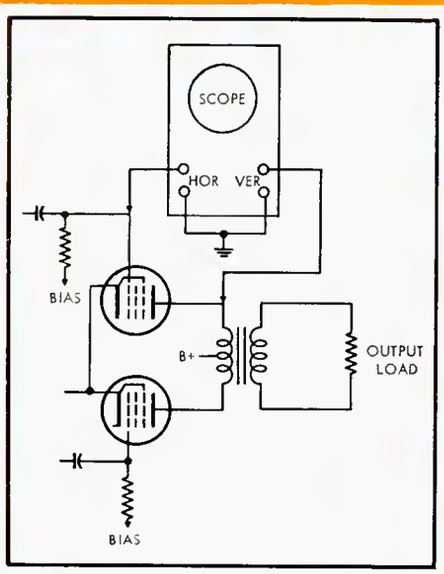
AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

MARCH, 1957

50¢



Performance of an output transformer at high and low frequencies may be checked by using an oscilloscope in this manner. See page 21.

Use those old iceboxes in your attic or basement to house a complete system—the vertical type makes a solid cabinet for equipment, while the chest type holds records. See page 24.

ADEQUATE AUDIO POWER IN THE HOME

NEW CONCEPT OF STEREOPHONIC SOUND

GET HOT MUSIC FROM A COOL CABINET

"FREE-RIDING" CONTROL RELAYS

presenting . . . **THE HARKNESS** . . . JBL Signature Model C40

a great new backloaded folded horn enclosure • contemporary lowboy console styling

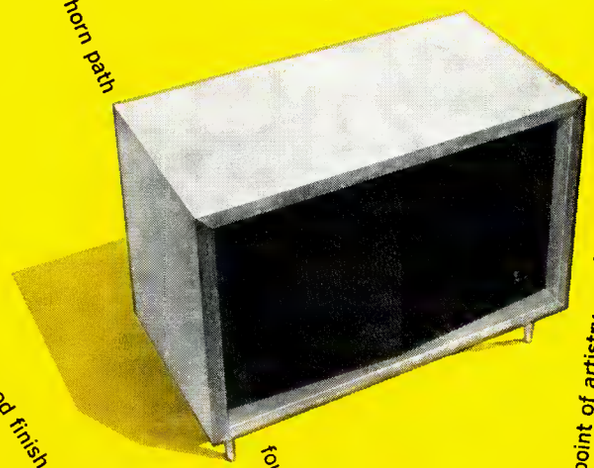
your choice of fine hand-rubbed hardwood finish • ideal for progressively assembled speaker system

six foot exponentially-tapered horn path

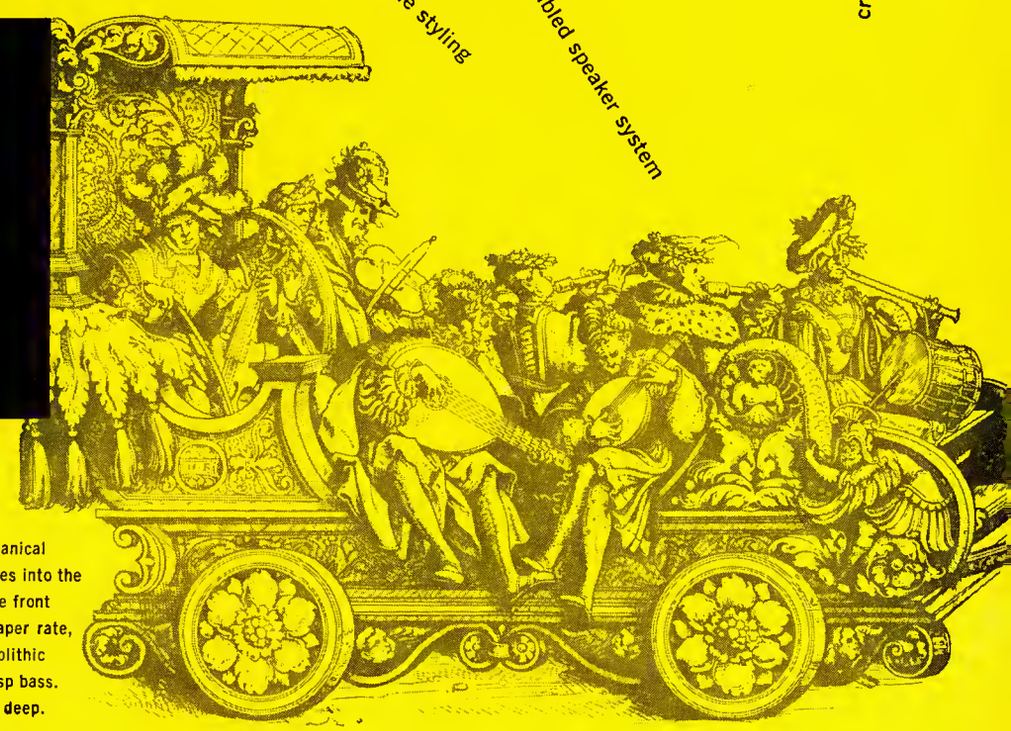
every note a perfect quote

four-square-foot horn mouth

craftsmanship carried to the point of artistry • for complete description write for bulletin SL604T



JBL



the new "Harkness," JBL Signature Model C40 is a lowboy console model backloaded folded horn designed to enclose either a 12" or 15" JBL Signature Extended Range Speaker or one of the Signature two unit, two-way speaker systems. Below a mechanical crossover point around 175 cps the rear of the speaker cone radiates into the throat of a six foot exponentially tapered horn. Above this point the front of the cone acts as a direct radiator. The carefully formulated taper rate, long horn path and large horn mouth, and solid JBL Signature monolithic construction aid in the production of an added octave of clean, crisp bass. The enclosure with legs stands 23¾" high, is 37⅞" wide, and 20" deep.

"JBL" means JAMES B. LANSING SOUND, INC., 2439 fletcher drive, los angeles 39, california

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In response to many suggestions, we present a convenient listing of B.I.C. products you will find at leading parts distributors and sound departments throughout the country . . . every one fully guaranteed, with service facilities and spare parts available at all times.

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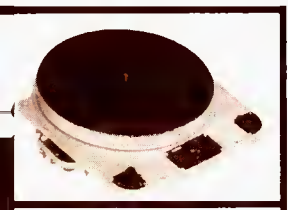
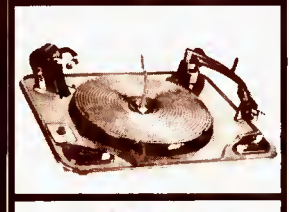


■ **GARRARD**
Model 301
Professional 3-speed transcription turntable. Each speed variable and adjustable. Each player with its own inspection report.

■ **GARRARD**
Model RC88
World's finest record changer. Automatic and manual operation. True-turret drive . . . no belts. 4-pole motor. Foolproof pusher platform.



■ **GARRARD**
Model RC98
The Super Changer! All RC88 features PLUS continuous + or — variable control on each speed.

■ **GARRARD**
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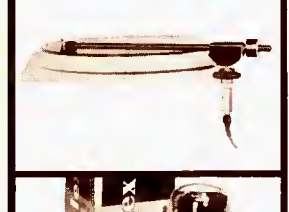
Mixer Changer . . . manual and automatic operation. Garrard's most compact, economical unit. 4-pole motor.

■ **GARRARD**
Model "T"
Manual player with automatic start and stop. Compact, efficient units, playing features of famed RC80 changer.

■ **LEAK**
TL/10 and TL/12
Britain's finest amplifiers and pre-amplifiers. Amazingly low harmonic distortion of 0.1%. BBC standard setters.



■ **LEAK ARM & DYNAMIC PICKUP**
Acclaimed by experts as finest in the world. Widely used by scientific laboratories and radio studios.

■ **GENALEX**
KT66-Z729 Tubes
The original KT66, Britain's famous power-amplifying tetrode . . . and the original Z729 low-hum input tube.

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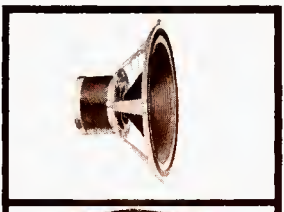

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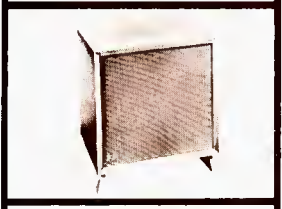
WHARFEDALE
Loudspeakers
Built under the personal supervision of world-famous engineer, G. A. Briggs. Unique soft suspension of cone.

■
BRIGGS ENCLOSURE
Exclusive sand-filled non-resonant corner enclosure for 3-way speaker system.

■
BOOKS BY G. A. BRIGGS
"Loudspeakers," "Sound Reproduction," "Pianos, Pianists and Sonics," and new book "High Fidelity, the Why and How for Amateurs."



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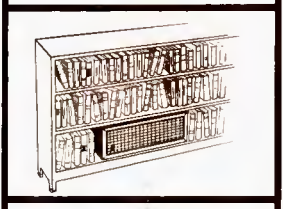
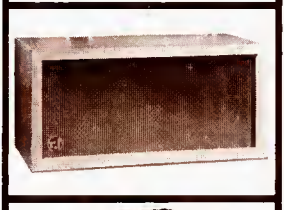
R-J ENCLOSURES
(Floor Model)
The original small space loudspeaker enclosures. Patented R-J design principles. Full, smooth bass; unobstructed highs.



■
R-J ENCLOSURES
(Single & Double Shelf Models)
"Maximum Bass; Minimum Space." Thrilling performance from any loudspeaker because of patented design.



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R-J WHARFEDALE
First and only complete R-J system . . . includes special Briggs designed Wharfedale Speaker.

■
RIVER EDGE
"Customized" Cabinets
Equipment and loudspeaker cabinets with panels cut to fit components of all manufacturers.

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RIVER EDGE
"100"
"Do-It-Yourself"
Kits, and assembled, but not painted units. Birch hardwood, takes fine furniture finish.

■
S. G. BROWN
High Fidelity Headphones
Internationally famous for precision, sensitivity, fine workmanship and ruggedness.

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ERSIN 5-CORE MULTICORE SOLDER
World's finest cored solder, made with exclusive Ersin Flux . . . non-corrosive, extra active.

All B.I.C. components are illustrated and fully described in the BIC High Fidelity Plan Book, a useful guide in planning any hi-fi system.

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MARCH, 1957 VOL. 41, No. 3
Successor to RADIO, Est. 1917.

AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

CONTENTS

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

AUDIOCLINIC ? ?

JOSEPH GIOVANELLI*

Plastic Resonance

Q. *What is meant by "plastic resonance"? S. Kalmer, New York, N. Y.*

A. Often, when the frequency response of a pickup is measured, there is found to be a rise at a particular frequency. This may not be the fault of the pickup but may be caused instead by a phenomenon known as plastic resonance, which operates in the following manner.

When the stylus moves in accordance with the modulation on the disc being played, it strikes the groove walls, causing them to give. However, they are flexible, and therefore spring back into place, pushing the stylus in return. These effects are not at all unlike those of a tuned circuit (an inductance and capacitance connected in either parallel or series), whose resonant frequency is dependent in this case upon the elasticity of the disc and the dynamic mass of the cartridge. All the mass of the cartridge can be assumed to be at the stylus tip, and is analogous to the inductance of the circuit. If the resonance of this circuit falls somewhere in the audio spectrum, some portion of the disc will correspond with resonance, causing exaggerated emphasis of a particular musical tone. There are two ways of eliminating this difficulty. One is introducing damping into the cartridge, which is the same as saying that a resistance has been placed across the tuned circuit, lowering its efficiency, though not completely eliminating its effectiveness. This has the disadvantage, however, of increasing the dynamic mass of the pickup, and with the high velocities encountered with present-day discs, groove damage is the probable result, caused by the irresistable force striking a *movable* object. The second method is to reduce the dynamic mass of the cartridge to as low a value as is practically possible. This results in reducing the force with which the stylus strikes the groove wall, in turn causing less displacement; since the mass is smaller, the stylus may more quickly return to its rest position. This results in an increase of the resonant frequency, the amount of increase depending upon the reduction of the mass and upon the stiffness of any given disc. Obviously, records will last considerably longer under these conditions.

Doppler Effect

Q. *What is meant by the Doppler effect? Norman Floyd, Puente, California*

A. How many times have we heard an airplane pass overhead, with the pitch of the engines rising as the plane approaches, only to fall sharply as it disappears in the distance. This apparent change in pitch is caused by the Doppler effect. Its operation can easily be understood from the following illustration:

Suppose that an observer is placed at a point where sound waves pass at the rate of one foot per second, at a frequency of two cycles per second. This means that two waves pass the observer during a single second. Suppose the observer now proceeds at a speed of one foot per second in the direction from whence the sound is coming. It can now be easily seen that he will pass twice as many waves as passed him before he was set in motion, doubling the frequency to four cycles per second, raising the pitch of the tone one octave thereby. Conversely, if the observer moves in the same direction of travel as that of the sound waves, he will encounter fewer of them per second, the exact number depending upon his velocity. It should be obvious that the same phenomenon would be noted if the observer remained motionless and the sound source were in motion. It would also occur if both the observer and the source were moving, but at differing velocities.

It should be said here that my figures were used only for illustration, so that the effects could be more dramatically evident. The actual velocity of sound is approximately 1100 feet per second *in air*, its exact speed depending upon temperature and humidity. The velocity of sound waves is different when they travel in media other than air.

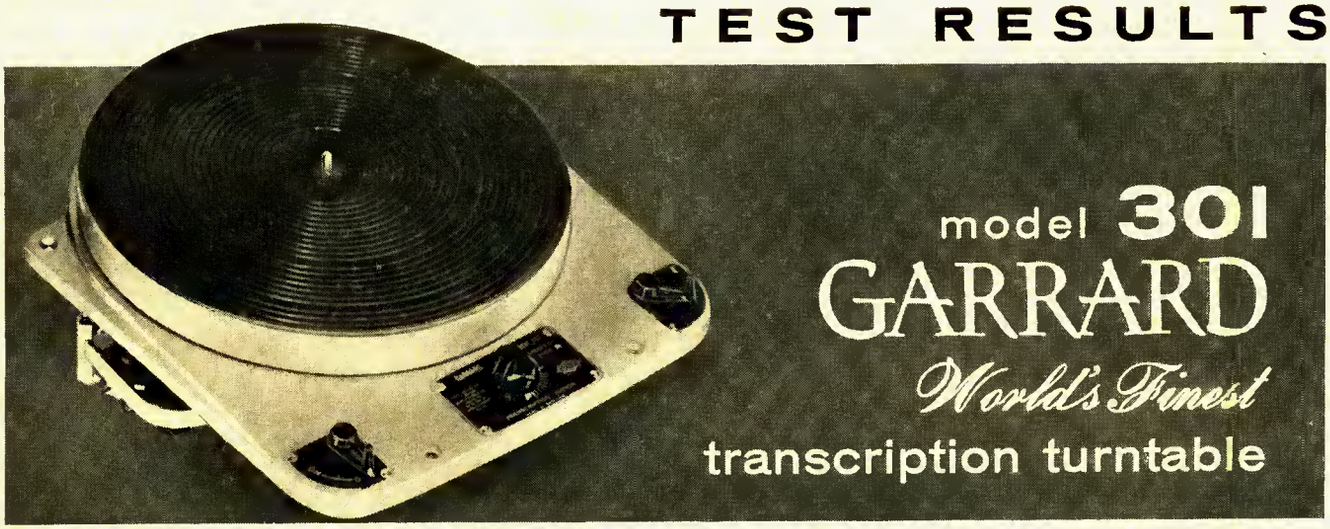
Transistor Gain

Q. *How does one determine the gain of a transistor? Edwin Fischer, Goldsboro, N.C.*

A. Like a vacuum tube, the transistor has differing characteristics when operated in the grounded, or common, base connection, common emitter connection, and common collector configuration. In all these connections, the gain is reckoned under short-circuit conditions, meaning that no load is applied to the transistor, but rather, its output lead goes through an a.c. milliammeter directly to its proper termination on the power supply. In all three instances, the gain is measured by injecting a small a.c. signal into the input and measuring the resultant a.c. current in the output lead. The preceding discussion is illustrated at (A), (B), and (C) in *Fig.* 1, which represents the common base, common emitter, and common collector connections respectively. The gain under common base conditions is represented by α. This forms the basis for computing the gain under the remaining two conditions. The α of a good junction transistor should run between 0.95 and 1.00, though this latter figure is never quite reached. If the α falls below 0.90, it is considered not to be a very good unit. Notice that under this condition the current gain is really a current loss, but with the proper load placed in the collector circuit, considerable voltage gain can be realized. With the common emitter connection, Fig. 2, the gain is represented by

* *3420 Newkirk Ave., Brooklyn 3, N.Y.*

TEST RESULTS



TESTED: for performance by Audio Instrument Company, Inc., an independent laboratory.

RESULTS: Garrard Model 301 tested even better than most professional disc recording turntables...sets a new standard for transcription machines!

Read Mr. LeBel's report below

3 Stock machines selected at random!

Gentlemen:

We have tested the three Garrard Model 301 Turntables which the undersigned selected at random from sealed unopened cartons in your warehouse stock. These three bore the following serial numbers: 867, 937, 3019. We used a standard Model WB-301 mounting base without modification, a Leak tone arm fitted with their LP cartridge, and a complete Leak preamplifier and power amplifier, model TL/10.

Pickup and amplifier system conformed in response to the RIAA-new AES-new NARTB curve within ± 1 db.

Standards referred to below are sections of the latest edition, National Association of Radio & Television Broadcasters Recording and Reproducing Standards. Our conclusions are as follows:

Turntable easily adjusted to exact speed!

Measurements were made in accordance with NARTB specification 1.05.01, using a stroboscope disc. In every case, speed could be adjusted to be in compliance with section 1.05, i.e. within 0.3%. In fact, it could easily be adjusted to be exactly correct.

WOW less than NARTB specifications!

Measurements were made at 33⅓ rpm in accordance with NARTB specification 1.11, which calls for not over 0.20% deviation. These values substantially agreed with those given on Garrard's individual test sheets which are included with each motor.

Garrard Serial No.	%
867	.17
937	.13
3019	.12

Rumble less than most professional recording turntables!

Measurements were made in accordance with sections 1.12 and 1.12.01, using a 10 to 250 cps band pass filter, and a VU meter for indication. Attenuation was the specified 12 db per octave above 500 cps and 6 db per octave below 10 cps. Speed was 33⅓ rpm.

Signal to Rumble Ratio Using Reference Velocity of 7 cm/sec at 500 cps

Rumble: checked by official NARTB standard method (—35 db. min.) —52 db.!

This reference velocity corresponds to the NARTB value of 1.4 cm/sec at 100 cps.

Garrard Serial No.	DB
867	52
937	49
3019	49

The results shown are all better than the 35 db broadcast reproducing turntable minimum set by NARTB section 1.12. In fact they are better than most professional disc recording turntables.

Signal to Rumble Ratio Using Reference Velocity of 20 cm/sec at 500 cps

Rumble: checked by Manufacturer A's methods —61 db.!

Garrard Serial No.	DB
867	61
937	58
3019	58

Rumble: checked by Manufacturer B's methods —84.1 db.!

We include this second table to facilitate comparison because some turntable manufacturers have used their own non-standard reference velocity of 20 cm/sec, at an unstated frequency. If this 20 cm/sec were taken at 100 cps instead, we would add an additional 23.1 db to the figures just above. This would then show serial number 867 to be 84.1 db.

Of greatest importance! Always consider these vital factors to evaluate any manufacturer's claim.

It will be seen from the above that no rumble figures are meaningful unless related to the reference velocity and the reference frequency. Furthermore, as stated in NARTB specification 1.12.01, results depend on the equalizer and pickup characteristics, as well as on the turntable itself. Thus, it is further necessary to indicate, as we have done, the components used in making the test. For example, a preamplifier with extremely poor low frequency response would appear to wipe out all rumble and lead to the erroneous conclusion that the turntable is better than it actually is. One other factor to consider is the method by which the turntable is mounted when the test is made. That is why our tests were made on an ordinary mounting base available to the consumer.

Very truly yours,

C. J. LeBel

AUDIO INSTRUMENT COMPANY, INC.

C. J. LeBel

$$\beta = \frac{\alpha}{1-\alpha} \qquad (1)$$

By applying this formula to a transistor whose α is 0.95, we see that the β is 19, meaning that the a.c. collector current is 19 times that of the base current.

Under the condition of common collector, *Fig.* 3, the gain is represented by

$$\textit{Common Collector Gain} = \frac{1}{1-\alpha} \qquad (2)$$

Since the common collector configuration is not so generally used as the preceding two circuit arrangements, we put up with having to refer to it simply as $\frac{1}{1-\alpha}$. Assuming the same α as before, 0.95, the gain under the grounded collector condition is 20.

When considering point contact transistors, the α is in the vicinity of two, meaning that in the common base connection some actual gain could be realized. But under the remaining two circuit configurations, far less gain is available.

The above does not hold at all frequencies. With increasing frequency, there finally comes a point where the gain decreases by 3 db. This point is known as the α cutoff. Beyond this point the gain falls rapidly. This is caused mainly by shunt capacitances within the unit, and by the fact that the time needed for electron-hole flow is rather slow.

Radio Waves

Q. *What is meant by the frequency of a radio wave? A. Palumbo, Flemington, N.J.*

A. *Figure* 2 shows a series of sine waves corresponding to those created by a radio transmitter. They are received unchanged by the antenna of your receiving set. The

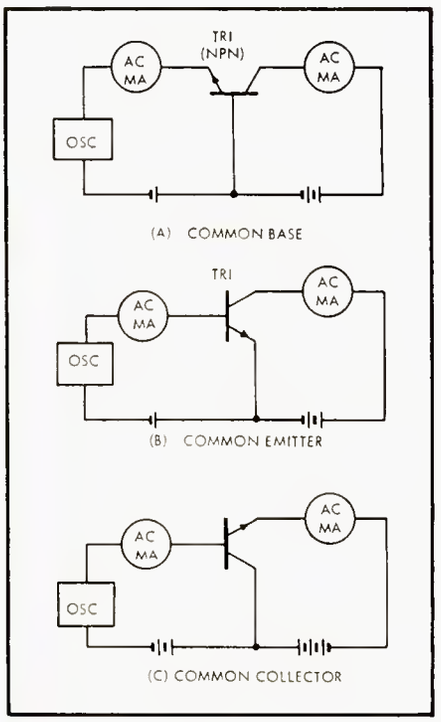


Fig. 1

frequency of the radio wave, or carrier, is the number of complete sine waves which leave the transmitting antenna per second. This is exactly what we mean by frequency in audio work, although the frequencies used in audio are lower than those used in radio transmission, corresponding to fewer waves passing a given point in a single second.

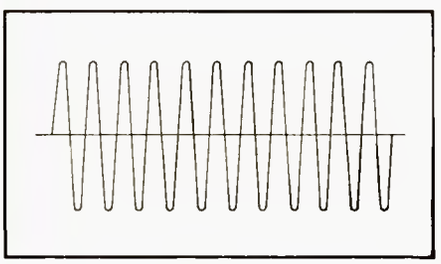


Fig. 2

Low Impedance Output Stage

Q. *Why has it not been found practical to employ many output tubes in push-pull parallel, lowering the output impedance, making the use of a matching transformer unnecessary? Harry Brody, Grafton, Ill.*

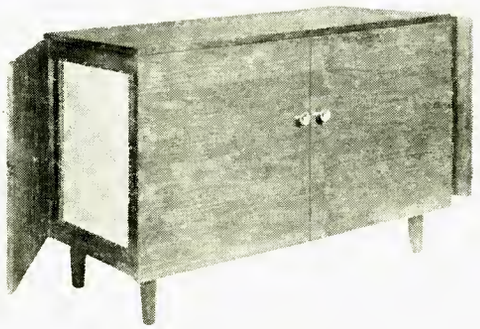
A. Such circuits have been constructed, with varying degrees of success. However, the cost of the power supply for such a unit is usually as high as that of an entire high-quality amplifier.

STEREO-FANTASY

The NEW BOZAK B-304 adds the Ultimate Ingredient of Realism . . .

Spatial Perception

This binaural speaker system in a single enclosure is a distinctively original Bozak concept. With two-channel stereo program material, it re-creates an unbroken front of living sound with the sense of breadth, depth and direction vividly perceptible over a wide angular listening area — retaining throughout virtually the entire room the sense of perspective and homogeneity of the sound that is the essence of the ultimate in realism. The Bozak B-304 literally transforms your living room into the pit of a concert hall — every instrument in its proper location on the stage and without the "hole in the center" that is felt so commonly with separate-enclosure stereo sound.



This is a luxury speaker system. It is expensive, and should be used only with two identical amplifying channels of the highest quality and minimum of 30 Watts power which, by their nature, are also costly. With wide-range, low-distortion two-channel discs, tape, or AM/FM broadcasts, the *Stereo-Fantasy* offers a listening experience approached by no other loudspeakers for the vital immediacy of its sound.

Superb cabinet work in a choice of two designs: The *Provincial* (above) in Fruitwood; and the *Contemporary* (left) in Walnut or Mahogany.

All Bozak Products are Designed and Built by the R. T. Bozak Manufacturing Company

The Very Best in Sound

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LETTERS

"A-B" Testing

SIR:

On Page 12 of the Jan. '57 issue there appears a statement to which we have often given thought, to wit, ". . . when you are to choose some hi-fi component or other you should listen for yourself and compare them on an A–B basis—making sure that the manufacturers of all the units compared are reputable." Since this statement is made under the heading of EDITOR'S REPORT, we presume that it reflects your opinion. As such, we respect it, but beg to take issue with it, at least insofar as speakers are concerned.

The A–B test is commonly accepted as *the* means of choosing between one component and another. This usually means rapid switching back and forth among two or more similar units under consideration. We submit that this method of selection creates, at least where speakers are concerned, the very false illusion and confusion it seeks to diminish or eliminate. (*We do not feel that switching should necessarily be* "rapid." ED.)

Is not this rapid switching an ideal condition for the demonstration of the more "sensational" unit? Which is to say: the most efficient, the most resonant, the most peaked, or otherwise colored. Unless the prospective buyer is an expert by experience, as too few are, he is naturally going to be more impressed by a louder speaker when it is switched in. Needless to say, efficiency *per se* is a desirable characteristic, but that by itself it is no indication of the component's sound quality.

It is generally recognized that the best loudspeakers are those that reproduce the original signal with the introduction of as little distortion and coloration as possible. These premium items sacrifice sensationalism for (you should pardon the expression) fidelity. Such integrity on the part of the manufacturer, and its end aural result, is placed at a disadvantage when allowed to express itself only in spurts, and is drowned out seconds later by the gallery playing companions, be they recessed resonators, under-sized and uncritically-ported reflexes, or just badly designed horns. "But hear that bass!" the novice is admonished for admiring the smoothness of an infinite baffle system. And he feels guilty, although he does not know that "that bass" consists of a single frequency.

What, then, do we propose to substitute for a critical evaluation of a speaker? Just this: listen to one speaker at a time, for as long a time as you can. Be impressed, if you are so inclined. Listen long enough to become aware and a little annoyed by that thump around 200 cps. The longer you listen to it, the more aware

The February Rigo advertisement incorrectly stated that admission to the Rigo High Fidelity show was free. This has been corrected to state that admission to the shows is 50¢. We regret any misunderstanding that may have been caused by this error.

you will become of it. Likewise, other peaks throughout the entire system are glossed over via A–B. It's the reason so many people are dissatisfied with a speaker in their homes even though they thought it was "fabulous" in the hi-fi show rooms.

Then, wait awhile before hearing another speaker. Overnight, maybe. You won't recall so precisely the exact way yesterday's speaker sounded to you, but you'll remember what you didn't like about it, and be critical on that point in the next speaker you hear. This is the beginning of really discriminating listening.

It might appear, from the foregoing, that we make loudspeakers. Such is not the case; we make records—tapes, if you please, of our own recordings, and as personal services to individual customers. But we express ourselves as we have because we are convinced that the way for quality reproduction to flourish in the home is to ascertain, as nearly as possible, that the ultimate consumer receives a product that will truly give pleasure. If the "terrific" speaker in the show room does little but belch in the home, said consumer is ultimately going to decide that hi-fi just isn't worth the bother and expense anyway, since he receives no satisfaction, just annoyance. He will divert his energies and cash toward photography, or sports cars, or something. This produces an unhealthy air, and unfertile soil for the maker of loudspeakers, the maker of records, and everyone in between.

We'd like to hear from your readers who may agree or disagree with us.

ROBERT J. BELDEN, Pres.
Pro Arte
P. O. Box 1001
New Brunswick, N. J.

NEW LITERATURE

● **Fairchild Recording Equipment Company,** 10-40 45th Ave., Long Island City 1, N. Y., has just published an enlightening 16-page booklet titled "How Good is Your Arm?" Clearly written and well illustrated, the booklet brings to its readers the various basic problems involved in the design of a professional quality tone arm at modest price. Written in simple-to-understand language and illustrated with numerous charts, it covers such important aspects of arm design as resonance, tracking error, torsional resonance, and pivot design. The booklet will be mailed free upon written request. **C-8**

COMING EVENTS

March 18–21—IRE Annual Convention and Radio Engineering Show. The Coliseum, New York City.

Apr. 9–11—Fourteenth Annual British Radio Component Show, Great Hall, Grosvenor House, Park Lane, London, W. 1, England. Admission by ticket only, obtainable from the Radio and Electronic Component Manufacturers' Federation, 21, Tothill Street, London, S.W. 1.

Apr. 12–15—The London Audio Fair, 1957. Waldorf Hotel, Aldwych, London, W. C. 2.

April 28–May 3—81st Convention of the Society of Motion Picture and Television Engineers, Shoreham Hotel, Washington, D. C.

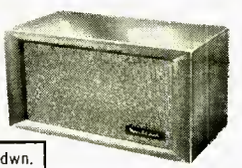
"We're building a HEATHKIT.®..

BECAUSE IT'S SUCH GREAT FUN . . . AND BECAUSE WE GET SO MUCH MORE FOR OUR MONEY!"

Every day more and more people (just like you) are finding out why it's smart to "do-it-yourself" and save by building HEATHKIT high fidelity components. These people have discovered that they get high-quality electronic equipment at approximately one-half the usual cost by dealing directly with the manufacturer, and by doing their own assembly work. It's real fun—and it's real easy too! You don't need a fancy work shop, special tools or special knowledge to put a Heathkit together. You just assemble the individual parts according to complete step-by-step instructions and large picture-diagrams. Anyone can do it!

Heathkit Model SS-1 Speaker System Kit

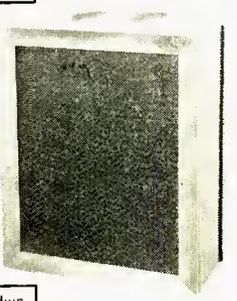
This high fidelity speaker system is designed to operate by itself, or with the range extending unit listed below. It covers the frequency range of 50 to 12,000 CPS within ± 5 db. Two high-quality Jensen speakers are employed. Impedance is 16 ohms, and power rating is 25 watts. Can be built in just one evening. Shpg. Wt. 30 lbs. **$39.95**



$4.00 dwn.
$3.36 mo.

Heathkit Model SS-1B Speaker System Kit

This high fidelity speaker system kit extends the range of the model SS-1 described above. It employs a 15" woofer and a super-tweeter to provide additional bass and treble response. Combined frequency response of both speaker systems is ± 5 db from 35 to 16,000 CPS. Impedance is 16 ohms, and power is 35 watts. Attractive styling matches SS-1. Shpg. Wt. 80 lbs. **$99.95**



$10.00 dwn.
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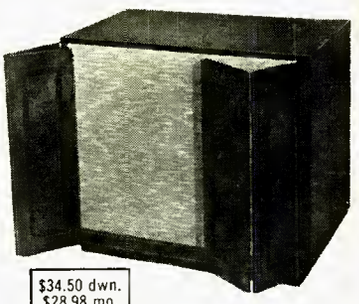
Months of painstaking engineering by Heath and Altec-Lansing engineers has culminated in the design of the Legato, featuring "CP" (critical phasing) and "LB" (level balance). The result is a *new kind* of high fidelity sound, to satisfy even the most critical audio requirements. Two high-quality 15" theater-type speakers and a high-frequency driver with sectoral horn combine to cover 25 to 20,000 cycles without peaks or valleys. "CP" and "LB" assure you of the smooth, flat audio response so essential to faithful reproduction. Choice of two beautiful cabinet styles below.

"Legato" Traditional Model HH-1-T

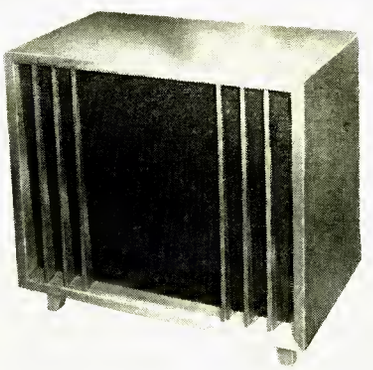
Styled in classic lines to blend with period furniture of all types. Doors attractively paneled. African mahogany for dark finishes unless you specify imported white birch for light finishes. Shpg. Wt. 246 lbs. **$345.00**



$34.50 dwn.
$28.98 mo.

"Legato" Contemporary Model HH-1-C

This fine cabinet features straightforward design to blend with your modern furnishings. Slim, tapered struts run vertically across the grille cloth to produce a strikingly attractive shadowline. Wood parts are precut and predrilled for simple assembly. Supplied in African mahogany for dark finishes unless you specify imported white birch for light finishes. Shpg. Wt. 231 lbs. **$325.00**



$32.50 dwn.
$27.30 mo.

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BENTON HARBOR 25, MICHIGAN

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It's Easy (and fun) to Plan Your Own Hi-Fi Installation
By Choosing the Heathkit Components
That Best Suit Your Particular Needs.

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MATCHING CABINETS . . .
The Heath AM Tuner, FM Tuner and Preamplifier are housed in matching satin-gold finished cabinets to blend with any room decorating scheme. Can be stacked one over the other to create a central control unit for the complete high fidelity system.

MODEL FM-3A MODEL BC-1 MODEL WA-P2

PRE-ALIGNED TUNERS . . .
A unique feature of the Heathkit AM and FM Tuners is the fact that both units are pre-aligned. A signal generator is not necessary! IF and ratio transformers are pretuned at the factory, and some front-end components are preassembled and pretuned. Another "extra" to assure you of easy kit assembly.

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EASY TIME PAYMENTS . . . We invite you to take advantage of the Heath Time Payment Plan on any order amounting to $90.00 or more. Just 10% down and the balance in twelve monthly payments. WRITE FOR COMPLETE DETAILS.

HIGH FIDELITY SYSTEM

1 HEATHKIT HIGH FIDELITY FM TUNER KIT Features AGC and stabilized, temperature-compensated oscillator. Sensitivity is 10 microvolts for 20 db of quieting. Modern circuit covers standard FM band from 88 to 108 mc. Employs ratio detector for efficient hi-fi performance. Power supply is built in. Illuminated slide rule dial for easy tuning. Housed in compact satin-gold enamel cabinet. Features prealigned transformers and front end tuning unit. Shpg. Wt. 7 lbs.

MODEL FM-3A Incl. Excise Tax (with cab.) **$25.95**

$2.60 dwn., $2.18 mo.

2 HEATHKIT BROADBAND AM TUNER KIT This fine AM Tuner was designed especially for use in high fidelity applications, and features broad bandwidth, high sensitivity and good selectivity. Employs special detector circuit using crystal diodes for minimum signal distortion, even at high levels. Covers 550 to 1600 kc. RF and IF coils are prealigned. Power supply is built in. Housed in attractive satin-gold enamel cabinet. Shpg. Wt. 8 lbs.

MODEL BC-1 Incl. Excise Tax (with cab.) **$25.95**

$2.60 dwn., $2.18 mo.

3 HEATHKIT HIGH FIDELITY PREAMPLIFIER KIT This preamplifier meets or exceeds specifications for even the most rigorous high fidelity applications. It provides a total of 5 inputs, each with individual level controls. Hum and noise are extremely low, with special balance control for absolute minimum hum level. Tone controls provide 18 db boost and 12 db cut at 50 cps, and 15 db boost and 20 db cut at 15,000 cps. Four-position turnover and four-position rolloff controls for "LP", "RIAA", "AES", and "early 78" equalization. Derives power from main amplifier, requiring only 6.3 VAC at 1A and 300 VDC at 10MA. Beautiful satin-gold enamel finish. Shpg. Wt. 7 lbs.

MODEL WA-P2 (with cab.) **$19.75**

$1.98 dwn., $1.66 mo.

4 HEATHKIT ADVANCED-DESIGN HI-FI AMPLIFIER KIT This fine 25-watt high fidelity amplifier employs KT66 output tubes by Genalex and a Peerless output transformer for top performance. Frequency response ± 1 db from 5 to 160,000 cps at 1 watt. Harmonic distortion less than 1% at 25 watts, an IM distortion less than 1% at 20 watts. Hum and noise are 99 db below 25 watts. Output impedance is 4, 8 or 16 ohms. Extremely stable circuit with "extra" features.

MODEL W-5: Consists of W-5M *plus* WA-P2 Preamplifier

Shpg. Wt. 38 lbs. Express only **$79.50** $7.95 dwn. $6.68 mo.

MODEL W-5M **$59.75** $5.98 dwn. $5.02 mo.

Shpg. Wt. 31 lbs. Express only

5 HEATHKIT DUAL-CHASSIS HI-FI AMPLIFIER KIT This 20-watt Williamson-type amplifier employs the famous Acrosound model TO-300 output transformer, and uses 5881 tubes. Frequency response is ± 1 db from 6 cps to 150 kc at 1 watt. Harmonic distortion less than 1% at 21 watts, and IM distortion less than 1.3% at 20 watts. Output impedance is 4, 8 or 16 ohms. Hum and noise are 88 db below 20 watts.

MODEL W-3M **$49.75** $4.98 dwn. $4.18 mo.

Shpg. Wt. 29 lbs. Express only

MODEL W-3: Consists of W-3M *plus* WA-P2 Preamplifier

Shpg. Wt. 37 lbs. Express only **$69.50** $6.95 dwn. $5.84 mo.

6 HEATHKIT SINGLE-CHASSIS HI-FI AMPLIFIER KIT This 20-watt Williamson-type amplifier combines high performance with economy. Employs Chicago-Standard output transformer and 5881 tubes. Frequency response ± 1 db from 10 cps to 100 kc at 1 watt. Harmonic distortion less than 1.5% and IM distortion less than 2.7% at full output. Output 4, 8 or 16 ohms. Hum and noise—95 db below 20 watts.

MODEL W-4AM **$39.75** $3.98 dwn. $3.34 mo.

Shpg. Wt. 28 lbs. Express only

MODEL W-4A: Consists of W-4AM *plus* WA-P2 Preamplifier

Shpg. Wt. 35 lbs. Express only **$59.50** $5.95 dwn. $5.00 mo.

7 HEATHKIT 20-WATT HIGH FIDELITY AMPLIFIER KIT Features full 20 watt output using push-pull 6L6 tubes. Built-in preamplifier provides four separate inputs. Separate bass and treble controls. Output transformer tapped at 4, 8, 16 and 500 ohms. Designed for home use, but also fine for public address work. Response is ± 1 db from 20 to 20,000 cps. Harmonic distortion less than 1% at 3 db below rated output. Shpg. Wt. 23 lbs.

MODEL A-9B **$35.50**

$3.55 dwn., $2.98 mo.

8 HEATHKIT ELECTRONIC CROSS-OVER KIT This device separates high and low frequencies electronically, so they may be fed through two separate amplifiers driving separate speakers. Eliminates the need for conventional cross-over. Selectable cross-over frequencies are 100, 200, 400, 700, 1200, 2000 and 3500 cps. Separate level controls for high and low frequency channels. Attenuation 12 db per octave. Shpg. Wt. 6 lbs.

MODEL XO-1 **$18.95** $1.90 dwn., $1.59 mo.

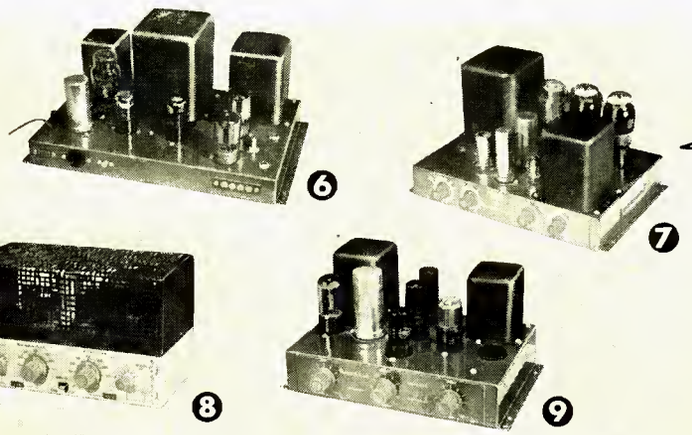
9 HEATHKIT 7-WATT ECONOMY AMPLIFIER KIT Qualifies for high fidelity even though more limited in power than other Heathkit models. Frequency response is ± 1½ db from 20 to 20,000 cps. Push-pull output and separate bass and treble tone controls. Good high fidelity at minimum cost. Uses special tapped-screen output transformer.

MODEL A-7D **$17.95** $1.80 dwn. $1.51 mo.

Incl. Excise Tax
Shpg. Wt. 10 lbs.

MODEL A-7E: Same as A-7D except one more tube added for extra preamplification. Two inputs, RIAA compensation and extra gain.

Shpg. Wt. 10 lbs. Incl. Excise Tax **$19.95** $2.00 dwn. $1.68 mo.



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EDITOR'S REPORT

THE BIGGEST HI-FI SHOW

SO FAR, THAT IS. For each succeeding hi-fi show seems to be larger than the previous one in any city where the major shows are being held. But the record to date was set by the Los Angeles High Fidelity Show from February 6–9 with a paid attendance of 30,443 and an estimated free attendance (dealers, distributors, representatives, press, and so on) of over 5000. And many more would have deposited their 75 centses if the Fire Department—always alert to the possibility of excessive crowding—had not stopped ticket sales by 9:00 p.m. on two of the evenings. And still more undoubtedly stayed home because of the heavy fog—light rain to anyone but an Angeleno—that dampened the proceedings.

For its part, San Francisco exceeded its previous records with a paid attendance of 14,200 and an estimated 3000 on the free list—taxing the facilities of Hotel Whitcomb pretty close to the limit. So both shows may well be called successful—the L.A. event exceeding in attendance the New York show of last September. Actually, no one was particularly surprised, since the facilities of the Ambassador's bungalows are ideal for the purpose, and Californians are well known for their interest in anything new.

Larger rooms, greater separation between them, and easier entrance and egress made for freer movement of the crowds, while the absence of the usual corridors permitted the decibels to dissipate themselves into the air with less concentration of sound. As a matter of fact, we heard "The Brave Bulls" for the first time sounding exactly as this music does in Plaza Mexico.

But the question comes to mind as to what the shows of the future are going to be like. How can we exhibit our equipment properly and satisfactorily to still larger groups of people and still provide some degree of sound isolation between adjacent exhibitors? It is possible that in order to be able to accommodate a sufficient number of people we may have to use a conventional exhibition hall where they can *see* the equipment and, in addition, several demonstration halls where they may *hear* various combinations of amplifiers, loudspeakers, and so on. The mechanics of this sort of show would have to be worked out carefully, but to this observer—who has long been in favor of the "hotel room" type of show—it would appear that hi-fi shows are soon going to be too massive to be handled in the way they have been over the past eight years.

One thing is certain—the members of the industry are seriously studying the problem. And when they come up with a good solution, we will continue our support of the shows—both in this country and elsewhere.

FURTHER ON THE "ELSEWHERE"

Space limited our description of activities in the Caribbean which was started last month, causing us to conclude before mentioning the interest in rapidly growing Puerto Rico. The core of activity there is centered in the Audio Borinquen, a group of hi-fi enthusiasts—some of whom are in the business and others who follow it only as a hobby. These dedicated individuals meet monthly at the home of one of the members for an evening of hi-fi and hot food. Fortunately, our trip coincided with one of these meetings, and the usual "fine time was had by all." At the last New York show we had the privilege of exhibiting a really superb amplifier designed by a San Juan doctor and built in collaboration with a lawyer friend of his in New York. We expect a story on this amplifier in a month or so.

As to shows—Mexico will certainly have one next October, Cuba is likely to, and Puerto Rico is planning to stage its first. It is our hope that these three shows may occur on three consecutive weekends—we enjoyed our trip so much that we are looking for a reason for repeating it this year.

Then, of course, there is the London Audio Fair in April (haven't quite found the excuse for this one yet) and we are never surprised to hear of others, no matter how small. Tokyo, it will be remembered, beat all records with an attendance of over 50,000.

The net result, though, is that there is plenty of interest in hi-fi wherever you go. And with more interest there will be more development, to the end that equipment will improve that much more rapidly.

RIGO ENTERPRISES' SHOWS

Although the expense of staging an Institute of High Fidelity Manufacturers show is too great to accommodate all of the cities in the U.S., there is still a demand for hi-fi away from the large metropolitan centers, and it is being met by the shows given by Rigo Enterprises, Inc., with upcoming shows in Pittsburgh, Philadelphia, Baltimore, Cincinnati, Miami, and St. Louis so far scheduled for the remainder of this year. Those that have been held so far have been successful, and have carried the hi-fi story to thousands who would not otherwise have seen and heard it. The shows are smaller, to be sure, but they are important to the industry and should be expanded to more cities as rapidly as possible.

Washington will have its High Fidelity Fair this month at Hotel Raleigh, March 15–17. This show has been announced but recently, but the shows in the nation's capital have always been well attended. Portland and Seattle are also scheduled for this month—look for dates and places in your local newspapers.

While we'd like to attend every one of these shows, we still have to produce magazines—but even if we aren't there in person, our best wishes go to all of them.

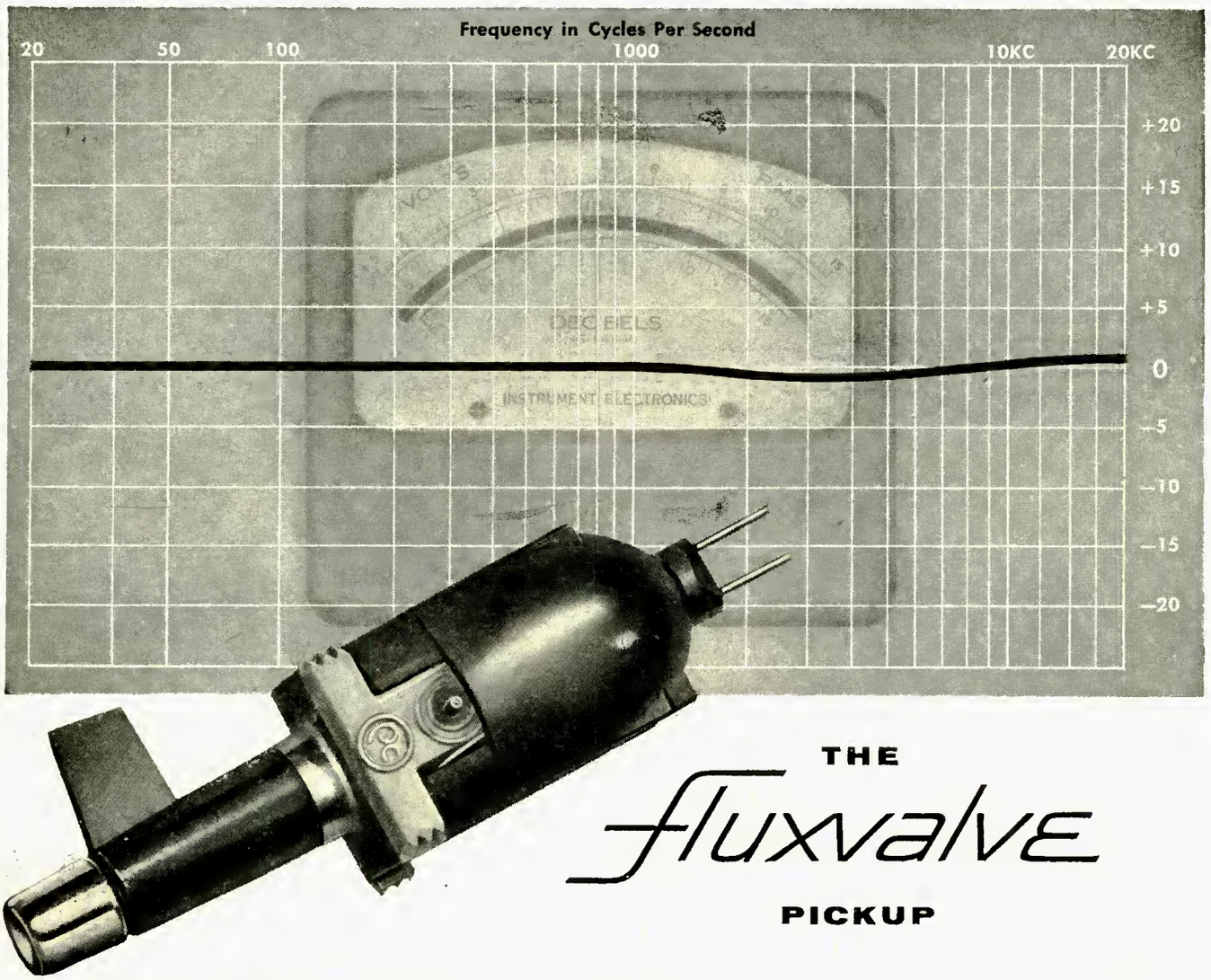
THE I.R.E. SHOW

Another kind of show altogether—one not open to the public but still drawing around 40,000 visitors every year—is the I.R.E. Show, to be held in the New York Coliseum March 18–21. Although only a small portion is devoted to audio—and that principally in the technical sessions—this annual exhibit is best described as stupendous. In number of exhibitors and in the variety of equipment shown, the I.R.E. show is the tops, and of greatest importance to the electronic engineer.

Don't miss it.

there is ***ONE*** pickup for calibrating and evaluating records!

(including test records)



THE *Fluxvalve* PICKUP

Important as it is to the recording industry, the FLUXVALVE offers values never before available to thousands of record playing enthusiasts!

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- *Long record and stylus life*
- *Low overall distortion*
- *Hermetically sealed*
- *Easily replaceable styli* ✲

✲ **Less than 1 mil stylus on special order**

THE FLUXVALVE PICKUP was originally developed for professional applications, particularly recording studios where accurate correlation between lacquer, master and pressings is essential, and has always been difficult. Now with the FLUXVALVE magnetic turnover pickup with which to make precise and *reproducible* record-measurements, a vital control step is simplified.

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

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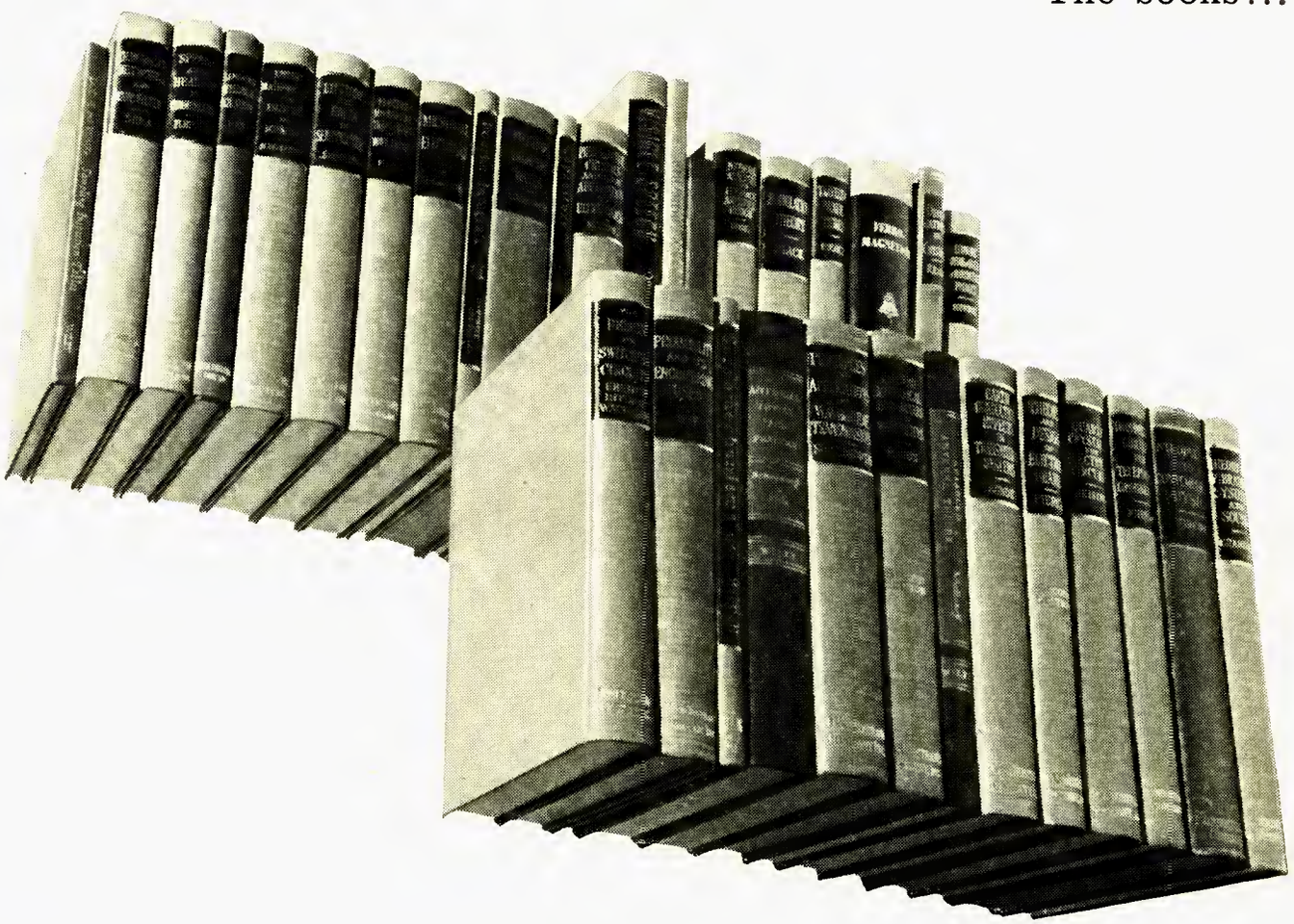

How the scientific world shares in fruits of the telephone art

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Hi-Fi in the Home . . .
Musical Sound or Blast

LEONARD WARREN

I ONCE READ an editorial that began, "The automobile is a wonderful invention, but God made the pedestrian too." Much the same attitude might be directed to Hi-Fi today.

Electronics engineers have developed a multitude of precision reproducing and amplification instruments and appliances which ought to work to the end of providing more pleasurable listening in the home, but which, like the automobile in the hands of an unskilled or arrogant driver, can be a weapon of destruction . . . destruction of peace of mind, listening pleasure, and the composer's and artist's intention.

Leonard Warren, famous baritone star of the Metropolitan Opera Association and the San Francisco Opera. He records for RCA-Victor Records.

It seems to me the most successful Hi-Fi installation need not necessarily be either the most expensive or the most complicated. Some of the gadgets available on the market require not only a sensitive ear, but in many cases, a knowledge of the aesthetics and mechanics of sound. In the hands of someone not endowed with the discerning ear attuned to the shadings of sounds, or not equipped to know the proper use of these gadgets, the results can be pretty devastating. Devastating not only to the listening companion who does have a discerning ear, but though he doesn't realize it, to the owner himself as well, for nothing is more physically fatiguing to the entire system than the "assault" that Sound can be.

I remember reading a fascinating story of a murder of a young wife known to be extremely sensitive to color, by a jealous rival, an interior decorator who re-did her home while she was ill in a hospital. The decorator chose violent colors she knew would distress her client. They did. In the wife's weakened condition on her unheralded return home, they provided such a blow that she obligingly succumbed, and the villainess and unsuspecting husband who allowed himself to be consoled by her, eventually married and lived happily ever after. Theoretically, I believe that Sound, sufficiently prolonged under similar adverse circumstances, could do the same thing.

One of the mistakes purchasers of Hi-Fi installations make most frequently is to make an undue use of the volume potential. Far from having any actual "high fidelity" to the original intention of the composer, the person who produced the recording, or the artist who performed it, the result produces a sound blast sufficient if they could but hear it, to make them throw up their hands and add to the general cacophony with their own bleats of anguish.

Another error Hi-Fi owners fall into, bemused with all the dials they can manipulate, is to confuse themselves with Walter Mitty and put on a good imitation of a Sound Engineer "living it up" in charge of a complicated control board. Knowing it is possible to increase the bass, they fiddle fascinatedly with the knob that will produce this result. The sound produced may be majestic, it may have all the "presence" of an artillery barrage, but it usually has nothing whatever to do with the music they have paid so dearly to hear properly reproduced in their home.

Why is this so? Simply because in almost all the vocal music I know, and certainly in most instrumental works, the essential quality of the music—its melody—lies in the treble. Deliberately manipulating your rig so that this melodic line is overwhelmed by the heaviness of the bass is to lose the essence of what you are listening to.

Listener or Conductor?

Is the answer then to turn amiably to the treble and emphasize that? De-

(*Continued on page 69*)

Adequate Audio Power in the Home

JAMES MOIR*

A discussion of the factors affecting the power required for satisfactory reproduction of typical program material and the methods of calculating it.

ESTIMATES OF THE AUDIO POWER required to produce adequate loudness from the domestic loudspeaker are characterised by a very wide divergence of opinion even among authorities, figures ranging from 100 milliwatts to 50,000 milliwatts (50 watts) having been quoted by different writers. It is interesting to examine the problem and to attempt to produce some reliable data. As a preliminary it is necessary to clear our ideas as to what is meant by the 'audio power' for it is evident that the same basic power may be expressed in several ways. Thus the same amplifier may be quoted as having an output of ten or twenty watts both figures being accurate statements of the performance.

Expressing the Power

In a mains frequency power circuit the supply voltage and current have the substantially sinusoidal waveform of *Fig.* 1 and without ambiguity the power dissipated as heat in a resistance load of R ohms will be given by $(0.707\ V)^2/R$ where V is the peak value of the applied voltage. To eliminate the necessity of always multiplying the meter indication by 0.707, commercial meters used in the heavy engineering field are scaled to indicate, not the peak value, V, but the *rms* (root mean square) value $v = 0.707\ V$. Within the usual engineering tolerances the value of voltage or current will be indicated quite accurately by ordinary commercial meters and the reading will be independent of the physical size of the meter.

The multiplying factor, 0.707 applies only to a sinusoidal waveform but in the communications field sine waves are generally confined to test equipment, speech and music signals having the much "spikier" waveform indicated by *Fig.* 2. There is no equivalent numerical factor relating peak and rms values that can be applied to such irregular waveforms and thus the output of an amplifier may be expressed either in terms of its peak power, V^2/R, or as rms power $(0.707\ V)^2/R$ the later figure being the power dissipated as heat in a resistor of R ohms by a sinusoidal voltage having the same peak voltage as the speech wave. It should be appreciated that this is *not* the rms power in the speech wave but a figure which may be perhaps ten times higher.

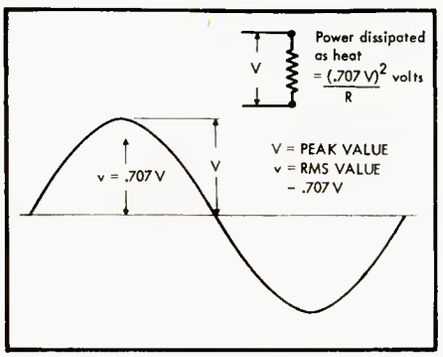

Fig. 1. Relation of peak and rms values of voltage for a sine wave.

On sinusoidal waveforms the rms power will only *be one half* (*ie* $(0.707)^2 = 0.5$) the peak power and thus the same amplifier may be rated in either peak power or rms power, the peak power figure being twice the rms power figure. As there is a fixed ratio between the two ratings there appears to be no good reason for departing from the practice of quoting the rms power output the standard practice in other engineering fields.

Measuring the Power

There need be no ambiguity in measuring the power output of an audio amplifier for sinusoidal test signals can be employed and special meters are not required, though it should be noted that the power specification is meaningless unless the distortion level is also quoted.

However our present interest is not in what power an amplifier *can* deliver but in what power it *does* deliver when used in the home. This is a much more troublesome problem, for speech and music waveforms are irregular, and have a high ratio of peak to rms power due to the intervals between words or phrases when no signal is present. Heating (a function of the rms voltage 0.707

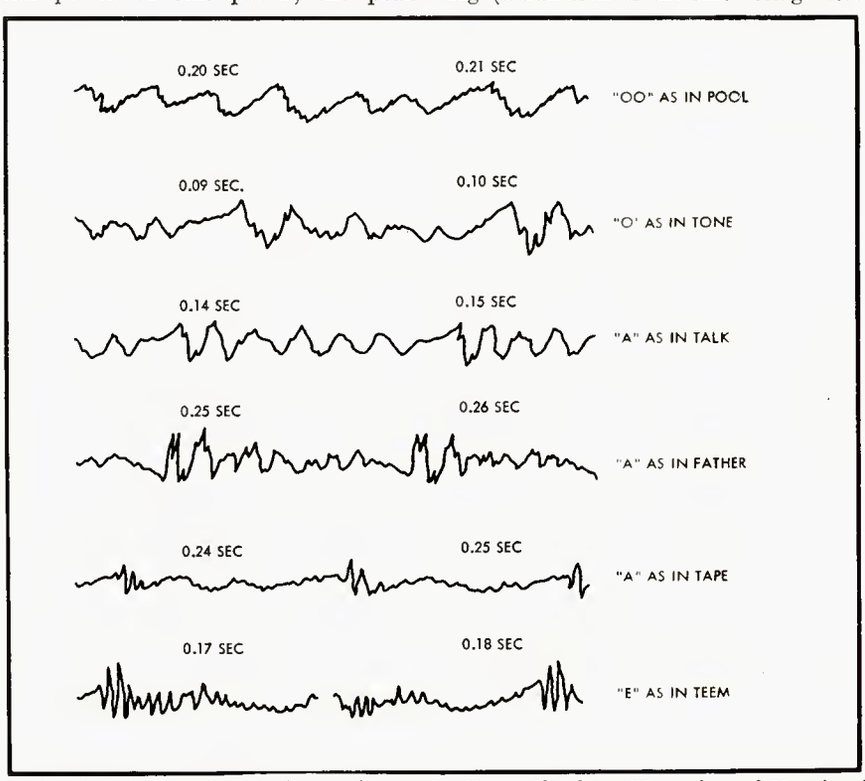

Fig. 2. Waveforms of typical vowel sounds. **(From Fletcher, "Speech and Hearing.")**

* *73, Bawnmore Road, Bilton, Rugby, England.*

TABLE I

Preferred Maximum Sound Level
db above 10^{-16} watts/cm²

	Public Musicians			Programme Engineers		Engineers
	Men	Women		Men	Women	
Symphonic Music . .	78	78	88	90	87	88
Light Music	75	74	79	89	84	84
Dance Music	75	73	79	89	83	84
Speech	71	71	74	84	77	80

V) is of little consequence in either amplifiers or loudspeakers and in consequence it is more reasonable to measure the peak values of signal voltage and express the speech power in terms of its peak value, V^2/R.

The measurement of the peak voltage of such irregular waveforms is by no means easy. Pointer-type meters of any kind have movements of sufficient inertia to prevent them reading peak values and the indications may easily be in error by a factor of ten times. Large well damped meters of high nominal accuracy invariably have heavy moving systems and are particularly inaccurate when used to "measure" audio voltages. Measurements using pointer-type instruments of the programme voltage across, into a loudspeaker are therefore completely valueless. Three types of instrument are in current use for measuring sound power, the sound-level meter, the high-speed level recorder and the cathode-ray oscillograph.

The sound-level meter has the disadvantage of a pointer-type meter but as the mechanical constants of the meter are closely specified the error due to instrument inertia may be roughly estimated. A typical meter may give readings that are below true peak by 20 db, the error being small when the signal is steady and rising to 20 db on speech signals where the gaps between words and sentences may be comparatively long.

The high-speed level recorder employs a tube-operated servo system to drive the pointer and will generally indicate values that are 5–10 db below true peak readings.

The cathode-ray oscilloscope has no significant error due to inertia and can indicate true peak values on the most complex waveform, but care must be taken to operate with sufficient brightness to show up the faint high-speed traces characteristic of peaks of short duration.

Failure to indicate whether peak or rms power is being quoted and the use of unsuitable power measuring equipment undoubtedly accounts for differences of from 10 to 100 times in the amount of power thought to be necessary for domestic reproduction. This is a large error but even greater discrepancies can occur if the maximum loudness is not carefully specified.

What Constitutes Adequate Loudness

Difference of opinion as to what constitutes "adequate loudness" is responsible for considerable discrepancies between writers' estimates and the importance of clearing the air will be fairly obvious when it is realised that a difference of 10 db in specifying the maximum loudness level thought to be desirable will result in a change in the required amplifier output power of ten times. Published figures seem to indicate that the differences of opinion embrace a power range of something nearer 40 db (a power difference of 10,000 to 1) so it is absolutely necessary to have our thoughts clear on this point.

At first sight it appears reasonable to approach the problem by reviewing the volume ranges encountered in original speech and music on the assumption that "a perfect reproduction" will require the same volume range. The most difficult case, an original performance by a large symphony orchestra may involve a power ratio of 80 db (100 million to 1) but this range is generally only encountered for a few tenths of a second in several hours, a more frequently occurring range being nearer 74 db.

At the receiving end it is reasonable to assume that the listener should adjust his volume control to bring the *minimum* signal to somewhere near the room noise level and as an average value for the domestic noise level is about 40 phon it implies that peak levels in the region of 114 db (or phon) are required. Though this appears to be a very reasonable deduction, experience suggests that it is wise to make a check and this has been done both in England and in America. The B.B.C. have made a very careful study of the sound levels preferred by their monitoring staff and by the general public and Table I lists some of their data taken from a paper by Somerville and Ward.

In these tests the listeners were provided with a high-quality reproducer system of ample power handling capacity and were asked to set the loudness to the level they considered preferable. The acoustic level at a point about 18 inches from the listener's head was then checked with a standard type of sound-level meter. It is surprising to note that none of the listeners wished to have sound levels greater than 90 phon a result supported by similar tests in America which indicated a preference for levels about 8–9 phon lower than the B.B.C. results suggest.

Sound levels approaching 114 phon occur in concert halls and there is not the least evidence that these are anything but satisfying, but the available evidence does suggest that these levels are not optimum in the home. The reason for this difference is not clear, but in the writer's experience a level of 110 phon sounds "louder," though "smaller" and more oppressive in a small room than the same level in a concert hall.

A major discrepancy between the various estimations of "power required" may thus be attributed to the choice of maximum loudness thought desirable. An estimate based on the very reasonable assumption that concert-hall loudness levels are necessary in the home will suggest a power some at least 20 db (100 times) higher than another estimate based on achieving only the maximum preferred loudness level of 90 phon. As it will be seen from Table I that the general public only require a maximum loudness level of about 80 phon, a "logical" engineering estimate of the power necessary will be about 30 db (1000 times) higher than is really required.

This preference for lower levels in the home is providential because some consideration for the neighbours is necessary. In flats, terraced houses or houses built in pairs, a house-to-house insulation of 55–60 db can be achieved fairly easily by simple building techniques but science and the average builder are not yet in close touch, with the result that 45–50 db is the figure more usually achieved in semi-detached pairs of houses having a 9-in. party wall. Peak sound levels in the region of 110 phon will result in the neighbours enjoying *your* choice of programme at a level of 70–80 phon and while this may be just tolerable in the early evening when their own noise level is in the same region as your own it must become a little annoying to them when later in the evening their own noise level has dropped to something nearer 30 phon.

Acoustic Power Requirements

The next steps in the enquiry are to make an estimate of the actual acoustic

TABLE II

Maximum Loudness Levels produced by typical sound sources in domestic surroundings.

Small Upright Piano	
Maximum in normal playing	— 72 db
Player asked to play a "loud" selection	— 82 db
Player asked to play "as loudly as possible"	— 90 db
Speech	
Boy normal speech	— 60 db
Man " "	— 65 db

TABLE III

Acoustic Power required to produce given loudness levels in a room of 1540 ft³ and reverberation time of 0.5 sec. Computed from Eq. (7) of Appendix.

80 db	.00036 watt	(.36 milliwatts)
90 db	.0036 "	(3.6 milliwatts)
100 db	.036 "	
110 db	.36 "	
120 db	3.6 "	

power required to produce the loudness levels thought necessary, and then to examine the electro-acoustic conversion efficiency of loudspeakers for this will enable the electrical power requirements to be predicted.

The actual acoustic power required to produce acceptable loudness levels is very small indeed. A first approximation to the figure can be obtained by considering the data on the acoustic power required for normal conversation. The most reliable data, that of Sivian, Dunn, and White indicates that the instantaneous maximum power rises to about 700 microwatts (0.7 milliwatt) when making an impassioned speech to a large audience. About 5 per cent of speakers will produce powers five times higher than the figure quoted, making their acoustic output 3–5 milliwatts. Declamatory speech of this kind would be intolerably loud in domestic surroundings, rather suggesting that the maximum acoustic power required for any purpose is not likely to rise much above 5 milliwatts. Data is available on the acoustic output of most of the common instruments but it is not particularly useful as an indication of domestic requirements as all the figures refer to tests in which the instrument was played as loudly as possible. A concert grand, played loudly, has a power output of about 350 milliwatts but experience suggests that even a small upright piano can be intolerably loud in a small room. In my own room a small upright piano played by a moderately competent player produced the loudness levels shown in Table II and it is perhaps significant that normal playing gave maximum levels of 72 phon with a level of 90 phon reached when the player was asked to produce the absolute maximum output. It should be noted that readings were taken when the sound level was reasonably steady and the absolute peak levels are therefore likely to exceed the meter readings by only 4–8 phon.

Calculation of Sound Power Requirements

In the appendix it is shown that the acoustic power required to produce a sound level of 100 db can be computed from

$$P = .0000116\ V/T \text{ watts}$$

where V is the room volume and T is the reverberation time. Applied to one of my own rooms having a volume of 1540 cu. ft. and a reverberation time of 0.5 second it suggests that the power shown in Table III will be required for levels of 80–120 db, the power required for 100 db being computed from the equation directly, and being modified by a factor of ten for each 10 db change in level. The suggested maximum requirement of 90 db is reached with an acoustic power of only 3.6 milliwatts, a figure that is in substantial agreement with the power deduced from that produced by a human speaker at maximum output.

Objection has been raised to any formula that suggests that the power required is inversely proportional to the reverberation time, on the score that the bursts of energy in speech are so short that room reflections do not have time to reinforce the direct sound from the speaker. It has therefore been suggested that the power required should be computed on the assumption that the loudness is entirely due to the direct sound. The calculation is not difficult but it does require a knowledge of the polar diagram of the loudspeaker over the frequency range.

A sound wave leaving the speaker will diverge in the form of a solid cone with the speaker at the apex but the angle of divergence will be a function of frequency, being greatest at low frequencies (180 deg. if the speaker is in the centre of one wall) and decreasing as the frequency increases until it is down to something near 25 deg. at 5000 cps. There is therefore some difficulty in fixing an effective average angle for the whole of the audio frequency range. Power, loudness and intelligibility are not linearly proportional to bandwidth, a fact that increases the difficulty in fixing an average angle for the whole frequency range. In spite of these difficulties it has been claimed that power requirements computed on the assumption that there is no gain in loudness from the reverberant sound, do give good agreement with measurement.

The earlier discussion suggests that the maximum acoustic power required in domestic surroundings is only in the region of 3–5 milliwatts but in the absence of data on the electro-acoustic efficiency of typical loudspeakers it is difficult to translate the acoustic power requirements into electrical power to be provided by the amplifier.

TABLE IV

Electrical Power required to produce a loudness level of 80 db from three typical speakers.

A—17-in., 17,000 gauss magnet.
B—12-in., high-fidelity type, 14,000 gauss.
C—8-in., radio receiver type, 8,000 gauss.

Speaker	Sound Level db	Voice Coil Power mw	Electro-acoustic Efficiency, percent
A	80	9.5	3.8
B	80	55	.66
C	80	240	.15

Electro-acoustic Efficiency of Loudspeakers

There is very little published data on the conversion efficiency of loudspeakers, partly because of the difficulty of measurement but also because any single figure can be misleading and liable to misinterpretation. In these measurements to be described, the figure quoted as the efficiency was determined by measuring the electrical power input to a loudspeaker operating on ordinary programme in the normal living room and simultaneously measuring the loudness level in the room. Care was taken to observe steady values and from this data the acoustic power output was calculated. The efficiency is the ratio

$$\frac{Acoustic\ \ power \times 100.}{Electrical\ \ power}$$

With domestic approval a sound-level meter, oscilloscope and oscillator were set up in the dining room as shown in *Fig.* 3 and several listening and watching sessions enjoyed. As a first check some co-operative members of the family were asked to adjust the loudness to their liking and as it was found that the levels chosen were in good agreement with those obtained by the B.B.C. (Table I) it was assumed that nothing was seriously amiss. The procedure then employed for the power measurement tests was to set up the CRO and sound-level meter in close proximity to enable both meter and CRO to be viewed simultaneously and to mark the tube face each time the meter peaked to 80 db. After a few attempts it was possible to draw two parallel lines on the tube face defining the maximum deflections produced when the sound-level meter reached this figure. A Promenade Concert provided valuable test material, as it was possible to watch the meter on one phrase and check the CRO deflection when the phrase was repeated a second or so later. Music also has the advantage that complex tones are held for sufficient time to provide a steady deflection on the meter, thus eliminating any argument about the contribution of the

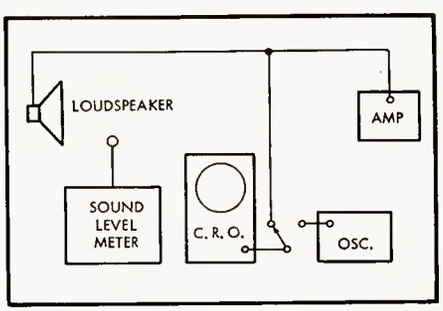

Fig. 3. Schematic arrangement used for audio power measurements.

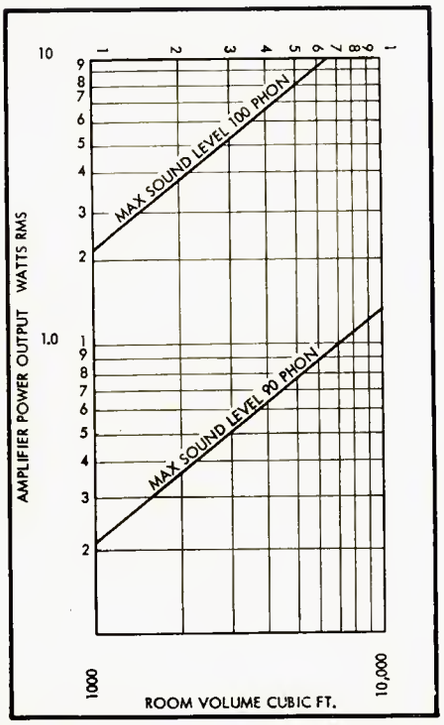

Fig. 4. Curves of power required for two sound levels in relation to room volume.

reverberant sound to the total loudness. Audience applause is equally effective for this purpose. The room was in semi-darkness and a bright trace employed to avoid missing sharp peaks of short duration.

Having defined the CRO deflection characteristic of a sound level of 80 db, the CRO was then switched to the calibrated oscillator and the rms voltage corresponding to the deflection noted. Three hours checking with three different loudspeakers provided some interesting data which is reproduced in Table IV.

As the input power to each of the speakers was adjusted to produce an acoustic level of 80 db in the room, it is assumed that the acoustic power produced is the same for all, a reasonable but not a precision conclusion, in view of the different frequency characteristics inherent in speaker units of such widely varying quality. Column 3 indicates the power in the voice coil computed on the assumption that the effective resistance of the voice coil is equal to its d.c. resistance. Column 4 contains figures for the electro-acoustic efficiency computed from the measured electrical input to the speaker on the assumption that the acoustic power output is given by Eq. (7) in the Appendix, corrected to a sound level of 80 phon.

Speaker A is a large 18-in. cone speaker having a 2½-in. voice coil working in a gap having a flux density of 17,000 gauss. Speaker B is a standard type of unit typical of the better quality 12-in. high-fidelity units, while speaker C is typical of the cheaper 8-in. units included in radio receivers.

Speaker B, typical of the units being used by most high fidelity enthusiasts only requires an input of about 55 milliwatts to produce a sound level of 80 db and a power of 0.55 watt to produce 90 db. If concert-hall levels of 110 db were required in domestic enclosures a power of 55 watts would be necessary but this speaker would have to call for help from at least four of its fellows if this power was to be handled.

Though a horn loaded unit was not tested it is known that electro-acoustic efficiencies of 20–40 per cent can be reached, enabling the concert hall level to be obtained for an input of about 1½ watts. As evidence of this, some recent measurements in a 700-seat theatre having a volume of 120,000 cu. ft. showed that the feature film was being regularly run with a maximum electrical input to the loudspeakers of less than one watt.

The 18-in. speaker is shown to have an efficiency twenty times that of the cheap radio speaker but this is insufficient to justify its use where cost is of importance, for acoustic power can generally be produced more cheaply by the combination of a small speaker and a large pentode, than by an expensive speaker and a small triode.

It is convenient to have available for ready reference curves relating to room volume, sound level, and electrical power required. *Figure* 4 provides this information based on the assumptions that

1. The acoustic power is computed from Eq. (7).
2. A loudspeaker efficiency of 1 per cent is obtained.
3. The optimum reverberation time relation of *Fig.* 5 is approximated in all cases.

In the majority of rooms above 2000 cubic feet the reverberation times of *Fig.* 5 are approximated, but in smaller houses current constructional methods appear to give a reverberation time of about half a second almost regardless of the furnishing scheme.

After reviewing the results obtained it appears that there is great opportunity for difference of opinion in estimating the power required to produce adequate loudness in small rooms. An experimenter measuring the power that gives him adequate loudness will find it to be in the region of 50 milliwatts if he uses a CRO, perhaps 5 milliwatts if he uses a high-quality rectifier voltmeter, and something less than 1 milliwatt if he has an rms-reading thermal meter. A devotee of Aristotle preferring meditation rather than experiment might be excused if he based his calculations on the assumption that the loudness level found desirable in concert halls would prove to be equally desirable in the home. He would then produce a figure approaching 40–50 watts, but if this was thought to be insufficiently impressive, he could with all honesty quote the same power as 80–100 watts peak, i.e. peak volts times peak current. A difference in estimate as great as 100 watts to .001 watt must be a record for an honest difference of opinion in the engineering field.

Though the reason is probably psychological the preference for reduced maximum loudness levels in the home is not understood and should form an interesting subject for further study.

Appendix

If it is assumed that "loudness" is related to the steady-state sound intensity the power required to produce any specified intensity can be computed from the standard exponential relation between sound-energy density and the time interval during which power is being supplied to the enclosure. The sound-energy density in ergs/cc at any time t secs. after the power is turned on, is given by

$$E = \frac{4P}{CS_\alpha}\,(1 - C \cdot 10^{-S\alpha t/4V}) \qquad (1)$$

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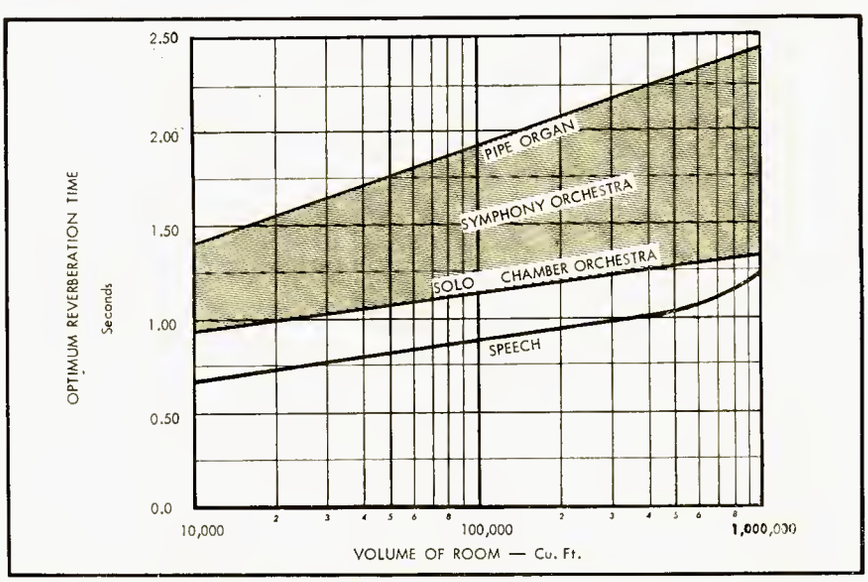

Fig. 5. Curve showing optimum reverberation time in relation to room volume.

"Free-Riding" Control Relays

RONALD L. IVES*

It isn't always necessary to provide a special power supply to permit the use of relays in audio systems. Most circuits can be modified to accommodate the relatively small current required without adversely affecting performance.

SWITCHING OF SIGNAL CIRCUITS in the more complete communication systems becomes quite complicated, often involving yards of shielded cable from the circuit components on the back of the chassis to the controls on the front panel, or extension shafts more than a foot long, or some ingenious, but not always happy, combination of both. Usually the path from the logical location of a control component to that of the control knob passes through a power transformer, or some other bulky component that cannot be conveniently relocated.

Solution of these difficulties usually lies in the use of relay switching employing modern small relays such as the Price 1035-1 (3 v.d.c., 100 ohms, 30 ma) radiosonde relay, or the Potter and Brumfield miniature telephone relays (type MH-17, a.c. or d.c., many voltages and resistances available).

Alternating-current relays are customarily operated either from the filament circuit, or from the a.c. line. Such operation, in high-level circuits, is quite satisfactory; but at low signal levels, the leakage field of the relay introduces hum, usually as a complex wave full of harmonics, due to the use of a shading ring or other phase splitter on the relay coil. Many a.c. relays are noisy in signal circuits because of the "working" of the contacts at twice line frequency.

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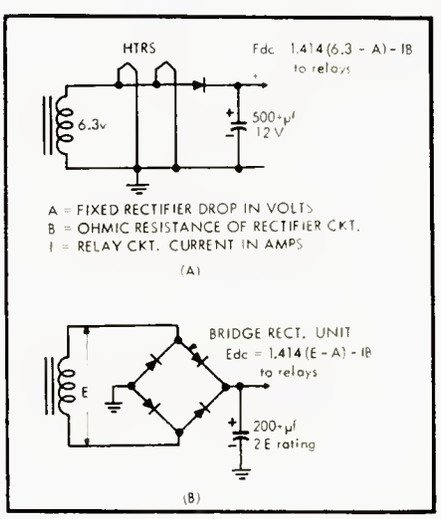

Fig. 1. Typical relay power supplies.

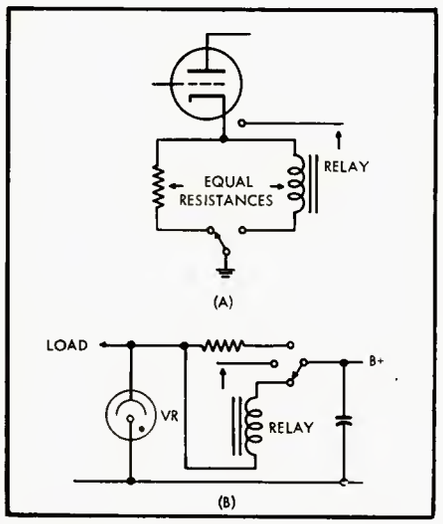

Fig. 2. Basic control circuits employing a "free-riding" relay.

Because d.c. relays do not suffer from these difficulties, most signal-switching relays are d.c. operated, usually from an auxiliary supply such as the filament circuit, through a rectifier and small filter. Although such rectifier-filter combinations are rather bulky and inefficient, they work quite well, giving a minimum of trouble if properly designed and constructed. Typical relay power supplies are shown in *Fig.* 1.

In most communication circuits, there is at least one resistor whose sole function is to produce a voltage drop. Most common examples are the cathode resistors of power tubes, and the series resistors used in voltage-regulated circuits. So far as the signal functions are concerned, it doesn't matter how this voltage drop is produced, and a relay coil, or combination of relay and resistors, can be substituted for the dropping resistor with no impairment of communication function. When this is done, the relay is literally a "free-rider," requiring no special power supply, and using no additional current for its operation.

Rather obvious circuits, in which a relay is substituted for a fixed resistor, are shown in *Fig.* 2. These circuits work very well, with the relay either in service or out of service, but produce rather severe switching transients, evidenced by a loud "blop" in the speaker of a sound system. Part of this transient is caused by actual momentary interruption of the circuit, and part by the spark which results from opening the relay-coil circuit.

By rearranging the components so that the circuit is never opened and control is obtained by shorting the unused component, switching transients are minimized, making circuit transfers substantially or entirely noiseless, from an audio viewpoint.

Two such circuits are shown in ***Fig.*** 3. In both circuits, local circuit resistance during function transfer doubles momentarily, whereas in the circuits of *Fig.* 2, local circuit resistance becomes infinite during function transfer. When a standard toggle switch is used to make the transfer, this interval of doubled local circuit resistance is a fraction of a millisecond. This slight surge is easily "taken up" by the cathode bypass capacitor in (A) of *Fig.* 3; and by the characteristic of the voltage regulator tube in (B). In both circuits the relay is de-energized by short circuiting the coil, effectively dissipating the back e.m.f. as heat.

It is frequently possible to find a stock relay whose current requirements and resistance are suitable for direct substitution for a given resistor. In other instances, a stock relay is not easily available, and some resistive padding or

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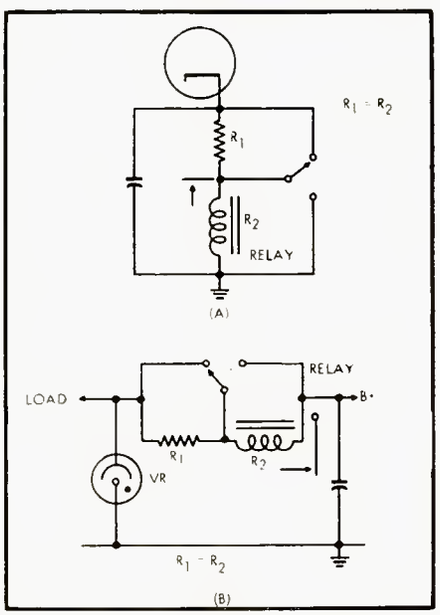

Fig. 3. Transient-reducing control circuits employing "free-riding" relays.

How an Output Transformer Causes Distortion

NORMAN H. CROWHURST*

The operation of audio transformers has long been surrounded with an aura of mystery. This article distinguishes the different forms of distortion an output transformer can produce, and gives some simple measurement methods.

In Two Parts — Part 2

As THIS distortion due to reactive loading is quite similar to the varieties that a transformer causes at high frequencies we will consider both together. (A) in *Fig.* 8 shows the practical circuit of an output transformer while (B), *Fig.* 8 shows the load seen by the output tubes.

Directly shunting from plate to plate is the primary capacitance of the transformer. The load resistance gets stepped up by the ratio N^2 but, due to leakage flux that gets between the primary and secondary windings, there is an effective inductance between this load and the tubes, shown in the equivalent circuit of (B), *Fig.* 8 as leakage inductance.

The winding capacitance has the same properties as any other capacitance in a circuit. A leakage inductance is precisely similar to any air-cored inductance: it cannot introduce distortion of itself.

However, if the leakage inductance is the dominant reactance at the high-frequency end, then the load resistance, referred back to the primary will look like a resistance with an inductance *in series.* If the output tubes cause distortion with series reactance added to the load resistance, then this kind of transformer will appear to cause distortion.

In other amplifiers, distortion may appear more rapidly when a reactance is added *in parallel* with the load resistance. In this case a transformer, in which the winding capacitance is the dominant reactance at the high frequency end, will show distortion more rapidly.

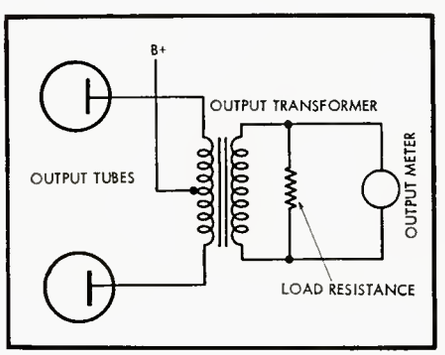

Fig. 8. Practical and equivalent circuit of output transformer for high frequency response: (A) actual circuit: (B) equivalent plate load for output tubes.

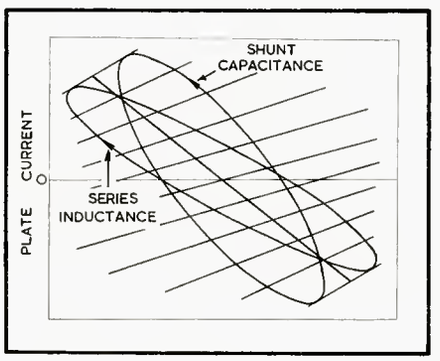

Fig. 9. A succession of elliptical load lines representing progressively larger values of reactance in series with a constant value of resistance, represented by the straight line. The parallel sloping lines at top and bottom represent the ideal tube characteristics for the extremes of grid voltage excursion.

These facts can be more readily appreciated by looking at the effect on the resultant load line of reactances applied in series and parallel with the resistance load. The kinds of ellipse produced are shown at *Figs.* 9 and 10. When these kinds of elliptical digression are applied to tube characteristics, distortion may appear more rapidly when the ellipse departs from the straight line on one side than on the other.

The two ways in which the reactances of (B), *Fig.* 8, can cause the load line to open out to an ellipse are illustrated against composite tube characteristics at *Fig.* 11. The series leakage inductance causes a voltage drop additional to that in the load and increases the effective plate-voltage swing while cutting down the current. The shunt capacitance takes additional current from the output tubes and tends to drop the plate-voltage swing. The resultant ellipse depends on which of these two effects is the greater. As we shall see presently, the transformer can present one of two kinds of impedance response to the output tubes. From the viewpoint of potential high frequency distortion this is the most important difference between different output transformers that may appear to give the same frequency response.

How Reactance Causes Distortion

In *Fig.* 11 the almost parallel lines are not a carelessly drawn attempt—they represent typical composite curves for a pair of pentode or tetrode type tubes operating in pushpull. In practice these lines would not be straight, but slightly curved. To make the drawing easier, straight lines have been shown, but the angle of the lines is representative of typical tubes. The middle line, passing through the operating point, is at the shallowest slope, while the extreme lines, representing zero grid voltage on alternate tubes, have the steepest slopes. This fact is generally true, whether pentodes or triodes are used—it is a little more prominent with tetrode or pentode type tubes than with triodes but the trend is the same.

The arrowheads marked on the two ellipses show the way the operating point travels around the ellipse in the course of a cycle. Notice that, for shunt capacitance, the spacing between intersections on consecutive grid voltage lines is wider going out from zero than coming back, while for series inductance it is narrower going out from zero than coming back. This introduces a form of distortion illustrated on the normal waveform display at *Fig.* 12.

In curve A the slope from each peak back to the zero line is steeper than that from the zero line up to the following peak. Curve B is a sine wave represent-

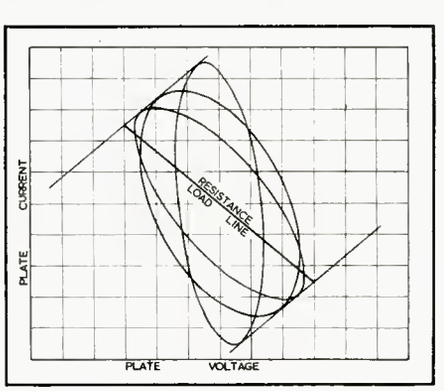

Fig. 10. A succession of elliptical load lines representing a reactance in shunt with a constant value of resistance.

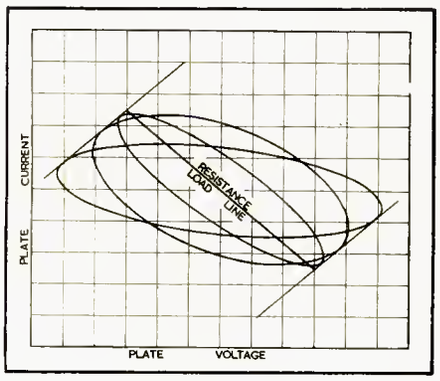

Fig. 11. Load lines on composite characteristics relevant to different possibilities in high-frequency response: the straight line across the characteristics represents the resistive load value at middle frequencies.

ing the output with the resistive load line, while curve C shows the reverse condition to that of curve A, the upward slope from zero to the peak is steeper than the return from the peak to zero.

If the grid voltage swing is increased a little more than that shown in *Fig.* 11, clipping occurs at both ends of the load line. The dotted sections in *Fig.* 12 show how the clipping shows up on each of the output waveforms.

Reverting now to the case of the shunt primary inductance causing distortion. This will produce an ellipse in a similar position to that shown for shunt capacitance in *Fig.* 11, because it will draw more plate current for a lower voltage swing than the resistance load line, but the direction of rotation will be reversed because it is the opposite kind of reactance. This means that the kind of wave shape will be similar to that produced by series inductance as shown at A in *Fig.* 12. If clipping occurs due to this shunting effect (maybe aided by feedback) then the flattening will also be in a position similar to that shown on curve A.

All the foregoing discussion is based on symmetrical forms of distortion. Some kinds of distortion, especially at the high frequencies, occur due to asymmetrical loading by the output transformer. If the leakage inductance and winding capacitance are not uniformly distributed between the two halves of the primary, each may have its own pattern of resonant frequencies. This will give rise to phase differences at the two plate's circuits (other than the normal 180 deg.). And these differences, especially in (a) pentode output circuits. and (b) with over-all feedback, can produce the most erratic forms of asymmetrical waveform distortion. In a sense the output transformer is responsible for this kind of distortion, but it is not due to non-linearity in the accepted sense. All the reactances in the transformer that cause it are linear circuit elements.

Identifying the Distortion

The curves shown in *Fig.* 7 and *Fig.* 12 show how the waveforms depart from sinusoidal when there is a relatively large amount of distortion. It would be difficult to determine the cause of distortion from the waveform when it is considerably less than 5 per cent. So we need a more precise method of observation. In some instances the distortion would be more than 5 per cent without the over-all feedback applied. In these cases the method of testing just to be described is a great help, because it shows up the original amount of distortion even with the feedback connected.

This very simple method employs loop traces on the oscilloscope, using the setup shown in *Fig.* 13. If over-all feedback is applied, the waveform at the plate

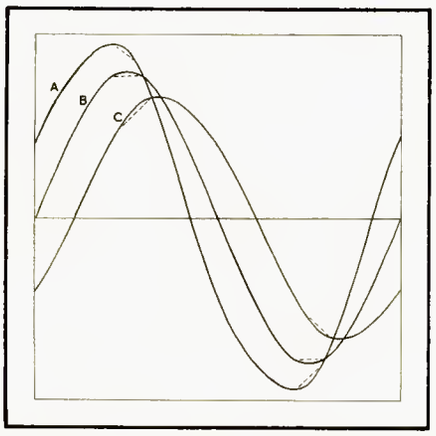

Fig. 12. Possible output waveforms, corresponding with the varieties of load line shown in Fig. 11: (A) for series inductance component; (B) for pure resistance (the only curve that is a sine wave;) (C) for shunt-capacitance component. The dotted portions illustrate the additional effect when clipping begins.

may be practically sinusoidal but, to achieve this, the waveform at the grid may need to depart considerably from a true sine wave. However, both waveforms, observed separately, may be so close to a sine wave that it is difficult to determine what kind of distortion is occurring, but by using the loop trace method of observation the two waveforms are compared and the kind of distortion is much more easily identified.

Before applying this method it is advisable to make sure that the amplifier is balanced to see that the waveform on both grids is identical and also that on both plates. A difference between the waveforms on each side indicates there is lack of proper balance somewhere in the amplifier, which should be attended to before further investigation. This procedure has been adequately described elsewhere, so we will assume that the amplifier is operating under a condition of good balance.

Figure 14 shows the kinds of trace that will be obtained with each of the varieties of distortion we have discussed except the asymmetrical one, which can cause such a variety of forms that no trace can be regarded as representative. These are somewhat exaggerated so the differences in shape can be clearly seen. Observation of a scope trace, even where the distortion is small, will quickly identify which of these varieties (or a combination of two or more) is occurring.

In *Fig.* 14, (A) is the kind of trace produced by saturation rather than reactance loading. The reason for this shape will be seen by reference to (B) of *Fig.* 7, where the input and terminal voltages are practically in phase but the latter has considerable distortion.

(B) shows the kind of trace produced by the relationship represented at (A) in *Fig.* 7 where the principal effect is due to the inductive reactance. The magnetizing current approaches 90 deg. phase lag behind the terminal voltage. In (A) of *Fig.* 7 the current is sinusoidal and the voltage waveform is distorted. If over-all feedback is used to "correct" the input waveform so that the output voltage waveform is almost sinusoidal, the sequence of relations will be similar, so the spot will travel round a similar trace but its traverse speed will vary. Either way a loop similar to (B) in *Fig.* 14 is displayed.

(C) shows the kind of trace produced by the reactive ellipse on pushpull characteristics. If the ellipse departs from its true shape by a straightening along alternate quadrants and a bending along the others as shown here, the cause of distortion is the reactive loading on the output tubes.

(D) shows what clipping does to reactance loading. If the horizontal deflection is taken from the grid circuit, as

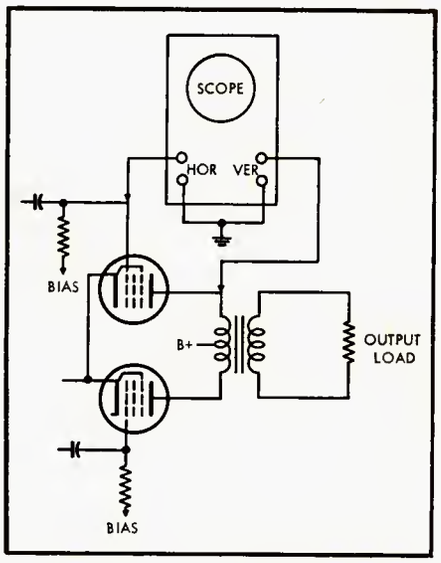

Fig. 13. Method of applying oscilloscope to amplifier circuit to check performance of output transformer at low and high frequencies. Before applying this method the waveforms on both grids and plates should be checked for symmetry.

shown in *Fig.* 13, the excursion will be abruptly limited by the grid current, producing the "lopped-off" end shown in solid line. The dashed line shows the true elliptical form in the absence of clipping. If the horizontal deflection is taken from some point earlier in the amplifier, the grid clipping will not show on the horizontal, but its result on the output waveform will produce distortion represented by the dot and dash curve in (D) *Fig.* 14.

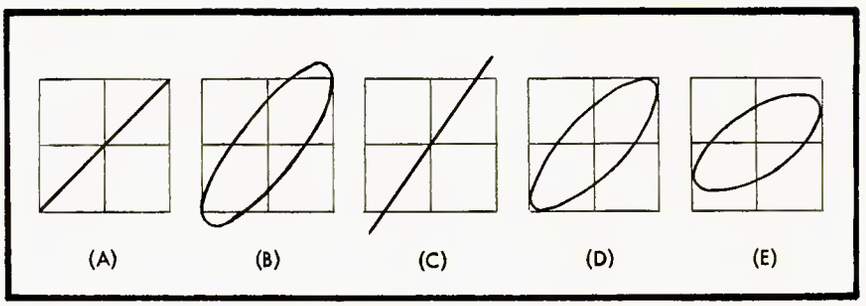

Fig. 15. Sequence of patterns at progressively higher frequencies when inductive and capacitive reactances resonate: (A) mid-frequency—totally resistive; (B) series inductance has predominant effect; (C) both combine to produce resistive dynamic impedance higher than (A); (D) and (E) successive shapes when capacitive reactance takes over.

Impedance Characteristic

By sweeping the audio generator over these higher frequencies we can see what kind of load-line response the transformer produces for the output tubes. One variety is illustrated at *Fig.* 15, which represents the display presented at successively higher frequencies: starting at a mid-frequency where the load is resistive; first the leakage inductance increases the output voltage producing an ellipse with a slightly increased slope, shown at (B); continuing to higher frequencies, the capacitive reactance begins to take effect: a point is reached where the two reactive components produce a dynamically resistive load line, as at (C); because the effective resistance is now higher than the original value, the *slope* of the line trace will be steeper than at (A).

Do not confuse *slope* with *length*. If the amplifier has a non-uniform frequency response the length of the line or size of the trace may increase or decrease but the slope indicates the relative magnitude over the output stage only.

At (D) a further increase in frequency turns the reactance over to the capacitive side and the output amplitude is falling off relative to the input amplitude; finally, at (E), the capacitive reactance is well on the way to a high-frequency roll-off.

The alternative kind of load-impedance characteristic a transformer can present to the output stage has the capacitive reactance predominating all the way. This happens because the leakage inductance is made so low that the load resistance is tightly coupled to the primary, and primary capacitance produces considerable roll-off before leakage inductance has appreciable effect.

In this case the intermediate patterns represented by (B), (C), and (D) of *Fig.* 15 will not appear, but the transition will be directly from the straight line of A in *Fig.* 15 to an ellipse in the direction indicated at (E).

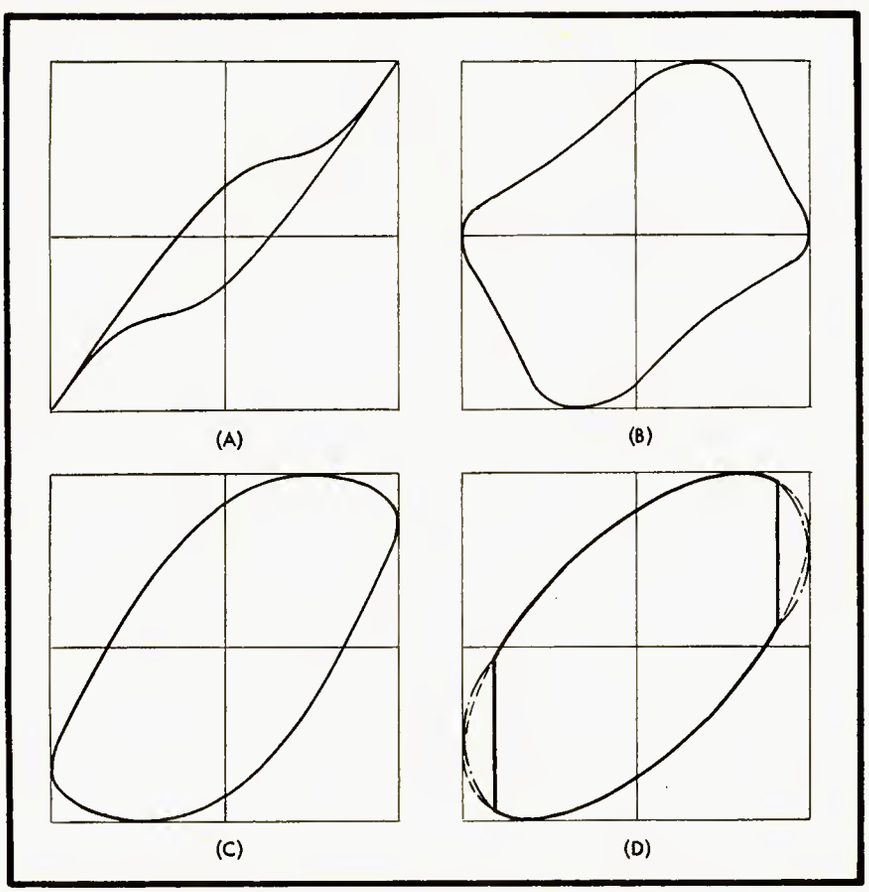

Fig. 14. Kinds of trace associated with different sources of distortion: (A) due to magnetizing current waveform only; (B) due to magnetizing current where this is highly inductive, producing considerable phase-shift; (C) due to tube curvature and any kind of reactance component; (D) due to clipping caused by reactive components: the solid line represents grid voltage horizontal, plate voltage vertical; the dashed line is a true ellipse, for comparison; the dot-and-dash line represents the shape where the input waveform is taken from a point before clipping occurs.

Conclusions

On the basis of the facts, the prevalent prejudice against output transformers would seem unfounded. This does not mean that we should turn around and get audio transformers at other places in the circuit in place of tubes once again. Maybe interstage transformers died a little prematurely because of prejudice, but the advent of over-all feedback would have signed their death warrant anyhow. The fact is, the tubes are still the principal cause of distortion.

This article has concentrated on giving a clear picture of how to make measurements on the performance of a transformer with a particular view to determining the cause of distortion. Sometimes two transformers may be equally good basically, but they will not operate equally well in the same amplifier circuit without certain circuit modifications. What we need to know is how to make the changes so the replacement transformer can produce best results. In a further article we shall go into the question of how to make measurements on different transformers operating in amplifiers and how to determine the changes necessary to produce the best operating conditions.

I Get Hot Music From a Cool Cabinet!

How I housed my Hi-Fi equipment at low cost in an old icebox.

DAVID K. SLIFER*

My Hi-Fi outfit at home is built into a massive mahogany buffet, set beside my bed. Then I got a summer hotel job in the Adirondacks. I wanted music with me, but I couldn't possibly haul the huge cabinet in my car. What to do?

I decided to dismantle the components and take them along, hoping I could figure out some temporary installation. But I did even better. For a few dollars and a little labor, I came up with the neatest, most compact layout I've had yet—in an old icebox!

Scattered through the woods around our hotel are former garnet-miners' cabins, now converted to guest cottages. And among the discarded furniture was a bunch of old-fashioned wooden iceboxes. (You could find the same kind in a junk yard or second-hand store.)

I chose an upright, front-opening box for components, a low, top-opening chest for record storage, and went to work.

The turntable fitted into a hole in the top of the tall box. I mounted an FM tuner in the panel underneath, and

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Fig. 1. Solid, functional, and in the Early American tradition, these two old iceboxes become sturdy housings for a hi-fi system and its necessary records.

Fig. 2. With the top panel cut out, suitable space is available for tuner, preamplifier, or what not.

in the shelves behind the door I put the preamp, a 45-rpm changer, and an old but serviceable AM tuner. All the wires went down the drain pipe that once carried away melted ice, and the amplifier was set underneath the box where it is readily accessible, with or without the flap that concealed the ice pan.

The lower, top-opening box became a record storage cabinet. Its top is hinged in the middle, and can also be removed completely. I added a central partition so that 10-in. records fit neatly in one side and 12-inchers in the other.

The ice boxes have some definite advantages. They are heavy enough to keep any turntable steady. They have casters which make them mobile. Like cobblers' benches or dry sinks, they go well with early American furniture, though this is, perhaps, rationalization.

The first step in construction was to remove the door in the top of the upright model, and cut a template for the turntable to fit the opening. (In this case, a scrap piece of half-inch plywood.) After drilling the holes for the template screws and checking to make sure the turntable fitted in all right, I measured the panel under the turntable in preparation for cutting it out. With something like a tape-deck in the top, which might take up more room, the panel could remain in place. But the turntable was shallow enough to allow plenty of room for a tuner or preamp. I could have put the preamp there just as easily, but chose the FM tuner instead.

The metal lining of the top compartment pulls out fairly easily, being nailed in only two places. It is a continuous piece of metal, crimped together in the corner where it meets. The front panel is then exposed for cutting. If the component to be placed there will not take up the entire space, it is advisable to cut out the whole panel and block up the panel later with matching wood. The panel is a very thin hardwood which does not cut well and can be pulled out of the frame easily.

The FM tuner just fitted into the width of the panel, with a scrap of wood under it to bring it up to the right height. Later, I used a piece of matching wood to fill in the panel at the top.

The bottom section I left as it was, removing the door only for refinishing. The door could be left off for easier accessibility, but then it no longer looks like an ice box. I

Fig. 3. Opening the door gives access to preamplifier, 45-rpm changer, and an old converted AM tuner.

wired the metal lattice shelf to its supports, because it merely rested on them and kept slipping askew when I worked the preamp controls. The 45-rpm changer and AM tuner fit in perfectly, side by side, underneath.

The wires go through the wire lattice to the preamp, or else down the pipe to the amplifier. Not wanting to take the plugs off and rewire them after I got them through the pipe, I removed it on the inside. It made more room for the components, and I found that the hole in the wood was several inches larger than in the metal, so I cut the metal out with a cold chisel to the circumference of the wood. That made it possible to pass the cords and plugs through the hole.

The conversion of the low chest was an easier task. The inside was just 24 in. across and would not take 12-in.

Fig. 4. If not large enough to accommodate two stacks of 12-in. records side by side, a properly spaced partition will keep the 12's and 10's separated.

records in their jackets, side by side. I put in a wood partition and arranged it to accommodate 12-in. records on one side and 10-inchers on the other.

The longest job, and the only expense, was the refinishing. Most of the converting I did with scraps found around the hotel. But I bought steel wool, varnish remover, sand paper, and varnish-stain, which cost something under eight dollars. Removing the old varnish, dust, and dirt, and refinishing were normal furniture jobs. The amount of work, of course, depends on the condition of the boxes.

Old ice boxes come in many sizes and shapes. I found five different kinds, including a huge one that would take a recording studio's equipment. But my own smaller boxes gave me an attractive, substantial hi-fi set-up that I was proud to bring home this Fall.

Fig. 5. The author starts to work on a second set of cabinets. Heavy and solid construction make the ice box equally suitable for loudspeaker housing.

A New Concept on the Physiological Aspect of Stereophonic Sound

HOWARD F. HUME*

The author describes a series of experiments designed to establish the factors that provide the stereophonic effect and to analyze their results in practical terms.

STEREOPHONIC SOUND has, in recent years, become an important consideration in the reproduction of sound for entertainment. Motion pictures, tape, and disc recordings in stereo sound are now widely used and more recently the poor relation in the sound field—the public address system—has changed to stereo.

The word "stereophonic" is derived from the Greek word "stereo" meaning "firm" or "solid," and "phonic" meaning "sound." This word should not be confused with "binaural" which simply means "two-eared." The stereophonic effect may be produced to some degree with one ear only though more exact when produced binaurally.

The common denominator in any present day stereo sound system is a pair of independent sound pick-up and reproducing systems wherein one system gathers and reproduces the sound emanating from the left side of the source and carries that signal to the left ear while the other system gathers the right-side sounds and transmits them to the right ear. This basic scheme has, of course, been modified in several ways. Sometimes a third or fourth channel is added to fill in the void between the extreme left and extreme right positions. In some cases, an amplifier bridges the two primary channels and a signal which is a combination of the two primary signals is reproduced in the center position in front of the listener.

Any of these arrangements produces only a near-stereo effect in the listener's mind and tests show that not every listener is convinced he is hearing true solid sound. The sensation more often experienced is that of an awareness of sound being louder on one side than the other. The multi-track motion pictures of today produce the latter effect, and not convincing stereophony.

Much has been written on the theory and practice of the stereo effect, but many of the writers disagree. This author submits that the reason the writers disagree is that there is a misconception on which a good deal of thinking has been based and which has seriously retarded the development of the techniques. The question, "Why are creatures able to orient a sound source?" must be answered satisfactorily before any successful attempt can be made to reconstruct the perception of direction at a distance from the source. Let us take a quick look at the human being again and review one or two basic principles. He has two ears, one on each side of the head, but except for a narrow band running vertically from the ground up and over his head, the path of the sound to one ear or the other is always obstructed by the head. The part of the ear which is stimulated by airborne sound waves is called the "inner ear" while the part that projects from the head the "external ear." The external ear projects from the side of the head at an angle to a line normal to the side of the head.

It has been believed that a creature can isolate a sound source in space because of one or more of the following reasons:

(1) The distance between the ears creates a time delay in a transient or any change from a steady state sound and this time difference provides the information to the brain.
(2) The distance between the ears creates a phase difference and this difference provides the information.
(3) The amplitude of the signals reaching the inner ears differs and that difference is used by the brain.

It has been further decided that each condition contributes some information and one effect confirms another, increasing the chances of a correct conclusion.

All writers agree that the stereo effect is produced by some differences in signal received by the two inner ears and the preceding three theories have been offered to explain what the difference is. It is at this point that this author disagrees with the others. We do agree there is a difference in signal, else why two ears. Also, we do agree that these three phenomena (namely, time delay in transients, phase shift, and amplitude difference) can, under certain circumstances, produce some differences in the left ear and right ear signals as received. This author believes that such differences in signal are not used in the perception of direction. We believe that the total value of these three conditions is, at best, in confirming a conclusion already reached by the brain. The difference in signals as received that does produce the stereo effect is a difference in wave shape.

Physical Reasons

The head and external ear, because of their size and shape shadow or filter out certain frequencies. In the head, for example, the frequency is approximately 800 cps and above. The external ear shadows higher frequencies and because of its angle, from a different direction. It is this shadowing process that produces a difference in waveform in the signals received by the two inner ears and which is used by the brain to make the perception of direction possible. Stated in another way, the stereophonic effect is produced by a difference in high-frequency or harmonic content, created by head and external ear shadowing, of the sound signals reaching the inner ears.

According to Oliver Read,[1] "Sounds having very low frequencies possess the most power and result in naturalness and apparent loudness. High-frequency sounds provide intelligibility." We add to this statement that the lower frequencies also convey the mood or emotion of the sender. The high frequencies contain the message and provide intelligibility, and the higher the frequencies that are passed in the transmission, the greater the intelligibility of the message and the more complete the description of the source.

The fundamental frequency of the human voice in speaking rarely exceeds 1000 cps. The note "C" two octaves above middle "C" is 1024 cps. The frequencies above 1000 cps are usually harmonics and are necessary for exchange of messages but have no effect on apparent loudness.

The head shadows the components above 800 cps while the external ear shadows the components beyond 5000

* *15 East Second Ave., Vancouver 10, B.C.*

[1] Oliver B. Read, *The Recording and Reproduction of Sound* 2nd Edition. Indianapolis. Howard W. Sams & Co.

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cps approximately. The exact values of these thresholds are vague because of the wide range of shapes and sizes found in nature, as well as the difference in angle at which each may obstruct the path of the sound. But for all practical purposes, these two figures seem acceptable.

The region in which the maximum stereo sensitivity exists is a narrow band directly in front of the face, extending from below horizontal to about 45 deg. above horizontal. The point of maximum stereo sensitivity is straight ahead. The reason for this is simple. It is in this direction that the two external ears gather, in total, a maximum measure of high frequencies and it is from this position that a unit amount of movement of the listener's head produces a maximum amount of change in difference in wave shapes of the signals reaching the two inner ears. If it ever becomes possible to measure human sensations more exactly it will be possible to plot the degree of stereo sensitivity throughout the full circle about the human head. It is obvious that the reason creatures turn their heads to face a sound source is twofold: first, to obtain maximum intelligibility (highest readability of the message); and second, to obtain maximum accuracy of orientation (maximum stereo sensitivity).

Several experiments were conducted on the stereophonic effect and the more significant results are shown.

Experiment 1. Four subjects were asked to orient a sound source in a 360 deg. circle about the subject. The sound was 100 cps "pure" sine wave. The result was that in several tests subjects were unable to agree, unable to isolate source with any accuracy.

Experiment 2. Same as 1 except frequency was 1000 cps. This resulted in an average accuracy of 25 per cent.

Experiment 3. Same as 1 except frequency was 8000 cps, and this resulted in an average accuracy of 75 percent. Thus we conclude that subjects orient "pure" sine wave tones with a low degree of accuracy.

To support this evidence, Dr. K. de Boer,[2] working in the Philips Laboratories, Eindhoven, Netherlands, found that "for steady sounds and especially for pure tones, the perception of direction in a room is not only difficult but often even false." As a result, Dr. de Boer used mostly speech for his experiments. It will be remembered that speech is rich in harmonics. We believe the principal reason a source of "pure" sound can be isolated at all is that all oscillator-amplifier-reproducer combinations generate some harmonic distortion, even though that distortion may be low in terms of percentage. We feel that it is because of these spurious frequencies plus random amplifier noise that it is possible to orient a so-called pure sine wave at all. Then, again, pure sine waves rarely occur in nature, so creatures are not required to cope with the problem.

The next series of experiments shows the effects of phase difference and amplitude difference.

Experiment 4. Two identical reproducers emitting a sine wave, in phase, were held opposite the ears of the subject. With one held stationary, the other was moved toward and away from the subject so that with the frequencies used, the phase difference ranged from 0 deg. to 360 deg. As a result, the subjects reported no stereo effect. The phase shift theory has some notable weakness that may be shown simply: (1) For phase shift to occur at all in the two ears there must be some measure of periodicity. Yet creatures are able to orient sources of random or non-periodic sound with accuracy; (2) The phase shift for a sound of a certain frequency could be the same for at least two different positions of the head. For example, let us say that a source is at 45 deg. left of front center. The time difference between the left and right ear received signals is the same as if the source were 45 deg. left of rear center. This argument also holds for the time of arrival of transients. Note too, that in this case the difference in amplitude of the signals would be the same. Present theories have all ignored the fact that creatures can isolate a sound source behind them with some accuracy.

We feel that this reasoning, plus the results of Experiment 4, shows that phase shift with or without amplitude difference, is not the difference in signals required by the brain to orient.

It should be noted that in all the experiments the subjects were blindfolded and not told what form the experiment would take. They were simply told to describe the sensation or illusion experienced.

Experiment 5. The construction of the experiment was the same as in 4 except that a variable dividing network was used to increase or decrease the amplitude at the reproducers in equal and opposite directions. The results were the same as in 4; there was no illusion of the source moving, merely the sound was louder on one side than the other.

It was decided to next investigate the effects of shadowing. In the Experiments 6 and 7, an audio oscillator provided a sine or square wave source which was amplified and then reproduced in air with a wide-frequency-range loudspeaker. Five feet in front of the reproducer, a microphone picked up the signal which was amplified and supplied to an oscilloscope and a wide frequency range meter.

Experiment 6a. A set of readings was recorded on the meter for various sine wave frequencies.

Experiment 6b. A block of sound-absorbing material approximately the same size as a human head, was suspended directly in front of the microphone. The results are shown in Table I.

TABLE 1

Frequency, cps	Difference in readings, db
100	- 3
200	- 3
300	- 3
500	- 3½
1000	- 7
3000	- 8
5000	- 10
8000	- 7

It must be noted that this experiment included as error the acoustics of the room and the acoustic relationship between the shadowing device distance to microphone and others. The result showed that shadowing occurs in higher frequency (function of size of shadowing device).

Experiment 7. The same apparatus was used as in 6, but the signal used was a square wave, rich in harmonics. The signal picked up by the microphone was viewed on the oscilloscope. When the artificial head was suspended in front of the microphone, the wave form approached sine wave shape, the fundamental frequency. If the fundamental were below 800 cps the amplitude of the fundamental was relatively unattenuated but the wave form was almost completely stripped of harmonics. Again, the room reflections introduce error.

Experiment 8. This experiment was the actual test of the theory. Two identical reproducers were mounted fixed and equidistant from the subjects' ears and in a line normal to the side of the head. The loudspeakers were in phase and connected to the same signal source, and in this case the signal was music.

The signal reaching the subjects' inner ears was exactly the same for each side except that a frequency discriminating network was introduced in the circuits so that at 800 cps attenuation began and continued at approximately 4 db per octave. The control was flexible and the attenuation could be smoothly decreased in one and increased in the other. The reproduction of frequencies below 800 cps remained equal for both speakers. With the control at the mid-point the frequency response of the two speakers was the same. This result was noted: when the control was moved from one extreme to the other the subjects reported an illusion of the artist moving from one side of the stage to the other. There was no effect of the sound being "louder on one side than the other."

The subjects were able to indicate precisely where the artist stood in an arc

(*Continued on page 60*)

[2] R. Vermeulen, "Stereophonic Reproduction," AUDIO, Apr. 1954.

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Essentials of Combination Patents

ALBERT WOODRUFF GRAY*

While a patent can be issued on a combination of items in which some are not in themselves new, it is still necessary that the combination give some new and useful effect which is entirely different from any previously provided.

SUIT WAS BROUGHT for the infringement of a patent of a hook-up circuit for a radio broadcast receiver automatically controlling the amplified signal voltage. To this suit the defense was made that the patent on which the lawsuit was based was invalid for lack of patentable invention. From a decree in favor of the patentee, granted by the United States District Court and sustained by the Court of Appeals, this judgment was appealed to the United States Supreme Court.

There it was contended in the defense that the elements of this amplifier which the inventor had combined, were old and well known, and as a consequence the patent, consisting as it did of a combination of old and well known elements, was invalid.

"The device," it had been said by the Federal Court of Appeals in holding the patent infringed, "secures automatic volume control. The elements of the combination were old but the combination was new and the result was new. That constitutes invention."[1]

By the Supreme Court however, this judgment was reversed on the ground that not only had the elements of this invention already been disclosed to the public but that the combination itself demanded of the inventor for a valid patent, an advance over discoveries already made, which was lacking here.

"We conclude," said that court in its reversal, "that the patentee accomplished an old result by a combination of means which singly or in similar combination, were disclosed by the prior art and that he was not in fact a first inventor, since his advance over the prior art, if any, required only the exercise of the skill of the art."

The provision of the statute to which reference was made by the court as a "combination of means," provides in relation to patentable inventions, "Whoever invents or discovers any new and useful process, machine, manufacture or composition of matter or any new or useful inprovement thereof, may obtain a patent therefor subject to the conditions and requirements of this title."[2]

Here there had been the composition of matter but it had lacked the novelty required under the patent law. This demand of the law is implicit in the famous remark of Voltaire, "He who makes two blades of grass grow in place of one renders a service to the state."

For many years the courts have insisted on this feature, that not only must a combination to be patentable, be new and useful, but to be entitled to the protection of the patent law, the elements of the combination must go farther than the functions of the composing parts and by the combination must produce a new and useful discovery. In a combination of hydrogen and oxygen the combination of the two elements is not merely the composing elements but a third, water.

In a characterization by the Supreme Court of a similar lack of invention it was said, "The conjunction or concert of known elements must contribute something. Only when the whole in some way exceeds the sum of its parts is the accumulation of old devices patentable." To this the court added the terse comment, "Two and two have been added together and still they make only four." Not two blades of grass where there had been but one before.

The Disc Phonograph

In the early years of the disc phonograph there was before the Supreme Court an action for the infringement of a combination patent having the elements, "(1) A traveling tablet having a sound record formed thereon and (2) a reproducing stylus shaped for engagement with the record and free to be vibrated and propelled by it."

Of the earlier inventions and the combination patents claimed here by the Victor Talking Machine Co. to have been infringed, the Supreme Court said:

"In the prior art the reproducing stylus and sound record were brought in operating relation to each other in two ways. The sound record was mechanically conveyed across the reproducing stylus, or the reproducer and its stylus were mechanically conveyed across the record. By one or the other of these means the stylus was kept in engagement with the record and accommodated to the shifting positions of its operative portions.

"In the patent in suit such independent means are dispensed with. The stylus is made to engage with the grooves in the record tablet, is vibrated laterally by its undulations and guided or propelled at the same time with its diaphragm attachment across the face of the tablet, the successive portions of the groove representing sound waves, which are transmitted to the air."

To this statement of the invention was added a characterization of combination patents. "A combination is a union of elements which may be partly old and partly new or wholly old or wholly new. But whether old or new, the combination is a means—an invention—distinct from them."[3]

Recently before the Federal appellate court for decision was an action for infringement brought by a soap manufacturer for the infringement of a combination patent of pressurized shaving cream. There the court said in its description of patents of this type, "A combination is a composition of elements, some of which may be old and others new, or all old or all new. It is however the combination that is the invention and is as much a unit in contemplation of law as a single or noncomposite instrument.

"The authorities establish the following propositions respecting the patentability of devices or processes of this character:

"(1) That a patent is patentable if it produces new and useful results, though all of its constituents were well known

* *112–20 Seventy Second Drive, Forest Hills, New York.*

[1] Detrola Radio & Television v. Hazeltine Corp., 313 U.S. 259, reversing 117 Fed. 2d 239.

[2] 35 U.S.C.A., Sec. 101.

[3] Leeds & Catlin v. Victor Talking Machine Co., 213 U.S. 301, aff'g. 146 Fed. 534.

how will
you have your

HIGH FIDELITY

...components or consoles?

Pilot *offers you the same superb quality in both*

People show two preferences in high fidelity. Some select individual components which they install and connect themselves—while others prefer self-contained consoles that need only be plugged in and played.

If you are among those who enjoy the 'doing' as much as the listening, you will find no finer components than the tuners and amplifiers offered by Pilot. Or, if you favor the easy, 'plug-in-and-use' convenience of a console, you will find an exciting message in the story of Pilot Component-Consoles.

Pilot High Fidelity **COMPONENTS**

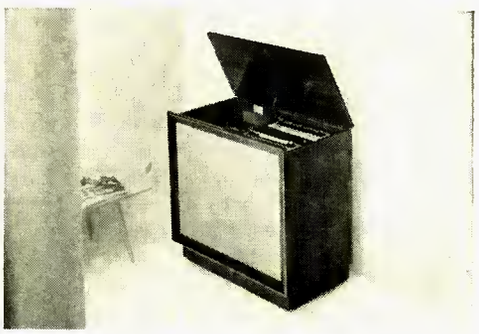
Today's Pilot Tuners and Amplifiers are the most advanced in circuit design and engineering. They cover all design types to permit the greatest flexibility in planning a system: tuners with built-in phono and tape preamps, for use with basic power amplifiers; and basic tuners for use with preamp-equipped amplifiers. The choice of combination is one of personal preference.

Pilot Tuners and Amplifiers are also the most modern in styling and appearance. They are housed in attractive metal enclosures, finished in brushed brass, and trimmed in contrasting burgundy. Pilot high fidelity components make handsome matched pairs when used on tables and open shelves.

Pilot high fidelity components are easily interconnected, and can be used with all makes of record changers, turntables, tape recorders, and speaker systems. All Pilot Tuners feature the new Beacon Tuning Indicator for easy, accurate station selection. This insures the precise tuning necessary for distortion-free FM reception.

Cathode follower circuits are included to permit the use of long amplifier connecting cables without degrading frequency response. The preamps provide equalization for tape heads as well as tape recorders and records. There are separate bass and treble controls, and separate loudness and volume controls. Hum-free DC voltage is used on the preamp tube heaters. Every essential quality feature has been included to assure flawless high fidelity performance.

Pilot Tuners are priced from **$79.50** to **$189.50** Amplifiers from **$49.50** to **$165.00.**



Pilot High Fidelity **COMPONENT-CONSOLES**

You can now enjoy the proven, superior performance of high fidelity components without having to assemble, connect, and install your own system. For, with a Pilot Component-Console, you have a custom made component system, installed in a handsome cabinet. And you can identify each of the components—the Pilot Tuner, Pilot Amplifier, Garrard Changer, Magnetic Cartridge, 3-Way Speaker System—components you would select, or be advised to select if you were planning your own installation.

But the performance of the finest components can be impaired through the use of cabinets with internal resonances and wall vibration. Pilot therefore turned its top engineering skill to the task of designing a cabinet with the necessary sturdiness and rigidity to permit all of the components to be operated in a single console.

Even the speaker system is completely closed off in a heavy-walled, acoustically-padded infinite baffle. And inside this enclosure there are four loudspeakers to cover the entire audible frequency range: a 12″ woofer; a 6″ mid-range reproducer in its own vented, acoustically insulated baffle; and two 3″ tweeters.

Pilot has achieved a wonderful, new approach to high fidelity for the home—by combining component quality with console convenience—superb high fidelity performance in a single cabinet.

ENSEMBLE 1035 FM-AM Radio-Phonograph (illustrated) in cordovan mahogany **$415;** in cherry or blond mahogany **$425.** Other models from $178 to $605.

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and in common use before it was made, provided the results are a product of the combination and not a mere aggregate of several results, each a product of one of its combined elements.

"(2) If it produces a different force, effect, or result in the combined forces or processes from that given by their separate parts, and a new result is given by their union.

"(3) If it either forms a new machine of distinct character or formation or produces a result which is not the mere aggregate of separate contributions but is due to the joint and cooperating action of all the elements. When the several elements of which it is composed produce by their joint action either a new and useful result or an old result in a cheaper or more advantageous way."[4]

In an infringement action brought long ago, the decision by the Supreme Court of the United States has become an outstanding authority. The contention had been made that a patent for a molding crucible was void since the elements composing it were old and the combination a mere aggregate of earlier discoveries or inventions. As a consequence it was claimed in this action that there could be no infringement as there was no valid patent.

"All the devices of which the alleged combination is made are confessedly old," said the court in that decision. "It must be conceded that a new combination if it produces new and useful results, is patentable, though all the constituents of the combination were well known and in common use before the combination was made. But the results must be the product of the combination and not a mere aggregate of several results, each a complete product of one of the combined elements.

"Combined results are not necessarily a novel result, nor are they an old result obtained in a new and improved manner. Merely bringing old devices into juxtaposition and there allowing each to work out its own effect, without the production of something novel, is not invention. The combination to be patentable must produce a different force or effect, or result, in the combined forces or processes from that given by their separate parts. There must be a new result produced by their union. If not so it is only an aggregation of separate elements."[5]

Typical of the frequent refusal of the courts to recognize combinations as possessing the qualifying features of patentable inventions is a recent decision by a Federal District Court in Maryland. In that instance the court dismissed an infringement action against the Radio Corporation of America, based on an alleged infringement of seven patents for degassing radio tubes in the process of manufacture.

Here as in so many similar cases, the court insisted that the combination to be patentable must be more than the mere sum of two and two. On the ground that the patents for which this infringement action was brought were merely an aggregate of methods and processes well known in the art the Federal court said, "The general propositions of law applicable to combination patents are not difficult either to state or to understand. A combination is a union of elements, some of which may be old and others new or all old or all new.

"It is the combination which is the invention. But the result must be the combination and not a mere aggregation of several results, each the complete product of one of the combined elements. It must be the product of the coacting influences of the various elements and which is produced by their union. A number of old parts or elements which in the aggregation perform or produce no new or different function or operation than that heretofore performed or produced by them, is not a patentable invention."[6]

Suit for infringement was brought a few years ago by the patentee of a moveable frame such as is used on the counters of self-service grocery stores. One of the justices of the Supreme Court concurring in the refusal of that court to recognize this grocery store device as a patentable invention, said, "The patent involved in the present case belongs to that list of incredible patents which the Patent Office has spawned.

"The fact that a patent as flimsy and spurious as this one has to be brought all the way to this Court to be declared invalid dramatically illustrates how far our patent system frequently departs from the constitutional standards which are supposed to govern."[7]

This feature of the patent law is old. In an early case that came before the Supreme Court, suit had been brought for an injunction against the infringement of a so-called combination patent, consisting of a piece of rubber attached to one end of a lead pencil.

"This combination consists only of the application of a piece of rubber to the end of the same piece of wood which makes a lead pencil," said the court in that early decision. "It is as if a patent should be granted for an article or a manufacture, as the patentee prefers to term it, consisting of a stick twelve inches long, on one end of which is an ordinary hammer and on the other end a screw driver or a tack-drawer or, what we will see in use in every retail shop, a lead pencil on one end of which is a steel pen.

"It is the case of a garden rake on the handle end of which should be placed a hoe. Each however continues to perform its own duty and nothing else. In this and the cases supposed we have but a rake, a hoe, a hammer, a pencil or an eraser when we are done. An instrument or manufacture which is the result of mechanical skill merely, is not patentable.

"Mechanical skill is one thing. Invention is a different thing. The combination to be patentable must produce a different force or effect or result in the combined forces or processes from that given by their separate parts. There must be a new result produced by their union. If not so it is only an aggregate of separate elements."[8]

In that same court a few years later, a summary, following the rule laid down here, was made of the scheme of the patent law which has been consistently followed by the courts in their refusal to award the protection of that law to such gadgets as the counter tray of a self-service grocery store.

"The design of the patent laws is to reward those who make some substantial discovery or invention, which adds to our knowledge and makes a step in advance in the useful arts. Such inventions are worthy of all favor. It was never the object of these laws to grant a monopoly for every trifling device, every shadow of a shade of an idea, which would naturally and spontaneously occur to any skilled mechanic or operator in the ordinary course of manufactures. Such an indiscriminate creation of exclusive privileges tends rather to obstruct than to stimulate invention.

"It creates a class of speculative schemers who make it their business to watch the advancing wave of improvement and gather its foam in the form of patented monopolies, which enable them to lay a heavy tax upon the industry of the country without contributing anything to the real advancement of the arts. It embarrasses the honest pursuit of business with fears and apprehensions of concealed liens and unknown liabilities to lawsuits and vexatious accountings for profits made in good faith."[9]

[4] Colgate Palm-Olive Co. v. Carter Products, 230 Fed. 2d 855, March 8, 1956.

[5] Pickering v. McCullough, 104 U.S. 310, October, 1881.

[6] Berghane v. Radio Corporation of America, 116 F.S. 200, October 22, 1953.

[7] Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp., 340 U.S. 147, December 4, 1950.

[8] Reckendorfer v. Faber, 92 U.S. 347, October, 1875.

[9] Atlantic Works v. Brady, 107 U.S. 192, October, 1882.

• • •

Let's Get Down To Earth About Electrostatics

FEW developments in the audio field have created such a whirlwind of fantastic claims, sarcastic denunciation, and fanciful daydreaming as the electrostatic loudspeaker. We doubt that any product has ever created so many self-appointed experts in so short a time. The electrostatic has been alternately praised on the one hand as tolling the doom of the dynamic loudspeaker, and on the other hand wishfully dismissed as a "romantic" concept of speaker design "which has been thoroughly disproven". Neither statement is accurate. ***While we firmly believe that eventually all quality systems will include an electrostatic high and mid-frequency reproducer,*** *it appears at this juncture that the low end can best be reproduced with cone designs. Manifestly, the head-in-the-sand ostrich approach which tries to dismiss the electrostatic with a wish, is proclaimed either out of abysmal ignorance or malice.*

The development of electrostatic loudspeakers has progressed to the point where they can no longer be referred to as identical, any more than all dynamic designs can be so classified. **In some respects, there is an even wider divergence of design between the various electrostatics than exists in their dynamic counterparts.** No informed individual would attempt to evaluate a $300 multi-driver speaker on the same performance basis as a $2.00 replacement cone. Neither should the inexpensive single-ended electrostatics be compared with the precision-built push-pull designs.

The electrostatic is in the ascendancy not because it is now simpler and more inexpensive to build, but rather because the basic principle, long recognized as superior to dynamic designs for reproduction of the upper octaves has been made practical for the first time by the **utilization of new materials, techniques and theories** previously overlooked. Adherence to rigid production tolerances and test procedures virtually assures that the JansZen will never become a mass-produced item. Its relatively high cost directly reflects the uncompromising design and construction for which it is justly famous.

Since efficiency, per se, is no real criterion of loudspeaker performance, we have made no attempt to emphasize this factor in our electrostatic design. In fact, the last thing we would want to do would be to match the raucous output of loudspeakers designed for theater use, whose outrageous invasion of one's sensibilities creates the effect of a brass band in the bathroom. We take strong exception to the thinking of some theater sound purveyors who prefer to base their high-powered efficiency claims on a single frequency or narrow band where conversion of electrical energy into acoustical energy is highest, even though claimed response is far in excess of these limits. ***With a given power amplifier, the maximum acoustic power output of the JansZen is higher than that of any other loudspeaker at the higher frequencies.*** *Over the entire frequency range it is a suitable match for the very finest low frequency systems.*

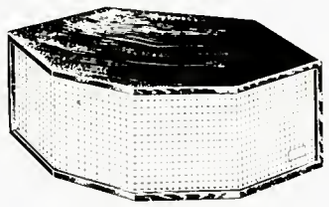
While high frequencies are by nature directional, the exclusive JansZen array results in uniform high frequency distribution throughout the room, without the use of any baffles, gratings, etc. imposed between you and the music. The result is a broad sound source with none of the resonances and reflections common to mechanical systems.

We categorically state that the JansZen has the finest transient response, and will provide the smoothest, most extended frequency response available in any high frequency loudspeaker, with absolutely no trace of any inherent noise.

In the light of the above facts, we hope when you are planning your "ultimate system" that you will give serious thought to the inclusion of an electrostatic, preferably a JansZen.

JansZen

Electrostatic



Send for complete literature on the JansZen 1-30 Electrostatic as well as the name of your nearest dealer!

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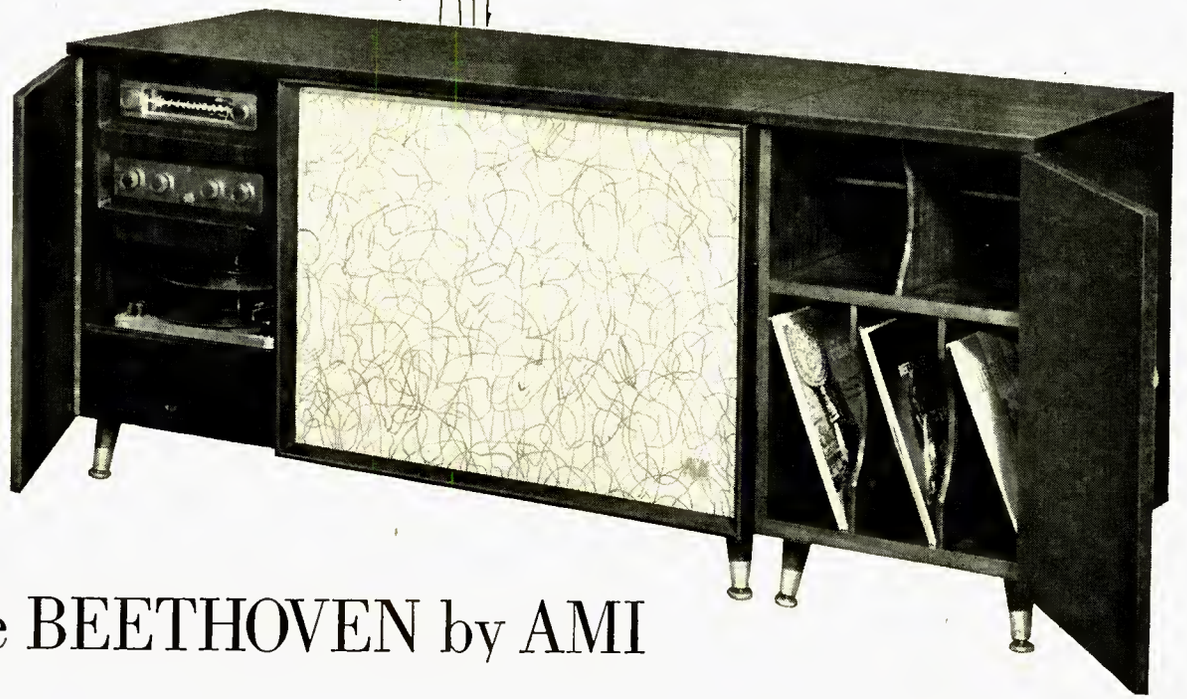

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The very essence of high fidelity . . . and the *one* professional sound system that adapts custom components, acoustic-engineered enclosures, and precision calibrated controls to your ear . . . your recordings . . . the individual acoustical requirements of your home.

The Beethoven, shown with the AMI Mark VII Record Storage Console, is one of the new AMI Mark Series instruments included in a selection of six precision high fidelity AM-FM phonograph-tuner sound systems. Three are fully integrated, three are available with separate wall or corner horn enclosures and remote control consoles.

Audition an AMI sound system today. You'll be convinced there's nothing better in sound and luxurious cabinetry. Write us for the name of your nearest dealer.

EXCLUSIVE THREE-CHANNEL FRONT-LOADED EXPONENTIAL HORN SYSTEM: Below 45 cps to 16,000 cps flat with usable response in excess of those frequencies. Exceptional transient response. Three-way frequency dividing network with cross-over at 550 cps and 4,000 cps. High output 22 watt amplifier with preamp. 20 to 20,000 ± 1.5 db. Less than 2% IM distortion (60 cps and 7,000 cps; 4::1 ratio signal). Precision calibrated bass and treble tone controls for definite stops in cut and boost; separate continuously variable volume control; professional three-step loudness control; 12 db/octave high frequency roll-off control (scratch filter) with 3-6-10 "KC" and "Flat" positions. Other input selector positions: "Mike," "Tuner," "Tape," and "TV." AM-FM tuner with AFC; 4-speed precision intermix changer of advanced design; G-E variable reluctance cartridge with 1 mil diamond and 3 mil sapphire styli.

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Equipment Report

Capps CM-2000 Series Condenser Microphone and power supply — Audax Model KT "Do-it-yourself" Tone Arm

CONDENSER MICROPHONES have become recognized as the standard by which others are calibrated and, therefore, compared. Back in the early days of broadcasting these devices were standard for a time, since they represented a great improvement over the carbon mike which was all that had been available previously. Another type was used in sound picture production for several years prior to the availability of the more compact and—then—more reliable dynamics.

There is a great difference between these early condenser microphones and the small and extremely flat-response models that are available today. The early models were enormous by today's standards, erratic in performance, often became noisy, and required battery power supply for their operation. Modern condenser microphones are comparable in size with dynamic types, even including the necessary coupling tube, which is essentially nothing more than a cathode follower to reduce the high impedance of the condenser microphone head sufficiently to permit it to be coupled into conventional equipment.

The Capps CM-2000 series of condenser microphones includes a number of models which differ only in their output impedances: CM-2001 is designed to work into an open grid or an impedance of not less than 100,000 ohms; CM-2030 will work into a 30-ohm microphone input circuit; and CM-2250 is designed to work into a 250-ohm line or microphone input circuit.

Each of these models consists of the microphone proper, a cathode-follower coupling tube or preamplifier, a matching transformer (except CM-2001 which operates directly into a tube circuit), and a power supply. The microphone head is a chrome-plated brass housing and cover plate, a thin stretched aluminum diaphragm, a backplate assembly, and the necessary locking nuts. The backplate is circular, and is pierced with a number of small holes which permit the air behind the diaphragm to flow through and into a space within the mounting insulator. This space is actually an acoustic network which damps the resonant frequency of the stretched diaphragm so that response is held practically flat up to 15,000 cps.

The microphone head and its preamplifier are housed in an aluminum tube with an overall size 1⅛" in diameter, and 8¼" long. The end opposite the microphone head encloses a 6-pin Cannon plug through which all connections are made. The power supply

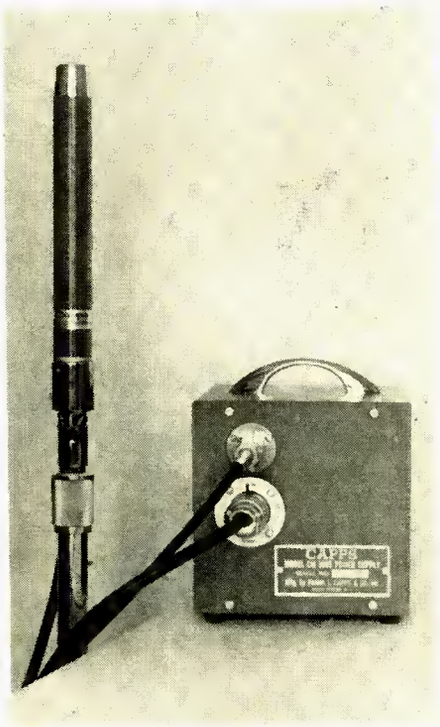


Fig. 1. Capps CM-2000 series condenser microphone with its power supply.

is contained in a rectangular box 6" × 6" × 7", and it is equipped with an a.c. switch, neon pilot light, line cord, and two receptacles—one for the microphone cable and the other a small 3-pin receptacle for the output. *Figure* 1 shows the microphone mounted on a typical stand, together with the power supply. *Figure* 2 is the schematic of the microphone and its preamplifier, while *Fig.* 3 is a schematic of the power supply.

Performance

While we have long used a high-quality microphone for comparative measurements on loudspeakers (we wouldn't presume to claim that we are able to make absolute measurements on speakers), we were impressed with the aural quality of the Capps CM-2030. This unit was fed into a broadcast-type remote amplifier, and by comparison the Capps microphone appears to have an output of approximately 56 db below 1 milliwatt for a sound pressure of 10 dynes per sq. cm., which is approximately that developed by male conversational speech 1 foot from the mouth. Thus this unit could be used to replace any microphone of usual broadcast type without requiring any additional amplification.

Subjectively, the sound from the Capps microphone is "rounder" in the low range than from most other types compared to it, and the high-frequency range is smooth and without peaks. It is essentially nondirectional, even when pointing straight toward the source of sound—being down only 15 db at 15,000 cps angle of 180 deg. from the front.

The baffle construction is such that the microphone is quite free of the pop that is usually heard on words in which the letter "*p*" occurs—*p* being the only letter in the alphabet which requires an explosive burst of air from the lips. The over-all performance is exceptionally satisfactory.

The only possible disadvantage to any condenser microphone is the necessity of an external power supply. It would seem that high-quality amplifiers for p.a. use as well as remote amplifiers and mixer consoles might well be equipped with the necessary power supply so that the extra unit would not be necessary. Since the microphone proper has a transformer output this change would only entail the provision of a 6-terminal receptacle with suitable voltages available. This would certainly simplify the use of the condenser microphone and would eventually improve the average sound quality of recorded material.

C-19

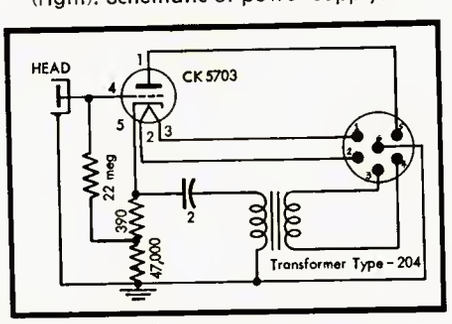
AUDAX Model KT TONE ARM

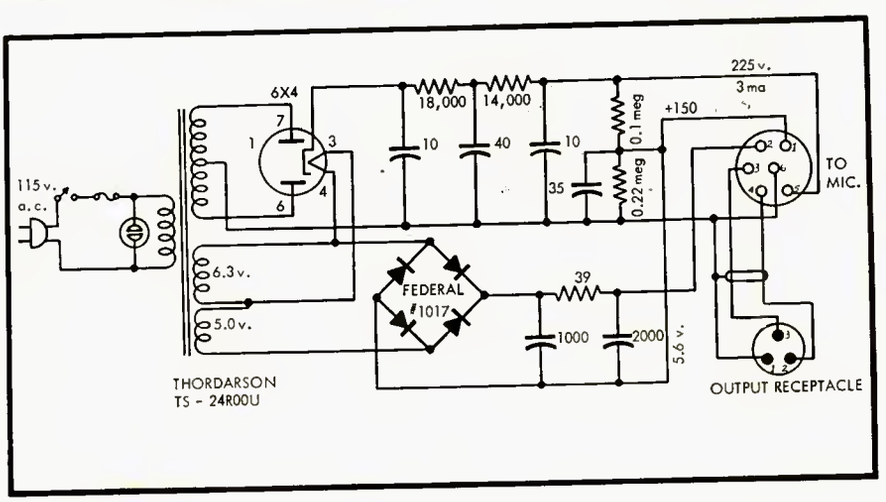
"You, too, can earn from $50 to $75 per hour while you assemble your new Audax Tone Arm."

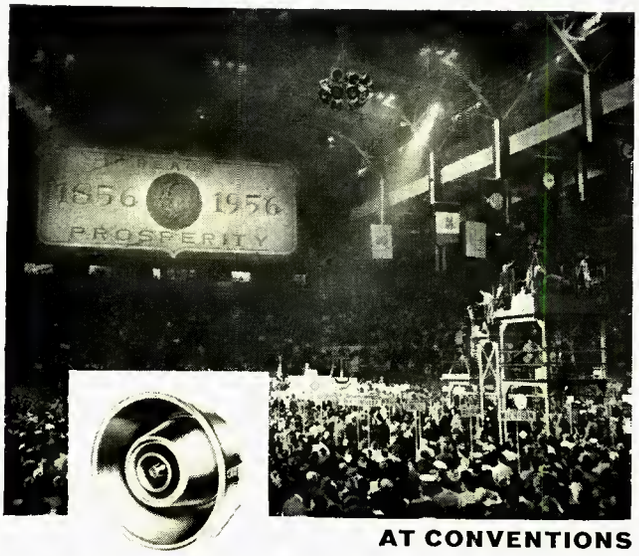
That is the way the ads might possibly read if the audio industry used some of the techniques employed by the highly developed mail-order field. For you save about $12.50 over the price of a factory-assembled KT-16, and about $9.50 on the KT-12,

(*continued on page 38*)

Fig. 2 (below). Schematic of microphone and its associated preamplifier. Fig. 3 (right). Schematic of power supply.

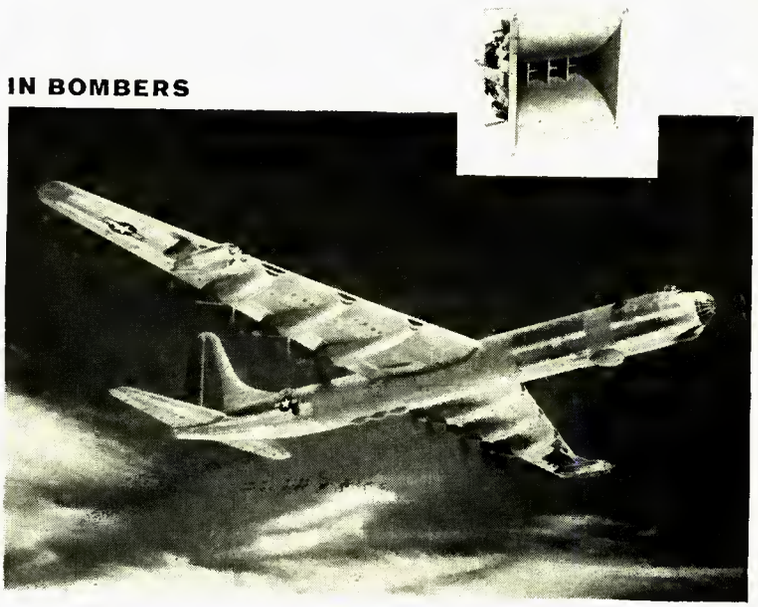






AT CONVENTIONS

IN BOMBERS



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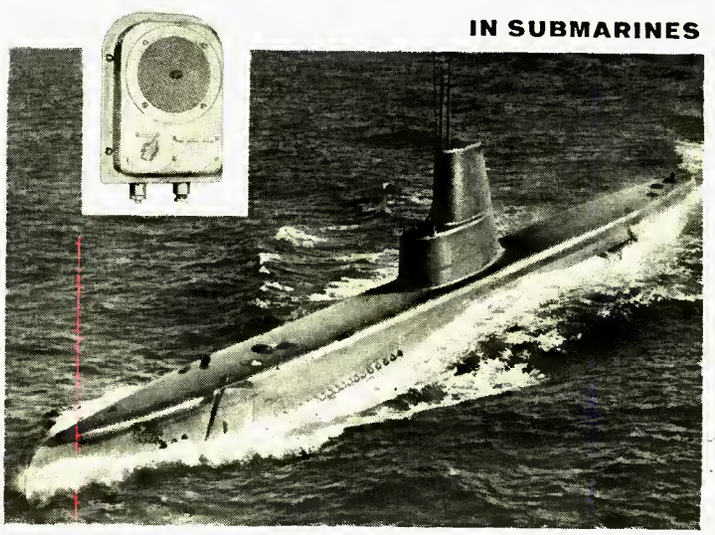

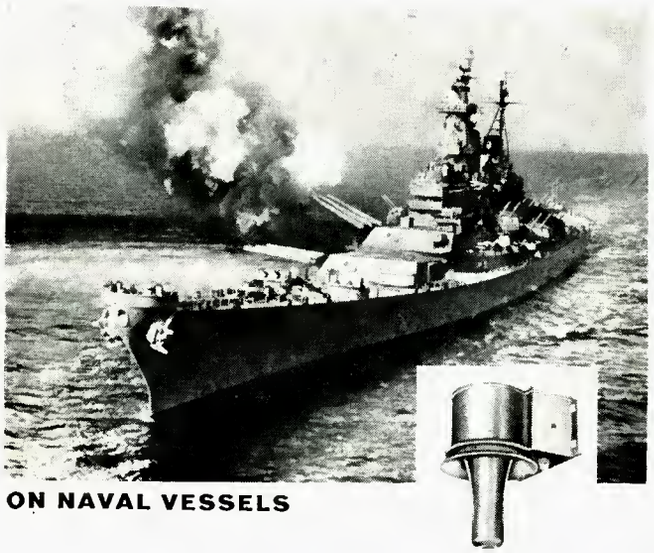

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. . . it means that just "know-how" and mere claims count very little in the *making* of quality speakers. University achievements speak for themselves.

. . . it means that the high precision techniques and specialized engineering skill acquired in meeting the exacting requirements of military and industrial reproducers are applied to the design and production of high-fidelity speakers.

. . . it means that University's meticulous system of quality control guarantees that all speakers of a given type be identical in every minute detail. A speaker is rejected at the slightest variation from rigid specifications.

. . . it means that the immense resources of the University organization make it possible to offer the highest quality speaker possessing unique and exclusive University features . . . at the lowest possible price.

. . . more than all this, it means that the integrity of University, into which the U.S. government and the greatest industrial names have put their confidence, is your guarantee of a superior product.

Yes, University sounds better, because it *is* better.

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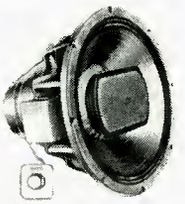
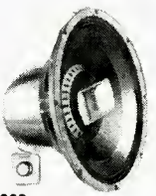
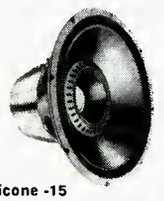
These self-contained units are just a few of a very complete selection of quality wide-range and thru-axial speakers and components to meet every size and budget requirement



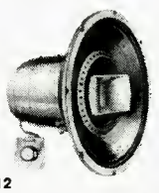
Model 315
A 15" 3-way Super-Diffaxial speaker. Employs the deluxe multi-sectional "Diffusicone" element and 6½ lbs. of Alnico 5 magnet. Response to beyond audibility. Exceptional power capacity of 50 watts. 8-16 ohms. **$132.00 User net.**



Model 6303
A 15" 3-way Diffaxial speaker. Employs the deluxe multi-sectional "Diffusicone" element and extra heavy 2 lbs. of Alnico 5 Gold Dot magnet. Response to beyond audibility. 30 watt power handling capacity. 8-16 ohms. **$80.10 User net.**



Diffusicone -15
A 15" 2-way Diffaxial speaker. Employs the deluxe multi-sectional "Diffusicone" element and heavy 24 oz. all-Alnico 5 Magnet. 30 watt power handling capacity. 8-16 ohms. **$45.00 User net.**



Model 312
A 12" 3-way Super-Diffaxial speaker. Employs deluxe multi-sectional "Diffusicone" element and extra heavy woofer Alnico 5 Gold Dot magnet. Handles 25 watts, 8-16 ohms. **$64.50 User net.**

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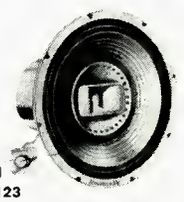

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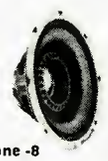

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Equipment Report

(*from page 35*)

the two kit arms recently introduced by Audak Company. The difference between them is in the length, as would be expected, causing the difference in the earnings while you assemble your own, since it takes the same time to assemble either one, and it shouldn't take anyone more than about eight minutes to put it together.

Above and beyond the fact that you are earning these fabulous figures while you assemble one of the new Audax arms, you end up with a very satisfactory unit that will accommodate practically any pickup, and which provides a number of attractive features.

Figure 4 shows the finished arm, with the head which carries the cartridge. When used with the Audax pickups the head is not used, but the cartridge itself mounts on the end of the arm in its own fitting. *Figure* 5 shows the various elements which make up the arm, and *Fig.* 6 is a "closeup" of the head end. Referring to *Fig.* 5, *A* is the preformed arm, which is built with two cross sections—the larger at the base end and the smaller toward the head. If the arm were to have the same cross section throughout it would be likely to resonate, while under the same conditions an arm with different cross sections will not. *M* is the compass-pivoted base structure, which consists of the fixed mounting base and the rotating section. This is factory assembled, which permits a careful check of the bearing quality. Two pivot screws are shown at *D*, and these are covered, as well as locked in proper adjustment, by the nuts *P*. *B* is the counterbalance weight, which is held in place by the screw *C*, which threads into a thumbnut *Q* to permit easy adjustment of the stylus force. A double-ended pointer is fitted under the thumbnut to indicate the position of the counterweight so that settings may be repeated easily, it being suggested that the proper setting point be marked in pencil on the cartridge shell so that if the user changes cartridges occasionally he can reset the stylus force without the need of actually making measurements.

The shielded cable is already made up with its tiny "cotter-key" plugs and a ground-lead lug on the end that goes to the head of the arm, and two felt blocks *F* —which hold the lead and also tend to damp any possible resonance in the arm—stick in place because of an adhesive coating on one side. The finger lift is held in place by the screw that holds the ground lead, and the screwhead is so shaped as to engage the arm rest.

Fig. 4. Audax KT pickup arm in completed form. This model is identical, when assembled by the user, with the factory-built models.

The head is designed to accommodate cartridges with the standard spacing of $\frac{7}{16}$ in. from the mounting holes to the stylus tip, and the arms should be mounted with the arm pivot $11\frac{5}{16}$ in. from the turntable center for the KT-16, and $8\frac{3}{4}$ in. for the KT-12. This dimension must be held quite accurately to ensure minimum tracking error.

In actual practice, the physical act of mounting a pickup arm entails the application of more care than would seem reasonable. But it must be remembered that the user has to measure from a turntable center pin which does not have a center marked on it to a spot on the motor board, and then he must mount a base over the selected spot with the center of the pivot directly over it. One method would be to take a compass and scribe a circle on the motor board with a diameter equal to that of the base, and then to mount the base directly in the circle. Those arms which mount in a single hole are somewhat simpler to mount, but a measurement must still be made from the center of the turntable pin, and then the hole must be centered around the mark.

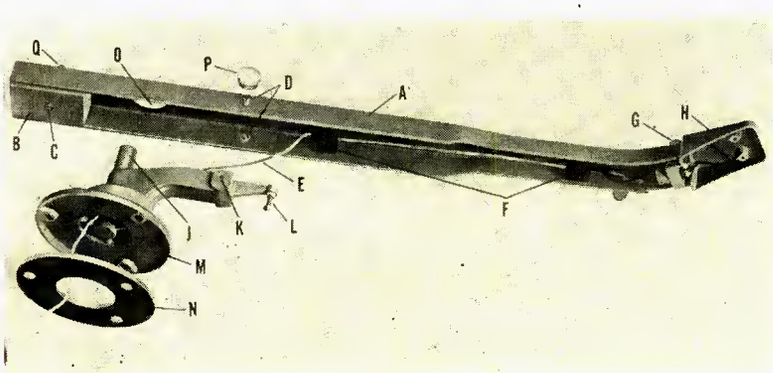
This is only intended to bring out the fact that there is one correct place for an arm to be mounted and that should be held to within less than $\frac{1}{32}$ in. to ensure minimum tracking error. To simplify the mounting of the Audax arm, a new method has been used.

A small cardboard gauge tube is furnished with the kit. When placed on the turntable center pin, which it fits firmly, it is the same height from the turntable surface as the top of the pivot bearing, shown as *J* on *Fig.* 5. Instructions suggest that a ruler be placed on top of the tube and "*J*" and the arm raised or lowered by means of the spacer washers provided so that the ruler is parallel with the turntable surface. Then the arm base may be located readily by measuring from the center of the gauge tube to the center of "*J*," and the holes marked for the three mounting screws.

The counterbalance will provide a stylus-force range from 0 to 15 grams with a typical cartridge (most of which are in the vicinity of 15 grams). This is a sufficiently great range for any normal requirement. The indicating scale is in arbitrary units, being calibrated in twenty divisions and marked from 1 to 5 on one side, and from 6 to 10 on the other. The two sides are offset by half a division, which permits the user to set the counterweight to a given line, rather than to have to estimate the centering between two divisions.

In use, the arm is extremely free on both vertical and horizontal pivots, and with modern pickups its resonance is well below 20 cps. The finger lift is large enough to allow a good hold so as to avoid damage to the stylus, and the head gives full vision of the stylus to simplify cueing.

C-20



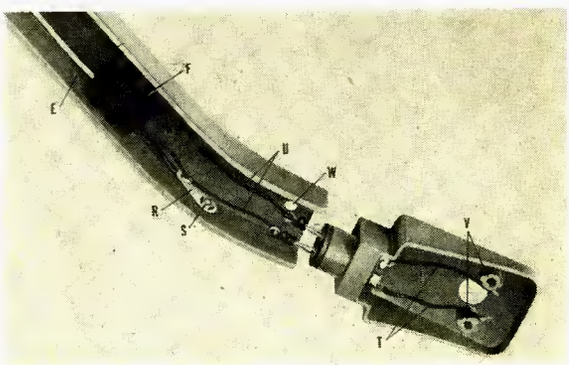


Fig. 5 (left). Constructional details of the Audax arm. Following the instructions carefully will enable anyone to assemble it in less than ten minutes. Fig. 6 (right). Details of the head assembly.

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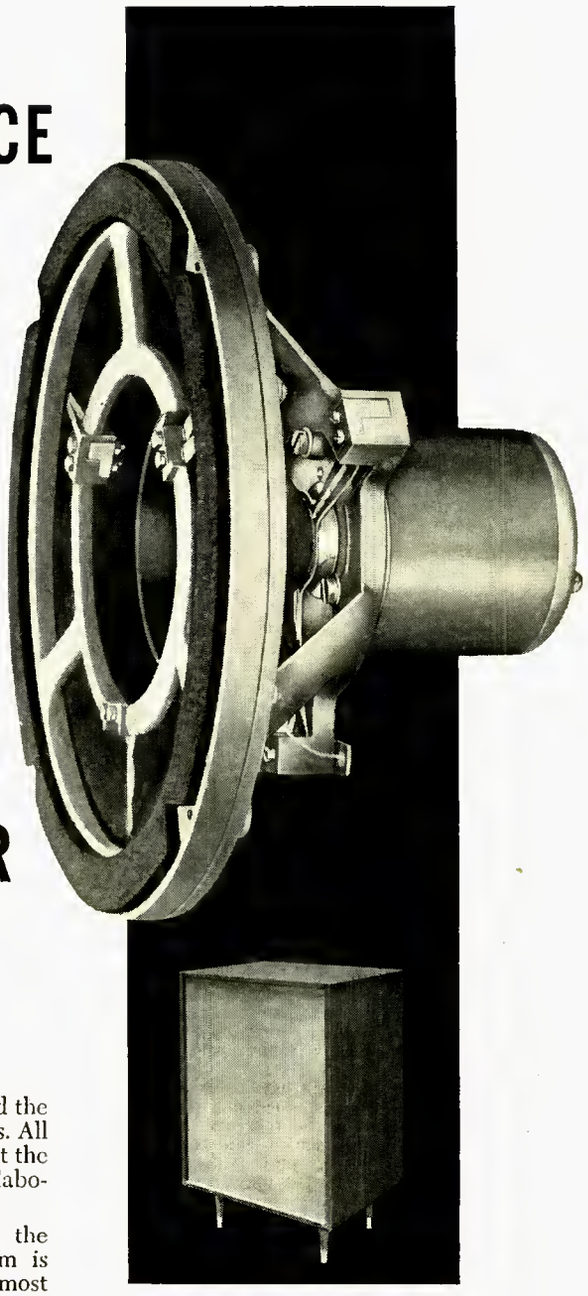

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EDWARD TATNALL CANBY*

CLASSICS

Chopin Recital. Philippe Entremont, pf. **Epic LC 3316**

Judging by the similar covers—rows and rows of candid close-up shots of the young pianists in the midst of performance—Columbia and Epic are running this young artist and another, Glen Gould, in the same league. I don't have this one's age on me, but it might be 18, might be 20.

A terrific pianist—for his age. And a product of his age, decidedly. These are the honest attributes one can ascribe to Mr. Entremont, and who would want more. In our day of the adoration of supermen we somehow get the idea that a genius of a boy can act like a wise, fully developed man, as though experience could be replaced by sheer innate intuition. Maybe, maybe. But most young geniuses act their age, and rightly. Not many of us are superhuman, yet it's amazing how good a man can be and still be human!

All of which is to say, philosophically, that Philippe Entremont is a pianist to listen to with pleasure, though almost any knowing ear, I think, could spot him as a young, rather than an elderly pianist.

His ear is excellent, he hears harmonies as many another wizard his age does not. He understands the larger outlines, too, and he knows which parts of the music can bear emphasis, which need to be played down. (Some new pianists don't.) He plays with today's sparkling lightness and intensity, high-powered but not massive.

On the other hand, he has much to learn about the subtleties of phrasing, notably in the more rapid passages. He's in a hurry to get places on the keyboard and he neglects, in comparison to the masters, the shaping of the little notes on the way. In common with many younger pianists, too, he is casual about tone quality and sometimes he bangs. That seems to be one of the consequences of the jazz age. The poetry of piano touch is no more! (It used to be, just the opposite, rather a bore to those who couldn't follow the enormous subtleties of touch that were so assiduously taught by those who knew.)

Altogether a pleasant record and some day, if you buy it, you may say, "Ah, but you should have heard him when he was young! Now just wait 'til I get out my old records. . . ." Never can tell.

Brahms: Cello Sonatas #1, Op. 38; #2, Op. 99. Antonio Janigro, Paul Badura-Skoda. **Westminster XWN 18234**

Seems to be a question of microphoning here and just possibly a horse-changing in mid-stream, or so my ear says. The first movement of the earlier opus 38 is miked with gorgeous cello sound but with the piano distant, as an accompaniment—very, very wrong for any Brahms sonata where the piano is involved. Old Brahms was a pianist and a piano-lover; his sonatas of this type are truly a collaboration with, maybe, the piano a bit the richer of the two vehicles.

But as these players tore into the last movement I realized that the piano had crept up on us. Now it was closer, louder and indeed beautifully balanced! Miking? On the other side throughout, balance is excellent. Well . . . it might be my imagination; possibly Badura-Skoda just played modestly at first. Try guessing for yourself.

These are superb sonatas, the earlier one fresh and simple and lyric, the later a rich, thick, intense Brahms piece. They are, for me, the only real cello sonatas ever written! By this I mean that in these works the cello "belongs," blends with, cooperates with the piano in a positively orchestral way. There are superb colors, rhythms, the cello sings high and plays a marvelous bass line too. Those who are cello specialists may have other favorites, but most listeners who have felt that cello music somehow all sounds the same will quickly find how very special these works are. (Brahms' Clarinet music—Sonatas, Quintet—belong in a similar category in its idiomatic writing for the instrumental combination.)

There are other recordings of these cello sonatas, among which probably London's with Fournier and Backhaus is the toughest competition. I'd put the present disc up against that one any day, though there are differences in the approach. Janigro and Badura-Skoda are wonderfully musical, play a bit slowly and with lyricism and a characteristic Austrian softness. I like 'em.

Bach: Complete Organ Works, vol. 4: Toccata and Fugue in D mi., F; Passacaglia and Fugue in C mi.; Toccata, Adagio and Fugue in C. Carl Weinrich. **Westminster XWN 18260**

Fourth volume in a series that will run to 22 discs, this record features a brace of relatively familiar pieces, including the Big Two, the D minor Toccata and the Passacaglia. Spendthrift, I'd call it—the later discs will have to get along on the unfamiliar fare. A good reason for the choice here is that these are all youthful works and show a very clear kinship, as is nicely described in the notes by Mr. Geiringer.

I trust I'm not going to say it 22 times, but I'll have to say it again—Weinrich is a strong, cold, efficient organist whose playing miraculously manages to avoid every bit of warmth and humanity it can. How do you play "humanly" on an organ? Easier done than described! How does one speak in a human way? A matter, of infinitesimal but significant bits of relaxation, of microscopic change of pace, inflection, with here and there a trace of a smile, a softening. . . . Sounds silly, but that's the sort of thing one does on the keyboard too, and I don't find it here.

Can't help think of the old phrase, the perfect crime—Weinrich is the arch-detective, I guess, who has the perfect solution—and of Robert Browning's phrase, the glory of the imperfect. It's not that I object to perfection in any performance—far from it; we all strive for that. But where old Schweitzer plays his Bach organ music with, shall I say, more nobility than mobility, Weinrich plays his as though the whole were a neat problem in precision gymnastics.

Which isn't to suggest a lack of force in these recordings. The man is a potent organist and his registrations are often wonderful to hear, full of clarity and contrast. But after awhile I get bored, then just plain annoyed at the dogmatic inflexibility, so strong in itself that it makes a major performer out of him.

Westminster's ultra-close miking seems to me to aid and abet all this, emphasizing the sharp, staccato technique, the dry, brittle quality of the playing. And the upper works are so potently realistic that the pedal, the very foundation of the music, suffers from relative eclipse. Surely, this is the ultimate reaction to the old-fashioned organ sound, all blur, pedal and fuzzy grandeur!

(Note: as a close-up recording this will sound best when played into a big, live listening space. Worth trying.)

The Renaissance Chorus. (Motets by Isaac, Des Pres, Palestrina, etc.) Harold Brown. **Esoteric ES 546**

The first side of this remarkable choral disc is given over to a series of related motets by an old but excellent composer, Heinrich Isaac, contemporary with the better known Josquin Des Pres—the latter one of the big men in all Western music. Isaac wrote in the early Sixteenth century; the other music on the record includes assorted composers from that time into the early Seventeenth.

The singers are superb. They are young people from the High School of Music and Art in New York, chosen for their marvellously blended "flat" voices (i.e., without wobble and wow) and, of course, for their musical sense and ability to learn and sing this old music.

Youth, ah youth! Such effortless re-creation of an art so far distant from us you cannot imagine. They take to it like ducks to water. Such beautifully long-phrased, sure-pitched performance I've scarcely ever heard. Hard to believe they are just our own city kids.

The music won't be like anything you've heard—not a bit like Fred Waring and even less like the local church choir you hear on Sundays. An unfamiliar kind of music and a tonal quality that isn't quite a children's adult chorus either. Teen age. If you have any sort of yen for the unusual, if you want a novel and intense new musical experience (always assuming you have never heard this sort of thing before), I recommend Heinrich Isaac & Co. as your next sensation-of-the-month.

FOR ORCHESTRA

"Debussy" Images for Orchestra (Gigues, Rondes de Printemps, Iberia). Amsterdam Concertgebouw, Van Beinum. **Epic LC 3147**

I missed getting to this last year and hereby resurrect it as worth consideration—all three of the extensive orchestral works of this series, played, as they seldom are in the concert hall, one after the other. "Iberia" is ordinarily heard by itself (it has its own

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

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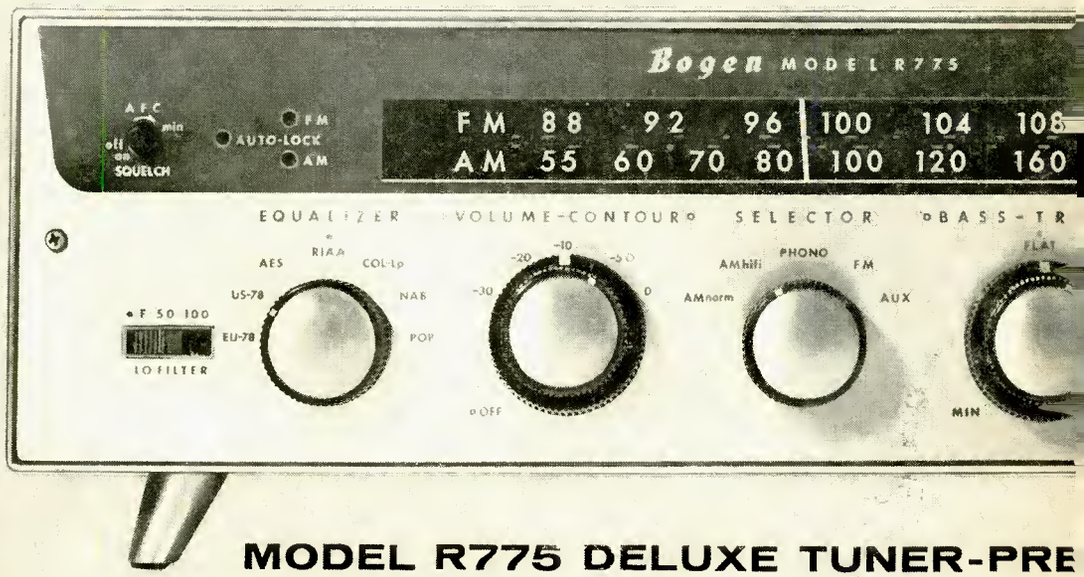

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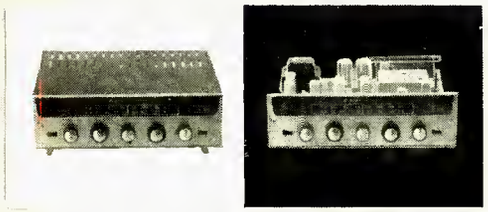

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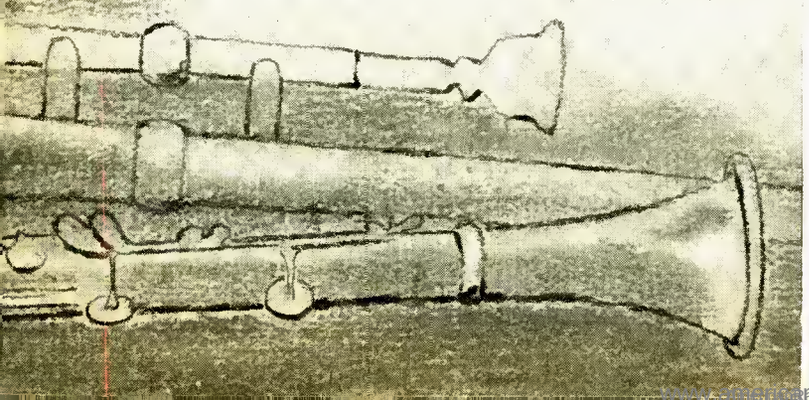

what the 'sound men' say...

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three movements) but it takes on an interesting new contrast, as intended by Debussy, when placed next to the other two, the first based on an Irish or Scotch tune ("The Keel Row"), the second on a French one. Three pieces, three nationalists, and it all is very much Debussy, especially the very un-Celtic treatment of "The Keel Row"!

Competition comes from London's version with Ansermet and his Swiss. (Odd that this French music seems to be recorded by non-French performers.) The Amsterdam Orchestra, here, displays its fabulous accuracy and exactitude as well as the crystal-clear and transparent miking of the Phillips Co. (Try the first section of "Iberia," note the precision of the loud string chords. Amazing.) But as to interpretation, it seems to me that these Dutchmen miss the sensuous luxury of the music; they don't feel it lushly enough. A commonsense, skillful playing but lacking a wee bit in the Gallic soulfulness it ought to have.

Tchaikowsky: Symphony #4. Leningrad Philharmonic, Kurt Sanderling.
Decca DL 9883

RECORDED IN VIENNA, says the label on this item, somewhat unnecessarily since some recent Russian-made tapes have begun to challenge those of the West in quality. This one is up to present top-quality standards, as a matter of course; the Leningrad orchestra must have been visiting in Austria.

I was particularly interested to hear a Russian presentation of Tchaikowsky to compare with the many European and American versions. This one is as might be anticipated by those who have followed Russian music in late years. A thoroughly expert, well-played performance throughout and, paradoxically, a sweet, soft, Romantic version, stressing the lyrical aspects of this piece, playing down the violent, hard music in it.

Odd, isn't it. Here in the West and in America particularly, we tend to play Tchaikowsky with all the 20th century steeliness we can muster; we blow the tragedy in him up to terrifying proportions, not sentimentally any more but relentlessly and, so to speak, without quarter. Especially in this tough Fourth Symphony. Yet in the land of the tough, hard no-quarter governmental system, Tchaikowsky is played with all the softness and human sentiment that the players can dig out of him. You can hear it, with your own ears—these men almost weep as they play!

My own private guess is that, maybe, it's a kind of musical wishful thinking. This is what the Russians find in Tchaikowsky for themselves. And, just possibly, that is what Tchaikowsky himself put into the music. In any case, for my taste this Fourth is a welcome change from too much powerhouse hysteria and I like it. Well worth a try.

Tchaikowsky: Symphony #1 ("Winter Dreams"). Bolshoi Symphony, Nicolai Golovanov. **Westminster XWN 18224**

A lively performance of this tuneful and long-winded First Symphony, which doesn't have to deal with the question of over-tension because it scarcely comes up in this early Tchaikowsky. A few slight hints of out-of-tune playing are all that mar the musical end of this recording; the music rolls along merrily enough.

The "hi-fi" aspect, alas, is low. Distant sound, minus audible highs of any significance (the cymbals have that faint, far-away sound that they used to have in many an old 78). Will not spoil the music, by any means, for those who are interested, but don't look for sound sensations on this disc

Beethoven: Symphony #7. Philharmonia Orchestra, Klemperer. **Angel 35330**

Wow, is this a superb series! Here the Seventh is added to the superb *Eroica*, number Three, released recently. I haven't heard a sweet, mighty, rip-roaring, plastic, beautiful Seventh like this for years, it seems.

In this day of tension and leader-worship we tend to make nervous monstrosities out of these great symphonies, straining them into our own high-tension mold, taking them hard, fast, loud and taut. We forget that even

Beethoven was human,' that he composed in a time when great heroes were still warm-blooded! Klemperer, who in his latter days is emerging as our finest Beethoven interpreter, brings back the warmth into Beethoven—and what a difference it makes. The Symphony is the bigger because of the humanity in it, the climaxes the more potent after the sweetness.

No, this isn't the ultimate interpretation or the one-and-only; there can be no such. But I find it tremendously exciting and full of good ideas and good sound.

Mozart: Symphony #39 in E Flat; Clarinet Concerto. Bernard Walton, cl., Philharmonia Orch., von Karajan.
Angel 35323

I began this Mozart Symphony, taken from a waiting pile of them, without looking too carefully at the cover; I didn't know who it was that did the playing. (This is one way, I've found, to be really impartial!) After a rather solemn opening slow section, a bit pretentious in the playing, the following fast section seemed for my ear tense, in too much of a hurry. Somebody was being ambitious here, as a conductor, trying to play for posterity.

It was von Karajan, who is by nature a fine Mozart conductor, out of Austria, but also one of the most ambitious of the rising younger lessers today and on his way towards top rank. My feeling is that ambition got ahead of music in this performance. It isn't relaxed, it doesn't flow with effortless control, as it should. The tempi are fast and strained throughout. (Another conductor might do the music just as fast yet convey the proper sense of ease and control.)

For reasons inscrutable, the Clarinet Concerto is more relaxed and easy-going under von Karajan; possibly because in this music the conductor is in a less exposed position. As for the soloist, he plays his clarinet—never exactly a flamboyant instrument—in a commendably workmanlike fashion. Other clarinetists have put more personality and flair into their versions, but whether that is desirable or no is a matter of taste.

Delibes: Coppelia. Orch. of the Royal Opera House, Covent Garden, Irving.
Delibes: Sylvia. Philharmonia Orch., Irving. **RCA Victor LM 1025, 2036**

If you enjoy this sort of delicious and tuneful French ballet music, these two discs should make for the best sort of easy listening. Out of RCA's English associated operations, the recordings are smooth and mellow, the playing lively, warm and unpretentious. No objectionable super-hi-fi stunting but plenty of good, sensible quality sound. The ballets are played semi-complete, the majority of the original numbers included. The "Sylvia" record, with the Philharmonia, is a shade brighter and more immediate in sound quality; otherwise the two are more or less alike.

VARIETY

Leibert Takes Richmond. ("Mighty Wurlitzer" organ.) Dick Leibert, Byrd Theatre Organ, Richmond.
Westminster XWN 18245

Leon Berry at the GIANT Wurlitzer. (Hub Rink, Chicago.) Vol. 1.
Audio Fidelity AFLP 1828

The Wurlitzers are booming, and I like 'em in an odd way. I'll have to tread carefully in this touchy area, slightly outside my home range, but at least I can bring these to your notice—if you like the stuff.

Both, natch, are hi-fi, meaning loud, brazen, recorded with ultra-sharp close-up technique for maximum "fi." The GIANT disc is called a Special Hi-Fi Show Edition, which ought to place it pretty well in the scheme of things.

I'll take Leibert's any day, though maybe for my own reasons which are—believe it or not—musical. My ear tells me, for what it's worth, that Leibert is a good musician (and some of these theatre organ men are really tremendous musicians). I hear Mr. Berry as strictly so-so, musically. He just plays, and I just get bored, hi-fi or no.

AUDIO ETC.

Edward Tatnall Canby

MORE ABOUT STEREO

Playback

The pay-off on this particular matter came at the end. As I said, we took down the last concert on stereo tape, complete. After the final encore we quickly reeled back and, before most people had even stretched themselves, turned on the last piece, playing it stereo exactly as it had been recorded.

Now mind you, the sound that came out was absolutely identical with that which we had heard a few moments before, *in every respect* except perhaps for the loss of a bit of damping from the people who had left. There we were, reeled back in time and rehearing exactly what we had just heard, in almost exactly the same circumstances.

What happened? Everybody began to talk at once. A number of people sat down to listen again, but this time they weren't silent. They talked of this and that, and especially of the music. A few were standing up, coats over arms, looking rapt. Others were pestering Jan Syrjala, the engineer, with hi-fi questions, ignoring the music altogether. Still others just got up, put their coats on and left, as though there were no music playing at all. The concert, definitely, was "over," the listening atmosphere broken.

And yet there was the same, identical sound coming from the speakers, the sound which five minutes before had held these people utterly silent and reverent.

Now you don't need to suggest that this was simply because they didn't want to hear the music twice. Yes, the concert was long and to a lot of people it all sounded pretty much alike. (Why *do* people go to concerts when they can't tell a musical head from a tail?) Some people just wanted to get out, and they did.

But some didn't—and stayed on to listen again, with interest. Nevertheless, this time they talked. They moved, they stretched as they listened. The reason? This was no longer actual performance. This was reproduction after the fact. Identical in sound, but utterly different in listening psychology.

The difference was neatly dramatized, isolated, because in this case the two sounds were indeed identical and both were reproduced; there was no pitting of "live" music against reproduced music. This was reproduced music simultaneous with the performance, against the same reproduction, from a recording and after the fact.

And that one difference was enough to change the entire listening attitude of the people who were there, in a couple of seconds.

Conclusions

First, then, our experiment unintentionally pointed out the very profound difference that people will feel between the experience of a "live" reproduction—heard as it is actually happening at the mikes—and a recorded one, heard later. Short of fooling people into thinking that a recording is actually happening when it isn't, there's no way we can sidestep this important effect. And look at the things it accounts for.

On the one hand—with visual aid—it accounts for the enormous appeal of the live concert, where musicians actually play for you before your eyes and ears. As we see, the effect can even hold over into a reproduced version of the same, minus the visual portion and the actual presence.

On the other hand, this difference has greatly to do with the now tremendous effectiveness of recorded sound, in its own special ways. The "rules" for recorded listening are utterly unlike those for "live" listening; people react differently, listen differently, expect different things. There is really no use trying to apply the same ideas to both. Records are records, live music (including that which is reproduced, simultaneously) is something else again.

Just ask the recording technicians who try to judge "actual" performances through the loudspeaker, as they are being recorded. Almost impossible; you must listen to the playback before you can get your bearings. The same sound—but the effect is already different.

Ask the tape editors. Mistakes are one thing in an actual performance and altogether something else in a recording. Our reaction to them—that of all of us—is very different. And so recorded music has rightly come to have its own standards for mistakes and the like. The whole art of tape editing has grown up around the difference. Musicians may complain about editing, but they should think twice in these terms before asking us to "record" actual performances. Once recorded *they are no longer performances,* but recordings.

Ask the recording people who have taken down music festivals—live concerts before audiences. The impact of these concerts as heard *at the time* is often distressingly and

disastrously unlike the impact of the same sound heard in recording, months later and perhaps thousands of miles away. Beware of the music festival, you recording impressarios!

TV. Off the track, but you may think a bit about the prevalent use of filmed material in the TV medium and the current controversies on the subject. Certainly, it's easier to do the show ahead on film, correct the mistakes, get the timing right, pull in outdoor scenes from any and everywhere . . . but it isn't *happening*, and this you cannot dodge. "Live" TV, with all its faults, is as different as night from day and every audience knows it.

I'm intrigued to see how many TV ads now claim "live" or "in person" appearances, as a come-on. True, many people think that filmed stuff is, indeed, actually happening as they watch; but most people now know better. And they won't be satisfied unless they can be sure that it's real, and it's happening right then. They eat up the mistakes, the slips, the fumbles, because these prove that the thing is "unrehearsed"—or, anyhow, unedited!

Second conclusion, to get back to stereo, is this.

I honestly do not think that we could have established the "concert" feeling as we did via a single-channel system, with the same equipment. The stereo effect, outwardly very slight and scarcely noticeable on brief listening, was nevertheless a vital thing in making these people *feel* that they were at an actual concert in the process of happening. We could have held them a while, with one-channel sound, but I am certain that the monaural mixing of the violin and piano, with no distinction at all between them in front of us, would have falsified the musical effect to the point where the deficiencies of the listening situation began to make themselves painful.

With stereo to help the imagination, the audience was able to forget the unpleasant room liveness, the reflections from the mirrors along one wall, the hard, low ceiling. They "took" all that as they never would have with less to aid their musical imagination. That is what good stereo can do for good music—command attention, aid the intelligence, help the ear to create realism. Given the right situation it is certainly worth it, in concert or in the home.

Selective Control

An extra word about our technical arrangement. We were able to achieve a quite remarkable selective control over our violin and piano sounds via a simple use of tone controls. One channel, with mike close to the violin, was fed through its McIntosh preamp with the high control boosted up about 25 degrees—two "points" on the dial—and the bass rolled off a similar amount. This "violin" channel picked up the piano at some distance and with inherently less bass; the tone control setting favored the violin's own sound and further reduced the already weakish fundamental piano tones in that channel.

The other channel, the "piano" channel with its mike close to the piano's half-opened tail end picked up much more bass, and we increased this difference again by boosting the bass control on that preamp. Also the highs, since piano highs tend to be weak.

The result of this selective use of the tone controls was that we had a surprisingly delicate control of the separate instruments, in spite of the large overlap in the sound pickup. "More violin" or "more piano" could be accomplished over a remarkably wide dynamic range. With the "violin" channel playing alone, on this controlled setting, the piano was almost without bass and decidedly too faint in the ensemble. With the other channel, the "piano" channel, playing by itself, the piano boomed tremendously and the fiddle was almost drowned out.

To achieve balance, we began with the violin (left-hand) system open, then gradually brought in the piano (right-hand) until the balance was adjudged correct.

As the violinist moved forward and back we were able to readjust the two channels to keep him musically in balance. We even made changes dictated by musical differences between one piece and another. When at one point Mr. Szigeti, listening to the playback, muttered "the piano is too loud there!" I hastily turned down the right-hand channel a bit, and he beamed. To this moment I don't know whether the pianist himself played too loud, or whether our reproduction was out of balance. Doesn't matter—we could fix it and did.

* * * *

Try it yourself. This sort of overflow concert arrangement is worth a trial, decidedly, in many situations. Best for medium-sized affairs where the overflow audience isn't too big for the stereo listening space—say, not over sixty or seventy people at most. Thirty or forty is ideal. (A smaller group may be too informal and the concert atmosphere will break down, talking begin, and the whole thing fall to pieces.)

If you give it a whirl, in your local situation, be sure to make capital of the stereo aspect, if only to remove the old and persistent stigma that still attaches itself to loudspeaker remote-pickup arrangements. Make this a hi-fi presentation. Stereo hi-fi. Then you'll get plenty of audience.

Noted in passing . . .

1. $\sqrt{0}$

BEFORE NOTING some of the items of audio interest I have on hand, I must get some bees out of my bonnet in respect to the English language, as we use it now.

My mail is full of publicity, like yours, and I scan it day by day in order to find out what is going on. What gets me down, though, is the job of translating that we must do in order to find out as best we can what it all really means.

It's not that it doesn't mean what it says. It doesn't say anything, and this quite deliberately, in various positive ways. The trick in writing, now, is to suggest as much as possible while saying as little. And does that really leave the field of communication wide-open! Our fine writers are getting so extremely ingenious at suggesting All while saying Nothing that pretty soon we're going to lose our very ability to communicate intelligibly with one another.

After all, we have to have some agreement, somewhere along the line, as to what means what. Or to put it in a more familiar way, we must have standards.

With the very best of intentions (i.e., greater sales and profits), our writers are now deliberately breaking down the sacred English language into sheer hunks of unsubstantiated wishfulness. Already we can scarcely communicate among ourselves except in extreme and amazing super-superlatives. The ordinary words are all stone dead and void of meaning.

We're getting to be super-geniuses at doubletalk that leaves the imagination utterly free to fill in the blanks. We twist and turn and wangle, until the daring mind that tries to untangle the stuff goes blank. Most don't bother; they just mentally swallow it whole, sense or no sense. "*Now you can have your dream car!,*" one inspired writer tells me. How nice of him to let me know . . . but unfortunately he is assuming the unwarrantable, that his company's car *is* my dream car. He's telling me so, or implying it. But he's wrong, so very wrong, and he's not going to push *me* around by any such sheer suggestion. I'll resist to the death.

But what a struggle it is. And what a job to do all this necessary translating. I see a triumphant statement that so-and-so amplifier is now "*better than ever.*" Humm. Translation: "They've continued the old model with no important changes." A good model, too.

"*Now you can bring the concert hall right into your own living room.*" Ah yes, I've heard that one before, and have done my bit to suggest that this is strictly impossible; but the ads sail merrily along and will as long as the idea can be safely suggested—to the imagination. "*Matchless quality . . . peerless performance. . . .*" I apply a large grain of salt, in my translation, to the idea that nobody, but nobody, can *match* this quality, that this performance in fact has no *peer*—no equal. Maybe so, maybe not; the fine words by themselves don't convince me *factually* more than 1 per cent, even though they might, of course, be actually true. Just words, and as such they don't convey any positive information any more. It's not the product that's at fault; it's the language.

Sometimes I translate between the lines, where even the vaguest writer has somehow failed to keep the wrong suggestion from entering my little head. Too bad. "*New simplicity of speaker connections.*" (Ha! So they've dropped the damping control.) "*New economy of performance*" Ohoh. That might suggest all sorts of things. Could be more output power at the same price. Or *less* output power (and so less power consumption). Or maybe they took off a few gadgets and lowered the price. The words tell me nothing; they just suggest.

I've made up these quotes out of my head and they don't actually represent anybody's specific product. But you've seen the likes of them, throughout audio (and everything else).

It happens everywhere. Here's a real quote: "*Each record . . . is a brand-new, pure vinyl, 12 in. 33-1/3 rpm long-play disc recorded on the latest high-fidelity equipment with the full range of sound the human ear can hear.*" You don't say! Sounds really terrific, especially at the low, low price. But when you stop to think, you'll note that this fine statement applies to virtually every new record now being made, including plenty that are full of distortion, since even the latest hi-fi equipment can be (and is) operated by plumbers on occasion. Just one more of the tricky twists—make a quite factual statement that, however, implies all sorts of marvels while actually saying nothing of any importance.

Then there's sheer linguistic inflation. "*You may have the most glorious works of*

Bach, Haydn, Beethoven, Brahms . . . and music's other immortals—superbly performed by the most distinguished conductors, soloists, and orchestras Europe has to offer, often in the very birthplace of this great music.''

Ho hum. My first translating job here is quite routine—just omit all the adjectives. They mean precisely nothing, serving merely to suggest another dream world. I'm not dreaming right now, thank you. Translation, roughly: ''You'll be able to buy the works of Bach, Beethoven . . . and other composers, performed by European conductors, soloists and orchestras, recorded often, as it happens, in the very countries where the music was originally composed.'' Not bad, and for my ear, just as convincing. And as to the ''birthplace'' biz., I can read between those lines: Beethoven is recorded in Austria simply because it's cheap to record him there right now. Fine, and quite legitimate. But, natch, our inflated language couldn't say that in plain, ordinary terms! Gotta dress it up until it's sufficiently meaningless to suggest something full of glamor.

Can't stop without mentioning what to me is the pay-off in this business, the Dangling Infinity. That's my favorite. I'll give you two. First, *''More women use Floosey's Instant Milk.''* (Well, that's not the title, but it'll do.) Do they really? Just ''more women''—not more women *than* something? Not even more women than men? You're left to fill in the missing linguistic link with your own suggestion as to what product *less* women use, if any! You'll never know for a fact. And so, you see, the statement is quite safely devoid of meaning, yet full of infinite suggestion. Lovely.

Now I was tempted to call this missing factor, that leaves so many fine statements dangling in space, just plain X, but I can't. X, after all, is the unknown, as every algebra student remembers.

X, I remind you, is the unknown quantitity that we want to identify. Now Heaven forbid that anybody should identify the Dangling Infinity in one of these tricky statements. That would void their meaninglessness. And so I've come up with a better figure, the square root of zero. That ought to get the general idea over. $\sqrt{0}$.

Take this lulu, which still has me gasping. It's an innocent little public service message, only indirectly selling a product. *''Remember, clean light bulbs and reflectors give nearly double the light.''*

As yes, an eternal truth of a sort. Rub off the dirt and the light comes through. Can't quarrel with that. But look a bit closer at this lovely. The more you think about it, the dizzier it gets. I dare you to fill in the $\sqrt{0}$ on this one.

What does it mean? Well, translate: ''. . . almost double the light from dirty bulbs and reflectors.'' Right? Simple enough—so far. But if so, I ask you, just how dirty must the dirty lamps (and reflectors) be in order to fill the bill? That's simple, too, if we give an arbitrary value to ''nearly double'' or, say, 1.9×. Let's use the good old x and call x the degree of dirtiness; then y equals a clean bulb (and reflector). And so, obviously, any dirty lamp's light is equal to $y/1.9$. That's what it says.

But, to go further, this means that all dirty bulbs are equally dirty; for otherwise they couldn't all be ''nearly half'' as bright as the corresponding clean ones. And if all bulbs have exactly the same degree of dirtiness, then, as I see it, there must be some necessary moment, a sudden instant in time, when each individual bulb suddenly switches from the utterly *clean* state

(*Continued on page 64*)

Jazz and all that

CHARLES A. ROBERTSON*

George Lewis: New Orleans Stompers, Vol. 1 **Blue Note 1205**

George Lewis makes his return to the label that first presented him to the public fourteen years ago on masters cut in New Orleans by Bill Russell about the time he was doing field work with one of the earliest wire recorders developed by the Army. Then it was imperative to listen carefully so as not to lose any notes in the poor recordings. Now just as careful listening is invited by some of the best sound yet given this limpid clarinet. The early records were made in fear this music would disappear before a commercial company got around to preserving it. But the discovery of Lewis created an audience which sent him to the studios dozens of times with his own groups and those of Bunk Johnson, culminating in this date supervised by that specialist in jazz reproduction Rudy Van Gelder.

In high fidelity the biting New Orleans brass is untempered and comes out with all its roughness, but not magnified by distortion or poor surfaces. Pianist Alton Purnell sounds at times as though an upright action might suit his style better than the stiffer grand piano. The clarinet is heard in all its lyric glory as is the surging drive of the band.

Lewis has his peers as a soloist. It is when he flips in a quick phrase to fill an opening or flings a liquid line soaring above the brass in the ensembles that he is unsurpassed.

This group has been playing some of the tunes since the early 1900's and in most cases can find something to say that is new to records. Avery "Kid" Howard, trumpet, and Jim Robinson, trombone, fill out the front line. George Gueson, banjo, takes the Lonnie Johnson chorus on Savoy Blues. Alcide Pavageau, bass, and Joe Watkins, drums, put down a solid beat that has more dynamic variation than usual. Purnell sings *See See Rider* and *Heebie Jeebies,* Watkins takes *Bucket Got a Hole In It* and "Kid" Howard does the traditional *Walking With the King* and *Lord, Lord, You Sure Been Good to Me.*

Jess Stacy: Piano Solos **Brunswick 54017**
Tribute to Benny Goodman **Atlantic 1225**

The release of "The Benny Goodman Story" renewed interest in the music of the late 1930's and brought forth a covey of swing-era releases. The most pleasant result was the flushing of pianist Jess Stacy from the foothills of the Sierras and into West Coast studios for what promises to be the enduring contributions of this revival.

The Brunswick is the reengraving of a ten-incher of several years ago, in line with the general policy of discontinuing this size, with the addition of four original solos. George Van Eps provides the rare treat of an unamplified guitar in the eight older titles. The sound is still equal to that of many of today's recordings.

On Atlantic, the 52-year-old Stacy lends his support to a front line which spots Ziggy Elman in numbers associated with Goodman. It is the veteran trumpet man's best recorded work, a heated performance in fine sound. As one of the several trio selections, Jess includes an original, the haunting *Blues for Otis Ferguson,* certainly a suitable epitaph for a jazz critic.

Though the Atlantic was available a few months before the Brunswick, for the most part it was made several years later. The sound is unexceptionable. It brings out in all realism the trademark (rim shots on the high-hat stand) of Nick Fatool, who drums in crisp rhythm on both discs.

One of the few pianists able to swing a big band, Jess could not be bothered to make the one number allotted to him in "The Benny Goodman Story." These records more than make up for that omission.

Bill Perkins: On Stage **Pacific Jazz PJ 1221**

Bill Perkins, a graduate of the Woody Herman band, joins his tenor saxophone with four other alumni: Red Mitchell, bass; Carl Fontana, trombone; Jack Nimitz, baritone and bass clarinet; Stu Williamson, trumpet and valve trombone. Bud Shank, alto, and Mel Lewis, drums, complete the octet which goes all out for big band sound and gets it with the aid of an open recording made in the Music Box Theatre, Hollywood.

The arrangements, thinking, and blowing are in the big-band vein, but the curtailed instrumentation permits a more expansive perusal of ideas. They are not for lazy listening and another change of pace in the manner of Johnny Mandel's plaintive *Just a Child* would have eased matters. Perkins, Lennie Neihaus and Bill Holman have written arrangements, two from the Basie book, cleverly designed to give a full sound to this small West Coast group.

Doc Evans: Traditional Jazz, Vol. 6 **Audiophile AP 33**

This might be classed as a Mid-West revival group, but their forthright authenticity is enough to set them apart from most present-day dixieland groups. Their's is an unperturbed genuineness, with none of the tendency to hurry tempos and play for superficial effect which began in the 1930's.

There is no one to top Doc Evans in this field on cornet today. He is a lead horn in the best tradition and has the quality of moving the band along in the ensembles. His solos are everything they should be: warm, driving and inventive. It is regrettable that none of the Chicago-style men such as Spanier, Davison, and Kaminsky have been given such a wide-range recording.

For the all-essential dynamics are fully realized in this open recording which captures everything from the awesome woof of the tuba to some of the best piano sound anywhere. It was made following a concert in the Walker Art Center in Minneapolis.

In the Jelly Roll Morton numbers, Knocky Parker restores the original piano touch with

*732 The Parkway, Mamaroneck, N. Y.

uncompressed shadings. His solos on *Black Bottom Stomp, Kansas City Stomp,* and the *Original Jelly Roll Blues* are unadulterated joys. Hal Runyan's trombone is especially effective in *Tiger Rag.* Harry Blons is a well-rounded New Orleans clarinetist, but might show more heat and intensity in the Morton pieces.

As a drummer, Red Maddock is almost unbelievable. He eschews all the obtrusions added in this department since the 1920's. Such archaism may be debatable, but here it is with all its solidity. If this is the kind of drummer Turk Murphy wants, it is easy to see why the hunt is likely to be long. The steady tuba of George Tupper sets a delectably slow tempo in *See See Rider* and Bill Peer fills out the section with a fine blues feeling on banjo.

Frankie and Johnnie, Waiting for the Robert E. Lee, Four or Five Times, and *Ballin' the Jack* are also to be heard. Evans does *Sugar Blues* in a Bixian mood as a duo with Parker.

If there is anything to be desired from this group, it would be fresh writing and original work in this genre. Perhaps next time they will expand on a blues theme. This label was the first to present a really good recording of jazz. Now other companies are giving it some of the care and attention it deserves, but have been successful mostly with small groups where balance is easier to achieve than with a big band. It would be nice to hear what Ewing Nunn could do with a full brass section.

Thad Jones: The Magnificent Thad Jones
Blue Note 1527

Every so often a new trumpet player comes along to gain a recognition that makes him the talk of jazz circles. Ruby Braff came down from Boston to win the last such acclaim. Now Detroit has sent along Thad Jones, who seems to be taking the spotlight. That both men play a clean, open horn, colored only by their own personalities, is a salutary trend and an indication of the taste of some of the younger men.

Jones is allotted uncramped solos on this date and it is a pleasure to hear him think them through. The presence of Percy Heath, bass, and Max Roach, drums, make certain he is shown to advantage. A clear Rudy Van Gelder recording brings out the delicate cymbal touches and encompasses the brassy tone of the Jones horn. Two other Detroiters—Barry Harris, piano, and Billy Mitchell, tenor—ably fill out the group.

Jones plays three choruses on *April in Paris,* the tune which first attracted attention to him in the Count Basie band. An extra treat is the almost forgotten ballad of twenty-five years ago, J. P. Murray's *If I Love Again.*

Chet Baker Sings **Pacific Jazz PJ 1222**

It is surprising that such a mild mannered individual as Chet Baker should provoke such violent reactions. But his trumpet and singing styles are either liked or disliked with no halfway measures.

One side is spent on a re-pressing of the 10-inch album of the same name made in February, 1954. The six bands on the reverse were made in July, 1956, and indicate the progress made by Baker in that time. He seems to possess a greater assurance and more certainty. Some of the best moments come when pianist and arranger Russ Freeman turns to the celeste and etches a skillful line behind the voice. There is a noticeable improvement in recording, particularly that of the piano.

British author Gerald Heard ventures a liner note casting "this remarkable young man" in the role of a non-conformist, which says more on psychological grounds than musical.

Barbara Lea with the Johnny Windhurst Quintet **Prestige 7065**

Presented here is the most encouraging girl singer in some time and it is remarkable that two years have ensued since her disc debut and this well-constructed LP. Her predominating characteristic is intelligence in manner and choice of repertoire, a quality rare in this field, and it is this that has invoked comparison with Lee Wiley who is similarly equipped. A more valuable blessing is to be a natural-born singer, one who finds it hard

to do anything wrong, such as Bessie Smith and Billie Holliday, or in show-business Judy Garland and Ethel Merman. Miss Lea comes close to combining these two attributes.

In the elapsed time, she has gained an ease of delivery, enabling her to sail into a song with the more natural verve of a Mildred Bailey. Several of the twelve songs in this offering are not heard too often: *Gee, Baby Ain't I Good to You, Where Have You Been*, and *Baltimore Oriole*. The accompanying quintet is in the best swinging tradition, and is caught in acceptable sound. Johnny Windhurst creates trumpet backgrounds that should demand his return to the studios for more of the same. The pianist is the always dependable Dick Cary.

Rodgers and Hart Gems
Pacific Jazz JWC 504

Ballads for Backgrounds
Pacific Jazz JWC 503

Two mood albums bred for the most part from previously issued sides by the West Coast youths in this company's stable. The Ballads seem to present best value as a well-rounded sampling. The tribute to Rodgers and Hart, featuring the voices of Chet Baker and Kitty White, will please their admirers, but be warned that it is the third time that Baker's version of *My Funny Valentine* has been released, which is sort of overdoing it.

The Dukes of Dixieland, Vol. 2.
Audio Fidelity AFLP 1840

Messengers picking up packages at the offices of Dauntless International are apt to be startled by the earth-shaking roar of a locomotive passing through the building. Aware that a New York Central spur is nearby, they may well look for cover on the chance that one of the usually inoffensive switch engines has run amuck or the 20th Century Limited has been misdirected.

A startled inquiry will bring the reassurance that the clicking wheels are on tape and the sound is coming from an Altec Voice of the Theatre speaker system in a rear studio. It means that the dynamic young president of Audio Fidelity is regaling a visitor with a sidelight of his trip to the High Fidelity Show at New Orleans—a sound picture of a through express passing at full clip.

The tape was made with two microphones, one for air vibrations, the other for vibrations carried along the roadbed, on the outskirts of the city. Anyone not too far removed from his youth to remember placing his ear against a rail on a hot summer day to make certain Train 8 is on time, will know that the approach can be first detected through the ground. And so it is heard at 750 10th Avenue, from the first faint rumbling and whine of the rails to the floor-trembling clatter as the cars thunder past.

Thirty-six-year-old Sidney Frey has captured in all realism another sound he likes. And that, in the shortest possible phrase, is the success story of Audio Fidelity. For enough people have bought what the head of this young company likes to keep him very busy putting more of the same on the record.

Of the eight years in the business credited to Frey, only two have been spent producing wide-range recordings. The first six were devoted to learning the ropes in the competitive export and distributing end of the industry. In fact his first venture nearly made him seek a more sane way of making a living. A plan to send religious records to Israeli flattened his bankroll by $3000.

Two years ago he had recouped to the point where he could indulge in a wish he had been harboring since his first bullfight. As Frey tells the story: "I wanted to put my love for the sport into a handsome package which would convey as much of the excitement of the arena as possible by means of sound, and provide complete notes and colored reproductions by some of the famous bullfight artists.

"I would have been happy to break even on the export trade and sales to fans. It was released in time for the Chicago High Fidelity Show and received considerable play. I found I had something that was being bought for sound alone by people who may never see a matador in action. Since then there have been two more volumes and I think each one is better than the last."

It was encouragement enough to launch a catalogue aimed at those wanting the best in fidelity. Frey has a hand in every step of production. His is a never-ending search for ideas and artists to bring to the studio and he is overjoyed when he finds something that suits him. The sessions are another thrill. All under his supervision, they have involved a good dozen trips to Mexico as well as Chicago and Los Angeles. The rest is just a lot of hard work.

By the time the tapes are ready to be made, Frey is familiar with the material and has an idea of what he needs in the way of microphone placement for best balance. Expressing his views on this controversial subject, he said: "Our records are made to be listened to in the living-room and for this a multi-mike technique seems best. As many as eight have been used to get proper balance. In most cases we are not trying for a concert-hall sound, but one to fit the acoustics of the room in which it is heard with a feeling of presence.

"Many fine recordings have been made with the concert-hall effect, some with a single microphone, and quite a few listeners think it essential to a symphony orchestra. But they hold up only around a certain volume level, usually a high setting unless the dynamics have been unsuitably compressed. And they can overextend a fair reproducing system. I want our records to deliver at low volume to fit a mood, as well as all out for sonic impact. This is achieved by getting as much sound into the grooves as possible and the result will bring out the best in any system.

"Even in the bullfight and organ records, a feeling of spaciousness was sought rather than a sound colored by the auditorium."

A point of pride is his association with the B & C Recording Company which cuts the masters with the aid of a Scully lathe, and Grampian feedback cutter heads driven by specially designed 200-watt amplifiers. Their Johnny Bubbers helps out at recording dates. Quick to assign them credit for the pains taken to assure a superior product, Frey stated, "I know that because of the low noise level and the tremendous signal-to-noise ratio our pressings are superior to monaural recorded tape which has, as everyone knows, an inherent hiss. There is still much to be done to improve LP's and I feel we are making progress with every record, especially in signal-to-noise ratio. Some of the companies rushing into the field of recorded tape would do well to devote as much attention to the perfecting of record production.

"Of course, everything we do now is taken down on stereophonic tape. That's like taking out life insurance.

"You may notice, though the RIAA curve is followed, there are more dynamics below 300 cps and above 8000 cps than on some pressings. Because of quality control and the limited number of pressings from each stamper, no discernable distortion is heard in this area, so they are easier to equalize than mass-produced pressings with less sound."

When asked what guides him in his choice of material and artist. Frey said, "I try to find something I like that has not been overdone by other companies. When possible I try to be first; if not, I try to be best. I don't expect anyone except myself to like everything I do, but so far enough people have liked each album to let me know my ear is pretty good."

This seemed the time to bring to his notice one criticism of his output, that it mostly consisted of tourist-type music. An unabashed laugh came from Frey as he stated, "I consider that a compliment. I want to bring to people some of the excitement missing in humdrum everyday existence. I try to give them not just a record, but an emotional experience with all the impact of high fidelity's full bass and brilliant highs. It may help them relive a happy interlude, or take them out of themselves for a bit."

His venture into dixieland jazz was the result of one of the happy accidents that mark his career. Returning from the Los Angeles High Fidelity Show last year, Frey found that he had two free days. He decided to stop over in Las Vegas for a little relaxation. While in conversation with a roulette croupier at the Sahara Hotel, it came out that he made records. The advice to catch the band at the Thunderbird followed.

Figuring there was nothing to lose, Frey went and liked what he heard. He asked the Dukes of Dixieland to make an album for him and got a short negative for an answer as they were determined to limit their activities to the biggest companies. After bringing his persuasive powers into play, a date was finally set during their stay at the Preview Lounge in Chicago.

The disc was ready for the New York High Fidelity Show where it matched brass with the cannon on the *1812 Overture* for sustained appearance on the assorted turntables. Persons who had heard dixieland only in inferior sound were amazed by its qualities as it emerged in all its glory. Next, dealers learned what was meant by a request for "that dixieland record." The Dukes are well satisfied as in four months sales totaled five times that of their previous high mark. And Frey is cornered by musicians who ask, "Why can't my company record me like that?"

Personally Frey favors dixieland and wants to do more of it, as well as other jazz. He sets his sights high with the statement, "Louis Armstrong has never been given the sound he deserves. I want to put all of that powerful horn on the record." Also in his plans is a trip to Brazil and Argentina this spring to search out local prospects for the studios.

The second session of the Dukes of Dixieland for Audio Fidelity is even more of an adventure in high fidelity sound than the first. More aware of the unfettered playing that this kind of recording permits, they are not reticent in exploiting the dynamics of the music to the utmost. It is a more cohesive performance with all the brash vitality and vigorous drive of youth.

The Assunto brothers have been playing together since high school days in New Orleans when in 1948 they began forming pickup groups with other young musicians. Their first taste of success came when they won a Horace Heidt talent contest and went on tour with him. Returning home to join the union and turn professional, they spent several years perfecting their style before leaving their native city again for the nightclub circuit.

It is a tight family group that heads the unit. Fifty-year-old Papa Jac, graduate of Tulane University, joined his two sons in 1955 when Mrs. Fred Assunto, billed as The Duchess, or Betty Owens, left to present him with his first grandchild. He took leave from teaching to sit in on banjo and trombone. Now the teaching is left behind and he is a permanent member and steadying influence.

Frank, trumpet, and Fred, trombone, make up the front line with Harold Cooper, clarinet. Stanley Mendelson's piano is a bulwark in the rhythm section, backed by Bill Porter, bass and tuba. Roger Johnson, drums, is a new member.

As contrasted to a revival group, this is contemporary dixieland in the manner of Louis Prima or Preacher Rollo. Designed with an eye to showmanship, it has more immediate public appeal. A real dixie fan likes either when the band is right. And this one has no real weakness. Playing nightly in a club is apt to lead to a facility deleterious to the spirit of the music. There is no evidence of that as this all-out session catches them on their mettle.

The Duchess has a vocal style well matched to the band. Based in the blues, it has overtones of the modern popular singer, enabling it to deliver such diverse numbers as *My Blue Heaven* and *Go Back Where You Stayed* with equal conviction. Frank Assunto sings *Basin Street Blues* and introduces the band in *Mama Don't 'Low*. The band is heard in such old standbys as an ebullient *Slide, Frog, Slide, Dill Pickles* and *That Da Da Strain*. Also a swinging *Mocking Bird, Ain't She Sweet, Sheik of Araby* and *Limehouse Blues*.

AUDIO INTEREST

Red Dougherty: Easy Listening, Vol. 3.
Audiophile AP 27

Bobby Hammack: Easy Listening, Vol. 4.
Audiophile AP 35

This is what Ewing Nunn calls music for "Easy Listening" and it is not easy to describe because there is nothing else like it on records. When the styles heard on these two discs were developed they were fresh and unspoiled. Then the creative performers who first charted them moved ahead, leaving them to be loaded with gimmicks by arrangers for commercial bands, or to be watered down to cocktail-hour combo consistency. Just as in its dixieland series, Audiophile has been able to find musicians who grew up with this music and are able to restore it with all the original flavor and charm. For the first time it is afforded a high-quality recording.

Red Dougherty is a two-fisted pianist of the mid-20's who can play numbers like *On the Alamo, Angry, Some of These Days,* and *Everybody Loves My Baby* as though they were written yesterday. He is joined by Harry Blons, clarinet, who starts things off with a choice *Tailgate Ramble*. Eddie Tolck is always stimulating at the vibraharp, as is Don Anderson with an unamplified guitar. Bernie Sundermeier, bass, and Bob Bass, drums, complete the sextet. *The One I Love, It Had to be You, Ain't She Sweet, Sheik of Araby,* and *Wherever You Are* may be heard along with an effective *I Never Knew*.

Bobby Hammack is a light swinging pianist in a style that began to develop a good dozen years later. It is tightly arranged as Hammack doubles on the celeste and Jerry Friedman covers the vibraharp, xylophone, and marimba in addition to soloing on the chimes in *Lady Be Good* and *In a Spanish Town*. Another unamplified guitar handled by Wesley Nellermoe, and Irving Eddleman, bass, and Milton Holland, drums, fill out the quintet.

One original is contributed by Hammack, who takes his inspiration from the end of Bix's *I'm Coming Virginia,* and dedicates it to Beatrice who, in case you have not been introduced, is the occasionally unladylike bass sax of Joe Rushton. Tunes of the swing era to be heard include: *Honeysuckle Rose, Twilight in Turkey, If I Had You* and *Sophisticated Lady*.

The commercial units have their financial rewards. The advanced creative artists have their avid supporters. It is good to know that this kind of musician has found a champion in Ewing Nunn.

Audio Note: Many owners of high fidelity systems find it a saving in both time and money to keep a complete set of tested tubes in reserve. The easiest way to be certain reserve tubes are reliable is by mass substitution when the system is operating at its peak. In my last such substitution, I tried a pair of the new GZ-34 rectifier tubes as replacement for 5U4G's with noticeable results. It is one of the most economical attempts at sound improvement that can be made. When changing tubes piecemeal it is usually best to start with the rectifier and work forward, rather than to start with the power output tubes and work back.

The Chromatic Scale Test Record.
Cook Series 60

Sounds of Frequency.
Folkways FPX 100

The Compleat In Fidelytie.
Cook 1044

Most owners of wide range equipment have invested in at least one test record, or have borrowed one for a quick run through, but there is bound to be a demand for the latest Cook entry in this field as it is easily the most valuable and absorbing for the average audio enthusiast. I have spent several hours with it and am nowhere near exhausting its possibilities.

For review purposes, I can say that the five-page booklet of instructions should be thoroughly assimilated before it is played as it differs quite radically from most such productions. In this respect, it might have been a help if the label listings were reprinted for ready reference on the now vacant back of the front cover. Then the arm must be watched for tracking difficulties on the loud low notes of the Fletcher-Munson side, and the cartridge weighted if necessary to keep it in the heavily modulated grooves. The 32.7-cps tone here is harder to handle than 15.6 cps on the Folkways record.

The obvious innovation is the use of actual musical tones over the entire frequency range to check playback response. Listening evaluation is done with the aid of pitches of the chromatic scale rather than arbitrary oscillator settings. On Side A, the Fletcher-Munson characteristic preadjusts all pitches so that they should seem evenly matched in loudness. Side B is recorded electrically flat on the RIAA curve to produce constant voltage at the voice coil terminals. The difference between the two can be used as a reference for the response of the listener's ear.

In place of a frequency sweep, rapid octave skips are used to judge balance. Bass and treble tone bursts are provided to determine the ability of the system to handle transients, and to reveal speaker hangover and false resonances in enclosures. At this point much of its value depends upon the ingenuity and needs of the user. It should be helpful in tuning ports, correcting faults in enclosures and estimating the influence of room acoustics on reproduction.

A voltmeter may be used in the check of comparative intensity levels, but it is not essential. A stroboscope on the label is an aid for setting turntable speed at Tuning A (440).

"Sounds of Frequency" was prepared by Peter Bartok and can be studied without test instruments, though an oscilloscope and volume indicator are needed to make full use of it. Side A is recorded at 78 rpm and is a revelation of what can be done at this speed now with quality equipment. A demonstration is made of the frequency response on the inside and outside bands. There are three bands for Tuning "A"—444, 435 and 440 cps—useful for checking turntable speed with a pitch pipe or stroboscope. The test signals for frequency-response measurement run from 22,500 cps to 15.6 cps, and are always the same musical distance apart. There may be tracking trouble at the low end, but it is not as likely as on the Fletcher-Munson side of the Cook record.

Side B turns at 33 1/3 rpm and is designed to go with the enclosed oscilloscope diagrams. In effect, it is a signal generator for the entire system and makes possible the most rigid overall test of equipment. Bartok also presents his case for the long playing curve with a 630-cps turnover by means of his recording of the *Mikrokosmos Suite.*

For those who have no patience for test records, there is always "The Compleat In Fidelytie" which may seem like the sweepings from the tape splicer's floor at first, but has much to extend the best system: firecrackers from Mexico, jet aircraft, trains, a baby's cry, telephone bell, and so on. Also the wheeze of a two-cylinder gas engine as a condenser mike is inserted in the spark plug hole. The second side is devoted to some chilling breezes whipping a telephone wire on the crest of Mt. Washington.

Vinton Wight: Sounds of Steam Locomotives No. 1. **Folkways FX 6152**

When audio engineer Vinton Wight went on a vacation in the Canadian Rockies five years ago, he stumbled on a project which was to occupy much of his spare time in the intervening years—that of preserving the sound of the steam locomotive before the Diesel takes command of the roadbed. With the assistance of fans and railroad men, he has assembled an engrossing cross section of what he calls Stack Music.

Wight is modest enough to admit that his portable recorder did not capture everything that he might have put on tape with more elaborate equipment. But his twenty years of experience with radio station KFAB, Omaha, Nebraska, has served him well. Few documentaries have been as skillfully engineered and edited. And few hi-fi fans will want anything more impressive than the Union Pacific's "Big Boy" in action, or a double-header on grade. He has spotted his microphone for a variety of sounds at points in Nebraska, Colorado and Wyoming where patient investigation showed he would get best results in the way of whistles, bells, the play of live steam, and the drama of a 100-car freight as it climbs to Summit at the top of the Missouri River watershed.

Each section tells a story that is detailed in the notes. Wight does not say where he is with the microphone, and that is part of the fun of this set—trying to locate him.

(*Continued on page 61*)

ABOUT MUSIC

HAROLD LAWRENCE*

MUSIC ON TV

ON JANUARY 12, 1953, in celebration of the 25th anniversary of his American début, Vladimir Horowitz played the Tchaikovsky Concerto with the New York Philharmonic. The performance had been offered to television at a cost of $35,000, a modest figure compared to usual TV production expenses. Both N.B.C. and C.B.S., who were informed of the program's availability, turned it down on the basis of prior sponsor commitments and long-range schedules. While there is no reason to doubt the networks' stated motives in failing to take advantage of the offer, it is no secret in the industry that good music, especially instrumental and symphonic, is equated with low ratings. Broadcast officials do not deny that classical music is an attractive commodity in the form of concerts and recordings, but they insist that the visual element is superfluous when it concerns music on a screen.

Concert managers, music critics and musicians deplore the lack of attention paid to good music on television. In support of their arguments that there is a place for it within the framework of this commercial mass medium, they point to a number of programs which, over the years, have received critical acclaim and, in some instances, impressive ratings.

Early in March 1954, C.B.S.'s *See It Now* devoted a program to the "Anatomy of a Symphony Orchestra." Edward R. Murrow took viewers on a guided tour backstage at the New York Philharmonic; Dimitri Mitropoulos was interviewed and the cameras focused on the orchestra before and during an actual rehearsal picking up such candid shots as the expressions on the faces of some individual players and the comments of the conductor lost in the shaping of a musical work.

On an *Omnibus* program in 1953, Leopold Stokowski introduced sections of Moussorgsky's *Pictures at an Exhibition* with notes on the paintings that inspired the composer, while the camera followed him down the imaginary gallery. The same mixture of art and music made up a B.B.C. show entitled "Goya and Granados."

The second Hurok *Festival of Music* was a high point in the history of music on television. Boris Christoff sang the role of Boris Godunov in the Death Scene from Moussorgsky's opera with staggering power and eloquence, Marian Anderson interpreted a group of spirituals, Segovia exhibited his mastery of the guitar in some well-chosen short pieces, and Artur Rubinstein played Rachmaninoff's *Rhapsody on a Theme of Paganini.*

The Chicago Symphony, under its permanent director Fritz Reiner, was seen on the Dumont network in a weekly series of programs distinguished by fine camera work and tasteful production. N.B.C.'s *Recital Hall* consisted of a half-hour edition of a solo program that might be given in Town Hall.

The most ambitious musical project in television is unquestionably the N.B.C Opera Theatre which has already produced an imposing list of works including *Amahl and the Night Visitors, The Magic Flute, The Marriage of Figaro, Salome, Billy Budd, The Trial at Rouen, Abduction from the Seraglio* and others. Its latest production was one of the outstanding events of the past winter: the American première of Prokofiev's monumental score *War and Peace.* Handsome sets, effective singing and thrilling direction provided a compelling two and a half hour program. The magnificent ball scene, the tense drama of the war council, the battle sequence, Andrei's death—these were some of the exciting moments that made this presentation of Prokofiev's vast musical canvas a memorable event.

Leonard Bernstein, who is fast becoming one of television's most popular figures, has conducted lecture-performances on *Omnibus* exploring the creative process involved in Beethoven's *Fifth Symphony,* the growth of jazz and its use by serious composers, the meaning of modern music, and other subjects.

Let us examine the special ingredients that go into each of the above approaches to music on television. *See It Now* was primarily a repertorial account of an orchestra at work, with the accent on human interest, that is, the unguarded responses of the players and an informal portrait of the conductor. In Stokowski's stint for *Omnibus,* extra-musical material was interspersed at three or four minute intervals between each tableau so that the visual had an equal share in the proceedings with the musical. "Goya and Granados" followed a similar pattern. Hurok's *Festival of Music* was essentially a glorified Ed Sullivan Show with its parade of acts and performers introduced by a master of cere-

* *26 W. Ninth Street, New York 11, N. Y.*

monies. The judicious interlarding of personalities was fortunately combined with the fact that each artist was allowed enough time to establish himself, thus avoiding the category of a "teaser." Even so, one was inclined to fidget during the longest work on the show, the *Rhapsody on a Theme by Paganini.* The first few times the camera caught Rubenstein's expressive features, the effect was interesting. The same may be said for the lights being dimmed during the softer and more lyrical sections of the score. After a while, however, one came to resent each camera shift and lighting change and, when it was all over, was left with not the foggiest notion of what the performance had been like. But what was the poor director to do, confronted as he was by merely a soloist and his grand piano for some 21 minutes? (The orchestra was barely seen.) Not a very stimulating visual prospect.

As for the N.B.C. Opera Theatre, dramatic forms adopt well to television since there are three other factors present besides the musical score: sets, libretto and action.

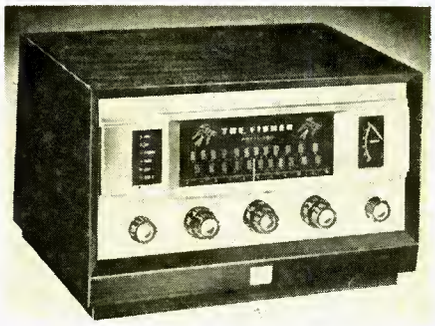
Of these examples, only the Chicago Symphony and *Recital Hall* broadcasts represent concerts pure and simple, and both of these are currently off the air. The best chance of survival of unadulterated music in the new medium logically falls to stage works, as demonstrated by the N.B.C. Opera Theatre, now in its ninth year.

This opinion, however, is open to controversy. In an article in the English publication, *Musical Times,* Lionel Salter relates the resistance to concert on television to the early days of the phonograph when "musicians dismissed it contemptuously as a mere toy . . . People have become so adept at divorcing their ears from their eyes (a practice only of the last quarter-century or so) that the wail, 'But the picture interferes with my enjoyment of the music!', is a very common one." They claim, writes Mr. Salter, that "changes of shot, or of camera position, are distracting to musical listeners. Yet a static long-shot of the full orchestra would very quickly become impossibly boring; and of course, at a concert, our eyes do move about from one place to another."

Mr. Salter is right when he says that our eyes move about, but though we may focus on the conductor, an individual player or instrument, the complete ensemble is always before us at an actual concert. And no matter how skillful the camera work (the Chicago broadcasts were excellent in this respect), there are still two things that will have to be overcome before concert music wins over the discriminating music lover. First, television sound transmission is far below the technical standards of contemporary recordings. Second, the television tube simply cannot satisfactorily encompass any large number of musical forces. Finally, there will always be those who feel that television can only perform well when the visual aspect is a necessary part of the musical score. In other words, to paraphrase Benjamin Franklin, "there is a time to hear and a time to see."

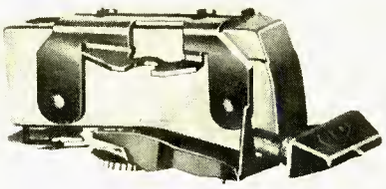
NEW PRODUCTS

● **Fisher FM-AM Receiver.** The new Fisher "500" is a complete receiver, incorporating a sensitive FM-AM tuner, audio control center and 30-watt amplifier on a single compact chassis. It is necessary only to plug in a record player and loudspeaker to complete a high-fidelity music system. In addition to exceptional sensitivity, the "500" features a meter for accurate tuning. The amplifier has uniform response from 16 to 32,000 cps. There are four inputs, including a separate tape playback preamplifier-equalizer. Output impedances



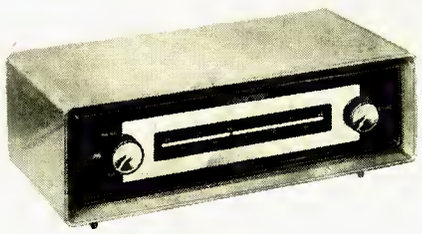
are 4, 8, and 16 ohms. Seven controls include a 9-position channel selector, a 4-position loudness-contour control, volume, bass, treble, power and station selector controls. The "500" is handsomely styled with a three-dimensional escutcheon and front panel finished in brushed brass. Pin-point pilot lights indicate the selected channel, and an oversize slide-rule dial and logging scale afford unusual legibility. Circuitry includes 14 tubes plus two germanium diodes. Fisher Radio Corporation, 21-21 44th Drive, Long Island City 1, N. Y. **C-1**

● **High-Output Phono Cartridge.** Intended primarily as a replacement unit for low-cost low-gain phonographs using one or two tubes, the new Shure Model W9 cartridge has an output of five volts and a frequency response to 10,000 cps. A dual-stylus cartridge, the W9 uses the Shure



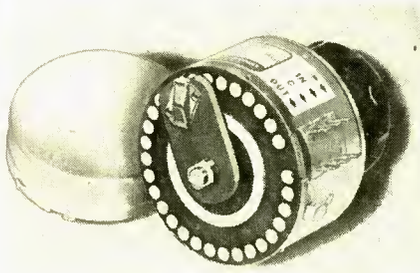
"twin Lever" design principle which provides individual 78-rpm and microgroove response. The stylus can be changed in a matter of seconds, without tools and without removing the cartridge from the tone arm. The W9 replaces 69 different cartridges now being used in thousands of low-gain type phonographs. Shure Brothers, 225 W. Huron St., Chicago 10, Ill. **C-2**

● **Knight FM Tuner Kit.** This new Knight tuner kit, recently introduced by Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill., combines contemporary cabinet styling with such features as



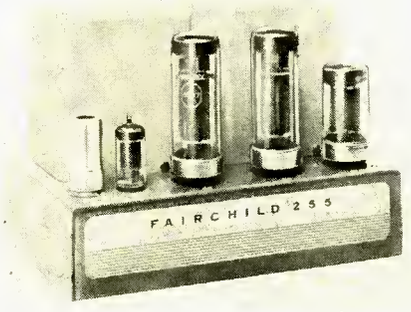
printed circuitry, flywheel tuning, automatic frequency control, and high fidelity performance which meets critical listening standards. Designed for use with any amplifier with volume and tone controls, the tuner is equipped with but two controls of its own, an on-off switch which also selects AFC or non-AFC operation, and a tuning knob. Printed circuit wiring greatly speeds and simplifies assembly of the kit. All leads of critical length or position are pre-wired on the printed circuit board. R-f coils are pre-adjusted and require no further alignment after the kit is assembled. Two output jacks are provided. One can be used to feed an amplifier, and the other a tape recorder for off-the-air recording. Sensitivity is 10 microvolts for 20 db quieting at any point on the FM band. **C-3**

● **Daven Low-Impedance Attenuators.** The new Daven LA-130 series attenuators are low-impedance controls for use in broadcast equipment and public-address systems. Because of compact design, they are



well suited for use in portable equipment or in installations where limited mounting space is a factor. They offer 30 steps of attenuation in a housing only 1¾ ins. in diameter by 1-15/16 ins. deep. Moderately priced, the LA-130 series may be readily incorporated as mixer or master gain control in popular priced equipment. A large selection of various impedance combinations and db losses is available from stock. Additional data on the LA-130 attenuators may be obtained from The Daven Company, 530 W. Mt. Pleasant Ave., Livingston, N. J. **C-6**

● **Improved Fairchild Amplifier.** Alterations in circuitry and changes in tube complement permit increase in power/rating of the Fairchild Model 255 amplifier from 25 to 30 watts. The new units use EL34 output tubes and a GZ34 rectifier.



Circuit changes have also improved stability and transient response. Average production units measure less than 0.1 per cent intermodulation at full output. Further information can be obtained by writing Fairchild Recording Equipment Company, 10–40 45th Ave., Long Island City 1, N. Y. **C-7**

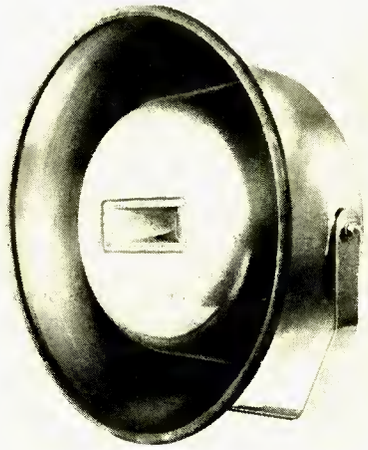
● **Bell 20-Watt Amplifier.** Appearance has been given equal consideration with performance in the new Model 2300 amplifier recently introduced by Bell Sound Systems, Inc., 555 Marion Road, Columbus 7, Ohio. Many of the 2300's esthetic features are functional as well as decorative. The perforated front panel, for example, facilitates ventilation for cooling. Ingenious layout of tubes around the perimeter of the chassis also reduces concentration of heat within the cabinet. Power output is 20 watts at less than 0.3 per cent harmonic distortion. Panel controls include 4-position input selector switch, 5-position equalization switch, separate scratch and

rumble filters, 3-position speaker switch, and a continuously-variable loudness control. Literature will be mailed upon written request. **C-4**

● **Three-Way Selector Switch.** The versatile Anchor S-203 Selecto-Switch has many uses, such as switching among the components of a hi-fi system, operating speakers singly or in combination, and switch-

ing from TV to FM. Connections are solderless and two mounting ears provide for simple installation. The case is made of unbreakable plastic and measures 3" × 1¾" × 1". For literature and complete information write Anchor Products Company, 2712 W. Montrose Ave., Chicago 18, Ill. **C-5**

● **Jensen Weatherproof Speaker.** The new Jensen Model HF-100 is so constructed that it is virtually impossible for rain, sleet or snow to reach either of its two drivers. The high-frequency horn has a 90-degree fold placing the driver at the top of the assembly, thus providing self-draining. The low-frequency unit is specially moisture proofed. The HF-100 is a two-way divided system, coaxially arranged to provide best possible perform-

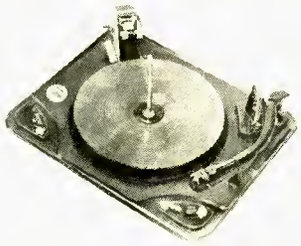


ance in compact form. In action, a heavy-duty 8-in. speaker reproduces frequencies below 2000 cps. This unit drives a single-fold horn with a phase-inverter reflex port near the horn throat for maximum efficiency at low frequencies. A bridging-type electrical network provides frequency division. All frequencies above 2000 cps are reproduced by a horn-loaded compression driver. Easily mounted on almost any surface, the HF-100 is excellent for home entertainment in patio or garden, or for commercial installations where inclement weather is normally a problem. For more information on the HF-100 projector, write Jensen Manufacturing Company, 6601 S. Laramie Ave., Chicago 38, Ill. **A-10**

HARVEY Reports on HI-FI

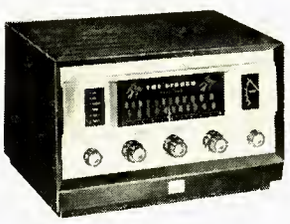
MARCH-APRIL, 1957

Progress in hi-fi equipment design is gradually reaching the point where medium-priced components can come close in performance to the costliest items produced for the audio perfectionist. The current crop of developments discussed below is an excellent illustration of this happy state of affairs. In some cases the very finest equipment itself is down to a medium price. This trend is, of course, a source of great pleasure to HARVEY's, "the store where high fidelity came of age," since it brings the unique advantages of separate-component hi-fi at its best within the reach of an ever-growing group of music lovers. That has always been and will always remain one of HARVEY's principal aims.



The Garrard Model RC88 "Triumph II" three-speed automatic record changer is a case in point. It would be an exaggeration to say that this latest version of one of the all-time equipment classics is in every way equivalent to a top-flight transcription turntable and pickup arm combination, but it's close, very close. . . . The turret drive and oversized "soft-tread" idler wheel are, in fact, copied right from the famous Garrard 301 professional turntable. Features like the full manual position and the interchangeable spindles, plus a host of others, make this thoroughly fine machine a perfect choice wherever a record changer is called for. Price is an amazingly reasonable $54.50.

The fabulous little Tandberg Model 3 three-speed tape recorder is another illustration of this "close-to-the-best-for-less" trend. Although it is definitely in the low-medium range as far as price is concerned, its performance is in some respects quite comparable to that of the finest professional tape recorders. The designers of the Tandberg have somehow managed to keep the tape transport mechanism extremely simple and therefore relatively inexpensive to manufacture, and at the same time superbly stable and rugged. The result is the complete absence of audible wow and flutter even on piano recordings at 1⅞ ips! The specs tell the rest: Tape speeds 7½, 3¾ and 1⅞ ips. Usable frequency response 30-18,000 cps at 7½ ips; 30-10,000 cps at 3¾ ips; 50-6,500 cps at 1⅞ ips. Flutter and wow less than 0.1% at 7½ ips; only slightly higher at 3¾ and 1⅞ ips. Signal-to-noise ratio 60 db below high recording levels. The price, complete with built-in audio amplifier, Goodmans speaker, furniture cabinet, transport case, microphone, input-output cord, instruction manual and a reel of tape, is $299.50.



The new Fisher "500" exemplifies another aspect of the trend. Here, on a single compact chassis, are *all* of the purely electronic components of a first-class high-fidelity system — high-sensitivity wide-band FM-AM tuner, powerful 30-watt low-distortion amplifier, versatile preamplifier-control unit. Add a good loudspeaker and it's a complete high-fidelity radio. Add a record player and it's a complete home music system. And the main point is this — it costs incomparably less than separately purchased components of the same quality. The chassis alone is $239.50, mahogany or blonde cabinet $19.95 extra.

The new Fairchild Model 225 pickup cartridge illustrates a further, and most encouraging, point. Although it is inadvisable for the prudent audio connoisseur to talk about a "best" cartridge (or any other component), this fourth version of the famous Fairchild moving-coil design is as good a candidate as any for that honor — yet it is decidedly in the medium price range. As in the case of each of the previous Fairchild improvements, this new cartridge sounds just a bit cleaner, smoother, sweeter than its predecessor. One might justly ask "How smooth can you get?" — but the difference is audible, none the less. Small structural changes account for the improvement, chief of which is the new 'Micradjust' feature, which permits final micrometer adjustment of each individual cartridge before shipment. Price is still only $37.50.

Finally, just to re-establish our faith in the relationship of price to quality, there are the **Marantz power amplifier and 'Audio Consolette'** preamplifier-equalizer. Together they constitute an integrated amplifier system that is unequivocally in the topmost price bracket — but, to paraphrase a popular whiskey ad, "if you can find a better amplifier, buy it!" It would be futile to try to enumerate in this space all of the features of this amplifier of amplifiers — you name it, it's got it! The fantastic care that goes into the selection of components and into the construction of the Marantz units has its parallel only in special types of military, communications and telephone equipment — it is certainly well beyond the highest hi-fi standard. The resulting quality of amplification, freedom from noise and all other bugs, plus long-term reliability and ease of servicing (if that should ever become necessary!) make the initial investment an eminently worth-while one. The power amplifier costs $198.00, the 'Audio Consolette' $168.00 (or $153.00 without cabinet).

Remember HARVEY's mail order service! Just enclose an extra allowance for shipping charges (excess will be promptly refunded) and let us ship your order the same day as we receive it.

HARVEY RADIO CO., INC. 1123 Avenue of the Americas (6th Ave. at 43rd St.), New York 36, N.Y. JUdson 2-1500

STEREOPHONIC SOUND

(From page 28)

of 180 deg. in front. Settings of the control were recorded and related to the imagined location of the artist. On repeated tests the subjects maintained a high degree of accuracy in orienting the imagined performer with respect to the control settings. Further, the subject noticed no blank space in between the extremes of left and right. The same degree of accuracy in orienting was maintained with this artificial head shadowing experiment as was found when an actual sound source of complex wave form moved about the subject.

Probably the simplest and most dramatic experiments that disprove the current theories (phase and transient theories) is that a person with one deaf ear or one ear completely closed off *can* orient to a surprisingly high degree. Information about the position of the source can be obtained by moving the head slightly. A person is able to remember a tone quality or wave shape of a sound for a certain period. By moving his head he can compare the wave shapes received at different times and from different angles and from these samples, decide on the position of the source, even though he is using only one ear to gather the information. If, on the other hand, phase or transient timing were measured by the brain, the subject would need to take his tests of the signal from two points simultaneously. One can not store information about time in a way that would permit comparison of phase shift or arrival time.

Conclusions

The conclusions that may be drawn separate themselves into two categories. First, in order to orient accurately, the brain must be supplied with information concerning the amount by which the left and right ear signals deviate from a sine wave or pure tone for fundamental frequencies below 800 cps. The ear receiving the more nearly sine-wave signal is farther from the source. Since most of the power in a sound signal is found in the fundamental, for fundamentals under 800 cps no appreciable drop in effective volume is experienced through shadowing.

In the main, left-and-right orientation is provided by head shadowing while front-and-rear orientation by external ear shadowing. Every angle of the full 360 deg. about the head produces a slight difference in amount of these two filtering effects with maximum sensitivity occurring at 0 deg.

Conversely, to produce the effect of a difference in volume from one ear to another, the amplitude of the frequencies below 800 cps must be increased or decreased. It is this which has produced

the unrealistic effects found in present day stereophonic techniques.

The second and more practical conclusion that may be drawn is that to improve realism only the upper frequencies should be picked up and delivered through different channels. In a stereophonic sound reinforcing system for example, there need be only one pickup, amplifying, and reproducing system for the frequencies below 800 cps and since most of the power requirements are in that range costly equipment need only be single channel. Only the high notes and harmonics should be reproduced by a dual channel system. Amplifiers and loudspeakers become less costly and easier to install when required to handle high frequencies only.

Important, too, is the fact that many of the noise components of electromechanically reproduced sounds such as emission noise, tape hiss, needle scratch, and so on, are at the high end of the frequency spectrum. When high frequencies are increased or decreased in the ear from time to time, the listener's attention is drawn to these noises. Therefore, care must be taken, to achieve stereo realism, to use apparatus which is as near noiseless as possible. It is a problem which becomes more important with stereophonic reproduction than with dimensionless reproduction.

JAZZ

(*From page 55*)

Don Elliott and Rusty Dedrick: Counterpoint for Six Valves.
Riverside RLP 12-218

With the addition of four tracks made in April, 1956, this is an expanded edition of the 10-inch LP made in March, 1955, and attended on release by the deserved approbation of reviewers. Those who may have been turned away by the stress given "experimentation" in the liner notes can be advised that it is a noteworthy disc which transcends the appeal of such a limited descriptive tag.

Aside from the term "modern jazz" itself, which too often is used as a catchall to cover any of the multitude of sins, experimentation is probably the most misused word in music today. In a form as new as jazz there is little excuse for the context in which it is placed now as it is something that has been going on since the first drum was struck in Congo Square. Musicians once confined such things to the woodshed. When in the 1930's the public discovered the jam session, the demand arose that it be permitted to hear the artist as he continued the development of his instrument and researched ideas.

The record companies found it quite simple and profitable to bring a Charlie Parker or Lester Young to the studio and give them freedom to improvise as many choruses as time allowed. If it happened that one of them had too much crammed into it or was not too original, no one would rightly complain. In fact, when lesser performers turned out one good chorus in four, the records still sold. The jazz public accepted and even defended such efforts in the name of experimentation, gaining for them a validity which extended to arrangers and bandleaders, who might come up with innumerable ideas during a season to have a bare dozen survive to the next.

Then came the unhappy day when an A & R

struggled through a session with a group of tyros and came up with a tape fit only for the demagnetizer. But the promotion man had a second thought: bill it as experimental jazz and see what happens. As the buyers bit, so began the downfall of the word to its present suspect state. And jazz is being selected once more, not from the publicity notes, but by the ear testing it for varying degrees of good or bad.

Here is good jazz. Rather than experimentation, it is a potent distillation, by six skilled musicians of years spent exploring and expanding the use of their instruments. Pianist and composer Dick Hyman has fashioned seven originals to showcase the trumpets of Dedrick and Elliott in contrapuntal interweavings which give them room to knock sparks from each other's horns. Though these are men of the cool school, they play with heat, wit and melodic inventiveness to fit the demands of the music.

Numbers added are *Gershwin's Mine, The Bull Speaks* and *Henry's Mambo,* which delves into Latin-American themes with a bit of satire. *Theme* and *Inner Tube* is a rewarding exercise for trumpets only.

The solos of Hyman and guitarist Mundell Lowe serve the score well. Ed Safranski, bass, and Don Lamond, drums, contribute to the aura of well-being which comes when everyone on a date is *en rapport*. The recording is good, except for the usual billowing effect of guitar amplification.

Don Elliott and the Bob Corwin Quartet. Riverside RLP 12-220

Versatility is commonplace among jazz musicians, but only a few have recorded on different instruments as extensively as Don Elliott. He started on vibes six years ago with George Shearing, almost made the mellophone his trademark, and is now concentrating on trumpet. Though his facility on the horn was demonstrated with Dedrick and on other discs, he waited more than a year before he felt ready to essay a lead role on an entire LP.

It is pleasant to report that the latest chapter in his career is one of continuing development. His statements in a low register are even fuller, perhaps due to his study of the mellophone, and there is greater certainty in his playing.

Bob Corwin assumes a featured position as his brisk, incisive piano helps out on eight standards. One original by each of them was fabricated during the year they had been together for interplay between the piano and horn. When outlining a lyric background, Corwin is at his best. He is apt to try too much in his solos and tighten up.

Among the problems the LP has brought to the recording supervisor is the necessity for a well-rounded program, to be assembled in the editing in an order most satisfactory for aural enjoyment. The practice of splitting up five 78's into ten haphazard tracks is mostly a thing of the past. Bill Grauer and Orrin Keepnews have made an intelligent listing of the material as is their custom.

A good recorded performance should also create an atmosphere or consistent over-all effect. This is difficult to do with an assortment of numbers to be packaged for three-quarters of an hour or more of uninterrupted listening. In this case, by the end of the second side, it becomes evident that everyone is trying too hard. A nervous tension is conveyed which obscures memory of the more sensitive passages. Yet it is so slight as not to be apparent on a single track. So take this one by degrees.

On bass, Ernie Furtado is heard in some suave bowed passages, but could have been more forward to help the piano sound when the mid-range is belabored in fast progressive choruses. Jim Campbell is on drums to complete the quartet, which is given a sound consistent with the standard being set by Riverside.

Paul Chambers: Whims of Chambers.
Blue Note 1534

Introducing Kenny Burrell.
Blue Note 1523

After presenting the debut last month of the exceptional young Detroiter **Thad Jones,**

one of the most important trumpet men to come along in some time, this label introduces as leaders two more newcomers from that city.

Twenty-one-year-old Paul Chambers is a promising young bassist developing in the Miles Davis Quintet, and likely to be heard often from now on. He is skilled in pizzicato and his bowmanship is intensely musical. He is spotted with just rhythm in two originals and adds another when Donald Byrd, trumpet, and John Coltrane, tenor, expand the group to a sextet. Both are effective horns in the post-bop idiom and are each credited with two originals. Pianist Horace Silvers solos strongly, and "Philly" Joe Jones is on drums.

Twenty-five-year-old Kenny Burrell completes this section and is joined by Chambers on his own LP. His guitar tone is richer and fuller than most of the hard school of moderns, and it would be difficult to excell the group of rhythm men gathered around him.

Kenny Clarke, drums, and Candido, conga drum, lend expert support and are heard as a percussion duo in a Rhythmorama interlude. Still another Detroiter, Tommy Flanagan, is pianist.

Burrell presents three originals and *Delilah, Weaver of Dreams* and *This Time the Dream's on Me* in a disc attractive to those who like modern rhythms more than modern horns. Fine, close Van Gelder sound on both.

Presenting Ernie Henry.

Riverside RLP 12-222

Thirty-year-old Ernie Henry has been playing professionally since he finished his army service in 1947. He stayed with the big bands, including Dizzy Gillespie and George Auld, for about five years before leaving to free-lance and develop an individual alto sound which led to his discovery by Riverside.

In high school he admired Johnny Hodges and in the bop period shifted his allegiance to Charlie Parker. Now he plays with a forceful attack and the smokey, after-hours tone characteristic of the out-of-the-way clubs and barrooms which have been his latest training ground. In this he is reminiscent of Pete Brown, who was first heard playing this kind of alto and matured in much the same way.

What sets Henry apart is the ensembles he has worked out with Kenny Dorham in the basement of his home. These have a lyricism from his solos and provide a relief from the usual round of choruses. They mark the five Henry originals, the best being *Cleo's Chant*, an extended blues.

Riverside makes much of uncovering Henry and, though he may not measure up to the liner notes, it is to be congratulated for taking down this step in his development. He has since returned to the Gillespie band where he should continue to make himself heard, if not in the same way. Those who have discovered the trumpet of Dorham will find that he makes the date worthwhile. Kenny Drew fits in well at piano as Wilbur Ware, bass, and Art Taylor, drums, complete the fine rhythm section. A competent engineering job by Jack Higgins of Reeves Sound Studios.

Art Farmer and Donald Byrd: Two Trumpets.

Prestige LP 7062

The meeting of two musicians of the same instrument can be a contest and display of prowess, or it can be an exchange of ideas and respect. In either case they are often more inspired by the feeling of cooperation or rivalry. In a series of Friday sessions at Rudy Van Gelder's, Prestige has applied this principle to assorted alto, tenor, and trumpet men. Spontaneity is sought, sometimes at the expense of an even performance and the best sound. Their appeal is to those wanting uncrystallized modern thinking, especially in respect to a particular instrument.

In the sixth pairing, Art Farmer and Donald Byrd cross trumpets for heated bouts in *Dig* by Miles Davis, Kenny Drew's *Contour*, and an original blues by Byrd. A more relaxed spirit is found as Farmer solos on *When Your Lover has Gone*, and Byrd balances it with *'Round Midnight*. Jackie McLean, also works in well as a contrast and foil for the swift horns.

Red Garland: A Garland of Red.
Prestige LP 7064

On the scene as a pianist since the end of his Army service in 1944, thirty-three-year-old William "Red" Garland is currently with the Miles Davis Quintet. In his first LP he shows a pleasant touch in six standards, including *Little Girl Blue, Making Whoopee, A Foggy Day,* and *September in the Rain.*

He gives credit to Nat Cole, Art Tatum, and Bud Powell as models who shaped his style. The know-alls will expend more effort in trying to distinguish these influences than in listening for Garland. It is not until the last two tracks that his real strength emerges undiluted. He is magnificent in ***Constellation,*** and *Blue Red,* an original blues theme, shows what he can do on his own. It is this vein he should exploit in the future.

Paul Chambers, bass, has been his section mate in the quintet and gives better support than a pianist should expect. Art Taylor is an able drummer and his one solo is well spotted in *Constellation.* Recording is by Rudy Van Gelder.

George Williams: Rhythm was His Business, A Salute to Jimmie Lunceford.
Victor LPM 1301

George Williams has tried to capture the Jimmie Lunceford spirit by means of arrangements in the modern idiom designed to reinterpret it as though the band was operating today. Main interest is in the presence of Charlie Shavers, trumpet, and drummer Jimmy Crawford, who sparked the original group. The sound of the specially assembled studio band of twenty pieces is unbalanced and hardly acceptable.

Sounds of the Grand Prix of Watkins Glen, N. Y.
Folkways FPX 140

Sounds of Sebring.
Riverside 5001

Sports Cars in Hi-Fi.
Riverside 5002

Sports cars and high fidelity seem to go together and the racers are out in force on LP this season. The competition between Watkins Glen and Sebring is almost as hot as that on the track and I am not going to take sides in it by making a choice between the records which detail the scene of last year's races. Sports car fans will want both anyway.

Henry Mandler and Robert Strome used an Ampex 400 tape recorder, an Electro-Voice EV 655 dynamic microphone for voice, and a Capps condenser microphone was placed within thirty inches from the speeding wheels for car sounds at Watkins. 20,000 feet of tape were brought back to New York for editing by Emerson Boardman and the master record was cut by Peter Bartok. Bill Grauer supervised at the Sebring event with the help of Reeves Sound Studios.

For those who want plain unnarrated sound, the Sports Car disc is the one as the first side presents nineteen separate tracks of various engines turning over at rest. It is suggested that a game of identifying them be played without reference to the notes. With the turntable set at 78 rpm, they should be the answer to the press agent who thought up the album title: "Jazz for James Dean, If James Dean Had Liked Jazz." The reverse side presents portions of the Watkins Glen race in which the tick of gravel hitting the cars is evident. Ray Fowler made the recording with a modified Magnecorder and a Stevens "Tru-Sonic" microphone.

More Moondog.
Prestige LP 7069

As an individualist in a world of conformists, Moondog is often a lonely figure as he plods the streets of Manhattan. With this second collection of the unexpected ways in which his roving imagination finds expression, it is possible to know him well by means of the tape recorder which follows him on his travels.

He is heard attempting to match his bamboo pipe to the Queen Mary's whistle, pummelling a drum with ostrich feathers and playing the Oo and Trimba, instruments of his own invention. Visits to his home include an interlude in which his cocker spaniel Ninon is introduced, along with further examination of his unconventional rhythmic ideas.

An extended monologue follows the processes of the unconscious as methodically as Stein or Joyce. The sound is good for portable equipment and the editing arranges the sixteen tracks for a varied sampling.

AUDIO ETC.

(from page 49)

to the *dirty* state. It's instantaneous, necessarily. Because if bulbs (and reflectors) got dirty gradually, then they wouldn't all be 1.9 times as dirty as the clean ones. . . .

Ugh. You take it from there, and I'll return to audio and try to write you a better superlatively marvellous article that will positively slay 1.9 times as many readers. 1.9 more than $\sqrt{0}$, of course.

2. Make it Miniature

I see by the grapevine that the transformerless amplifier is still coming along. See other departments of this mag, month in and month out, for the technical pros and cons, but what this means to me is a purely external matter—for, as I see it, the transformer is now just about the only element left in our audio amplifiers, what with transistors, modules, printed circuits, that still *must* be bulky. Eliminate the transformer and you've opened up the way (maybe . . .) towards the pocket-sized System.

I've harped for years, on and off, on the subject of miniaturization. It keeps advancing. Our pickup cartridges are now almost universally small, and our arms are beginning to follow them after a fashion, though there still remain problems of groove tracking and of arm resonance to postpone the sub-miniature arm for awhile longer. Speakers and speaker enclosures have gone a long way, these late years, towards good bass in small space.

Now that the transistor radio has been launched with public success (and at what a price!), the idea that a home amplifier could be *really* small is going to be a catchy one as soon as anybody is in a position to toss it out—without ducking for cover.

I predict . . . well, maybe I'd better not predict yet. I only say that here is a potent, useful, salesworthy, sensible goal towards which we'll all be able to work. Maybe not for the fancy hi-fi systems, but surely for the thousands and hundreds of thousands of intermediately costly home rigs that are in the ultra-practical class of household equipment in daily use. The miniature amplifier.

Lots of things have caught my eye that tend in this direction. Like R & D Electronics Laboratory's radio kit, announced last fall, using two assembled modules to do the work of 16 electronic elements, out of the government's "Project Tinkertoy" (it says), which is aiming to reduce the number and complexity of parts in military electronic equipment.

Modules, in our field at least, are stacks of small ceramic "wafers" on which silver may be applied ingeniously in various ways to make coils, capacitors, resistors and so

on. A variant of the printed circuit and a super idea, I'd say. This sort of thing, plus transistors replacing most or all tubes, can, and will, revolutionize our audio building techniques, and the sizes and shapes required as well. Now, if we could just get rid of that output transformer. . . .

Which reminds me irresistably of the present fine row going on in another and significantly related miniature area, the portable TV set. I note with much glee that a fight to the death is on between those miniature portables that still include transformers, and so are small—but heavy, and those which have eliminated the transformer and thus have saved a phenomenal amount of weight, but at (apparently) some sacrifice. I wouldn't know what sacrifice, if any, but the advantages of enterprise and forwardness are all on the side of the little transformerless sets of the GE type.

And also I'm reminded of Avery Fisher's all-transistor phono preamplifier, which has been leading a strange life *chez moi*, lately, and one that even he wouldn't have guessed.

The gadget is battery-operated and is scarcely larger than a handful of cigarette packages. No sooner had it arrived than I found myself, by coincidence, minus a working preamplifier and mixer for my weekly taped radio program, which was about to resume after a summer hiatus. New system had been ordered and was "on paper," but the old one suddenly conked out for good.

Well, the new one is still on paper, in part, some twelve weeks later, and I've been using the Fisher phono preamp all this time, on emergency basis, as a low-impedance mike preamplifier, feeding itself into another "emergency" Fisher product, the 80-C Master Control, which I have used as a temporary mixer all this time. Low impedance? Seems that transistor circuits not only are small but also offer some odd side-values not usually available in tube-style circuits, one of which is that this gadget can also be used as a mike preamplifier for both high *and* low impedance. Transformerless.

The battery transistor preamp is, I'd say, in the nature of a pioneer experiment in this particular model. No special need for a self-powered battery model in most homes and there are disadvantages; no pilot light and I've had to scotch-tape the thing OFF each week to be sure not to forget it and run the battery dry. Also, I understand, when battery power begins to get low, distortion creeps in rather quickly. That's where I am right now, but my new system is due next week. (Also, note well, if you reverse the polarity in any transistor circuit by reversing the battery, you are in for new transistors, in so many seconds.)

Nevertheless. . . . This Fisher gadget is the beginning of something pretty big, in a reverse sort of way. I mean, of course, pretty small. Amplifier miniaturization.

3. Arms and Stereo

Speaking of arms . . . (let's see, was I?), a couple of items lying around here that may interest you. There's still much argument about the viscous-damped phono arm, some people feeling that any up-and-down impedance of the arm motion is risky when so many records are now warped in the vertical plane. Just adds to the wear and tear. My own feeling is that whatever the merits of that argument (and the facts of the case aren't too simple), I've saved many more records from drastic macro-damage via viscous damping than I've ruined by micro-damage. Besides, you can adjust the degree of damping.

Therefore I'm intrigued by an arm I've

seen announced, though I haven't tried it, which has *horizontal* viscous damping, but none in the vertical dimension. Tricky. It's called the Zephyr, made by H. L. Blatterman of Pasadena, and it costs a pretty dollar. Tubular, very light and spring-balanced, and it sounds like a good bet to me.

Still on the subject of arms and their cartridge contents, I'm interested to hear that Paul Weathers offers a complete and very reasonable modernization service for all older models of his Weathers FM pickup. For between $5 and $10 (maximum), you can have your older Weathers converted 100 per cent to the latest improved model, all the way through.

This is an honest and forthright idea and I'm all for it. For one thing, it not only suggests that the newest Weathers is "better than ever," but even admits, with candor, that if the new one is "better," then the old ones are by all the force of logic, not as good! Phew! There's one Dangling Infinity that doesn't dangle. I think we all should applaud this sort of honesty, and I mean it seriously.

Moreover, the deal is obviously a good one for all who may have acquired earlier models of the Weathers which, for one thing, were reputedly less stable in the FM circuit than the newer ones, more prone to temperamental acting-up.

Incidentally, I understand from strictly unofficial sources that Pickering and Co. is very good about re-vamping (or should I say, re-damping) well-worn models of its magnetic cartridges when they are returned for new stylus mounting. (Nope, they don't give you free diamonds.) Now don't start sending in those old Pickerings that got chewed up by the dog, or scraped across a concrete floor, or the cartridge the baby dropped into the dishwater one day. Pickering, I suspect, won't even bother to attempt the impossible. But routine renewal of legitimately elderly insides—yes. So I gather.

Another kind of service that looks reasonable from here is announced by an outfit that is called the Stereophonic Music Society, which appeared while I was away and so was unknown to me until this moment. Tape exchange.

If you're a member (the announcement doesn't tell me what you have to do to be one), you can trade in your high-priced stereo tapes for others on an exchange plan that will be operated by the Society on the basis of tapes other members want to pass along. Fair trade, and the handling fee to the Society is $1.50.

A fine idea and reasonable, though I wonder, myself, just how the Society is going to be able to keep us all in line when it comes to wear and tear. Frankly, I wouldn't trust us very far, and if I were running the Exchange I'd want to play every tape over from beginning to end before I sent it along to another user. Patches? Erasures? Missing sections? Bits of home conversation, printable or otherwise, just accidentally recorded onto the middle of, say, the Beethoven Fifth Symphony? The Unfinished Symphony even more unfinished than Schubert intended?

Well, the Stereophonic Music Society has undoubtedly thought of all this too, and so, with the cost of stereo tapes still many times that of LP music, you'd do well to write and investigate. 303 Grand Avenue, Palisades Park, N. J.

4. The Portable Mike

Maybe I'd better not do too much wishful thinking about gadgets I haven't even tried, but this one is too good to miss and I hope I *will* be able to get hold of one. Stephens Tru-Sonic Wireless Microphone. Zowie!

Now we've had wireless mikes and phonos around for many years, but people still

use the cluttery wired ones. Clearly, they must be better, if less convenient. Indeed, the condenser mikes are a fine nuisance, as I well know, what with extra power supplies, great, unwieldy, stiff cables that won't coil up and won't straighten out but flop all over the place like so many snakes. . . . Yep, I want a mike that has *no* cables to lead to the recorder input. (P.S. But it just has to have top quality. Otherwise I'll resign myself to the snake-cables, as usual.)

Now the Stephens Tru-Sonic line is generally known as a high quality one and so I assume that this mike, portable or no, is a top quality one. That's why I sit up and display interest. Maybe, just maybe, we now have a mike that can "walk" and yet will produce the real stuff, soundwise.

When this gets into proof I'm going to send a clipping of it to Stephens, then sit down in a prayerful attitude and wait. Do I detest cables, one and all, and especially the ones that trail around the floor and tangle themselves into portable knots. Oof!

5. Vanishing Vertical

Time was—several times—when vertical record cutting was just the thing. There's a lot of stuff still around in this form, both of the priceless acoustical variety and of the later and pioneer hi-fi sort, electrically made. (The first recorded "hi-fi" I ever heard was on vertical 16-in. transcription, back in ye early 40's.)

The old Western Electric 9 series of two-way pickups used to do well by the verticals, but those expensive cartridges aren't quite up to date any more (being, for one thing, perfectly huge by current standards) and we're in danger of losing our ability to reproduce the vertical sounds.

So, in this limited but important area, I signalize Fairchild's up-to-date vertical cartridge, the 216B, which I gather is not unlike the equivalent Fairchild lateral models in its performance. It has the new improved output (5 millivolts) and will play for you without an extra transformer, and it is claimed to be plenty rugged, too. If you specialize in old cylinder records, you can have the cartridge in a 7.5 mil size, to fit. Again—I haven't tried it, but I hardly think I need to. Anyhow, I have exactly two vertical-cut discs, a pair of old Edisons. They can wait.

Diamond, of course, and the 216B will cost you a mere 50 bucks. Well worth it for some users.

(P.S. Will we, some day, have stereo disc that uses both vertical and lateral cutting, simultaneously? Well, it has been done, but still we have, as of a month before, now, no practical launching news and the tape stereo people are going right ahead. A lot of serious bugs to iron out, I suspect, before disc stereo of this sort can get anywhere.)

6. Staggered Spacing

Back about four years ago I hit upon an old circumstance in staggered-head stereo. Staggered heads are the kind, case you didn't remember, that record their two tracks one behind the other on a single tape. Before the "stacked" double record and playback head had been developed, that was the only practicable means of putting two simultaneous tracks upon one tape. It still, evidently, is the cheapest way because offset or staggered head stereo players are still very much with us. Stereo tapes must still be offered, laboriously, in two forms, for stacked head (in-line) playing and for offset (staggered) playback.

The curious circumstance was this. A firm was about to try out a portable "binaural" recorder of the staggered-head type. I had asked about it and rather hoped to compare its field performance with that of the then quite new and unique "binaural" Magnecorder, also with two separate staggered heads. But would the portable-made tapes play on the big Magnecorder? In particular, *was the distance the same between the heads?*

If not, then clearly the playback would be out of phase. Correct playback requires that the two tracks be rigidly in phase, i.e., taken off the tape at precisely the same spacing with which they were put on.

The portable's maker, as I remember, hadn't even thought of this kind of playback in compatibility, at the time. And nobody in the local Magnecord forces, for that matter, could give me the official Magnecorder head spacing. I learned it finally from the main office in Chicago and passed it on to the portable maker. To this day I don't know whether he got together with Magnecorder or not.

Now guess what's going on today, a brace of years later. Yep, it's just as you are thinking. Believe it or not, today, after all that time, it seems that there is still no official standard for the spacing of stereo heads, though commercial staggered-head tapes are on the market. If you play them with the wrong spacing, your stereo sound may be very pleasing but it'll be thoroughly addled and out of step. No two ways about it.

I wrote to the EMC Corporation when I saw that this firm was launching a stereo tape player in models that offered both in-line and staggered playback. I wanted to know, simply, what the spacing between the heads was, and did this constitute a standard?

Mr. L. B. Lueck, vice president, wrote me immediately and was most informative, so I pass on his information to you with thanks to EMC for the cooperation.

". . . *We believe that no industry-wide standardization has ever been adopted, but that practice calls for a gap to gap spacing of 1.250*" (V-M says 1 7/32 in. which is 1.21875. Now what do we do? ED.), *and that all manufacturers comply with this dimension.*

". . . *if the spacing between heads on the reproduction unit is even a few thousandths of an inch different from the spacing used in the copying machine or the original recording, serious phasing problems may be introduced, and loss of high-frequency response may occur. The difficulty of maintaining dimensions within one or two thousandths is critical in manufacture of relatively low-cost equipment, whereas the problem does not exist for in-line heads.*"

This is clearly a fine argument for the use of the more expensive but more trustworthy double heads, in-line, and I'd say it constituted a suggestion to all those who buy stereo playing equipment with staggered heads that they check their spacing *very* carefully. Leaves a lot to the good graces of the manufacturer.

Even with correct spacing in the player —assuming the above figure as a standard—you can't be sure of good stereo, for there's no way to check the spacing on the staggered-head recorded tapes you buy. Reputable makers will stick as closely as they can to the standard, but it's only too easy, I'd say, to overlook the spacing problem, among all the others a recorded tape company has to solve.

Will somebody please adopt an official standard? Seems to me that there should be two standards, primary and secondary. Primary standard for head spacing: 0". (That is, in-line.) Secondary standard, 1.250" (or something), for all staggered stereo heads—record and playback.

Me, I'll stick strictly to the primary. With in-line heads you can't go wrong.

FREE-RIDING CONTROL RELAYS

(*From page 20*)

shunting is necessary. Typical circuits for resistance adjustment and pertinent formulas for their use are shown in ***Fig.*** 4. All of these formulas are derived from Ohm's and Kirchoff's Laws, and should appear familiar. Circuit of (D) in ***Fig.*** 4 is of special value when it is necessary to keep switching transients at an absolute minimum. Here, by use of a sensitive relay, the major part of the bias resistance can be R_2, and the resistance increase, during the moment of function transfer, is from $R_1 + R_2$ to $2R_1 + R_2$. If R_1 is quite small with respect to R_2, the surge due to resistance change during switching is of academic interest only.

Where relay current is considerably less than system current, so that a shunt is necessary, it can be evaluated from:

$$\textit{Shunt Resistance} = \frac{\textit{Relay Current} \times \textit{Relay Resistance}}{\textit{System Current} - \textit{Relay Current}}$$

All other computations necessary can be performed by substitution in the formulas in *Fig.* 4.

Relays operating from the cathode current of a vacuum tube have a "built-in" time-delay function. They will not operate until the tubes upon which they are parasitic are almost fully warmed up. In consequence, such relays may be used to insert automatic squelchers of warmup instabilities when deenergized, and to remove them when the equipment to which they are connected is warmed up.

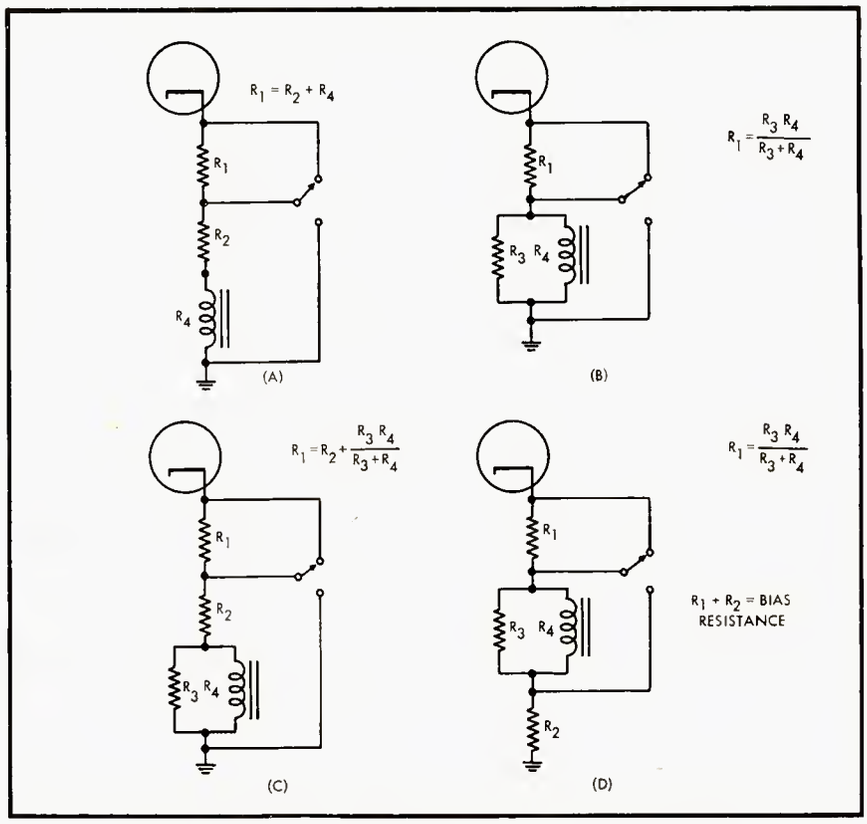


Fig. 4. Resistance adjustments for various types of relay circuits.

ADEQUATE AUDIO POWER

(*From page 19*)

where

P = rate of emission of the source, ergs/sec.
C = velocity of sound, cm/sec.
S = total surface area of absorbing surfaces, sq. cms.
α = average coefficient of absorption of all surfaces.
V = total volume of room, cu. cms.

When steady state conditions are reached, theoretically after infinite time, but practically after T secs. where T is the reverberation time of the enclosure, the bracketed term is equal to unity and the sound energy density is given by

$$E = \frac{4P}{CS\alpha} \qquad (2)$$

It is more convenient to have a relation involving the reverberation time T and the volume of the enclosure V rather than S

and α and this can be obtained from the normal Sabine relation for reverberation time $T = kV/S\alpha$, from which $S\alpha = kV/T$ Substituting kV/T for $S\alpha$ in Eq. (2) gives

$$E = \frac{4PT}{CkV} \qquad (3)$$

from which the source power in Ergs/sec. is given by

$$P = \frac{CkVE}{4T} \qquad (4)$$

If some standard intensity is adopted, the arithmetic is simplified and as 100 db is a convenient figure this will be inserted. It corresponds to a sound intensity of 10^{-6} watts/sq. cm. and a sound energy density of 3×10^{-4} ergs/cu. cm. Substituting this value in Eq. (4) and including all constants, the acoustic power in watts required from the source to produce a maximum intensity of 100 db is given by

$$P = \frac{3.4 \times 10^4 \times 16 \times 10^{-4} \times 3 \times 10^{-4}}{4 \times 10^7} \times \frac{V}{T} \qquad (6)$$

$$= 4.1 \times 10^{-10}\ V/T$$

or converting to ft. units

$$P = 1.16 \times 10^{-5}\ V/T = .0000116\ \frac{V}{T}\ watts \qquad (7)$$

For any loudness level other than 100 db the power required will be doubled for each 3 db increase in intensity that is considered necessary. The threshold of pain is reached at an intensity level of about 120 db requiring a power 100 times that given by the equation and presumably fixing the absolute maximum value of power that *anybody* might ever consider necessary.

REFERENCES

Somerville and Ward, "Listeners sound-level preferences," *B.B.C. Quarterly*, Jan. 1949.

Chinn and Eisenberg, "Sound intensity preferences of Broadcast listeners," *Proc. I.R.E.*, Sept. 1945.

Sivian, Dunn, and White, "Absolute amplitudes and spectra of musical instruments." *J. Acous. Soc. Am.*, Jan. 1931.

HI FI IN HOME

(*from page 15*)

eidedly not, for the bass notes have been written in the score for a reason. They contribute to mood and to color and so do the notes in the middle of the scale. To rule them out in favor of the treble is to lose much of the spirit of the composer's intention and that of his interpreters.

The answer to all this is not one that can be stated in black and white, and the points I have raised are merely to start home-listeners wondering if they are really getting more out of their sets as musical instruments to be listened to, or to be "played on" in an attempt at self-expression of themselves as operators.

The solution, I suspect, is to cultivate "the listening ear," and set your controls at the point where you, the hearer, receive the most impressions . . . melody, color, rhythm, mood. When one of these blots out the other, you have surely gone too far.

Hi-Fi on the retail level is basically

intended to give the purchaser the best listening possible in his home. This is an important fact to be remembered when listening in a shop to an installation you contemplate purchasing. What sounds good there does so because it has been tailored by experts to the surroundings which act as a sounding board for the sounds it will produce. You have no reason to assume the same set will sound as well in your own home, which may be very different as far as carpeting, draperies, height of ceiling, number of windows, and so on, are concerned.

Any reputable dealer will be willing to let you listen to your installation in your home on a trial basis before committing yourself. Many will be willing to listen with you and be able to make constructive suggestions about how to achieve the proper balance which will make listening a pleasure and a rewarding experience.

If your dealer is willing to take this trouble, let him. If he isn't, find one who is. To paraphrase the editorial writer I quoted earlier, "Hi-Fi is a wonderful invention, but God made the listener too." No one buys an automobile too big for his garage, or expects to enjoy it if he hasn't learned how to operate it. Exactly the same attitude is applicable to Hi-Fi.

PROFESSIONAL DIRECTORY

Industry Notes . . .

ALLIED RADIO BUYS VOICE AND VISION. Allied Radio Corp., Chicago, has purchased **Voice & Vision, Inc.,** also Chicago. According to A. D. Davis, Allied president, the new store will be the fifth in the Allied hi-fi chain. It will be known as **Allied Voice & Vision.** Irving Rose will remain as manager of the Voice & Vision branch.

FM GROUP ANNOUNCES PLANS. The newly-formed **FM Development Association,** a national organization founded recently to develop and expand the FM industry, has announced a promotional program to increase the commercial acceptability of FM radio. The association, which met for the first time recently in Chicago, is made up of major FM stations throughout the country. Officers elected are: Robert L. Brazy, Pan American Broadcasting Company, Los Angeles, president; Edward Wheeler, WEAW, Evanston, Ill., secretary, and Harold Tanner, WLDM, Detroit, Mich., treasurer. The Edwards Agency, Los Angeles, has been named advertising counsel.

AMERICAN MICROPHONE MOVES. American Microphone Company is closing, effective March 2, its Pasadena, Calif. plant and will immediately move equipment and key personnel to Elgin, Ill. for resumption of production in the near future. A. P. Barton, general manager, announced that the move was dictated chiefly by the need to re-locate the company in a centralized location for better service to the trade. Adequate inventory of all standard American products will be available at both Burbank, Calif. and Elgin to meet all trade requirements during the transition period.

AMPEX EXPANDS. Ampex Corporation announces the acquisition of a new building containing 70,000 square feet which, when combined with the company's present facilities, will provide the largest plant in the world devoted exclusively to the manufacture of magnetic tape recorders. Decision to acquire the new building will have no effect on the company's long range plans to move its plant from Redwood City to Stanford Industrial Park in Palo Alto, Calif., according to George I. Long, Ampex president.

Industry People . . .

Jay Quinn, pioneer in the high fidelity industry, has joined British Industries Corporation in an executive capacity . . . **James H. Owens** has been named manager of advertising and market research of the new RCA components division. Joining RCA originally as a radio operator in 1930, most recently he has been manager of electronic components marketing . . . **L. C. Racine,** formerly president of Chicago Standard Transformer Company, is the newly-appointed sales manager for the industrial division of the Gramer-Halldorsen Transformer Corp. . . . **Walter E. Peek,** until recently sales manager of electronic mechanical products, has been promoted to general sales manager of Centralab Division of Globe-Union, Inc.

Harry Shaffer of Hollywood Electronics has been elected to his third consecutive term as chairman of Audio Components Distributors Association.

ADVERTISING INDEX

SIMPLE AS A B C

To make it just as easy as possible for AUDIO's readers to subscribe, order books, get further information about the new products and the new literature mentioned in the pages of the magazine, or to get catalog sheets and brochures describing articles advertised, we provide herewith three cards. We know that many readers are loath to cut coupons from the pages of their favorite magazine because they have told us so. And we know that many times one would like to have complete and thorough data about something he sees in these pages, yet he considers it too much trouble to hunt up paper and envelope—not to mention the stamp—and write a long letter detailing what he wants to know. This is just as simple as we know how to make it with the exception of stenciling each subscriber's name and address on each of the postcards—an operation which would be highly impractical from the printing standpoint. But from now on, when you want more information about something you have seen advertised or mentioned in AUDIO you need only indicate it on the appropriate card, print your name and address, and drop it in the nearest postbox. We pay the postage, and it goes without saying that we wouldn't include these cards if we didn't welcome your use of them. And, for the first time, you can enter your subscription without sending a penny with your order—we'll bill you later. For books, we'll have to ask for the money in advance, but only for books.

Readers have told us that they often want to know more about some of the items mentioned in the *New Products* and *New Literature* pages of the magazine, but that they do not want to take the time and effort to write to each one of the sources individually to get all the information they need. As a matter of fact, in an average issue there are usually ten items in the *New Literature* column, and between ten and fifteen on the *New Products* pages. It is conceivable that the average reader might want information on at least ten of these items, since they are selected with the interests of most of AUDIO's readers in mind. Thus one would have to have ten envelopes, ten sheets of paper, and ten three-cent stamps, together with the need for writing the ten letters and inscribing each with name and address. We do it all for you, assuming that you are willing to circle the items about which more information is desired and to write your name and address once. We will forward your inquiries to the organization involved, and you will receive the data you want with only one inquiry. Isn't that as simple as A B C?

In just the same way you can get more information about any product that is *advertised* in the pages of AUDIO. Note the page on which the advertisement appears and circle it on the back side of this card. When there are two or more ads on the same page, the page number is followed by a letter, and the designation appears under each individual advertisement. Write your name and address clearly—someone has to decipher it—and it is a good idea to mark the card for all the information you want the first time, for there is only one card in each copy of the magazine. Of course, you *could* subscribe to two copies.

C

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Paper cover, $2.50.

☐ **Electronic Musical Instruments**
$7.50 in U. S. (All others $8.00)

☐ **AUDIO—Bound Volumes—1955 issues**
$10.00 (In U. S. only)

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NOW IT IS EASIER — ONLY ONE CARD

is necessary to get more information about any New Product or New Literature item, or about any product advertised in these pages.

At the end of each item of **New Literature, New Products,** or **Equipment Reports** you will notice a letter and a number—the letter indicates the month and the number indicates which item it is. All you have to do to get full information about the product or to get the literature described is to circle the appropriate number, add your name and address and mail it to us. We'll do the rest, and you may be sure that we'll be prompt because we are just as anxious for your inquiries to get to their destination as you are—and besides, we don't have room enough around the office to accumulate a lot of cards. Circle one item, if you wish, or all of them—we'll carry on from there. This whole system breaks down if there is a charge for the **New Literature** described, so if you can suggest any improvements in this service, we would appreciate hearing about them.

To get more information about the products that are advertised in each issue of AUDIO—use the new card at the left. Fill in your name and address clearly and circle the number of the page on which the advertisement appears. When there are two or more ads on a page, each one has under it a notation such as Circle 23a, Circle 48b, or Circle 76c and the same numbers appear on the card. Numbers C-2, C-3, and C-4 refer to the covers—C-2 is the inside front cover, C-3 the inside back cover, and C-4 is the outside back cover. SB is "The Sounding Board."

The only way to derive any benefit from this service is to use the card for all the information you want. We think you will find this new system more convenient and that you will use it more and more.

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AUDIO — Please send me further information about the coded items circled below and about those advertised on the circled pages of the March issue.
(PLEASE DO NOT USE THIS CARD AFTER JULY 1, 1957)

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C-2	C-12	C-3	7	36-37	50	60b	67	71e
C-3	C-13	C-4	8	39	51	61a	68	71f
C-4	C-14	SB	9-11	41	52	61b	69a	71g
C-5	C-15		13	42-43	53	62a	69b	71h
C-6	C-16	1	14-15	44	54	62b	70a	71k
C-7	C-17	2	27	45	55	63a	70b	71l
C-8	C-18	3	29	46	56	63b	71a	72a
C-9	C-19	4	31	47	57	64	71b	72b
C-10	C-20	5	33	48	59	65	71c	

the music Mozart wanted you to hear

Most experts hesitate, then take refuge in an old saw when asked to define high fidelity. "Concert hall realism" is the phrase they usually conjure up. Actually, this begs the question.

The concert hall is one special area of musical experience; listening to music in your own home is another. Each has its place for the music lover.

When you want to listen to live music played by live musicians — unless you have a home large enough to accommodate an orchestra — there is clearly no substitute for the concert hall.

We don't recommend high fidelity *in place* of the concert hall. It has certain advantages over a live concert but it does not bring live musicians into your home. Nor is high fidelity a mere *substitute* for the concert hall: it stands on its own as the best way to create fine music in your home.

High fidelity is the technique for reproducing music and the spoken word IN YOUR HOME the way the composer himself would wish you to hear it.

A symphony, a concerto, any real musical form, is a wondrous complex of sound and energy, tonal range and loudness, color and balance. This incredibly intricate relationship of sound moved through the composer's mind as he fashioned the music and it is this complex which must be perfectly recaptured if the listener is to experience *all* the music Mozart wanted him to hear.

In a concert hall you hear it all if you're fortunate enough to sit in the right seat. Harman-Kardon high fidelity does it for you every time *in your own home* because it takes perfect program material, created under ideal conditions, and retells it with authenticity. The special sonorities of the instruments and the coloration and balance among them are completely retained. Adjustment is made for the acoustic conditions in your room and for your own hearing characteristics.

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The Harman-Kardon Festival II (Model TA-1040), illustrated above, is an outstanding expression of high fidelity thought and design. Here in a graceful compact unit, only 16-1/8″ wide, 14″ deep and 4-5/16″ high is a complete high fidelity electronic center: Magnificent Armstrong FM with Automatic Frequency Control to insure accurate tuning — automatically — and Automatic Noise Gate to eliminate noise between stations when tuning; sensitive AM with 10KC whistle filter; complete preamplifier and 40 watt distortion free, hum free power amplifier.

Features include: Dynamic Loudness Contour Control to provide precise balance for your own hearing characteristics; separate bass and treble tone controls; selectable record equalization; remote speaker selector switch; illuminated tuning meter and rumble filter. All this expressed in six simple to operate controls.

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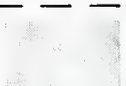

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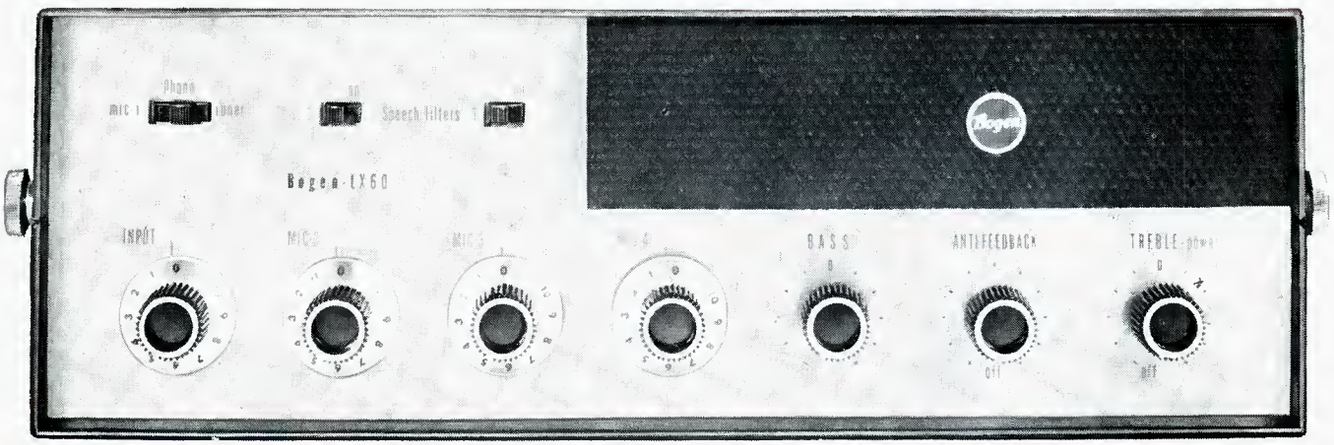
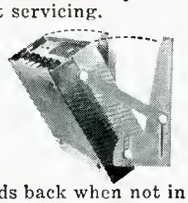
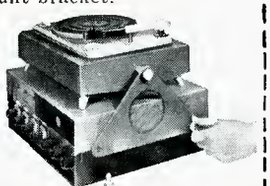


HOW'S THIS FOR EASY SERVICE ...EASY INSTALLATION

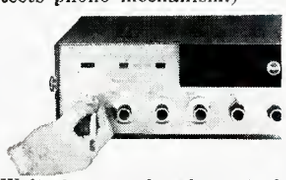
Loosen 4 thumbscrews and the lid's off for easy access and fast servicing.



Folds back when not in use in easy-sliding accessory wall-mount bracket.



4 Thumbscrews attach accessory record player mount. (Note: "cooling area" protects phono mechanism.)



Write-in on each gain control prevents embarrassing mistakes in volume settings. (Easy to erase markings.)

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Size: H. 5⅜", W. 16¼", D. 13", Wgt.: 25 lbs.

with accessory Manual Phono

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