

better listening

Through High Fidelity

Vol. 3, No. 11—NOVEMBER, 1957

In This Issue:

**WOOFERS AND
TWEETERS—**

Contrast in Design

VANISHING SOUNDS PRESERVED

Hi-Fi arrives in time to catch the nostalgic sounds of the age of steam now vanishing in the silence of the past.

—See story on page 8



Hi-Fi Shop

**2 N. HOWARD ST.
BALTIMORE, MARYLAND
Saratoga 7-3523**

HI-FI HEADQUARTERS



WEATHERS FM PICKUP SYSTEM

THE STANDARD FOR COMPARISON IN HIGH FIDELITY PICKUPS

Originally designed for broadcasting and precise sound engineering purposes, WEATHERS FM Pickup has been so advanced in design and construction, that it *can be treated like any ordinary phonograph arm under constant home use*. It is the "perfect beginning" to professional sound reproduction with high fidelity for everyone! Play your records once or a thousand times and with WEATHERS you'll enjoy professionally perfect high fidelity that's distortion-free, carefree!



Perfectly balanced for perfect record tracking

WEATHERS FM Pickup System is the only pickup designed and balanced at a stylus force of ONE-GRAM. For this reason, it perfectly traces all the minute record engravings which produce delicate overtones and represent sound with true fidelity. It causes no flexing of groove side-walls, thereby improving response to high frequencies without increasing surface noise.



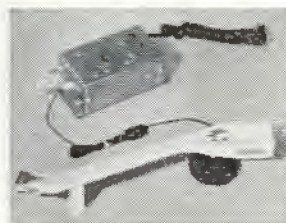
Saves records... preserves Hi-Fi qualities

Improper stylus force can ruin high fidelity qualities of your records at the very first play. WEATHERS, the lightest, professional touch, shows no record wear even after a thousand plays. Your favorite records, your valuable records will last a lifetime—and still sound new! A sapphire stylus on a Weathers pickup will last longer than a diamond stylus on ordinary pickups.



Distortion-free... carefree

WEATHERS FM Pickup System is free of all common causes of sound distortion. It does not pick up hum from motors, it tracks perfectly even if your turntable is tilted to a 45° angle, no leveling necessary! Accidentally dropped, WEATHERS pickup floats with feathery ease onto your record. Weathers pickup is shock-mounted...eliminates mechanical vibration and acoustic feedback.



MORE than a pickup, WEATHERS offers more to Hi-Fi

WEATHERS tone arm and pickup is a complete FM system, a virtual miniature FM radio station. Its sole purpose is to pick up and transmit impulses from your record. Your record practically does NO work when played with WEATHERS pickup. The result always is a flat response from 20 to 20,000 cycles.

WRITE FOR WEATHERS FREE BOOKLET ON HI-FI FACTS AND RECORD CARE TODAY!

Weathers

Industries, Div. of Advance Industries, Inc.

On the hi-fi record



By Edward S. Bergamini

MENOTTI: *The Unicorn, the Gorgon and the Manticore*. T. Schippers, chorus, instrumental ensemble. ANGEL 35437.

Gian-Carlo Menotti, born in Italy and musically trained both in that country and in the United States, likes to tell a story and set it to music. His productions come in all sizes; we find his fables sometimes ring truer than his "true" stories.

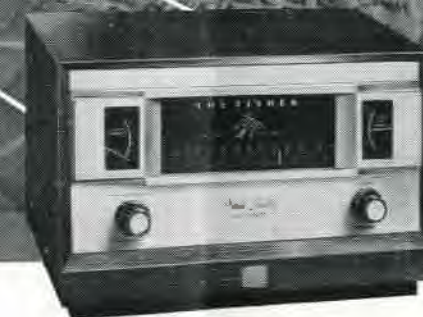
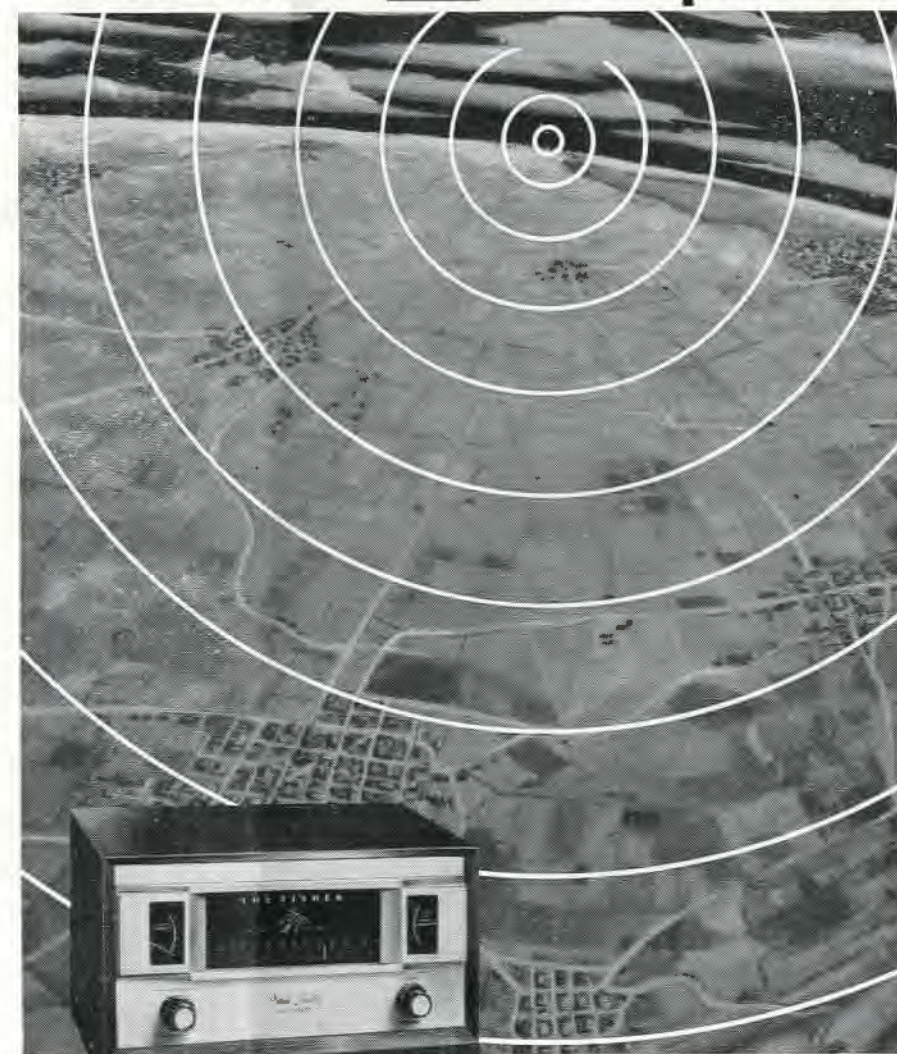
"Unicorn" spins the tale of the man in the castle, who appears to set a style or three, and the townspeople who imitate him while completely failing to understand him and his purpose (which wasn't concerned with style-setting at all!). But the listener should let the fable (set for the stage as a ballet), whose audible content is made up of madrigals and instrumental interludes, unfold to his own pleasure. We'll content ourselves with remarking that the chatter by the townspeople is very funny (they are forever babbling off into un-

(Continued on page 5)

DISC
OF THE
MONTH



245-Mile FM Reception!



THE FABULOUS FISHER 90-X FM TUNER

Fred W. Scholl, Jr. of Lancaster, Ohio, reports:

"My FISHER FM-90X Regularly Receives a 245-Mile Signal!"

■ "My 90-X is the most astounding FM tuner I have ever had the pleasure to own or operate, including the best to date. WWJ, Detroit, is our usual station for listening—air line about 245 miles!"

FM reception at distances over 200 miles, terrain permitting, is a regular occurrence if you own a FISHER FM-90X. There has never been a tuner like it in radio history. Such performance is no accident, for the key to the unequalled reputation of the FM-90X is the exclusive FISHER Gold Cascode RF amplifier, plus companion circuitry that takes full advantage of the Gold Cascode. Some evidence of the precision-jeweler characteristics of the Gold Cascode's internal construction will be found in the simple fact that we guarantee this tube for two years. With its half-micro-volt sensitivity, THE FISHER FM-90X has, in one sweep rendered all other FM tuners in its price range obsolete. Chassis, \$169.50

Mahogany or Blonde Cabinet, \$17.95

Ask for the **New FISHER High Fidelity Folder**

The Bass Reflex Baffle

THE "BASS REFLEX" baffle, or enclosure is one of the most widely used of loudspeaker enclosures. Its relatively simple design has made it popular for do-it-yourself construction, and also encouraged manufacturers to produce inexpensive but excellent commercial models. What's more, when properly constructed and matched to the speaker used in it, the bass reflex is sure to provide top listening results. It puts out the kind of bass that lets you distinguish between the deep thump of the big drum and the throb of a plucked string bass.

Those most characteristic aspect of its appearance is its twin openings: one is the cutout for the speaker, while the other, usually rectangular, serves as a "port." That port permits the back wave of the speaker to emerge in phase with the front wave, thus providing acoustic reinforcement at low frequencies. The port also permits the enclosure to be "tuned," or acoustically matched, to the speaker for maximum efficiency and minimum distortion.

Here's how it's done: each time the speaker cone vibrates, it sets up waves of sound from its front as well as from its back. But while the front wave is pushed, the back wave is pulled—and vice versa. As a result, the back wave is always out of phase with the front wave. In a very real sense, it represents the negation of the front wave—if permitted to mix unhindered with the front wave, serious loss of bass would occur. This is partly due to the nature of flow frequency waves—they have a tendency to spill over and spread around the edge of the speaker frame. The highs move in more of a straight line, so that the treble component of the back wave never really interferes with its counterpart in the front wave. As a matter of fact, in discussions of baffles and back waves, it is the bass frequencies that are our chief concern.

Now, in the infinite baffle the back wave is completely suppressed. In the bass reflex, the back wave is turned to advantage and is used to actually help the front wave. It's rather like a good example of "join 'em if you can't beat 'em."

A cabinet, with an opening of certain dimensions, will resonate at a specific frequency. The trick is to get the cabinet's air cavity to resonate at the same frequency as the natural resonance of the speaker.

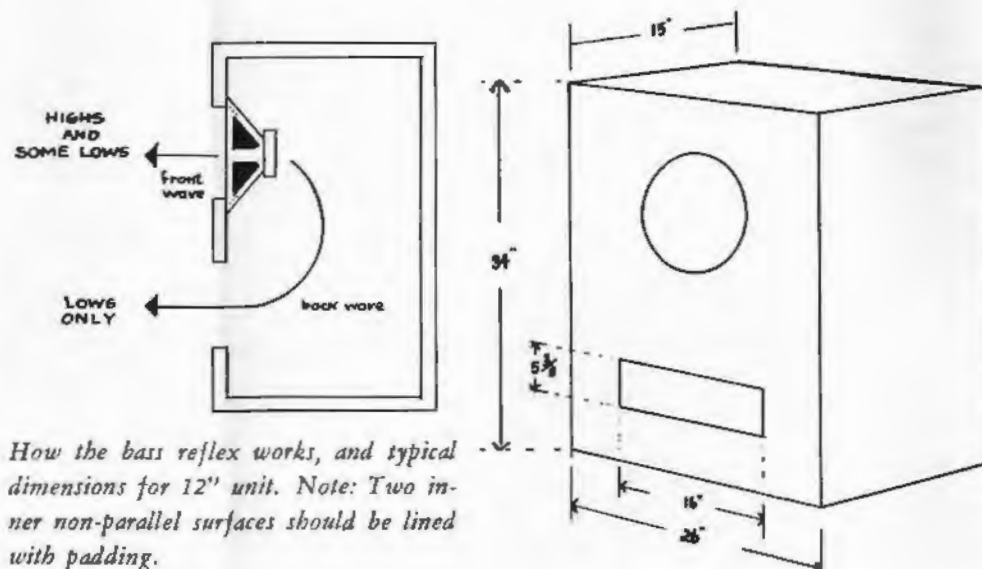
The bass reflex enclosure, however, provides an air cavity behind the speaker. This cavity has enough cubic volume to permit itself to be resonated at the same frequency as the speaker. The cavity is stirred to life by the back wave thrusts of the speaker cone at low frequencies. At resonance, the cavity and the cone are closely coupled. This means that the air vibrates in rhythm with the cone and pushes hard against it. The combined resonances of speaker and air cavity tend to cancel each other,

with the speaker maintaining a slight lead since it is, after all, the stronger of the two elements.

In terms of sound, the net result of this mutual degeneration (like fighting fire with fire) is to pull down and broaden the speaker's bass peak. In this way, its low frequency response is considerably smoothed and simultaneously extended by as much as a complete octave.

This, then, is one very important action achieved by the bass reflex cabinet. It provides the proper "air loading" on the back of the speaker cone for smooth and extended bass response.

In addition to smoothing the bass peak, the resonating air cavity is permitted—courtesy of the port—to emerge from within the box into the listening room. But by the time it has done so it has reversed its own phase and is actually in phase with the speaker's front wave. Thus, the back wave has not only been tamed, but has been given constructive directions as well. ■ ■ ■



On the Hi-Fi Record

(Continued from page 3)

finished fugues), that there are some exquisite musical textures (as in the setting of "muffle the horn and the lute" in the Sixth Madrigal), and that the instrumental interludes are delicious. The excellent performances and superb recording complete our recommendation of this record.

* * *

THE ORCHESTRA: *Stokowski, symphony orch.*

CAPITOL SAL 8385.

The sound of today's symphony orchestra, in whole and in part, is the substance of this release, which is also Stokowski's debut on the Capitol label. Part One allows the listener to hear its various sections by themselves, in pieces written for these instruments. The tasteful selections include a Dukas brass fanfare, Barber's "Adagio for Strings," a Strauss gavotte for winds, and part of Farberman's "Evolution" for percussion.

Part Two combines the sections. Brass and woodwinds bounce through the Scherzo from Vaughan Williams' Eighth Symphony. Add percussion: there's a March from Persichetti's Band Divertimento. Add strings: the Scherzo from Tchaikovsky's Fourth Symphony. Finally, the full orchestra, in the last two sections from Moussorgsky's "Pictures at an Exhibition." An attractive booklet describes the music here recorded.

The sound is remarkable, a documentation of the truth that sonic realism is the most spectacular hi-fi of all. It's a pleasure to anticipate future work by Stokowski-Capitol.

* * *

ENTREMONT PLAYS CHOPIN: 12 selections. *P. Entremont, piano.*
CONCERT HALL SOCIETY CHS 1502.

A dozen representative selections of this composer, half of them waltzes, played with delicacy and power as required, and with good taste. Listen to this young French pianist's thoughtful handling of the lovely Nocturne in F, op. 15, No. 1. Good piano recording.

(Continued on page 10)

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ALL ON ONE, COMPACT CHASSIS

FISHER FM-AM TUNER FISHER AUDIO CONTROLS FISHER 30-WATT AMPLIFIER



THE FISHER "500"

AN FM-AM TUNER of extreme sensitivity, a Master Audio Control, and powerful 30-watt amplifier—laboratory engineered and professionally combined on a single, compact chassis. Simply add a record player and loudspeaker and you have a complete high fidelity system. THE FISHER "500" is the simplest and most economical manner in which to acquire matched components—true to the twenty year FISHER tradition for quality.

Chassis Only, **\$249.50**

Mahogany or Blonde Cabinet, **\$19.95**

Outstanding Features of THE FISHER "500"

- Extreme sensitivity on FM and AM. ■ Meter for micro-accurate tuning. ■ Full wide-band FM detector for maximum capture ratio. ■ Powerful, 30-watt amplifier; handles 60-watt peaks. ■ Uniform response, 16 to 32,000 cycles. ■ 4 inputs, including separate tape playback preamp-equalizer. ■ 4, 8 and 16-ohm outputs match all existing speakers. ■ Recorder output ahead of volume and tone controls. ■ 7 Controls, including 9-position Channel Selector (AM, FM, AES, RIAA, LP, NAB, TAPE, AUX 1 and AUX 2), Loudness Contour (4-position), Volume, Bass, Treble, AC-Power, Station Selector. ■ Beautiful die-cast, brushed brass escutcheon and control panel. ■ Pin-point, channel indicator lights. ■ Smooth, flywheel tuning. ■ Largest, easy-to-read, slide-rule dial, with logging scale. ■ High efficiency FM and AM antennas supplied. ■ 18 tuned circuits. ■ 14 tubes plus 2 matched germanium diodes. ■ SIZE: 13 1/8" x 13 1/8" x 6 7/8" h.

Prices Slightly Higher in the Far West

Ask for the **New FISHER High Fidelity Folder**

EDITOR'S NOTE: We continue our series on loudspeakers, begun with our Special Loudspeaker Issue last month. The series will conclude next month with a report on an entirely new principle of loudspeaker design especially noted for its musical qualities.

Woofers and Tweeters

CONTRASTS IN DESIGN

by HERBERT REID

THE GENERAL PRINCIPLES of loudspeaker design, applicable equally to all types of speakers, were set forth in this journal last month. With these general principles as our base of thought, we are now free to carry our investigations further afield to mark the differences by which special-purpose speakers differ from the norm. In particular, we shall note the design differences that distinguish woofer and tweeter, making the one suited to the reproduction of low notes while qualifying the other for the upper range.

The obvious difference is in size and weight. We know from everyday observation that large, heavy and compliant bodies resonate at low frequency and that small, light and rigid bodies naturally sound higher. The woofer cone reaches the low resonance needed for effective bass production by being large, heavy, and very flexibly suspended at the rim. Highly compliant cone suspensions, such as cloth or leather, approximate the theoretical

ideal of a free-floating cone. Such suspensions have enough "give" to let the cone shoot back and forth like a piston at heavy bass amplitudes. This freedom from external restraint enables the cone to follow faithfully the widely swooping waveforms, producing deep, clean bass without false coloring. The stiff cone suspensions found in cheap speakers not only raise the cone resonance, thus weakening the bass, but they force the cone to flex. This causes the cone to break up into areas vibrating without relation to the signal, converting a high percentage of the signal energy into distortion.

Of course, highly flexible cone suspensions entail the risk of mechanical shock displacing the delicate center alignment of the cone. A good speaker therefore demands care and caution in handling.

Woofer cones are usually straight-sided. There is no need for the cone curvature, which often serves in single-unit speakers to extend frequency response, but which limits the ability of

the cone to execute heavy thrusts without breaking up into random ripples. Cone curvature is therefore detrimental in strictly low-frequency use. Corrugations add stiffness to the cone for piston-like action on the air. They also help subdue troublesome harmonics of the resonance frequency. Many designers favor deep woofer cones to transmit thrust or pull more nearly longitudinally through the cone walls, thus further reducing the danger of flexing and rippling. (Directivity, increasing with cone depth, does not appreciably affect the low range. However, it precludes the use of deep cones in full-range speakers).

Cone diameter is the factor most generally used in differentiating speakers. It is also most generally misunderstood. The widespread notion that the bigger speaker is necessarily the better is not necessarily so. Too many other factors enter the picture. It should also be remembered that upper range and tonal dispersion suffer with increasing cone size and that any speaker can be judged only in terms of

its intended use. However, large size definitely helps in low frequency production. In a woofer, where upper range and dispersion do not matter, sheer size wins the argument. Other factors being equal, every four inches added to the cone diameter gain about one octave of bass.

A large cone diameter, e.g., 12 or preferably 15 inches, improves bass in two ways: a) It adds to the weight of the cone and thus lowers its resonance. b) It increases the active surface in contact with the air and thus enables the speaker to move more air with each stroke. This provides more effective coupling of the loudspeaker energy to the air of the listening room. Especially in the low-frequency region, where much of the power produced by amplifier and loudspeaker is often lost through poor energy transfer between cone and air, this factor is of great importance. We must remember, however, that it is actually the job of the enclosure to present proper air loading to the cone and thus

to assure efficient energy transfer at low frequencies. A well-matched enclosure, rather than speaker size, is therefore the principal key to effective bass radiation.

The most exacting as well as the most expensive woofer requirement is a heavy, powerful magnet. It must have the strength to override the inertia of the heavy cone, speeding it instantly on the longest possible travel for a given signal amplitude. This gives the speaker the necessary sensitivity. Moreover, the flux density engendered by the magnet in the voice coil gap must spread uniformly along the entire coil path, so that the movement of the coil remains at all points exactly proportional to the signal amplitude. The amount and distribution of magnetic flux in the voice coil gap determine the woofer's ability to handle the power-laden thrusts representing the massive sound of bass instruments. A weak magnet, unable to create a sufficiently large uniform flux field, causes the speaker to distort at the amplitude peaks. The sound then becomes harsh

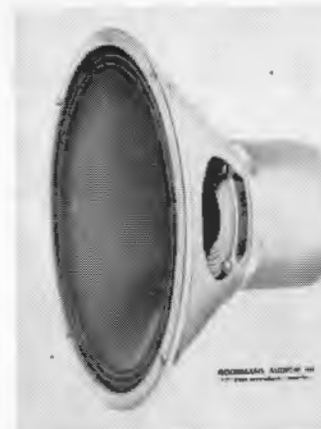
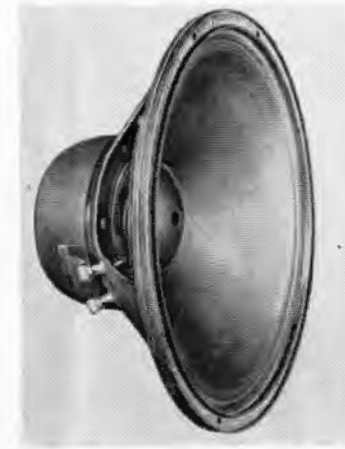
and grating; the true bass fundamentals, which make listening so effortless and enjoyable, are then lost among distortion products sapping energy from the true sound. Such a speaker always seems unpleasantly loud because of its high distortion content. A good speaker rarely seems loud—not even at full volume.

Damping, the quality responsible for clarity and definition of sound, also depends on the magnet, which must keep the cone from overshooting its mark or ringing like a gong after being energized by the signal. To accomplish this, magnet and coil act as generators, setting up a current opposing any motion of the coil caused by its own momentum rather than the actual signal. If the speaker is fed from a low-impedance (e.g., an amplifier with a large amount of negative feedback), this self-generated current is effectively shunted across the voice coil and "puts the brakes" on any random movement of the coil. The cone is thus con-

(Continued on page 12)

BETTER LISTENING 7

15 DUAL RANGE IMPEDANCE WOOFER



Woofers On Parade

Woofers on parade. The line-up (from left to right) shows typical products from such highly reputed manufacturers as University, Bozak, Altec-Lansing, Goodmans, Electro-Voice and James B. Lansing. They all exhibit design features discussed in the article.

Hi-Fi on the Trestle

ANY RECORDING process is, by definition, a link to the past. A hundred years ago, the visual recording process of lithography captured for us, through the prints of Currier & Ives, the image of a bygone America. Today, the recording of passing sights has been joined by the recording of passing sounds.

High fidelity, it seems, appeared just in time to catch a sound now vanishing into the long silence of the past—a sound that recalls to most of us our childhood fantasies of great journeys to those faraway places that always beckon from the corners of the earth, providing one is young enough.

A new LP disc, titled "Sounds of Steam Railroading" and produced by O. Winston Link, of New York City, preserves for us the varied noises of a steam railroad—all the clanks, wheezes, rumbles, shrillings, chuffs, pants, groans and clicks which combine to conjure up a mental image of trains and engines as they once were.

Those great black and sooty machines, once the most powerful conquerors of distance, messengers across continents and builders of great fortunes, now raise their hoarse voices on this disc for nearly the last time in a sort of iron swan song—mechanical, yet strangely moving. For

who among us, who are old enough to pay the bill for a hi-fi set, have not as children stirred in our beds when the whistle of the night train transported our fancy beyond all horizons? Who can't recall the wonder inspired by the great, snorting engine that spews fire against the dark sky as the head of a luminous snake wending through the evening landscape?

And if you, yourself, are immune to nostalgia, you might get this record for the kids; for chances are that these sounds are quite new to them: they only know the sleek Diesels that glide along the track with nothing more than a polite and efficient murmur. ■ ■ ■



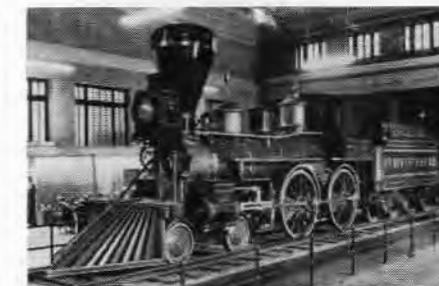
The last of the steam-age giants already bear the streamlined marks of a future era.



Above: The heavy freight, snorting past Fringer's Mill at Litbia, Va., adds a distinctive voice to the nostalgic chorus of steam.



Above: The clanking bell at a grade crossing completes the aural image of the passing train.



Above: The last stop. This 1861 vintage model is a polished and venerated museum piece.

Right: Arrayed with divers equipments, photographer-recordist Link and his helper haunt the nights along the Norfolk & Western tracks for sight and sound mementos of the "steam age."



Above: "Buck" Stewart has been calling the trains at Roanoke for thirty years. His voice is part of the tonal panorama presented on the disc.



In Memoriam:



Dennis Brain

THE MUSIC WORLD suffered a tragic loss in the death of Dennis Brain, killed recently when his car crashed into a tree on his way home to London from the Edinburgh Festival. The 36-year-old musician, internationally recognized as the greatest living French horn player, was known and admired by record collectors the world over. He came to America three times, with the R.A.F. Band, the Royal Philharmonic and with the Philharmonia of London. After a Carnegie Hall concert of the latter, the *New York Herald Tribune* wrote that the sound of the orchestra was "enchancing . . . the horn must come from another planet."

Dennis Brain had sometimes playfully been called the only young man fit to blow his own horn. The third generation and fifth player in a family of famous horn virtuosos, Dennis Brain came by his gifts legitimately. His grandfather, father and two uncles were all horn players of repute.

In this age of unsettled family life and disorganized personalities, such matter-of-fact adherence to a family tradition culminating in the attainment of excellence in a chosen craft is in itself a rare and admirable phenomenon.

Dennis Brain's singularly sweet horn
(Continued on page 16)

Audio-Then and Now

TODAY we take electronic dissemination of music so much for granted that it seems to us the natural way for music to reach us, while the "live" concert seems exceptional—a special sort of occasion. In the rapid passage of time, we forget how recently all this came about. Yet to many of us the historic photograph from Bell Telephone Laboratories of the early experiments in high-quality music transmission by electronic means will recall a time (circa 1927) still well within memory. Note the old-fashioned carbon microphone, the "control room" behind the instrument panel, and last but not least, the period piece of a lampshade. In contrast, a glimpse into Columbia Records present studio during a hi-fi recording session, shows the lavish progeny that sprang from this century's unique marriage between the unlike arts of music and electronics.



On the Hi-Fi Record

(Continued from page 5)

BACH: *Suites for Orchestra: Nos. 3 and 4. Van Beinum, Amsterdam Concertgebouw.*

EPIC LC 3332.

The four Bach Suites for orchestra are among the most ingratiating approaches to Bach for the doubting layman. (They are dance suites, and they sound sweetly to the ear, which should be plenty for a starter!) This completes the suite series by Van Beinum and his great orchestra (Nos. 1 and 2 are on Epic LC 3194). The second movement of No. 3 here offered is the well-known "Air for the G String."

* * *

ALESSANDRO MARCELLO: *"La Cetra" Concertos: Nos. 2, 3, 4, and 6. Oboe Concerto in D minor. I Musici, with S. Cantore and P. Accorroni, oboes.*

EPIC LC 3380.

Alessandro Marcello, Bach contemporary and brother of the better-known Benedetto, has written works worth re-discovering, judged from this, the first long-play record of his music. The concertos vary in importance; especially treasurable is No. 3, owning a quietly breathtaking slow movement. I Musici and their guest oboists perform splendidly as always, and are superbly recorded.

* * *

VIENNESE NIGHT AT THE PROMS. *Barbirolli, Halle Orch.*

MERCURY MG 50124.

For "Proms" in England, read "Pops" over here. And Barbirolli's energetic and well-tailored performance of music by

Johann Strauss and others (Fledermaus and Gypsy Baron Overtures, Tales from the Vienna Woods, Blue Danube, etc.) are certainly welcome. The sound is as fine as one could ask.

* * *

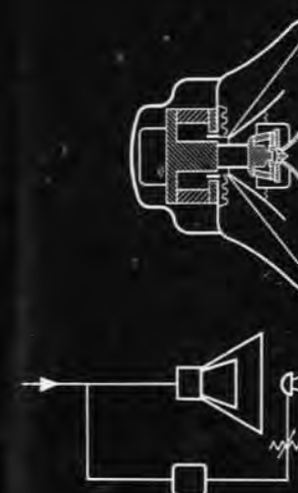
GREGORIAN CHANT: *Missa in Dominica Resurrectionis. M. Pfaff, Monks' Choir of the Benedictine Abbey of St. Martin, Beuron (Germany).*

DECCA ARC 3001.

First recording and an authentic performance of the High Mass for Easter Sunday. Perhaps these singers lack the extraordinary abilities of the choir at Solesmes, who appear occasionally on records; their rendering of this music's eternal, soaring lines is dedicated and beautiful. The setting of "Haec dies" is but one unforgettable moment. Near-perfect recording.

(Continued on page 15)

Burton Browne Advertising



NEW Jensen COAXIAL 3-ELEMENT HI-FI LOUDSPEAKERS

You'll spend less for more performance
... get traditional Jensen quality!

If you're looking for hi-fi performance outclassing anything remotely similar on the market today... with more performance... more easy-on-the-ears listening quality... at less than you'd expect to pay, then don't fail to investigate Jensen's 4 new Coaxial 3-Element models.

There are three radiating elements driven by two voice coils. H-F unit is a compression driver supertweeter 4000-15000 cycles; woofer-midchannel is a separately driven dual cone unit, with the small cone dispersing and smoothing the 2000-4000 cps. region. The whole skillfully blended combination rates at 30-15000, low end depending on enclosure. H-F control tunes it up smoothly to suit the ear. Choice of 12-inch CX-120 (1 lb. magnet) at \$49.50 or CX-225 (1 3/4 lb.) at \$59.50; 15-inch CX-150 (1 lb.) is \$66.50, CX-255 (1 3/4 lb.) only \$76.50. Write now for free complete condensed Catalog 165-B.



KTX-3 "STEP-UP" KIT

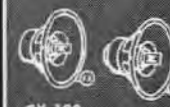
If you have the urge to improve your speaker later, you can have a full 3-way system by adding this compression horn midrange unit (600-4000 cps). Net \$62.50.



UNAX[®]
SINGLE ELEMENT



DUAX[®]
2-ELEMENT SYSTEMS



COAXIAL
3-ELEMENT SYSTEMS

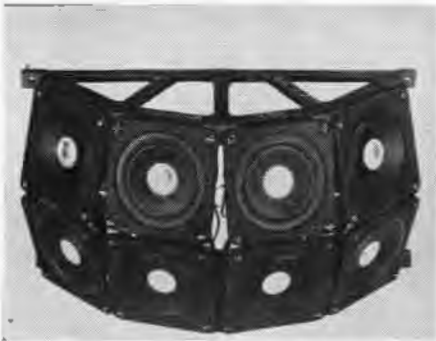
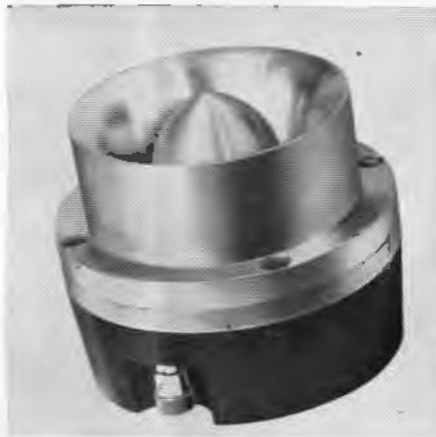


TRIAx[®] and
TRIAx[®]
3-WAY SYSTEMS

THE
WORLD'S
MOST
COMPLETE
HIGH
FIDELITY
LOUDSPEAKER
LINE

*T. M. Reg.

Jensen MANUFACTURING COMPANY



Greater variety in design principles exists among tweeters. To disperse treble over a wide angle, University (upper left) employs special horn flares, Bozak (lower left) uses a nest of cone tweeters facing in different directions and James B. Lansing (right) employs a ring radiator. A new omnidirectional tweeter has just been patented and will be described in the next issue of this magazine.

(Continued from page 7)

strained by the magnet to trace an accurate replica of the signal waveform without muddying or falsifying the tone by its own inertial or elastic motion. Of course, a heavy woofer cone has plenty of inertia and hence a strong "will of its own." It takes a powerful magnet to suppress it. High flux density as well as total magnet flux (indicated roughly by the magnet weight) are therefore significant factors to look for in a woofer.

Finally, the entire woofer should be assembled in a frame heavy enough to minimize its own resonance. Steel frames might possibly warp under stress from over-tight mounting bolts, slowly developing permanent misalignment of the speaker. A die-cast frame is therefore preferable.

Tweeters

Here specialization turns in the opposite direction toward smaller size, lighter weight, greater rigidity and hence higher resonance of the vibrating parts. Often these parts are not conventional cones, but light, stiff diaphragms made of aluminum or a rigid, low-density plastic. These diaphragms, together with their magnet and coil assemblies, are housed

in a separate unit, called a driver. Such drivers are always joined to a metal horn, which provides proper air loading to the small diaphragm and projects the sound. In addition to these "horn tweeters" there are also "cone tweeters" which look and work like small ordinary speakers. The mounting of tweeter cones or diaphragms, unlike the mounting woofer cones, has a stiff, hard resilience to assist in the rapid reversals of direction at high frequencies.

Tweeters have no need to accommodate wide amplitudes because cone excursions are much shorter in the treble. The distance the cone must travel to maintain constant power output (= flat frequency response) varies inversely as the frequency. This seems plausible when we consider that the high-frequency cone makes many more trips (cycles) per second than the low-frequency cone to do an equivalent amount of work. Each tweeter stroke therefore needs to accomplish only a fraction of the work done by each woofer stroke. Hence the tweeter stroke is correspondingly shorter.

This makes magnet requirements less stringent, for even a relatively small magnet is able to spread a uniform flux field over the short distance of tweeter travel and to provide adequate damping for the low mass of the small moving parts.

The characteristic sound of horn tweeters is brilliant and often spectacular, enhancing the excitement of brass, woodwinds and percussion. At its best, it is precisely what many people look for in hi-fi. However, tweeter horns sometimes introduce resonant peaks of their own, giving a strident tinge to the music. Particularly string instruments suffer some loss of their mellowness. Many veteran hi-fiers, including a significant sprinkling of professional musicians, therefore find the sound of horn-less cone tweeters more satisfying and easier to live with in the long run. Ultimately, the choice between horn tweeter or cone tweeter is a matter of personal tonal taste.

The overall effect of a tweeter depends largely on wide-angle distribution of its output. Treble tends to radiate in a narrow beam, forming a shaft of harsh, over-concentrated high-frequency sound along the center-line of the speaker, leaving dull acoustic shadow to either side. To scatter this beam evenly over the listening area, tweeter horns are shaped into special flares or divided into multiple cells fanning out in different directions. Some firms employ an "acoustic lens" in the tweeter horn, which works somewhat like an optical light diffuser. Cone tweeters generally rely on small, flat cones to approximate a point-source of sound, thus assuring omnidirectional radiation. Bozak cone tweeters are arranged in clusters of two or more with each speaker set off at an angle.

The minimum directivity requirement for a tweeter is uniform treble dispersion over a 90-degree sector so that the tweeter "sees" the entire listening room when facing diagonally from a corner. If corner position is not feasible, the dispersion angle should be correspondingly wider to include more of the listening area when the speaker is placed alongside a wall. Corner placement, however, is preferable not only because it simplifies the problem of high-frequency distribution but also because it literally multiplies the efficiency of the woofer and creates a far superior acoustic situation throughout.

...

The only quality AM-FM Tuner designed for STEREO

There's no such thing as obsolescence with H. H. Scott's new AM-FM Stereo tuner, Model 330-C. Use it as an AM tuner; as an FM tuner; or use both sections together for simultaneous AM-FM stereo reception. Top quality reception is assured on both FM and AM by H. H. Scott's unique wide-band FM circuitry and wide range AM circuitry.

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Technical Specifications: 330C AM-FM Stereophonic Tuner:

FM Section: Sensitivity 2 microvolts for 20 db. of quieting; 2 megacycle wide-band detector; wide band circuits assure freedom from drift and high selectivity; 2½ db. capture ratio; automatic gain control.

AM Section: Wide range AM circuitry for reception of high fidelity AM broadcasts; adjustable band-width including wide-range, normal, and distant positions; sharply tuned 10 kc. whistle filter.

Tuning meter on both FM and AM; outputs include: stereophonic, FM and AM monaural outputs, multiplex output, and tape recorder; dimensions in accessory mahogany case 15½" w x 5" h x 12½" d. \$199.95. Choice of handsome cases at \$9.95 and \$19.95.

Prices slightly higher west of Rockies

The H. H. Scott 330C Stereo tuner is shown below in a Stereo system with two H. H. Scott 99 complete amplifiers

Furniture and Accessories Courtesy Rapids Furniture, Boston.



when it sounds like this...



instead of this...



it's time for...

University

When your hi-fi wears out its welcome... tires your ears with shrill, discordant highs, muddy lows and general tonal fuzziness... you've probably got a case of "listening fatigue." It's a common trouble for which a University loudspeaker or system is the cure!

The reproduction of music is a fine art... as skillful, in its way, as creating it. Since the speaker is the last link of your high fidelity chain, University spent two decades perfecting the craft of making this link the strongest.

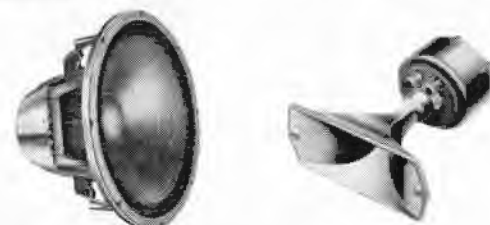
When next you visit your hi-fi center...

LISTEN

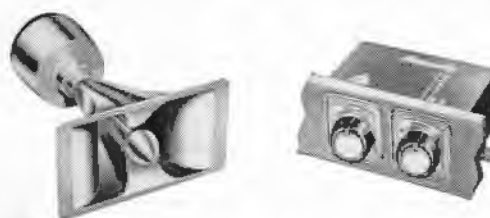
University sounds better



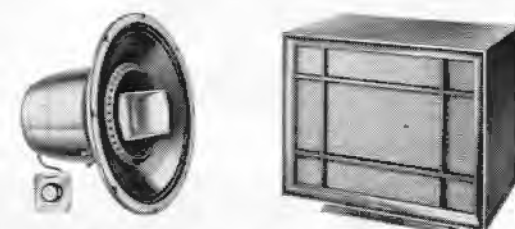
A FEW OF UNIVERSITY'S MANY



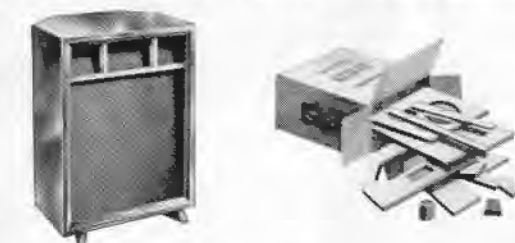
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On the Hi-Fi Record

(Continued from page 10)

ELGAR: *Enigma Variations*. VAUGHAN WILLIAMS: *Fantasia on a Theme by Thomas Tallis*. Steinberg, Pittsburgh Symphony.

CAPITOL P 8383.

Beautifully transparent recording (a bit higher in level than some other Capitol releases, which is good) enhances Steinberg's worthy efforts in two very English works. The two quite different scores are still "19th-century romantic" in their basic idiom; this Steinberg emphasizes rightly, even if he cannot equal the sternness of a Boult in the *Fantasia*, or the drive and fervor of a Toscanini in the "Enigma" variations.

* * *

SIBELIUS: *Pelleas and Melisande*. *The Oceanides*. *Symphony No. 7*. Beecham, Royal Philharmonic.

ANGEL 35458.

Beecham is justly noted for his Sibelius readings; we are here treated to a careful, loving version of the concert suite taken from the music Sibelius wrote to Maeterlinck's "Pelleas and Melisande." Sibelius' is a restrained setting of the drama; its quietly moving finale, "The Death of Melisande," finds the British conductor at his best. "Oceanides" is a lesser affair, well set forth. For the great Seventh Symphony, the last one Sibelius has given us, we prefer Angel's more openly eloquent, more sharply contoured recording (35316) conducted by Karajan, even though Beecham's is a very good one.

* * *

BRAHMS: *Symphony No. 1*. *Krips*, Vienna Philharmonic.

LONDON LL 1608.

Munch, Boston Symphony.

RCA VICTOR LM 2097.

For insight into this great, luminous score, we refer the reader to Krips's reading, mellow and well-molded. Munch simply cannot match this persuasiveness; his version of the symphony moves forward on clean lines (mostly) but expresses less. Splendid sound in each case.

* * *

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Rated output with less than 1% distortion: 20 watts (40 watts peak); frequency response: 20 to 20,000 cycles, ± 1 db. Has built-in preamp and audio control with hum-free DC on tube heaters; tape head and phono inputs with separate equalization; 3-position rumble and scratch filters; bass and treble controls; loudness-contour and volume controls; plus tape recorder output. Housed in handsome enclosure finished in brushed brass and burgundy.

Dimensions: 4 $\frac{1}{2}$ " h x 13 $\frac{1}{4}$ " w x 9" d.

\$99.50 Complete



AA-903B

Rated output with less than 1% distortion: 14 watts (28 watts peak); frequency response: 20 to 20,000 cycles, ± 1 db. Has built-in preamp and audio control with hum-free DC on tube heaters; tape head and phono inputs with separate equalization; 2-position rumble and scratch filters; bass and treble controls; loudness-contour and volume controls; plus tape recorder output. Housed in handsome enclosure finished in brushed brass and burgundy.

Dimensions: 4 $\frac{1}{2}$ " h x 13 $\frac{1}{4}$ " w x 9" d.

\$79.95 Complete



AA-410A

Basic amplifier—rated output with less than 1% distortion: 20 watts (40 watts peak); frequency response: 20 to 20,000 cycles, ± 0.5 db; 6L6GB output tubes. Chassis and cover cage finished in brushed brass.

Dimensions: 4" x 12 $\frac{3}{4}$ " x 6" high.

\$59.50 Complete



AA-908

Basic amplifier—rated output with less than 1% distortion: 40 watts (80 watts peak); frequency response: 20 to 20,000 cycles, ± 0.1 db; 6CA7 output tubes; provision for selecting optimum damping factor. Chassis and cover cage finished in brushed brass.

Dimensions: 12 $\frac{1}{4}$ " x 8 $\frac{1}{4}$ " x 6 $\frac{1}{2}$ " high.

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Dennis Brain

(Continued from page 9)

tone and the incredible smoothness of his legato passages were first engraved on phonograph records about twenty years ago when, as a mere boy of sixteen, he joined his horn-playing father Aubrey Brain in a recording of Bach's *First Brandenburg Concerto* with the now almost legendary Busch Chamber Players. This old British Columbia set of 78rpm discs has since become a treasured collectors' item whose musical merits no amount of technical progress in the recording art can ever render obsolete.

Fortunately, the unique art of his playing has been preserved more recently with the advanced high-fidelity techniques. His recording of the four *Horn Concertos* by Mozart (Angel 35092) attained the status of a best-seller, surprisingly surpassing the more popular "chestnuts" of the repertoire.

Richard Strauss' *Horn Concertos* (Angel 35496), Mozart's *Quintet for Piano and Winds* (Angel 35303), and Mozart's only recently discovered *Sinfonia Concertante* (Angel 3509) form part of the Brain legacy.

Yet Dennis Brain's particular genius stands most fully revealed in the two works which major contemporary composers have written expressly for him. Benjamin Britten's *Serenade for Tenor, Horn, and Strings* contains a haunting prelude and postlude for unaccompanied horn and in many of the songs the horn heightens the expressiveness of the human voice by underlining it alternately with mellifluousness and with compelling outbursts of stentorian power. This disc (London LL-994) is perhaps Dennis Brain's finest bequest. Yet those who cherish his art await the release, next January, of what is presumably his last recording: the *Horn Concerto* written for him by Paul Hindemith, perhaps the ranking composer of our day. In this recording (Angel 35500) as well as in the Britten *Serenade*, Mr. Brain enjoyed the privilege of recording under the composers' own direction. And surely records of such authenticity and artistic merit will assure not only the survival of his memory but let Dennis Brain remain a vital and well-appreciated participant in the musical world of the phonograph. ■ ■ ■

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the fully automatic record changer with turntable quality performance

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The new GS-77 provides a quality of performance unsurpassed by turntables up to double the price. Flutter and wow are virtually non-existent. Rumble has, for all practical purposes, been eliminated. And as for automatic conveniences — it is, without doubt, the most advanced record changer of our time.

There is more originality in the GS-77 than in all other changers combined! See for yourself.

'SPEEDMINDER'*...the amazing GS-77 feature that automatically selects correct turntable speed, and gives you record and stylus protection no other changer can equal.

You simply set the indicator to **'SPEEDMINDER'** and automation takes over...

- with the standard groove stylus in play position, the changer automatically plays at 78 rpm.
- with the microgroove stylus in position, the changer automatically intermixes and plays 33 and 45 rpm records without regard to speed, size, or sequence.

TURNTABLE PAUSES during change cycles and doesn't resume motion until next record has come into play position and stylus is in lead-in groove. Eliminates record surface wear caused by grinding action of record dropping on moving disc—a common draw-back in other changers. And the change cycle lasts only 5 seconds — fastest in the field.

* Trademark

* Patents Pending

Every feature† spells—Greater Convenience and Better Performance — The ARM is shock suspended and damped, effecting complete acoustical isolation from deck plate and motor and practically eliminating resonance. An accessible vernier control adjusts stylus pressure to match any cartridge requirements. Once adjusted, the variation of stylus pressure between the first and tenth record on the table does not exceed 1 gram. Transcription arm convenience includes: finger lift for manual play, as well as indicator to facilitate location of stylus in groove. The MOTOR is 4-pole induction, dynamically balanced, hum shielded and shock mounted — all to assure accurate, constant speed, and smooth operation.

The IDLER and other rotating parts are precisely centered and mounted on low friction bearings. Idler automatically disengages in 'off' position. Prevents flat spots and wow. **MUTING SWITCH** and R/C filter network squelch all annoying sounds.

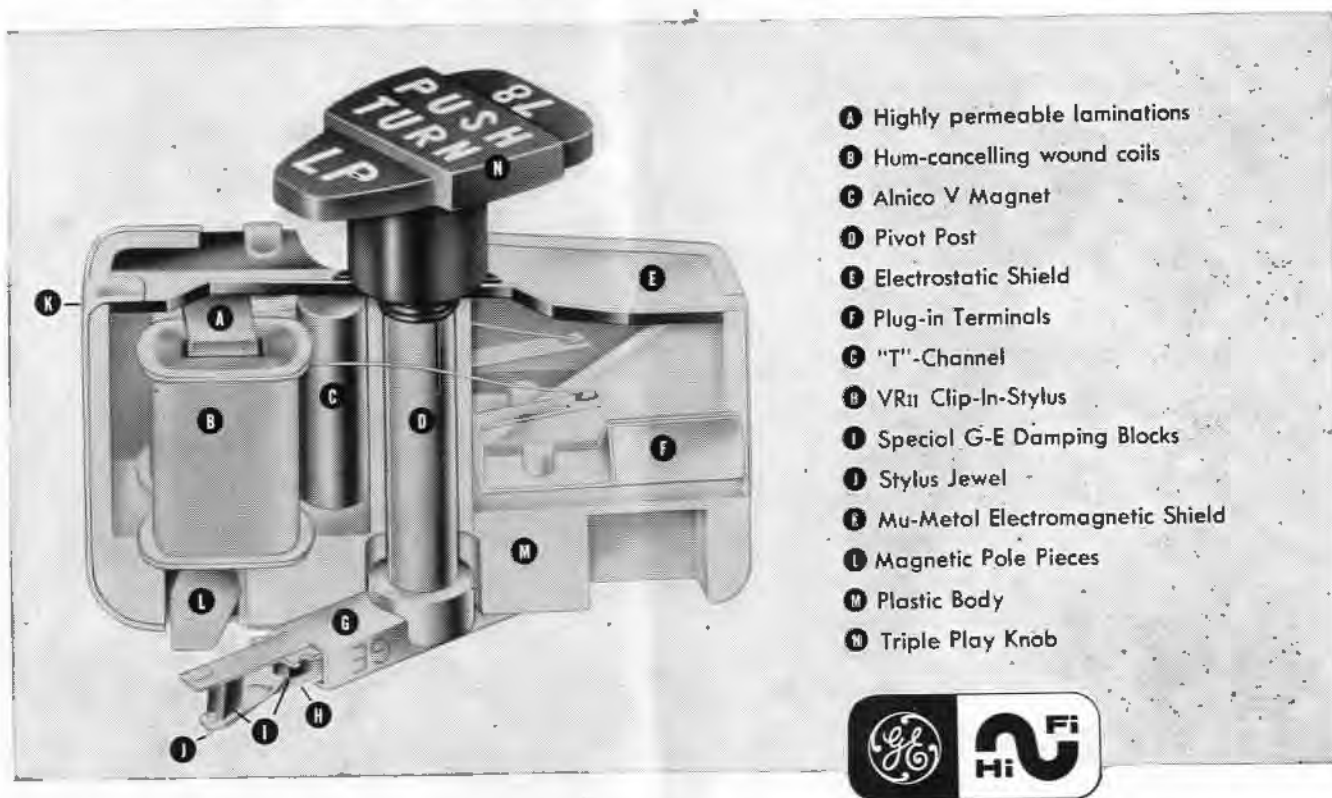
The GS-77 is absolutely jam-proof — built for years of trouble-free performance. A single knob controls all automatic and manual operations. The changer is pre-wired for easy installation, and is dimensioned to replace most changers.

less cartridge and base — **ONLY \$5950**

Styling of the new GS-77 is gracefully simple — enhanced by its ebony and brushed gold finish and oyster white turntable mat. For a thrilling experience — see it — hear it at your high fidelity dealer. Descriptive literature available on request.

NEW G-E VR_{II} CARTRIDGE

increased compliance...4-gram tracking force
...frequency-range 20 through 20,000 cycles



A dramatic new design to bring out the best in every Hi-Fi system

New Full-Range Reproduction. General Electric's new VR_{II} magnetic cartridge makes possible faithful reproduction from 20 through 20,000 cycles. Crystal clear reproduction from the lowest fundamental to the highest harmonics.

New 4-Gram Tracking Force. Lateral compliance of the VR_{II} has been extended to 1.7×10^{-6} cm per dyne, permitting a tracking force of only 4 grams to minimize record and stylus wear.

Instant CLIP-IN-TIP Stylus. Stylus replacements can be made instantly at home without removing cartridge from tone arm. There is no need to discard an entire dual assembly when only one tip is worn.

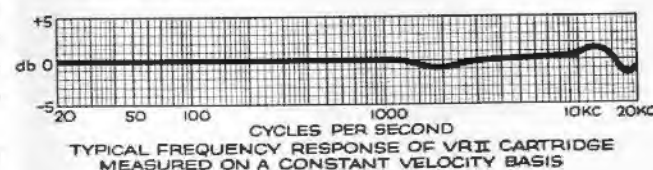
New Electrostatic Shielding. In the VR_{II} cartridge a new electrostatic shielding prevents pickup of electrostatic interferences and hum. This shield also grounds the stylus assembly, thus preventing the build-up of electrostatic charges from the surface of the record.

New Lightweight Construction. The new VR_{II} has been reduced in size and weight, with a new stylus guard.

Terminals and knob have been improved. The G-E VR_{II} is built to withstand continued usage under the most exacting conditions.

Frequency Response.....See typical curve below.
Output Voltage.....Nominal, 22 millivolts at
10 cm per sec. at 1000 cycles
Horizontal Compliance..... 1.7×10^{-6} cm per dyne
Inductance.....520 millihenrys nominal
Resistance.....600 ohms nominal
Cartridge Weight...8 grams (single type); 9.5 grams (dual type)

Come in soon. Let us prove the superior reproduction of the new G-E VR_{II} Cartridge and other custom made components.



GENERAL  ELECTRIC

Tape Reviews

By Edward S. Bergamini

ENESCO: *Roumanian Rhapsody No. 1.*
Perlea, Bamberg Symphony.
PHONOTAPES-SONORE S-501. Stereo.

Listen to the opening clarinet and oboe; one knows the sound will be glorious, and it is, a credit to the many-colored score. Perlea leads a performance of vivacity and stylishness, and his orchestra responds well. Vox offers a steady 250-cycle tone at the beginning of the tape, for the listener to set the level of each channel by. It's a noteworthy notion that we found helpful.

* * *

MENDELSSOHN: *Symphony No. 4*
("Italian"). Van Remoortel, Pro Musica
Symphony, Vienna.
PHONOTAPES-SONORE S-705. Stereo.

Here's an estimable performance of Mendelssohn's sunwashed, ageless evocation of Italy, recorded with notable detail and warmth—an excellent over-all sound. But a sharper differentiation, i.e., "split," between channels would have made the stereo effect more firmly effective and convincing.

* * *

GRIEG: *Piano Concerto.* Rubinstein;
Wallenstein, RCA Victor Symphony.
RCA VICTOR DCS-47. Stereo.

One of the most thoughtful statements of the Grieg concerto was Rubinstein's

(Continued on page 20)



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Fluxvalve
has 100%
IQF*



Choice of the best phonograph pickup can only be resolved by comparison! What is the yardstick? ... How can you tell? ... What do you look for? ... the answer is 100% Important Quality Features!

PICKERING has had long experience in the cartridge field, supplying the finest quality products for recording studios, broadcast stations, wired music services, and high fidelity home music systems. As a result of this extensive experience, PICKERING has developed the **FLUXVALVE**... the one cartridge which incorporates all of the Important Quality Features... so necessary for high fidelity reproduction from records.

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Feature	FLUXVALVE	Cartridge A	Cartridge B	Cartridge C
Frequency Response: Flat 20-20,000 cps \pm 2 db (see curves on right)	YES 20 Points	NO 0 Points	NO 0 Points	NO 0 Points
Low Tracking Force: 2-4 grams	YES 20 Points	NO 0 Points	YES 20 Points	NO 0 Points
High Output, No Transformer Required	YES 10 Points	NO 0 Points	NO 0 Points	YES 10 Points
Replaceable Stylus	YES 10 Points	NO 0 Points	NO 0 Points	YES 10 Points
1/2 Mil Stylus	YES 15 Points	NO 0 Points	NO 0 Points	NO 0 Points
One Cartridge For LP's and 78's	YES 5 Points	NO 0 Points	NO 0 Points	YES 5 Points
Anti-Hum Design	YES 10 Points	YES 10 Points	YES 10 Points	YES 10 Points
Hermetically Sealed	YES 10 Points	NO 0 Points	NO 0 Points	NO 0 Points
TOTAL POINT VALUE	100%	10%	30%	35%

THE FLUXVALVE... chosen time and again as the top cartridge solely on the basis of listening quality... by panels of qualified experts... tests which have proven that it is actually less costly to own a FLUXVALVE.

The FLUXVALVE preserves the quality and prolongs the life of your record since there is complete absence of resonances throughout the audio range.

It may interest you to know that the FLUXVALVE, because of its ability to make precise and reproducible record measurements, is used for calibrating recording channels and record masters.

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D-3510	1 mil Diamond	18.00	370-10	1 mil Diamond	25.85	350-05	1 mil Diamond/1/2 mil Diamond	54.00	1 mil Diamond/1/2 mil Diamond	54.00	54.00
D-3527	2.7 mil Diamond	18.00	370-20	2.7 mil Diamond	25.85	350-10	1 mil Diamond/1/2 mil Diamond	60.00	1 mil Diamond/1/2 mil Diamond	60.00	60.00
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Exciting, brilliantly engineered, the new Fairchild E/D brings to the turntable—a traditionally mechanical device—all the precision and accuracy of modern electronics.

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The new Fairchild E/D achieves a quality of performance beyond anything we have ever known. Rumble, wow and flutter become academic questions. They are virtually non-existent in the E/D. Speed constancy is maintained to an incredible accuracy—precisely regulated by an electronic power source. And the E/D's performance is entirely unaffected by variations in power line voltage and frequency.

PERFORMANCE SURPASSES ALL INDUSTRY STANDARDS

RUMBLE CONTENT	} 100% better than NARTB standards — better even than standards specified for primary professional recording equipment.
FLUTTER CONTENT	
SPEED REGULATION	

HOW IT WORKS

In the new Fairchild E/D turntable speed is changed by changing the speed of the hysteresis-synchronous motor. The speed of the motor is changed by altering the frequency of the current used to drive it.

This current is furnished by a variable-frequency oscillator-amplifier, called the Electronic Control-Regulator. Four frequencies are available which operate the turntable at 16 $\frac{2}{3}$, 33 $\frac{1}{3}$, 45 and 78 rpm respectively. Individual controls also permit the user to adjust each speed $\pm 5\%$.

The Fairchild E/D can be operated from any AC power line supplying 85 to 135 volts. It can be operated with DC, using a converter—or with storage batteries and a vibrator-inverter. No matter which source is used, the quality and accuracy of turntable performance remain the same.

The Turntable Unit, which incorporates the turntable, hysteresis motor and 2-belt drive, can be purchased without the Electronic Control-Regulator (ECR) and used as a high quality single-speed 33 $\frac{1}{3}$ rpm turntable from a 60-cycle power line. The ECR can be obtained at a later date, and easily mounted in the unitized turntable enclosure.

PRICES ARE: Fairchild E/D complete, \$186.50; Turntable Unit (less ECR), \$99.50; Electronic Control-Regulator (ECR) \$94.00; Hardwood Base (shock-mounted) in walnut, mahogany or korina, \$31.50.

COME IN TO OUR STORE FOR A DEMONSTRATION.

Tape Reviews

(Continued from page 19)

Victor disc (LM 2087). To hear it stereophonically is added pleasure. Victor has been successful in "centering" the piano between "high strings left" and "cellos right." The piano tone is solidly jewel-like throughout. Most persuasive.

* * *

STRAUSS WALTZES: *Josef Strauss: Secret Attractions. Johann Strauss, Jr.: Where the Citrons Bloom; One Thousand and One Nights. Fiedler, Boston Pops Orch.* RCA VICTOR CCS-45. Stereo.

The Josef Strauss "Secret Attractions" ("Dynamiden") with its lovely introduction, is perhaps the most winsome of the three excellent performances. Fiedler is rightly noted for his readings of waltzes by the Strauss family; still, one misses the special way others (such as the late Clemens Krauss) have had with these tunes.

(Continued on page 22)

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of the
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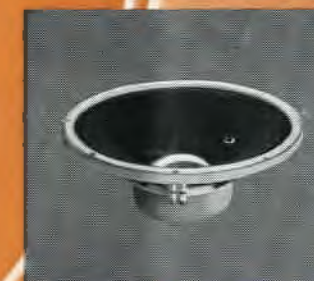
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bearings so cleverly contrived, the parts constructed with such meticulous precision that this great mass is moved smoothly and accurately with a 1/12th horsepower motor.

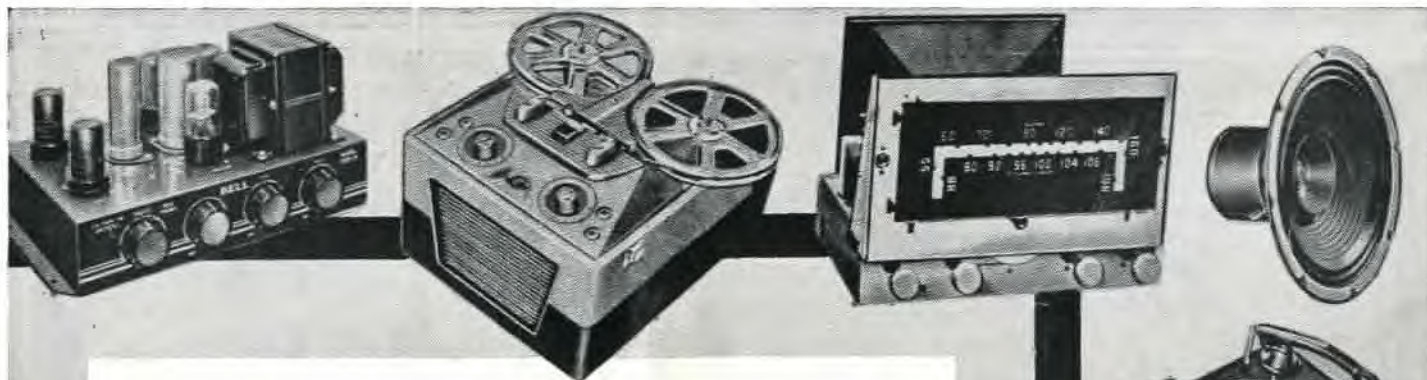
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There is as much difference in precision between an ordinary loudspeaker and a JBL transducer as there is between a toy telescope and an astronomical observatory.

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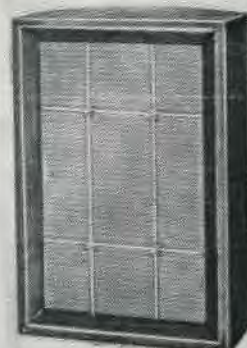
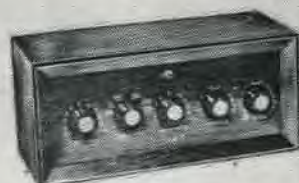
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