two colors, which may be selected by the dealer. A constant check of new products and prices is maintained by the publisher so that irrespective of when a jobber orders his catalogs, his edition will be up-to-date.

• **Alpha Wire Corp.,** 430 Broadway, New York 13, N. Y., will mail free a copy of Catalog 153-S, an eight-page booklet devoted exclusively to wire and cable for sound equipment. Featured in the catalog are illustrations which assist the reader in understanding the constructional make-up of each item listed. Each wire and cable is shown "stripped back" with its constituent conductors and insulation clearly marked.

• **John F. Rider Publisher, Inc.,** 480 Canal St., New York 13, N. Y., is now issuing a new 32-page catalog listing of the latest Rider books and manuals. Two new books on color TV, already supplied to distributors, are described fully, as are a number of other new books which will be published soon. Copies of the catalog are free and may be obtained from distributors and bookstores, or direct from the publisher. Address requests to Box RC-54.

• **Helipot Corporation, Technical Information Service,** 916 Meridian Ave., South Pasadena, Calif., is now distributing a monograph by Irving J. Hogan titled "Electrical Noise in Wire-Wound Potentiometers." It describes the kinds of noise which can originate in a precision potentiometer, discusses methods of observing and measuring noise, and sets up a system of units in which noise can be expressed. A copy of the 12-page illustrated paper will be mailed for the asking.

• **Aeronautical Radio, Inc., Military Electron Tube Project,** 1520 New Hampshire Ave., N. W., Washington 6, D. C., a non-profit organization currently conducting an extensive study of vacuum tube reliability for the Army, Navy, and Air Force, has just completed a 97-page report titled "Investigation of Electron Tube Reliability in Military Applications." Contained in the report is a discussion of the characteristic defect patterns of tube returns from each of eight military bases under observation and an analysis of each of the 20 individual tube types ranking highest in number of units returned. There is also an evaluation of tube weaknesses, supplemented by discussion of factors contributing to tube unreliability, such as environment, operating procedures, misapplications, and maintenance. The report incorporates 65 tables, 24 charts and photographs, and a statistical appendix. Requests for copy should be addressed to L. E. Davis and must be accompanied by a remittance of 50 cents.

• **Sorensen & Co., Inc.,** 375 Fairfield Ave., Stamford, Conn., manufacturers of various types of power supplies for electronic equipment, including regulated d. c. sources, frequency changers, inverters, magnetic amplifiers, and related equipment, has recently published a handsome two-color catalog which covers the company's entire line of instruments. The catalog provides abundant information on the operating principles of various instruments, as well as specific information on each individual model. Exceptionally fine illustrations and lucid copy make the Sorensen catalog an excellent example of industrial publishing. Requests should specify Catalog No. 254.

• AUDIO AUDITIES

SAUL J. WHITE

The Sounds We Never Hear

SOMEONE has asked: "Does sound exist where there is no ear present to hear it?" Is the crash of a falling tree in a remote wilderness truly sound when there is no one within a thousand miles of the event?" This is a specious and immature question, worthy of the ostrich.

Sound is a mechanical form of energy. Like the heat of a red hot poker, its existence is independent of our contact with it. As energy, sound is part of the reality of nature. It is subject to the laws involving the conservation and exchange of energies. The sophomore who originally propounded the above question has confused a mechanical actuality with *feeling*. It is like saying that electricity does not exist until we place our hands across the live wires.

Any disturbance in the atmosphere produces sound. If there is a human ear present to detect it, it is referred to as *sound sensation* or hearing. The word *sound* refers to any physical disturbance or alteration of atmospheric pressure regardless of frequency or the presence of the human ear or any measuring device.

Of course, the source of sound may be so remote that it is attenuated by distance to such a low intensity that the average ear cannot perceive it. But who can say at what precise point it ceases to exist? It would depend upon the distance and one's hearing acuity. Can we say that an ultra-sonic sound produced by the friction of two light bodies does not exist because nature has not endowed us with perception at these high frequencies? Seismograph instruments daily record hundreds of low-frequency sonic waves which are never detected by human ears because of their sub-audible nature, and many more go undetected because man has not yet contrived instruments for revealing them. It is conventional to regard sound as reaching its low frequency hearing limit at somewhere around 20 cps, yet it is possible for sound to exist at frequencies thousands of octaves below this.

There are vast multifarious sounds that refy detection. These occur around us day and night, even as you read this. Some of these low-frequency disturbances represent substantial energies. For the past billion years we have been subjected to the sound generated from a diaphragm having an area of millions of square miles with an amplitude of several feet. Man has been exposed to this ever since he crawled out of the primordial mud. However, this hasn't been too harmful to our nerves or eardrums because of the sub-audible frequency of this disturbance. In fact, its frequency is so low, about one cycle per 12 hours, that we recognize only its non-acoustic behaviour. If you haven't guessed by this time, I am referring to the oceanic tides.

From a quantitative point of view, there is more inaudible sound around us than all the audible natural man-made sounds put together. This is because our hearing range is so limited as to encompass only about ten octaves to the perfect ear. But nature has been most clever and thoughful in endowing us with this limited range as otherwise our heads would be filled with endless, meaningless, grating torment. Man has the hearing range he now possesses because this is the small critical range essential for his environment existance. Our hearing range is sufficient to keep us aware of enemies and the dangers of nature, as well as for means of communication. Evolution has not given us hearing down to a fraction of a cycle per second since this is unessential for man's survival. The snap of a twig, the growl of an unfriendly animal, the eruption of a volcano and other dangers involve frequencies in the hundreds and thousands of cycles per second and evolution has made us sensitive to them. Within this range, man has constructed his civilization, his culture, his sciences and his aural arts.

But slow moving phenomena, or changes and disturbances giving rise to what we now call sub-audible frequencies, seldom involve immediate danger and do not awaken man's instincts for self-protection and survival. The swaying of a tree, breezes, tidal movements, temperature changes, the advance of a glacier, do not generally represent a menace to our immediate existence. and nature has therefore failed to give us aural apprehension of these.

This is fortunate or else our heads would be filled with unnecessary noise. Any movement or turn of our heads would generate audible sound. The slight rise and fall of our heads while walking would generate a low-frequency tone. Any change in barometric pressure would be accompanied by audible sound. The wave of one's hand, the slow fall of a leaf, the ascent or descent in an elevator, could be perceived as sound, had nature given us such low-frequency hearing.

If there were no low-frequency limit to our hearing we could detect temperature changes thru our aural mechanism because of the effect of temperature upon atmospheric pressure or density. We could "hear" the turbulances of the sun's corona. The noise of gunfire, wind, lightning and explosions would take on a new character because their deep low-frequency components would now be evident to us. Waves breaking on the shore would reveal their tremendous energy to us, which is now only detectable by sensitive seismograph instruments. We could hear any movement within the room. Even the breathing of ourselves and of others would become a thousandfold more audible. The earth itself is constantly responding to internal pressures, causing slow shifts in terrain, yielding here and erupting there. Such seismic changes would warn us of earthquakes.

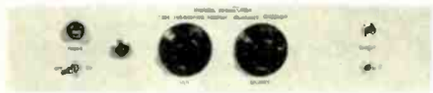
It is characteristic of the atmosphere that absorption losses increase with frequency, which explains why the sound of thunder has a sharp crack close by, but has only a deep rumble when heard at a distance. The low frequency components of thunder suffer the least loss, but even these seldom survive beyond five miles. However should we be endowed with sub-audible hearing, the sound of thunder would persist to many times its present distance. We could detect explosions hundreds of miles away. Because of the remarkable transmission characteristics of frequencies of 2 cps and lower, we could develop a means of aural communication by directing these frequencies at an angle toward the sky, reflect them from the ionosphere layer, and pick them up on the earth hundreds of miles away.

NEW PRODUCTS

(from page 48)

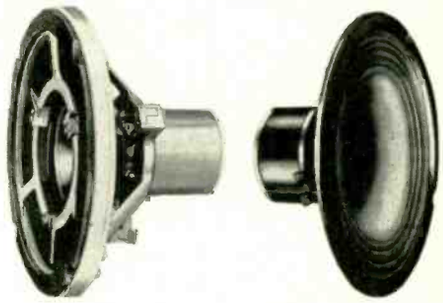
• **High-Power Ultra-Linear Transformer.** Intended for use with tubes of the KT-66 type in push-pull parallel output circuits, the new TO-330 transformer is a scaled-up version of the well-known Model TO-300, with similar performance characteristics and more than twice the power rating. The TO-330 has a bandwidth of ± 1.0 db from 10 cps to 100 kc for the transformer alone and permits construction of a Williamson-type power amplifier providing 60 watts output with less than one per cent intermodulation from four KT-66 or 5881 tubes. Data on the TO-330 and circuitry illustrating its usage are available on request from Acro Products Company, 369 Shurs Lane, Philadelphia 28, Penn.

• **Binaural Preamplifier.** Designed for dual-channel playback, the new Model 1732 preamplifier-equalizer manufactured by Eder Engineering Company, 1568 S. First St., Milwaukee 4, Wis., has a frequency response of 20 to 20,000 cps within ± 1.5 db. It is available in two types, one for tape and one for disc recordings, differing only in input characteristics. High impedance output of 15,000 ohms or low-impedance cathode-follower output is available in both types. Two controls are provided—one for adjusting gain of both channels simultaneously, the other for adjusting balance between the two channels. Output level is more than 1.0 volt.

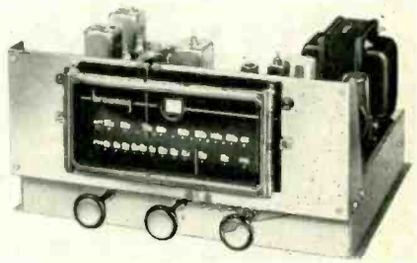


• **Battery Powered Converters.** Designed to provide 110-volt a.c. from a car battery, the Terado line of converters can be used to operate dictating machines, wire or tape recorders, test equipment, electric shavers, soldering irons, and other low-wattage equipment from 6- or 12-volt automobile batteries. Five models are available, with outputs ranging from 15 to 75 watts, and all are equipped with cigar lighter plugs for use in any car without the need for making special connections. Further information may be obtained from Terado Company, 1068 Raymond Ave., St. Paul 14, Minn.

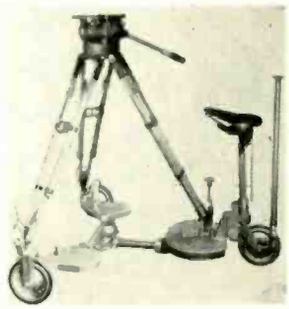
• **High Fidelity Speakers.** Two new speakers have been added to the line manufactured by Goodmans Industries, London, England. The first, designated Axiom 80, is a 9½-in. twin-cone free-suspension model of particular interest to the professional. It is stated to have frequency response extending from 20 to 20,000 cps within ± 4 db in free air. The second new model, known as Axiette 101, is an 8-in. single-cone speaker with frequency range from 40 to 15,000 cps. It contains a permanent-magnet assembly giving a nominal flux density of 13,500 gauss over a 1-in.-diameter pole piece. The Axiette is intended primarily for home music systems where present day restrictions on living space must be observed.



• **Browning Binaural Tuner.** Simultaneous reception of FM and AM broadcasts is offorded by the new Browning Model RJ48 tuner, recently introduced to provide listeners with a convenient means of tuning in stations which are engaged in binaural transmission. Although designed essentially for binaural use, the RJ48 gives excellent performance for either FM or AM high fidelity reception, or for independent reception of two separate programs with speakers located in different rooms. Detailed information is available without obligation from Browning Laboratories, Inc., Winchester, Mass.



• **Collapsible Camera Dolly.** A new 3-wheel dolly has recently been announced by Camera Equipment Company 1600 Broadway, New York 19, N. Y. In operating position it measures 45 in. wide by 46 in. long, yet it folds into the compact size of 18 by 12 by 36 in. and fits into handy carrying case. The dolly is equipped with a wheel in the rear for easy steering, but for straight dollying it may be locked into position. The unit mounts a small tripod, and has a seat for the cameraman and foot platforms for his assistant. Further information and prices may be obtained by writing direct to the manufacturer.



• **FM-AM Tuner.** Among unique features of the new Pentron Model AFM tuner is a dual-output arrangement which permits feeding flat response to a tape recorder, at the same time allowing the user to feed a tone-control-compensated signal to a high-fidelity music system. Circuitry of

the unit also includes a low-noise front end employing a grounded-grid triode r-f amplifier which provides 5-microvolt sensitivity for 30 db quieting. Other features of the tuner are: AFC control with push-button defeat switch, separate AM and FM front ends, separate bass and treble controls, magnetic cartridge preamplifier with three-position equalization switch, flywheel tuning control, and cathode-follower output. Front panel is decorator-styled in brushed copper with black wrought iron controls. The tuner mounts from the front and requires only a rough cut-out in the mounting panel. Complete specifications will be supplied on request by The Pentron Corporation, 221 E. Cullerton, Chicago 16, Ill.

AUDIO ETC.

(from page 39)

smoothly, then bring 'er back up with an electrical boost. But I pose one argument without any hesitation. We've already had all the equalization we can manage.

The Permoflux Diminuette enclosure uses two six-inch speakers (with the slotted and treated cone of the larger Permoflux line) instead of one eight, and achieves equivalent bass and a wider distribution of sound source. Good. The enclosure is a simple bass reflex. The Kingdom Combination is a modified bass reflex of the "shelf" type, the partition, cut on a slight diagonal, allowing for some horn loading of the speaker on the way to the bottom port. The smaller EW enclosure used a similar arrangement and, I understand, so does the Tru-Vox. Both the Kelton and the Jensen Duette employ speaker loading devices not unlike aspects of the RJ enclosure. Kelton's woofer is front loaded, the rear wave not used, where in the Jensen the rear sound is loaded up and emerges through a slot to reinforce the front wave—in this case as a sort of modified bass reflex, I gather.

And so a final word. There really isn't anything strikingly new about any of these proliferating small enclosures. They all rate as useful follow-ups on a good, new principle—more sound in less space. The real advance, when you come down to it, has been in the speakers of the eight- and six-inch class, which have in these last years been so extended in range, both up and down, and in efficiency as well, that they can perform wonders in any reasonably efficient small enclosure. I have a feeling that the end is not yet in sight as far as small enclosure developments are concerned. I think there are better, more original, more far-reaching things that can be done in this area, and I've heard just enough rumor to hope that some more radical developments will be forthcoming. Meanwhile, more power to the conservative and utilitarian models of the present.

AT HOME WITH AUDIO

(from page 23)

amplifier is developed across a 700-ohm resistor in the power supply, which provides approximately 70 volts. The 700-ohm resistor was replaced with one of 400-ohms the balance of 300 ohms being obtained from the heaters of the three preamplifier tubes and the pilot light, connected in series.

The modernized audio equipment now consists of a Pilot FM-607 Tuner, a 3-speed automatic record player with GE reluctance cartridge a 12-inch Altec 601-A coaxial speaker, and the self-built preamplifier.

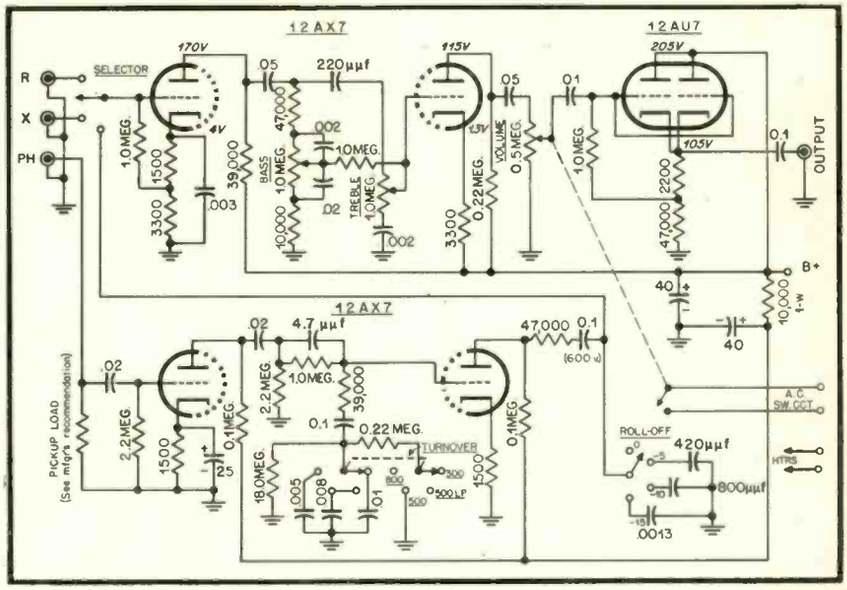


Fig. 7. Complete schematic of the preamplifier-control unit built by one enterprising reader.

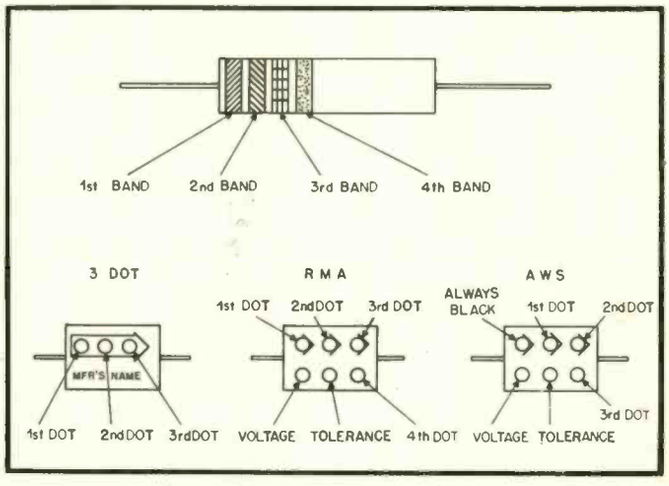


Fig. 8. Color coding makes construction simple—after you learn the code. First band on resistors indicates the first figure; second band, the second; the third band indicates the number of 0's following the two figures. Hence red-violet-orange indicates 2, 7, and 3 0's, or 27,000 ohms. Fourth band indicates tolerance—if no fourth band is present, the tolerance is 20%; silver band, 10%; gold band, 5%. If the third band is gold, the decimal point is moved one place to the left; thus orange-white-gold means 3.9 ohms.

Capacitor values are coded in micromicrofarads. Thus yellow-violet-brown is 470 µµf; yellow-violet-orange is 47,000 µµf, or .047 µf. Tolerance is same as for resistors; voltage is numeral times 100; Thus a silver tolerance dot indicates a 10% capacitor; a green voltage dot indicates 500 volts. (Tolerance dots may go down to 4, 3, 2, or 1%, using the colors as for numbers.)

Color	Figure	Color	Figure
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9
Green	5	Black	0

Hi-Fi Revisited

The way things move nowadays in this field, obsolescence seems almost to be super-induced. No sooner is an apparatus or even a circuit fitted into an audio system, it is superseded.

Technician though he is, our reader's above-reported alteration was made to a set in operation for barely two years. At the time, to the "best of his knowledge and belief"—and capacity to lay out hard coin too, perhaps—what he put together could have continued to serve well his varied and growing audiophile inclinations. Within the past two years since, however, preamp instrumentation has been bettered, and many more makes and types have become available. And so on through speakers, pickup arms, changers, turntables, cartridges.

Taking the field as a whole, there are sure to be just as significant improvements ahead of us as there have been in the two years past, and which have made valid and mention-worthy the current subject of *at home with* AUDIO.

Solutions are Many

We must alert our readers to the fact that the problem discussed here yielded to a technician's solution. While it may be true that practically any tool-handy amateur audio constructor can safely go

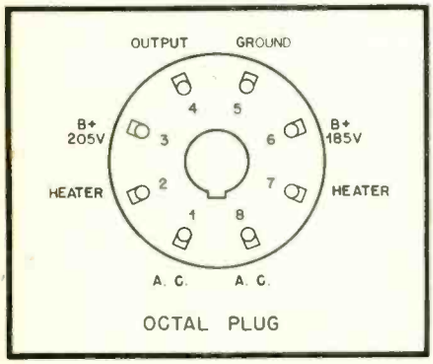


Fig. 9. Wiring of the octal plug used to conduct power from the main amplifier to the control unit, and signal from the control unit to the amplifier.

starry-eyed with the anticipation that he can be reasonably sure to be able to follow through on this example, bear in mind that there may be other ways out, other solutions than the rather difficut one our builder of custom audio sets elected for himself.

For most of us with less technical knowledge, but who have perhaps no less capacity for working-technique, there could be a number of alternatives. A manufactured front end can be used, even with difficult cabinet accommodation. For the unit can be placed away from the cabinet, on table or bookshelf, and the playback operated by remote control. Or a preamplifier could be built such as is described on pages 58 to 60 of the **audio anthology**, for example.

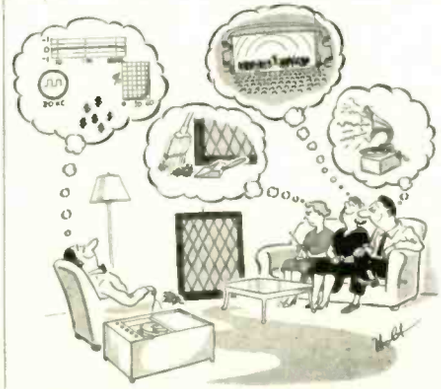
If adaptation there must be, perhaps a preamplifier of less complex formation and circuitry may serve as a model. This could be a way of simplifying the job for the amateur audio constructor, who

must cope with the problem—or dilemma—of spending close to a hundred dollars for a completely manufactured front end, or sweating it out with schematic and spaghetti, socket and switch, and the rest, to produce just as good (or nearly) for a smaller total cost than even the less than twenty dollars that happens to be the figure reported in this operation.

No doubt there are among our readers some who have had to face up to similar problems, and reports of their solutions will be welcomed for possible publication in this department.

PARTS LIST

1 4.7 μμf, mica or ceramic, 500 v.
1 220 μμf, mica, 500 v.
1 420 μμf, mica, 500 v.
1 800 μμf, mica, 500 v.
1 1300 μμf, mica, 500 v.
2 .002 μf, paper, molded, 400 v.
1 .003 μf, paper, molded, 400 v.
1 .005 μf, paper, molded, 400 v.
1 .008 μf, paper, molded, 400 v.
2 .01 μf, paper, molded, 400 v.
3 .02 μf, paper, molded, 400 v.
2 .05 μf, paper, molded, 600 v.
3 0.1 μf, paper, molded, 400 v.
1 0.1 μf, paper, molded, 600 v.
1 25 μf, electrolytic tubular, 25 v.
2 40 μf, electrolytic tubular, 450 v.
3 1500-ohm, ½-watt resistors
2 2200-ohm, ½-watt resistors
2 3300-ohm ½-watt resistors
1 10,000-ohm ½-watt resistor
1 10,000-ohm 1-watt resistor
2 39,000-ohm, ½-watt resistors
3 47,000-ohm, ½-watt resistors
2 0.1-meg, ½-watt resistors
2 0.22-meg, ½-watt resistors
4 1.0-meg, ½-watt resistors
3 2.2-meg, ½-watt resistors
1 18.0-meg, ½-watt resistor
2 1.0-meg, audio taper potentiometers
1 0.5-meg, audio taper potentiometer, with switch
1 2-gang, 4-position, rotary wafer switch
1 1-gang, 4-position, rotary wafer switch
1 1-gang, 3-position, rotary wafer switch
3 Noval tube sockets, with shield
2 12AX7 tubes
1 12AU7 tube
3 phono jacks
1 chassis, 5×7×2 in.
1 sub-chassis. 5×2 in.



DUAL-CHANNEL AMPLIFIER

(*from page 19*)

s.p.d.t. switch provides for single-channel or stereophonic operation. The other switch is a d.p.d.t. unit for placing the low-pass filter in or out of the circuit. The two jacks are the utility jacks mentioned earlier. They are placed on the panel to permit ready access to connections to one or two tape recording channels.

A word about the low-pass filter is in order. You can calculate the constants for the filter from the equations for a single *m*-derived section if you want to. However, for the purpose at hand this is neither the easiest nor the best method for designing the filter. Instead, the writer installed a 150-μμf *variable* capacitor for C_{14} across the inductor, L. If L has an inductance on the order of 1 henry this capacitance can be adjusted to give "infinite" attenuation for interchannel whistles of 10 k.c. An audio oscillator and a v.t.v.m. (or oscilloscope) are helpful here but the adjustment can be made by ear, if necessary, while the signal source is an AM tuner. The value of C_{15} can be determined so as to provide attenuation starting around 7,000 or 8,000 cps. The actual capacitance required will depend on the Q of the coil and the load into which the filter works. The values of capacitance and load resistance given in the diagram worked out well for the particular coil used by the writer. Some changes may be expected when using other coils. Unfortunately, the inductor shown in the photographs is not commercially available.

The circuits used in the amplifiers were chosen on the basis of low distortion. Some preamplifier circuits—including some designed earlier by the writer—amplify the signal up to 10 volts or so and then the equalizer attenuates the signal. Most triodes show high intermodulation distortion at such high levels. For this reason the volume controls used in this unit are placed immediately following the selector switches. The equalizers *precede* the two-stage feedback pairs; the signal is reduced before amplification, not after it has reached the level of high distortion. Sufficient feedback is incorporated to reduce the generator impedance to a value of 2,000 or 3,000 ohms. More feedback could be used if desired because the gain is higher than required for any normal input signal. This same feedback also reduces distortion, as mentioned earlier. Distortion is already low because the signal never exceeds 1 volt anywhere in the entire unit.

Another feature of interest in connection with lowered output impedance is the use of large (2-μf) oil capacitors for C_{12} and C_{28}. There is little point in reducing the generator impedance of the amplifier to a low value if this advantage is lost by high series reactance in the output coupling circuit.

HI-FI FURNITURE

(from page 26)

This is carried through to the C-D grade panel which is usually used for sidings of buildings etc. Obviously, a great saving can be realized by using less than A-grade panels where the plywood is unexposed. For backs of speaker enclosures, a grade A-D is recommended since one panel is exposed to the back.

The hardwood plywoods are graded more simply. A good one face panel would be known as G1S and a panel with two good sides would be known as a G2S. It is important however, that the G1S panel have its back veneer of sound construction, free from major defects. It must be of hardwood, but not necessarily of matching wood species with the face. Sometimes a G1S Walnut panel might come with an Oak back. Where it is necessary to expose both sides of a panel (such as doors etc.) then a G2S panel is recommended.

Despite the predominant use of plywood in the construction of cabinets and enclosures, hardwood lumber is still employed for use as trim, mouldings and in facing of edges. Principally it is used to cover up the end grain of plywood. Called *stripping* it consists of a ½" by ¾" edge strip of a matching wood species to the plywood face. Hardwood lumber is also used to make the beveled frames for the faces of speaker enclosures or equipment cabinets. Where tapered, carved, or turned legs are required in the various period styles, solid hardwood lumber is used exclusively. One great difficulty in using this technique is that extreme care must be exercised in selecting the solid hardwood lumber to match the texture and color of the plywood veneer face.

In Part II, the authors will discuss the aspect of woodworking related to the high fidelity cabinet.

Figure Credits

Figures 1 through 5, U. S. Plywood Corp.
Figure 6, Kierulff Sound Corp.

CLASSIFIED

Rates: 10¢ per word per insertion for noncommercial advertisements; 25¢ per word for commercial advertisements. Rates are net, and no discounts will be allowed. Copy must be accompanied by remittance in full, and must reach the New York office by the first of the month preceding the date of issue.

Industry People ...

Norman Krim, vice-president, Raytheon Manufacturing Company, addressed press meeting at New York's famous Toots Shor restaurant—offered truly convincing evidence that transistors are superior to tubes in many electronic applications . . . New members elected to the advisory committee of the West Coast Audio Fair include **Gramer Yarbrough**, American Microphone Company; **Bert Berlant**, Berlant Associates; **Bill Thomas**, James B. Lansing Sound, Inc., and **Bob Newcomb**, Newcomb Audio Products Company. **Bob Stephens**, president, Stephens Manufacturing Company, elected chairman of the committee for 1955—**William L. Cara** is Fair manager.

Jay T. Nichols has been appointed chief engineer of The Pentron Corporation—formerly served on the staff of the Armour Research Foundation . . . **G. W. (Gene) Rhein** and **W. L. Pedersen**, prominent audio figures, have combined to form Rhein Sound Systems, Inc., Orlando, Fla., for the manufacture of audio amplifiers—Rhein was co-founder of the Dayton Audio Club . . . **Wentworth Fling**, vice-president of Cinerama, Inc., gave the New York chapter of the AES one of its more enlightening and entertaining sessions with his discussion on various aspects of multitrack recording . . . Co-incidental follow-up to the **Fling** address was the award by the Academy of Motion Picture Arts and Science of an "Oscar" to **Hazard E. Reeves**, president of Reeves Soundcraft Corporation for development of the Magna-Stripe process of striping film with magnetic tracks which is used in CinemaScope release prints—**Frank B. Rogers, Jr.**, vice-president of Soundcraft, announces that MGM and 20th Century Fox are among major studios licensed to use the Magna-Stripe process.

Frank Gonzalez, Jr., has been appointed sales manager of Los Angeles' Kierulff Sound Corporation, replacing **William L. Cara** who resigned to join Ampex Corporation—he will also be assistant to **Cap Kierulff**, the firm's general manager . . . **Sherman M. Fairchild**, president, Fairchild Recording Equipment Company, announces a new Motion Picture Sound Division which will be under the direction of **Ray Crews**, vice-president. The new division's initial activity will be centered around the Perspecta Stereophonic Sound Integrator—the first "compatible" theater sound system that produces three-speaker stereophonic sound from a single optical track. The PSSI was invented by **C. Robert Fine**, president of Fine Sound, Inc., and is currently being delivered to major studios.

Rudy Bozak, president, The R. T. Bozak Company reports business so good that the firm will soon be looking for expanded quarters—**Norman Pickering**, technical director of Philharmonic Records, Inc., and director of research for Pickering and Co., Inc., has been appointed visiting professor of music at The College of the City of New York—will conduct a new course in music acoustics dealing with acoustical problems in broadcasting, recording, and in the concert hall.

ADVERTISING INDEX

The Tape That Mirrors the Original Sound

SOUND RECORDING

irish

BRAND

GREEN BAND Professional

THE FINEST TAPE YOUR RECORDER CAN USE

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

This can be confirmed by tests. Instruments will reveal that IRISH Green Band offers lower noise level, uniform sensitivity, minimum amplitude variation, less distortion.

But instrument tests are only the landmarks of good design and production. The final proof is in the hearing. Therefore, to know and appreciate the quality of IRISH Green Band Tape, it must be used, listened to, and compared with other tapes on the same recorder.

You will find that the only limitation to IRISH Green Band quality is the limitation of the tape recorder itself: it is the finest tape your recorder can use.

irish BRAND **GREEN BAND Professional**

is fast becoming the choice of audio engineers in broadcast stations, recording studios and wherever sound quality is of paramount importance.

1200 feet on plastic reel ..... $3.30 net
2400 feet on metal reel ..... 7.71 net

One day you will surely use IRISH . . . so write today for free test sample reel.

irish BROWN BAND for Popular Priced Recorders:

IRISH Brown Band, expressly designed for home and office recorders. Reproduces with true fidelity the frequency range from 100 to 8000 cycles. A high quality, plastic base tape for the price of ordinary paper tape!

1200 feet, plastic base, on plastic reel ..... $2.50 net

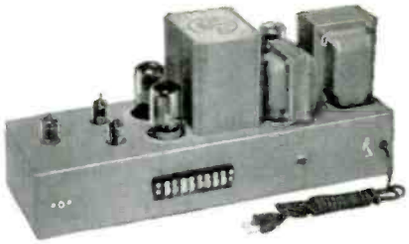
At all leading radio parts distributors

ORRADIO INDUSTRIES, INC.
OPELIKA 2, ALABAMA
World's Largest Exclusive Magnetic Tape Manufacturer
EXPORT DIVISION: Morhan Exporting Corp., New York, N. Y.

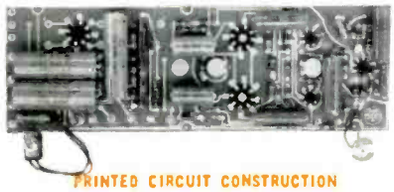
Revolutionary LINEAR STANDARD AMPLIFIER

NEW HEIGHT OF FIDELITY
20 WATTS
KIT FORM

LINEAR STANDARD MLF AMPLIFIER

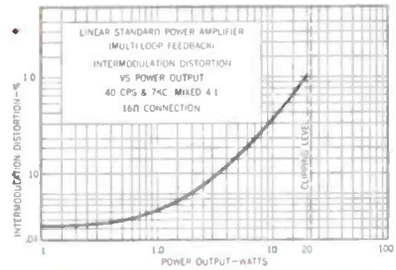


WITH COVER REMOVED

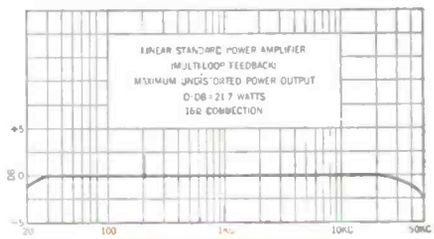


PRINTED CIRCUIT CONSTRUCTION

SUITED TO 7" RACK PANEL MOUNTING



INTERMODULATION DISTORTION CURVE



FREQUENCY RESPONSE CURVE

The Linear Standard amplifier climaxes a project assigned to our audio engineering group a year ago. The problem was, why does a Williamson circuit amplifier which tests beautifully in the laboratory seem to have considerable distortion in actual use? It took a year to fully determine the nature and cause of these distortions and the positive corrective measures. This new amplifier not only provides for full frequency response over the audio range but, in addition, sets a new standard for minimum transient distortion.

An inherent weakness of the Williamson circuit lies in the fact that its negative feedback becomes positive at subsonic and ultrasonic frequencies. The resultant instability in use lends to parasitic oscillation at the high end and large subaudio cone excursions both of which produce substantial distortions. The Linear Standard Amplifier uses Multiple Loop Feedback and network stabilization to completely eliminate these instabilities. The oscillograms below show comparative performance. The flat frequency response and extremely low intermodulation distortion provided by 36 db feedback, are self evident from the curves shown.

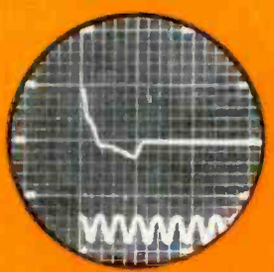
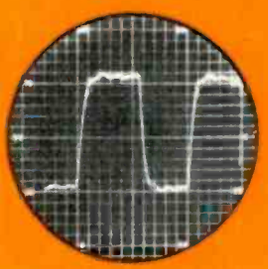
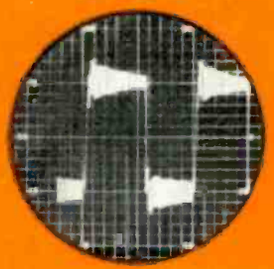
In addition to providing an ideal amplifier electrically, considerable thought was given to its physical form. A number of points were considered extremely important: (1) Size should be minimum (power and audio on one chassis). (2) Each kit must have identical characteristics to lab model. (3) Rugged, reliable, structure is essential.

This resulted in a rather unique construction employing a printed circuit panel as large as the chassis with virtually all components pre-assembled and wired. The result is that each kit, which comes complete, including tubes and cover, can be fully pretested before shipment. Additional wiring involves only the connection of 17 leads to screw terminals for completion.

LINEAR STANDARD TYPE MLF AMPLIFIER SPECIFICATIONS . . .

Rated Power Output:	20 Watts
Intermodulation Distortion:	.07%-1W, 1%-20W
Frequency Response (controlled):	1 db 20 to 20,000 cycles
Hum & Noise Level:	80 db below rated output
Feedback:	36 db
Output impedances (not critical):	4, 8, 16 also 2, 5, 10, 20, 30 ohms
Tubes:	1-12AX7, 2-6AU6, 2-5881, 1-5V4G
Dimensions & Weight:	5¼" x 8" x 17⅛", 24 lbs.
Net Price:	$108.00

COMPARATIVE PERFORMANCE

	LINEAR STANDARD	WILLIAMSON TYPE
Step function (low frequency) transient stability.		
High frequency oscillation stability. Average speaker wiring capacity.		
Overload recovery transients.		

United Transformer Co.

150 VARICK STREET NEW YORK 13, N. Y.

EXPORT DIVISION: 13 EAST 40th STREET, NEW YORK 16, N. Y. CABLES: "ARLAB"