AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

DECEMBER, 1954

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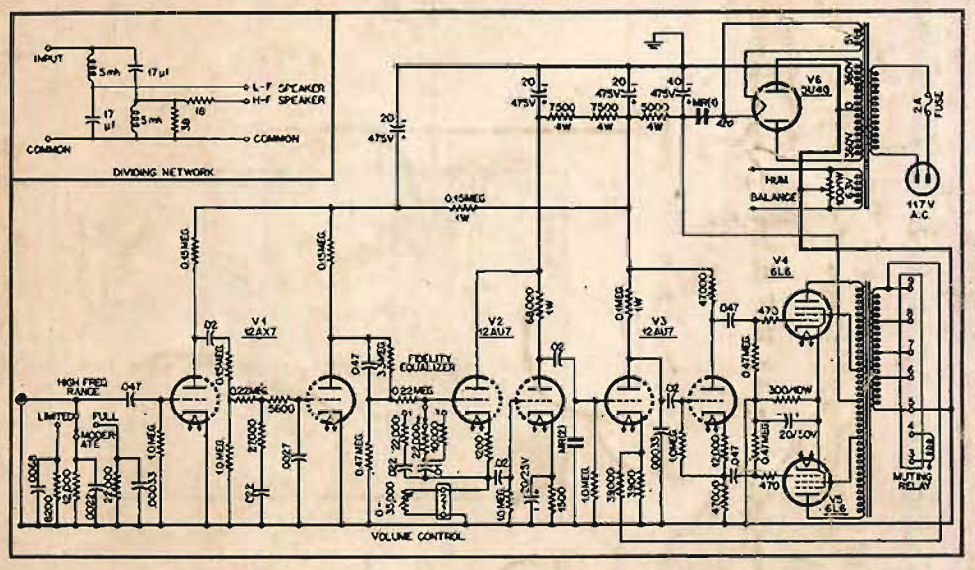
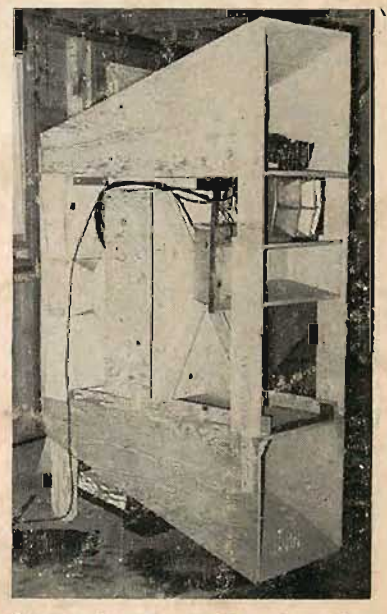


Incorporating many of the features found in home equipment, together with compression-loaded horns for both highs and lows, the new AMI Inc. juke box is a far cry from previous coin-operated instruments. Both hobbyist and engineer can learn from this amplifier design. See page 33.



One reader converted a closet into a four-way horn-loaded speaker system. How he did it is described thoroughly beginning on page 23.

THE HORN — a build-it-yourself article

THE JUKE BOX GOES HI-FI

TECHNIQUES OF MICROPHONE CALIBRATION

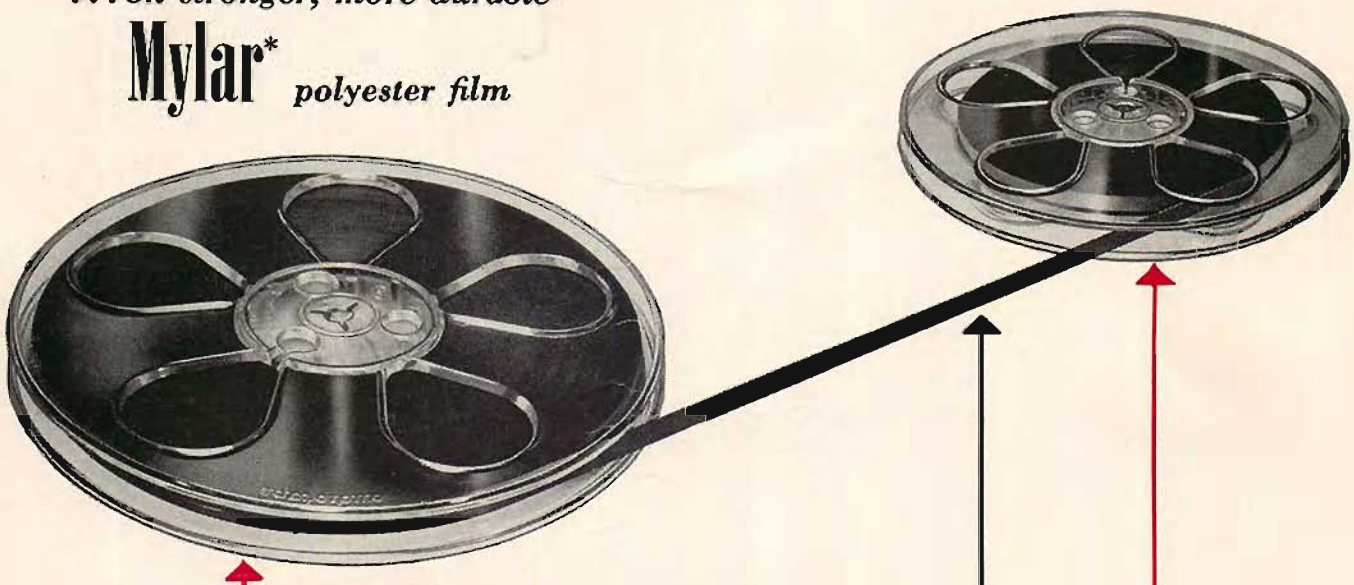
AT HOME WITH AUDIO — Hi-Fi a la Mode

new type LR Longer Recording audiotape TRADE MARK

gives you 50% MORE recording time per reel

. . . on stronger, more durable

Mylar* *polyester film*



With Type LR Audiotape, you get the equivalent of a *reel-and-a-half* of ordinary tape . . .

900 ft on a 5" reel
1800 ft on a 7" reel
3600 ft on a 10½" reel

Type LR Audiotape is made on a 1-mil base of stronger, more durable "Mylar" polyester film — withstands extreme temperatures, is virtually immune to moisture, gives maximum tape life under all conditions of use and storage.

This new *Longer-Recording Audiotape* saves time and effort, eliminates reel changes, gives uninterrupted continuity of recording and playback for *any application* where recording time exceeds the conventional reel capacity.

Laboratory tests, as well as unsolicited testimonials by radio stations and recording experts, have conclusively demonstrated the superiority of LR Audiotape — in both performance and durability. It is also important to note that the largest users of longer playing tape are now insisting that it be made on "Mylar" polyester film, the base material used for LR Audiotape — additional proof of its superior quality.

Ask your dealer for a supply of longer-lasting, longer-recording Type LR Audiotape. A copy of Bulletin No. 211, giving complete data and specifications on LR Audiotape, is yours for the asking.

*Du Pont Trade Mark

AUDIO DEVICES, Inc.

444 Madison Avenue, New York 22, N. Y.

Offices in Hollywood — Chicago

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

DECEMBER, 1954 VOL. 38, No. 12
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AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

CONTENTS

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

AUDIO PATENTS

RICHARD H. DORF*

I HAVE JUST READ, for the second time in four months or so, Patent No. 2,675,430, issued to Kenneth K. Clarke of Chromepet, Madras, India. This patent is the most curious combination of a doubtful invention and extremely broad claims that I have ever come across. I rather doubt that it will work at all in the form shown, and from some of the extraordinary statements made in the specification, it appears possible that either the attorney who wrote it or the inventor (or maybe both) are not overly familiar with either technical electronics or tape recorders as they exist and work. However, the idea behind it all is interesting and perhaps useful, so here goes a recital of it.

The premise is that it may often be desirable to take an existing tape recording and replace certain of the recorded material with new material. As anyone who has tried it knows, it is not always easy to erase certain rather precisely located portions and dovetail new material (particularly music) in with the old. The inventor's scheme is to play the tape and when the instant arrives at which the new material should begin to replace the old, the operator punches a button, which places on the tape (or wire) a brief burst of oscillation signal of a frequency in the upper audio range as a marker. Where the new material should end and the old resume, he again punches the button and a second marker signal is recorded.

When the actual replacement of material begins, the recorder is switched to the playback condition, and the tape is started. When it comes to the point of the first marker signal, a resonant circuit in the special apparatus detects the marker and applies it to the grid of a tube to the plate circuit of which is connected a sensitive relay. This closes the relay, whose contacts switch the machine over to record. At the second marker burst, the relay opens and the machine returns to playback. Presumably, the performer can thus listen to the recording and synchronize his singing or talking with it up to the very instant when the new material is to be inserted, and all without any attention required to switch the machine. Basically, it seems a good idea.

It doesn't seem, however, to this laymans mind, that it is the kind of idea that constitutes invention. It particularly does not seem the kind of idea that merits allowance of claims which appear to cover the entire field of using a marker signal to change the machine from playback to record and vice versa; yet this is (with only slight oversimplification on my part) just what the claims seem to cover! And the surprise is even greater in view of the apparent impracticability of some features of the embodiment shown. Any engineer or intelligent technician could probably remove the impracticabilities and make it work, which is my justification for presenting this patent, but the inventor didn't. Frankly, I am puzzled. But judge for yourself. . . .

Figure 1 shows the circuit, which looks and is economical for the job it

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

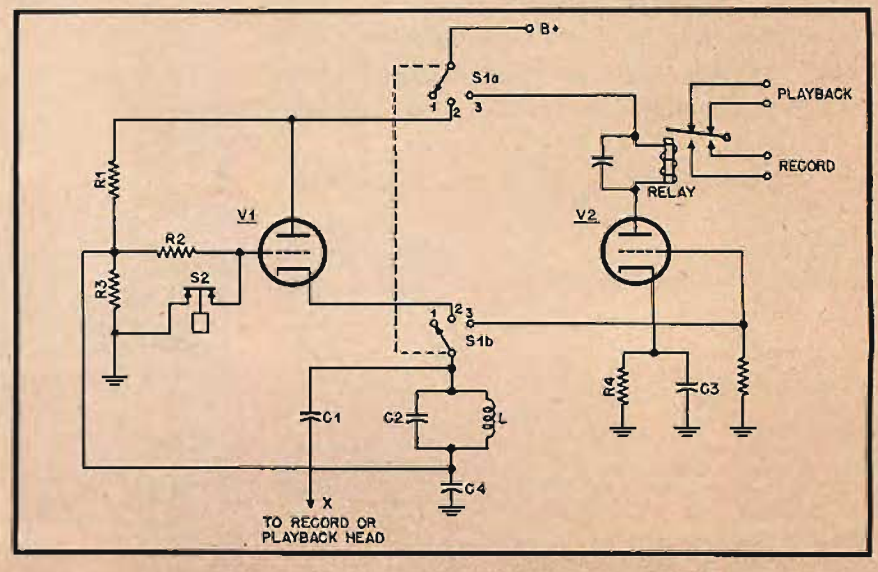

Fig. 1

Incomparable...

Since 1935
the Garrard has been sold and serviced throughout the United States.

It is recognized every where for superior performance, ruggedness and reliability.

CHECK CRAFTSMANSHIP, FEATURES, PRICE AND SERVICE . . .
and you will understand clearly why this is the world's No. 1 high-fidelity record changer

"RIGHTS" and "WRONGS"
of record changer design
(important in protecting your records).

RIGHT:
Garrard Precision Pusher Platform . . . the only record changing device that insures positive, gentle handling of records with standard center holes.

WRONG:
"Overhead Bridges" (as on ordinary changers) . . . which may damage or dislodge records accidentally.

RIGHT:
Garrard removable and interchangeable spindles . . . Easily inserted; accommodate all records, all sizes, as they were made to be played; pull out instantly to facilitate removal of records from turntable.

WRONG:
Fixed Spindles (as on ordinary changers) . . . which require ripping records upwards over metallic spindle projections after playing.

Other Garrard features include: 4 pole motor —no rumble, no induced hum • **heavy drive shaft** —no wows, no waves • **weighted turntable**—flywheel action, constant speed • **muting switch** —silence between records • **silent automatic stop**—shuts off after last record; no disturbing "plop". • **easy stylus weight adjustment**—protects long-playing records • **balanced-mounted tone arm**—true tangent tracking • **universal shell** —fits all popular high fidelity cartridges

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World's Finest Record Changer

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does. S_1 is the function switch. In position 1 the device is out of use. In position 2 it is supposed to record a marker signal whenever button S_2 is pressed. In position 3, the relay is operated when a marker signal is received on playback.

V_1 is the marker-signal generator. With S_1 in position 2, tube current flows until S_2 is pressed. When S_2 is pressed the tube is cut off, but, says the inventor, current flowing through coil L continues and oscillations are set up in the resonant circuit L-C_2. These oscillations are coupled through C_1 to the record head. S_2 may be a dashpot switch so that there is a delay after pressure is removed and the marker signal has a suitable duration. The oscillations cease when S_2 opens.

Before commenting on the two outstanding question marks here, let us refer to *Fig. 2*, redrawn by myself to make what sense is available of the V_1 circuit. The cathode is made positive with respect to ground by voltage divider R_1-R_4 from the B-supply. With S_2 open, the grid is at the same d.c. potential as the cathode, giving effectively zero bias (ignoring the probably slight voltage drop across the resistance of the coil L) and allowing plate current to flow. When S_2 is closed the cathode is obviously positive with respect to the grid, and presumably the d.c. across R_3 due to the B-voltage from R_1 is enough to cause tube cutoff. So far so good.

But when this happens, how does current continue to flow through L and cause oscillations at a frequency carefully defined by the inventor as $\frac{1}{2}\pi\sqrt{LC}$? Does the shock excitation produce a train of damped oscillations? If so, the Q of the L and C must be pretty special at these frequencies (he suggests 10 to 20 kc) to shock-excite the circuit into oscillations that will predictably last long enough to operate the control relay on playback.

Well, that might work. But obviously, when the signals are placed on the tape, the machine must be on playback so the proper places for the markers can be chosen. That being so, how are the marker signals recorded? Apparently—and this increases the mystery—the inventor has in mind a recorder with a single record-playback head.

When the new material is ready for insertion, $S1$ in *Fig. 1* is placed in position 3. The tuned circuit is now con-

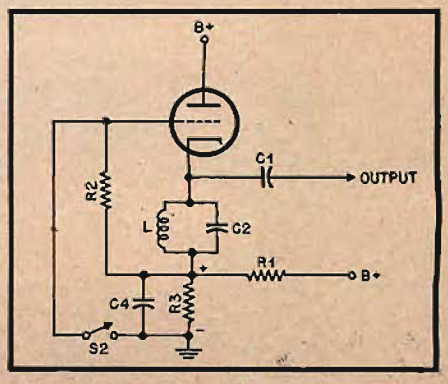
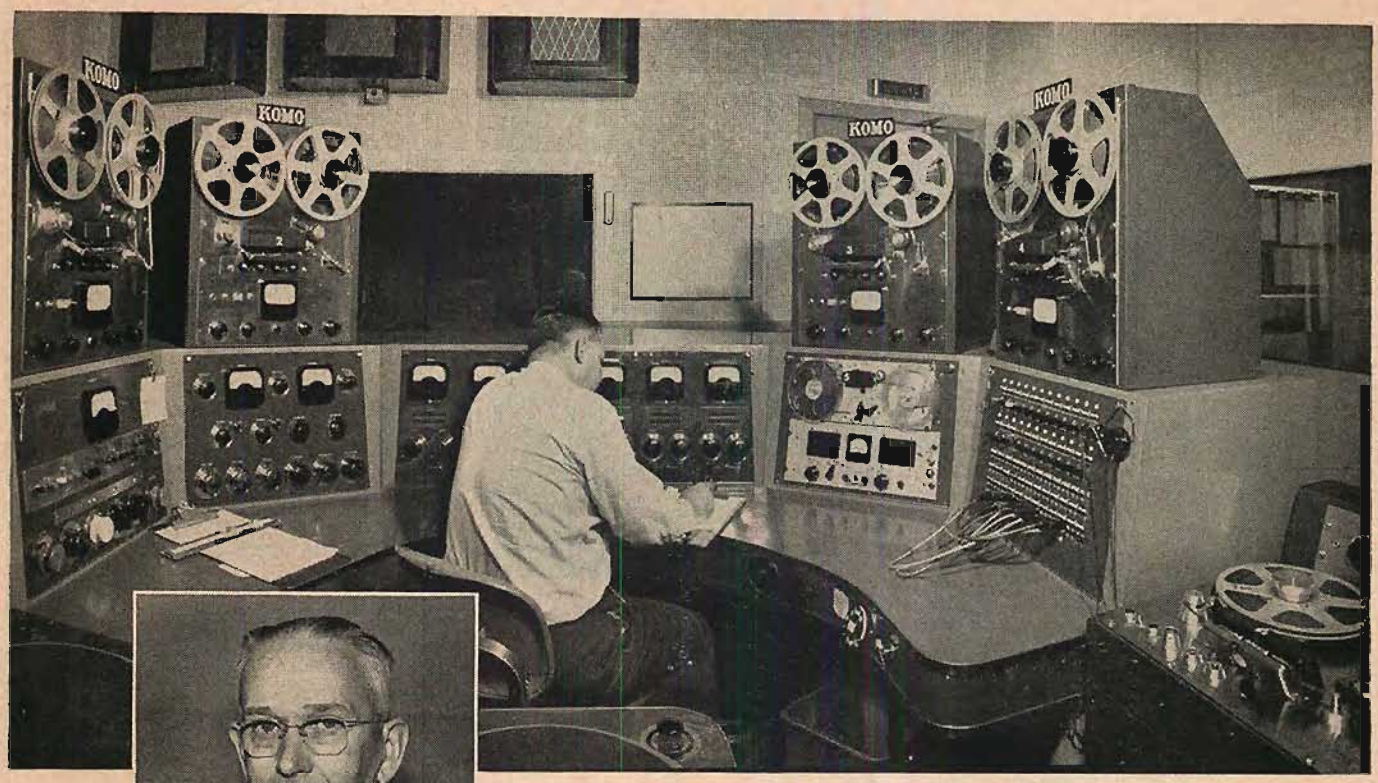


Fig. 2



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nected to the grid of V_2, which is cathode-biased in the normal manner by R_1, the bias value fixed at close to cutoff. When the first marker signal comes along it is detected by the tuned circuit and the plate current of V_2 increases. This actuates the relay, causing the machine to go to the record condition while the new material is recorded.

The relay is specified as a type which will now remain actuated, even after the marker signal passes, until either (1) another marker comes along or (2) B-plus is removed. Condition (1) can be satisfied with an "impulse" relay which alternately opens and closes on receiving energy. These are well known, though not usually in the plate-circuit types. Condition (2) can be satisfied by using an ordinary relay with an extra set of holding contacts, also a standard arrangement. But offhand I can't think of any type that will satisfy both requirements. They may be possible, but I doubt that they exist now. The idea is that the second pulse will return the recorder to playback automatically at the point where the new material should end.

But with a two-head machine, the tape hits the erase head before it passes the record-playback head. Of course, being in the record condition it couldn't play the marker signal into the resonant circuit anyway. But even if it could, the marker would, like all the material to be replaced, pass the erase head first and be erased before it ever reached the record-playback head. This could only be overcome with a three-head machine, with the heads rearranged so that the tape would pass first the playback, next the erase, and finally the record head.

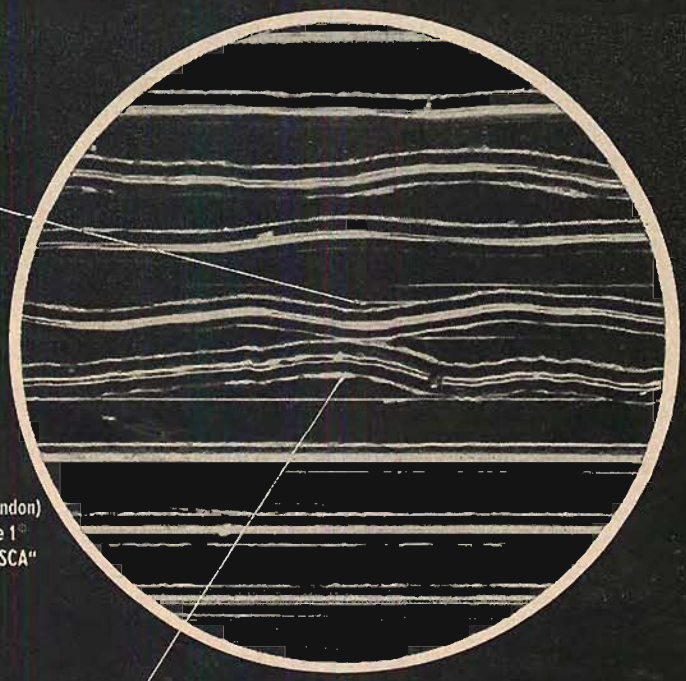
Among the uses cited for the invention is adding a "harmony part" to a previously recorded vocal rendition by superimposition. This is done simply by using the invention as described. We can charitably assume that the erase head is to be disconnected for the purpose though the inventor doesn't say so. But even so, what special provision prevents the bias from partially erasing the previous vocal? There is no indication of a need for anything of the kind.

As I said at the beginning I have presented this patent because I think the idea is good and probably it would not be hard to design a workable embodiment of it. But I am sticking my neck way out in being caustic about the flaws I think are shown in the patent. Maybe I am just displaying my own ignorance. But if I am right, I hope I have succeeded in expressing shock and distaste at the allowance of 13 big, fat patent claims on the basis of an embodiment that may not work, of an idea that it seems to me any engineer could have and probably would have conceived (and most likely did) if the desire or necessity of achieving the stated results ever arose.

You can look this one over yourself at a cost of 25 cents remitted to The Commissioner of Patents, Washington 25, D. C.

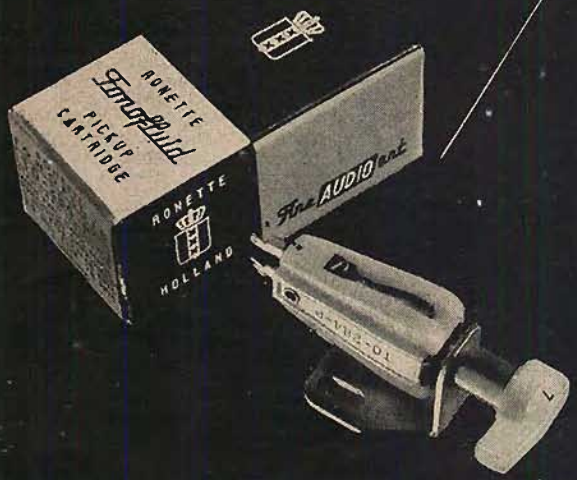
Grooves or crossroads?

that depends on the cartridge!



Untouched photograph of DECCA (London) LXT 2730 Side 1 Puccini's "TOSCA"

No troubles with Ronette TO-284's!



Look at the center of this enlarged photograph of a hard-to-track long-playing microgroove record. The wall between the grooves is barely perceptible. But your precious long-playing records are safe with Ronette Fonofluid System Cartridges. The very high compliance of a Ronette Cartridge permits perfect tracking even where the wall between grooves is as thin as this. They don't make "cross-roads" here.

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NEW LITERATURE

• **Cinema Engineering Company Division of Aerovox Corp.,** 1100 Chestnut St., Burbank, Calif., has available two new catalog sheets for distribution to interested engineers. One covers Cinema hermetically-sealed resistor networks, while the other covers the new Cinema "PW" resistors for automation and printed wiring. Both publications may be obtained direct from the factory or through its authorized representatives.

• **Heath Company,** Benton Harbor, Mich., is now distributing its new catalog for 1955, the largest and most complete catalog the company has ever issued. Featured are seven new Heathkits, four radically re-designed Heathkit models, and restyling of most of the remaining instruments. In all, the new 48-page catalog describes more than 55 kits, including test instruments, amateur equipment, and high-fidelity audio equipment. Copy may be had by writing direct to the company.

• **Newark Electric Company,** 223 W. Madison St., Chicago 6, Ill., features a complete 64-page high-fidelity section and the largest listing of electronic items in the company's 20-year history in its new 1955 catalog which is now being distributed. Forms were held open until the last minute to assure inclusion of the latest models of all manufacturers. Bound in varnished-stock four-color cover, the catalog is indexed by sections for easy reference to any product desired.

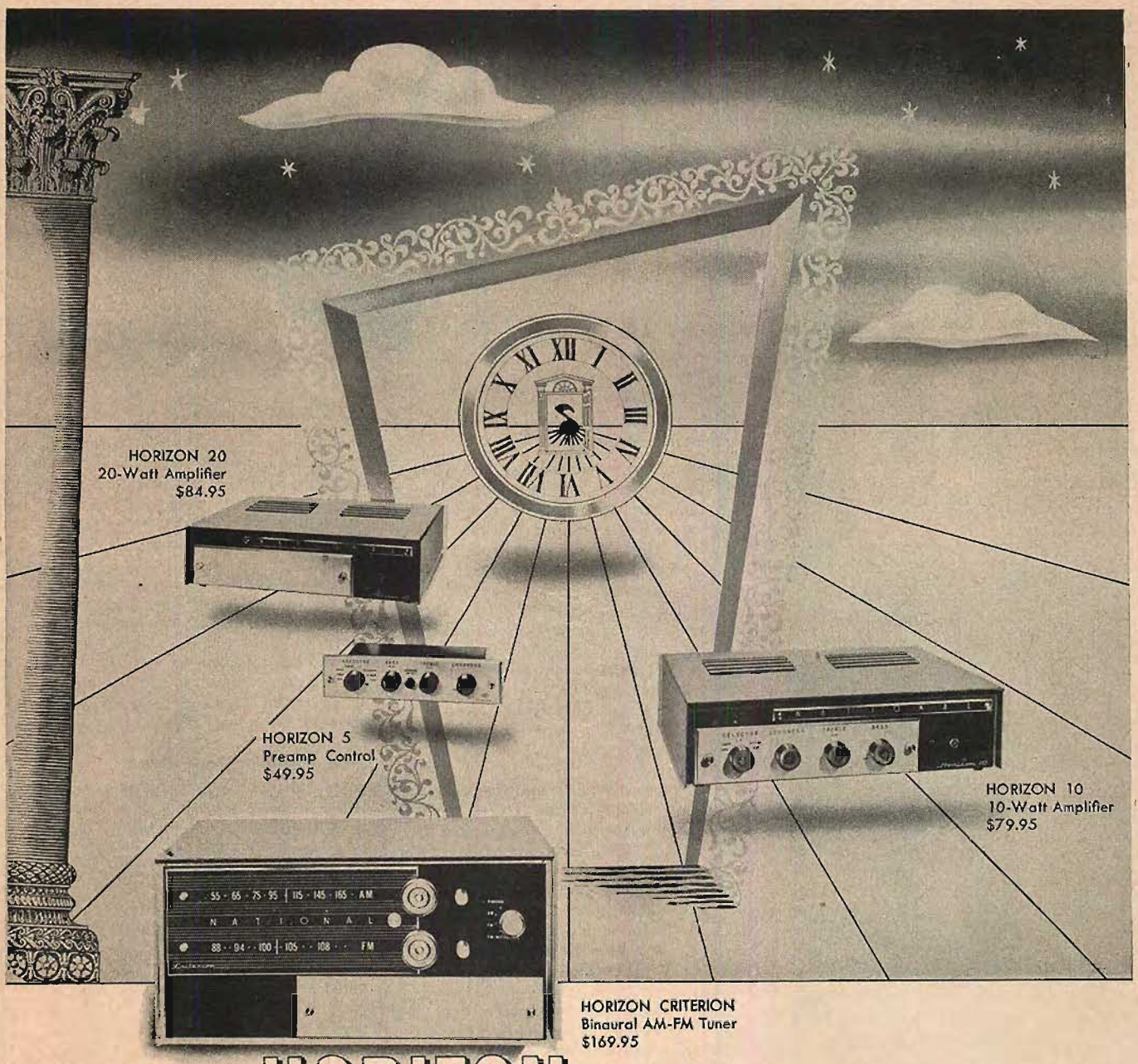
• **CBS-Hytron,** Danvers, Mass., includes data on all miniature tubes, irrespective of make, in the seventh edition of the CBS-Hytron Reference Guide for Miniature Electron Tubes, which is now being distributed free through CBS-Hytron distributors. Twelve pages of data include 329 miniature types of which 79 are new, and 134 basing diagrams of which 27 are new.

• **B. B. Butler Mfg. Co., Inc.,** 3150 Randolph St., Bellwood, Ill., describes and illustrates the many standard and special types of ceiling, wall, and corner baffles in the company's line in a new catalog which will be mailed free on request. Baffles shown are for use with 6-, 8-, and 12-in. speakers, and are designed for the radiation of sound evenly over large areas when used in low-level public-address systems. Complete technical data, including frequency response curves, are included with the description of each baffle. Also incorporated in the catalog are trim plates, mounting fixtures, speakers, and transformers, with complete dimensions and prices.

• **Federal Telephone and Radio Company,** 100 Kingsland Road, Clifton, N. J., has recently issued a publication of distinct value to engineers in the form of a general catalog covering Federal's measuring and testing instruments. This line, introduced to the industry for the first time, incorporates many instruments which are novel in concept of design and technique of measuring. Many instruments are drawn from foreign divisions and associates of the IT&T System, and from leading instrument makers abroad. This new Federal catalog should be in the hands of every design and development engineer. Request for copy should be directed to Rudolf Feldt, Instrument Division, at the address shown above.

• **The William Brand and Company, Inc.,** Willimantic, Conn., announces publication of a new Turbo Products Catalog which combines easy-to-use features with helpful information on wire and tubing, an appendix which defines technical terms, and tables of insulation resistance temperature coefficients, and temperature conversion. The product index refers to 44 pages of specific information concerning wires and cables, plastic tubing, and identification markers.

(Continued on page 53)



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HORIZON 10

Unity-coupled output circuit. Built-in preamp control unit with record equalizer, loudness control, bass and treble controls — three inputs.

HORIZON 5

Less than .2% harmonic, .3% intermodulation distortion. Four inputs, 7 equalization curves, loudness-volume and bass and treble controls. Slips into tuner or 20-watt amplifier.

For complete specifications write Dept. A

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London Letter

RICHARD ARBIB*

A Complicated Hobby

Hobbies get so complicated. Do you remember years ago as a kid, when you took photographs with a Kodak. It was very simple wasn't it? You just pressed a button, after 8 exposures you sent the film to the local store, and within a day or so had some prints back. If you then progressed in photography you amassed thousands of dollars-worth of equipment, could not take any picture without lots of gadgets, and often in the end waited weeks until you found time to develop and enlarge the prints. Furthermore, you were never satisfied. The same situation, to a certain extent, appears to have come about with records.

I remember distinctly the time when one just took 8 or 10 records, loaded them on to a machine, pressed a button and they were played. Now, if you are a real enthusiast, you have to select the speed of record, adjust the machine and the pick-up to play the speed and to be on the safe side, adjust the controls to comply with the correct recording characteristic. What you are supposed to do when you are playing several records of different brands on a changer is not quite clear because apparently as yet, there is no automatic method of altering the reproducing characteristic to suit the brand of record. However, if you are an addict to the art, you may want to have a transcription motor and a separate pickup for each speed and not allow the pick-up to actuate an automatic stop as that might in some way damage the styli or the record. It seems that with hobbies the more advanced you get, the more complicated things become.

Having records in 3 diameters with 3 speeds and about 8 recording characteristics has made the life of the audio enthusiast quite complicated. The situation was reviewed most amusingly by O. J. Russell in an article aptly titled "Stylus in Wonderland" in the October issue of the British journal "Wireless World."

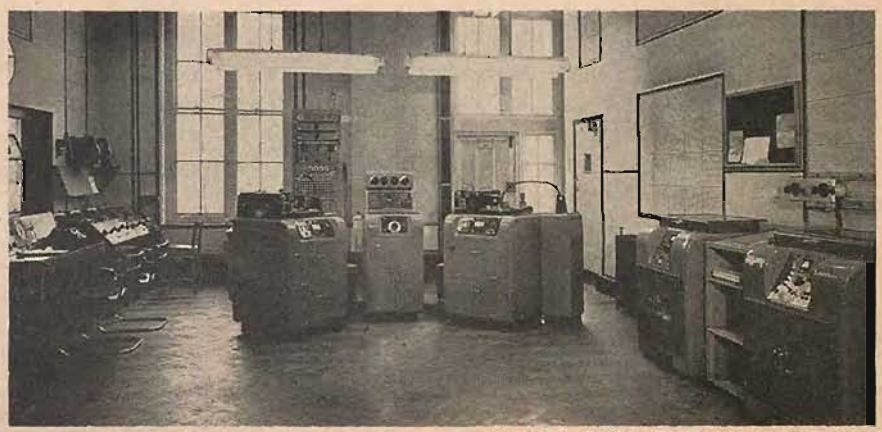
New Recording Tape Splicer

By the time this "London Letter" appears in print, another device which should be of assistance to tape enthusiasts, will be available in England. For nearly 5 years now your correspondent has been waiting for someone in Britain to market a really efficient tape splicer. Having waited in vain so long he has now produced one which is the subject of a patent. It incorporates the best points of many of those that are marketed in America.

Styli Life

During recent months some attention has been paid to the life of recording styli. With a view to finding out what the Recording Companies themselves recommend, approaches were made to both Decca and E.M.I. Decca obviously have the whole

* *Multicore Solders, Ltd., Hemel Hempstead, Herts., England.*



(Courtesy British Broadcasting Corporation)

BBC transcription recording unit—channel E, Maida Vale Studios. At the center are BBC disc recorders, type D. At the right are two E.M.I. magnetic recorders, type BTR/2.

problem well in hand for a comprehensive instruction sheet arrived without delay, stating quite clearly that under normal conditions a life of more than 36 hours could not be expected for a sapphire stylus. Information from E.M.I. was much more vague and they were not prepared to make any definite statement.

It is significant that the new Leak pickup is fitted only with a diamond stylus and the Philips Group have now stated that all their radio-gramophones will be fitted only with diamonds.

Largest Recording Organisation in the World

Probably the largest recording organisation in the World is the Recording Department of the British Broadcasting Corporation. Although this Department is responsible for the maintenance and operation of 379 recording machines, they never sell a record. The playing of commercial records is the responsibility of another B.B.C. Department. The figures quoted above exclude any sound recording activities of the television service of the B.B.C. It must be remembered that in England sound broadcasting is exclusively undertaken by the British Broadcasting Corporation. Although most people think that the B.B.C. is Government controlled, it is actually appointed by Royal Charter to undertake its task. The B.B.C., apart from being responsible for the operation of a number of programmes in 45 different languages for overseas listeners, broadcasts throughout the United Kingdom three different programmes; the Home Service; Light Programme and Third Programme. At the present time about 40 per cent of the programmes transmitted through these three channels which, of course, have various transmitters strategically situated throughout the British Isles, are from recordings made by the B.B.C. In addition, of course, a number of recorded programmes made by other organisations are transmitted as are a controlled content of commercial records.

The B.B.C. Recording Department operates in six centres in London. It has a maintenance unit which keeps all the machines in working order and a section which makes sapphire styli. Ten mobile recording units are located in London and mobile and static equipment is operated at twelve regional centres in the British Isles. In addition, recording units are maintained in the Middle East at Cairo, and in New York. Whilst the bulk of the Recording Department's activities are for the recording of programmes to be broadcast subsequently over the B.B.C. Home or Overseas Programmes, they also are responsible for the Transcription Recording Unit. This section of the B.B.C. is maintained at the expense of the Government and not out of the licence fees paid by users of radio in England. It is considered to be good propaganda for the British way of life for complete broadcast programmes to be recorded and despatched overseas for use free of charge.

The Transcription Unit at the moment does all its distribution on 16-in. discs at 33⅓ r.p.m. (not microgroove). Experiments are being undertaken with a view to changing over to microgroove but before this could

be accomplished, there are technical problems to be overcome, with particular reference to cueing and also to ensure that the hundreds of reproducers overseas are capable of playing microgroove records. Many of these programmes are not just recordings of B.B.C. programmes but are ones specially performed for overseas consumption. Other programmes are Home Service performances with foreign language announcements replacing the English comments.

A brief visit to Broadcasting House, the centre of the British Broadcasting Corporation in Portland Place, London, and a conducted tour by D. Winget, Assistant to the Superintendent Engineer Recording, was only able to give your correspondent a very brief idea of the considerable activities of the B.B.C. recording organisation. The recording is carried out by two methods, either disc or tape. Disc records are made at either 78 r.p.m. or 33⅓ r.p.m. (not microgroove.) The standard tape speed now used by the B.B.C. is that of the C.C.I.R. primary standard, i.e. 15-in. per second, single track. For portable tape recorders a slower speed may be adopted in the near future. In considering tape speeds one problem with which the B.B.C. has to contend is the receipt of tapes from overseas broadcasting organisations, particularly those on the Continent of Europe. The Germans like 30 in. per second; some tapes arrive at 7½ in. per second; some are single track; others double track. In order to have a standard for transmission, the B.B.C. usually re-record overseas tapes if they are not of the same speed of 15 in. per second or of the standard B.B.C. recording characteristic.

Why Discs Are Used

The tape enthusiast may well ask why the B.B.C. should use disc recording at all, but an examination of their problems makes it clear that there is still a field for discs. Whilst the proportion of tape to disc at the B.B.C. is somewhat lower than one would have thought, it is only due to the fact that the B.B.C. engineers believe in installing first-class tape equipment and they cannot do everything in a short while for all expenditure has to carefully considered. The principal type of static tape machines used by the B.B.C. cost $3,000 each and when one realizes that 118 of these are already in use, it will be appreciated that changes cannot be made rapidly. However, new tape machines are being brought into use practically every week and it is thought that within a year or so the general proportion of tape to disc recording will be something in the order of three tape to two disc.

The B.B.C. engineers are not satisfied that tape has a good enough storing property for what they call their "Archive Library." That is a library of programmes or proformances of historical interest which, it is believed, should last practically indefinitely. The B.B.C. engineers told me that the German Broadcasting Organization keep all their Archive recordings on tape, but to be on the safe side they re-record every tape every five years. This is, of course, quite a job and it means that by the end of 50 years the tape has been

(*Continued on page 58*)

TUNG-SOL 6550 BEAM POWER AMPLIFIER

HIGH POWER CAPABILITIES (Up to 100 watts output in pairs) LOW DISTORTION OUTPUT • EXTREMELY UNIFORM CHARACTERISTICS • LONG LIFE

first in its power range . . designed specifically for audio service

The Tung-Sol 6550 is a brand new and direct approach to the high power design requirements of high fidelity audio amplifiers. For outputs up to 100 watts, two 6550's in push-pull will provide the same power now attained in most existing designs by the use of four or more tubes. In addition to greater audio output, use of the new 6550 results in simplified electrical balance, reduced maintenance and lower cost. The Tung-Sol 6550 is not directly interchangeable with the 6L6, 5881 or KT66 class of tubes. With proper circuitry, however, the 6550 will provide full power output with approximately the same grid voltage drive as the smaller tubes. The 6550 is produced under laboratory conditions with exhaustive quality control to assure premium performance and long life.

Rugged Construction — *The advanced design features which have made the Tung-Sol 5881 so extremely reliable are embodied in the 6550.*

1. Glass button stem construction is strong and compact and provides a rugged support for the tube structure.
2. Micanol wafer and metal shell base provides full lifetime electrical insulation and greater mechanical strength.
3. Cathode materials of exceptional stability give more uniform emission with greater life expectancy. Cathode is not poisoned by inactivity during standby periods.
4. Maximum control of grid emission achieved by gold plating and carbonizing.
5. Triple gettering promotes long, gas-free life. Getters are confined by a spray shield to prevent mica contamination.
6. Life tests are made under severe overload conditions to assure adequate safety factor.

MECHANICAL DATA

Coated Unipotential Cathode	
Outline Drawing	Bulb—Short St-16
Base	Large Wafer Octal 8-Pin Mical with Metal Sleeve B8-86
Maximum Diameter	2 1/16"
Maximum Overall Length	4 3/4"
Maximum Seated Height	4 5/16"
Pin Connections	Retma Basing 7S
Pin 1—Base Shell	Pin 5—Grid No. 1
Pin 2—Heater	Pin 7—Heater
Pin 3—Plate	Pin 8—Cathode and Grid No. 3
Pin 4—Grid No. 2	
Mounting Position	Any

ELECTRICAL DATA

(INTERPRETED ACCORDING TO RETMA DESIGN CENTER SYSTEM)

DIRECT INTERELECTRODE CAPACITANCES — *No Shield*

Grid #1 to Plate	0.85 μμf
Input	14.0 μμf
Output	12.0 μμf

RATINGS

Heater Voltage (AC or DC)	6.3 ±10% VOLTS
Maximum DC Plate Voltage	600 VOLTS
Maximum Plate Voltage (Triode Connection)	450 VOLTS
Maximum Plate Dissipation (Triode Connection)	40 WATTS
Maximum DC Grid #2 Voltage	400 VOLTS
Maximum Grid #1 Voltage	—300 to 0 VOLTS
Maximum Plate Dissipation	35 WATTS
Maximum Grid #2 Dissipation	6.0 WATTS
Maximum DC Cathode Current	175 MA.
Maximum Heater-Cathode Voltage	
Heater Positive (Peak) (DC not to exceed 100V)	+200 VOLTS
Heater Negative (Peak or DC)	—300 VOLTS
Maximum Grid #1 Circuit Resistance (Fixed Bias)	50 KILOHMS
Maximum Grid #1 Circuit Resistance (Self Bias)	250 KILOHMS
Maximum Bulb Temperature	250 °C

HEATER CHARACTERISTICS

Heater Voltage	6.3 VOLTS
Heater Current	1.8 AMP.

The TUNG-SOL engineering which has produced the 6550 is constantly at work on a multitude of special electron tube developments for industry. Many exceptionally efficient general and special purpose tubes have resulted. Technical data sheets, or circuitry suggestions for the 6550 may be obtained by writing to Tung-Sol Commercial Engineering Department.

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ELECTRON TUBES

LETTERS

The Audio Fair

SIR:

With the 1954 Audio Fair relegated to its place in history, an audiofan mulling over his briar in moody retrospect garners the feeling that audio developments exhibited in the sparkling array of new equipment has somewhat followed the trends evident in the 1953 Fair. Refinements and improvements of known circuits and speaker enclosures together with the breath-taking quality of many of the new records recently produced by the progressive record industry did, in most of the exhibits, provide thrilling reproduction close to but not quite complete satisfaction.

Post impressions of the Fair are that the over-all "Fair" sound generally lacked real depth and bottom. The bass heard in many exhibits sounded constricted or cut by the limited size of cabinetry comprising tonal depth for size (evidently due to popular demand). In other words, the treble seemed to be balanced by a loud *high* bass rather than a solidly extended *low* bass. The big jobs did sound better on the low end, but even so any supporting bottom much below 50 cps was difficult to detect.

The horns emphasized again to the briar puller that horn loading does provide the most satisfactory type of loading for solid space-filling bass response. The hitch that complicates matters, however, is that in horns folded for space saving the path length of the bass horn projection is usually much longer than that of the treble speaker.

Perhaps the time between now and next year's Audio show of shows will produce a horn speaker system with equalized bass and treble path lengths responding solidly and clean down to, say 30 cps, and just to give the briar industry a lift let us set the objective to retain the same bass-treble balance over the entire reproduced dynamic range.

S. L. HEIDRICH,
29 Richmond Drive,
Darien, Conn.

(*See page 23—maybe that will help. Ed.*)

Proposed New Audio Power Tube

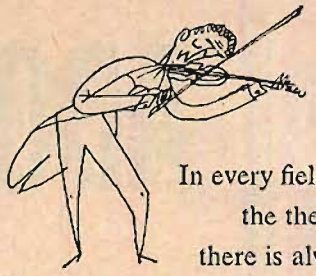
SIR:

In proposing the new audio triode, Mr. Markwalter (LETTERS, November) put his finger on the problem—if a triode is to draw sufficient plate current at low plate voltage it must necessarily have a low mu, and is therefore hard to drive. On the other hand, a high-mu triode, easy to drive, demands a high-voltage plate supply, though this latter isn't so difficult these days, using "ham" type power transformers and rectifiers.

Still, he needn't look so far for his "dream" triode. Take a look at the specs for the 3C33—twin triode, mu of 11, dissipation 15 watts per side. It fits his description fairly well, and the only drawback is price. For some reason, probably small demand, this bottle sells for $25, though some of the surplus dealers occasionally have some at about one third of that. Demand would reduce the price, I'm sure, and it doesn't look any more difficult to make than a 6AS7G, for example, except for the fancy all-glass mount. Possibly for audio use this tube could be based like the 6080 and 6082, if that would make for any economy.

It looks interesting, just the same. . . .

JOHN S. CARROLL,
1 Montague Terrace,
Brooklyn 2, N. Y.



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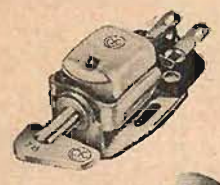

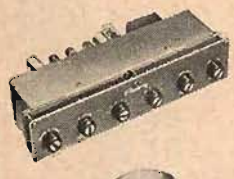

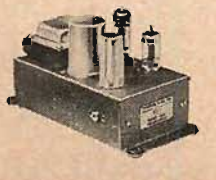

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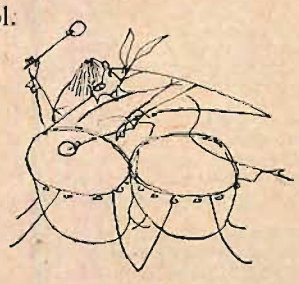

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ABOUT MUSIC

HAROLD LAWRENCE*

More Than Meets the Ear

ABOUT TWO YEARS AGO, the dumpy and yet curiously dignified figure of Sir Thomas Beecham lumbered across the stage of Carnegie Hall toward the podium for a performance of Lord Berners' *The Triumph of Neptune*. The audience settled back in its seats in anticipation of some superb music making. Here was the unexcelled Philadelphia Orchestra led by a conductor whose very life and personality were perfectly attuned to the score at hand. Stroking his goatee, Sir Thomas waited for the applause to die down, and then began what was to this writer one of the most sparkling performances of his career. Near the conclusion of the work, a surprising event took place. Ushers suddenly were making a search of stairways and corridors, some in the audience took quick glances down the aisles and under the seats, and the hall was momentarily filled with the buzz of whispered exclamations. The cause of this mild excitement was what sounded like an invasion of a pack of fox hounds in hot pursuit. The grins on the faces of the Philadelphians, however, gave them away. Sir Thomas had instructed his men to bark (as indicated in the ballet) during a certain passage in the score. An ovation greeted the performers—dogs and all—at the close of the concert. Everyone seemed to agree that the Berners piece was the highlight of the evening.

Ever since his first piano pieces were published in 1914, Lord Berners (1883-1950) has been tagged by critics and public alike as a tongue-in-cheek dilettante whose music is no more nourishing nor lasting than the nose-tickling bubbles in a champagne glass. And works like *The Triumph of Neptune* would seem to support this theory.

Gerald Hugh Tyrwhitt-Wilson (Berners' family name) was born in Shropshire, educated at Eton, and spent many of his early years abroad learning French, German, and Italian in preparation for a diplomatic career. His initial musical studies were made under a dryasdust English professor who thoroughly submerged any love the young man may have felt for the art. After a few of these sessions, Berners returned to diplomacy with a profound sigh of relief. But shortly before World War I, he met two composers who were to revive his musical instincts: Alfredo Casella and Igor Stravinsky. Berners' unique gifts were at once apparent in his early set of piano pieces, *Three Little Funeral Marches* (1914), which Casella introduced in Rome at the Academy of Santa Cecilia in 1917. This and a number of other Berners compositions are now available on an excellent MGM recording performed by Menahem Pressler. All the familiar Berners elements are here: satire, parody and acid charm. But this is not merely the work of an accomplished amateur who, in the words of one critic, "unable to reach the sublime, contented himself with the ridiculous; an artist who, too insignificant to make a good portrait painter, fell back on becoming a cartoonist."

A number of factors have led to the pigeon-holing of Berners' music in particular, his extra-musical activities. He did, in fact, carry his original intention of becoming a diplomat, his first assignment being that of attaché to the British Embassy in Constantinople. He was an accomplished painter and a brilliant writer. In addition to a stimulating autobiography, he wrote some fantastic novels. Two of the latter are worth mentioning because they reveal something of the man's personality. In *Romance of a Nose*, Berners develops the theory that, before her historic meeting with Caesar, Cleopatra had suffered through a perfectly miserable adolescence due to her repulsively large nose. Her political enemies capitalized on her deformity by waging a campaign of ridicule

(Continued on page 61)

Eric Satie, by Picasso
(Courtesy The Bettmen Archive)

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Evolution of "The Horn"

EDWARD V. KETCHAM, JR.*

The conception, design, and construction of a speaker enclosure consisting of a closet-contained low-frequency horn with a midfrequency horn and two high-frequency sound producers.

"THE HORN" is a home-built loudspeaker system. It is large in size and magnificent in performance. It was conceived as a result of reading about Albert Kahn's huge home audio installation publicized as a "Residence Entertainment Center" by Electro-Voice, Inc. Mr. Kahn is president of this organization. The "Center" features a bass section comprised of a large horn driven by two 18-in. woofers, and occupies one entire end wall of a sizable room.

More specifically, "The Horn," truly an amateur's project, was first considered as a half-size edition of Mr. Kahn's installation, turned on end and backed into a rectangular hall closet. As completed (*Fig.* 1) it became a combination of Klipsch speaker cavity and horn throat principles, feeding through an exponential horn, plus design features and driver components of the Electro-Voice Patrician. The entire assembly was designed and built to fit existing closet space and exhaust into one end of the living room listening area. Technicians may find faults in its layout, but it performs superbly.

General procedure was as follows. Details of the "Residence Entertainment Center," the Patrician, and some basic rules of horn design were obtained. Paul Klipsch's papers on folded horn principles and the Jensen monograph on horns were studied. The basic idea of a low-frequency horn with its mouth divided in two by a compartment containing associated apparatus was drawn to rough scale. It became apparent that it would be advisable to face the low-frequency woofer speaker *away* from the listening area, and fold its associated horn around two right-angle turns to bring the latter's mouth out in the desired direction. This design feature would provide the longest path and most gradual taper within the limits of available space.

Concentrating on this low-frequency horn, an approximate path length was established. After several false starts a list of cross-sectional areas was compiled. The list itemized the recommended area of (a) the mask opening in front of the 18-in. woofer, (b) a pre-throat chamber, (c) an eight-inch-long throat, and (d) calculated areas at six-inch intervals along the length of the horn. Figures from (d) established an exponential curve or expansion rate to the recommended mouth area. Working dimensions were figured from (d) by assuming widths as large as closet space allowed and dividing these into the listed values, the quotients denoting height or depth dimensions. The drawing of *Fig.* 2 details the results of these calculations.

Lest your interest sag at this point, the end product is a low-frequency horn from which pours full, clean, unforced low-frequency sounds—a tuba player at an interview trying for his lowest note, Mr. Cook's organ records, a bass viol, drums—without resonant peaks or "behind-the-door" muffled effects. First indications of its performance became evident upon completion of the basic structure and the installation of the 18-in. woofer in its tightly sealed cavity. A test was made on the concrete floor of the garage workshop using a Cook test record and 10-watt amplifier.

The first try ran at moderate volume. Waiting for the test record to run its course provided anxious moments as treble tones weakly wandered forth. One thought was paramount. "When will it take hold? *Will* it take hold?" At about 500 cps the test tone became solidly effective and then progressed lower and lower. Positive response was audible down to 30 cps and apparent response below that; however, the pickup used and this layman's ears preclude accurate judgment in this rock-bottom region. Theoretically "The Horn" functions to 25 cps and the speaker resonates at 27 cps.

A repeat test at high volume produced sufficient unadulterated low-frequency

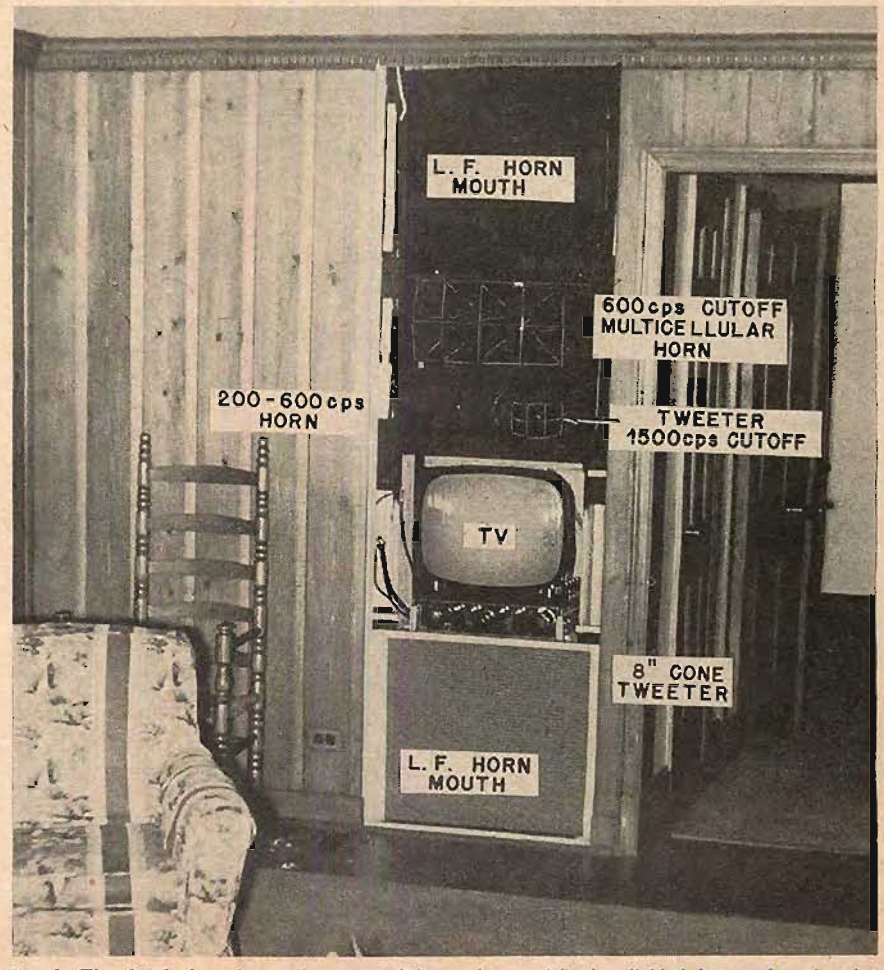


Fig. 1. The finished enclosure is mounted in a closet with the divided horn exhausting into the listening area. Between the two sections is the TV receiver. The upper section will be covered with a grill similar to that over the lower section.

* *50 South Bay Ave., Brightwaters, N. Y.*

sound power to be a potential cause of physical damage in a finished room. Vibrations created a sense of being surrounded by something untouchable. Small objects moved of their own accord. Others vibrated audibly. Small wonder that a chance visitor arriving upon the scene, replete with the odor of drying paint, accused the writer of nefarious activities relating to the production of illegal beverages!

Construction

The photos of *Figs.* 3 and 4 illustrate construction details. Upper and lower mouth sections, throat and back are built separately, then assembled. The speaker cavity came last. Joints are glued throughout. After testing at loud volume strong bracing was added to the back of the speaker cavity to reduce the possibility of developing extraneous vibrations. It is believed this can be better accomplished by building the cavity irregular in shape while maintaining its cubic content.

Having successfully provided for low-frequency range, the next stage was the building of a 200- to 600-cps horn for a 12-in. woofer, as prescribed by the Patrician details. This was patterned directly from the furnished data except for two variations. Available width being less than specified, the height was increased to maintain prescribed mouth area. The second change consisted of arranging the horizontal and vertical axes off center so as to aim the unit toward the exact center of the listening area at ear height.

Then the upper frequencies. Purchased Partician components were arranged to point at the listening area center point. From 600 to 3500 cps a horn-type driver unit operates through a multicellular horn with 600-cps cutoff. Two tweeters operate from 3500 cps up. One, a horn-type driver operates through a multicellular horn with 1500-cps cutoff. The other is an 8-in. cone speaker modified for extreme high-frequency operation. A four-way dividing network channels source material signals to the proper drivers.

With the assembly of all components completed, further tests were in order. After preliminaries with the test record, the writer proceeded to launch units of the New York Central Railroad upon a new route via Cook's "Sounds of Our Times" by way of an open garage door. The open mouthed admiration of a four-year-old neighbor was wondrous to behold.

A word now from the voice of experience! No doubt you know of the fellow who built a boat in his basement and was unable to get it out. Similarly let it be understood that a big audio horn once built . . . has to be installed. In planning, one must consider not only available area for the installation but also difficulties in reaching that area. "The Horn," while restricted in width to that of a hall closet, is ceiling high and cannot pass through doorways in an upright position. A five-foot closet depth and corresponding front-to-back dimension, however, make transportation possible face down. This does not entirely conclude the problem as the over-all diagonal measurement from bottom front to top back momentarily is all important when raising the assembly to an upright position. In the case of "The Horn" one inch to spare proved sufficient.

Finishing was handled in a novel manner, as the photos reveal. The wall was first torn away exposing the closet installation area. The unit was backed into position. Wedges were driven between the unit and surrounding walls. Lag bolts through the sides into adjacent studs made everything "solid as a house." With "The Horn" finally at its destination, panelling was installed across the entire end of the room on top of existing plaster. The panel seams were spaced so that the wall opening at the closet measured exactly four boards wide, as can be seen on *Fig.* 5. An up-and-down sliding panel of like material and similar width was constructed on concealed slides so that it can be raised out of the way through the ceiling. A counterweight simplifies this maneuver. In passing, the writer admits partial defeat at this stage as the panel was divided and hinged across it center making a visible steam. The only alternate was to "raise the roof." The next project will be to provide push button control of this panel with an electric motor mechanism.

A sliding drawer or cradle permits the TV chassis to be serviced; a TV front panel and a plastic grill cloth provide finished appearance. Source material comes from amplifier, FM tuner, and record player in a fireside wood closet at the far end of the room.

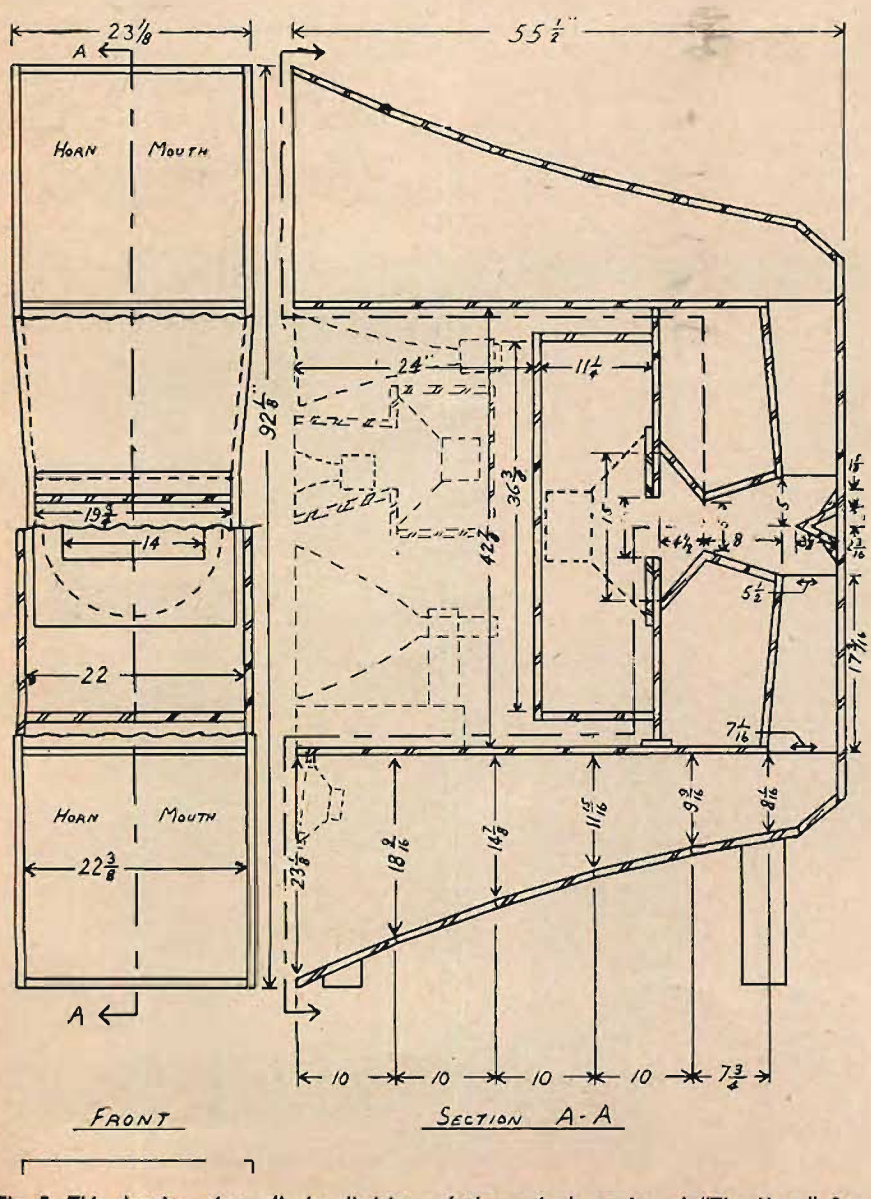
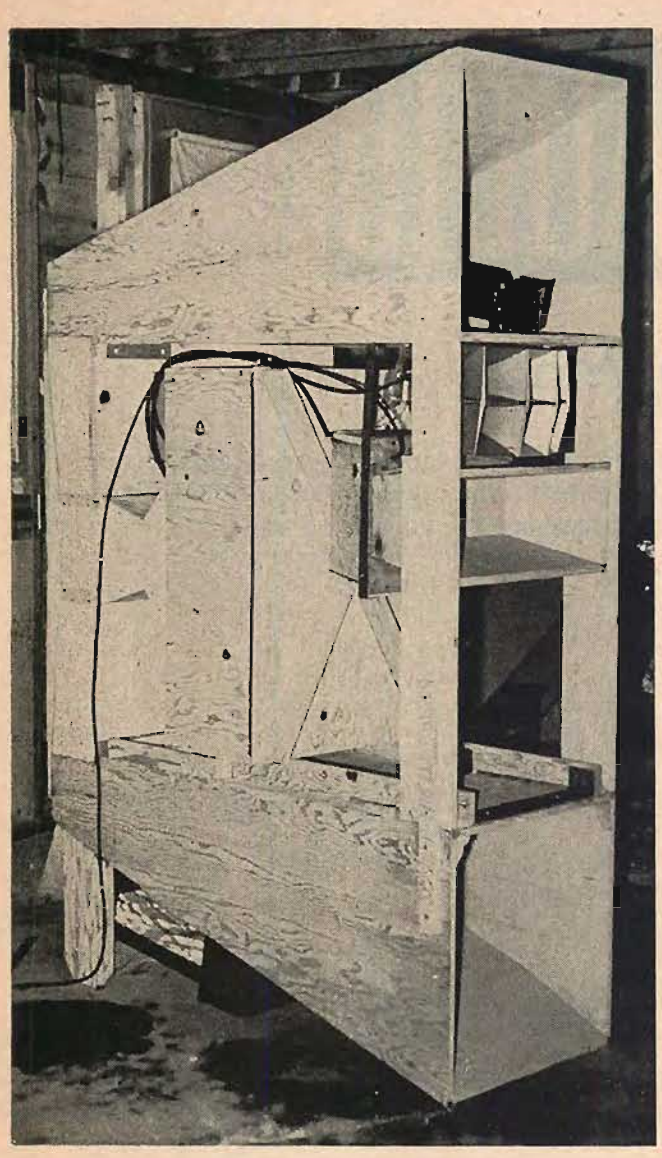


Fig. 2. This drawing gives all the dimisions of the author's version of "The Horn." Some alterations may have to be made by other constructors to fit existing spaces.

Other Speakers

In experimenting with "The Horn" by changing relative volume levels of the different drivers, the writer has formed an opinion that may be of general interest. It is that most approaches to extended low-frequency reproduction



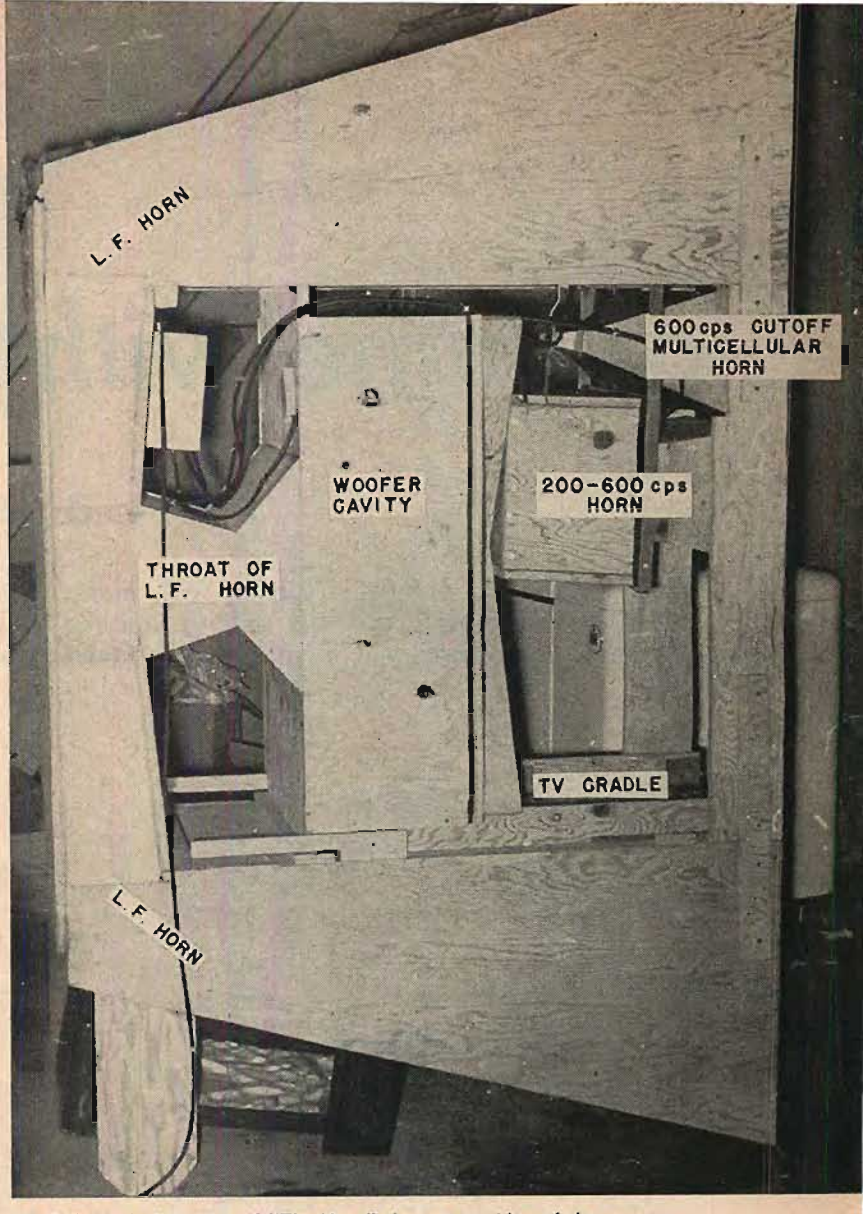


Fig. 3 (above). Side view of "The Horn" shows some idea of the construction. Fig. 4 (left). This three-quarter view shows placement of the 200-600-cps and lower-frequency horns.

in the home indirectly cause poor speaker response in what may be termed upper bass. To substantiate, the bass-boost curve of home amplifiers peaks between 50 and 100 cps. Enclosure designs are available that are remarkably efficient in this range, and when used with a low crossover network and level controls usually make amplifier bass boost undesirable. Under such circumstances the direct-radiator cone speaker employed for midrange reproduction lacks bass boost that it can use to advantage. Said boost not being present, the overall response curve of the speaker system droops in the upper bass range. This droop may lead some to think their low-frequency units perform better than is actually the case, due to the relative difference in output volume between the low and midrange speakers.

The remedy is to employ a separate upper-bass speaker. Its efficiency must compare favorably with the extreme low-frequency unit. Such a device is the 200–600-cps horn with 12-inch driver described above as a component of "The Horn." It plays a large part in producing the wide-range, even response that is the outstanding characteristic of this multiple speaker system.

Building and installing "The Horn" was an adventure. Test record tryouts and lengthy listening sessions have revealed wide-range efficiency most rewarding for the effort expended in its creation. It utilizes equipment found in the most elaborate factory assembled systems and several enthusiastic critics consider that its performance ranks with the best professional demonstrations, yet through home construction many dollars were saved, and the system was built in. The writer formerly used a high-priced coaxial speaker mounted at the location now occupied by "The Horn." The closet served as an infinite baffle and the same source material equipment was in use. There is little comparison. Direct-radiator speakers are not in the same league with several properly-horn-loaded drivers.

Yes, it was a satisfying adventure. Look around, friend! Have you a workshop? A strategic closet? Ever knocked down a wall? You have? Well?

Fig. 5. This photo shows how the entire installation is covered by the vertically sliding panels when it is not in use.

at home with AUDIO

LEWIS C. STONE*

Hi-Fi a la Mode

For thoroughly enjoyable "living with music," why not utilize a tape recorder, radio, records, TV, and automatic controls to give you the kind of entertainment you want throughout your home—equipment that even saves up your favorite programs for you when you aren't home?

DURING September's closing days, there came to view in a national magazine a sequence of full-page color ads in which a group of manufacturers displayed a common interest in, of all things, the TV room. Each of the four double spreads came up with suggestions—one for arranging and using comfortable viewing furniture, another on floor carpeting, another the TV set itself, the next on painting and decorating walls and woodwork—in each case urging their products on the TV-room-fitted consumer. In huckster language, the institution of the TV room was being merchandized by four manufacturers—one for each of the commodities described—and with apparently telling results. As for our hi-fi brethren, they were nowhere in evidence. They missed a bet.

Someone must surely, and pretty soon, come up with as good a merchandising presentation—exploiting the idea of the TV *and* Hi-Fi room and its fashioning and furnishing. There you really have a broadly functioning home entertainment center, carrying not only the transitory video image, but also the recordable, replayable and repeatable radio broadcasts with the aid of the TR (tape recorder) on the audio end of the electronic home entertainment spectrum. We will then see the merchandising of an environment for the most shared entertainment spot in the privacy of the home. With it will go the full panoply of tuners, pre- and power amplifiers, turntables, changers, speakers, microphones, cartridges, pickup arms, tape recorders, automatic timers, etc., etc. This dream is not ours to claim, nor are the bucksterish details of its execution our concern at the moment.

We have, in fact, touched on the hi-fi environment to some extent in this department, ever since we entered on our agenda (AUDIO for April 1954) "variations on the theme of housing the equipment" as one of our areas of discussion in these pages. The theme comes up time and again, as we receive communications from more and more of our readers among whom are hi-fi devotees whose fervent addiction literally compels a full and proper appreciation of the importance of being in earnest about the place of the hi-fi system in the home.

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Study With Hi-Fi

Take, for instance, the system conceived by a reader in Chicago and collated by a local firm of audio engineers. It is fine proof, we think, that "how-to-do-it" is a question that never fails of ever new answers. For is it not always a qualified "how to do it, *here* in *my* place, for *my* use. . . ."? And each answer in the particular can so easily become the inspiration to any one for yet another variation on the same theme. An electronic chain reaction, so to speak. In figuring out your hi-fi system requirement you establish, pretty nearly, its housing and environment too. Thus, as our Chicago reader reveals in his communication, a complete hi-fi system with TV can be contained in a housing area of 78 vertical square feet and taking less than 15 square feet of floor area. A thoroughbred system, this, in a planned environment created within a study, a room measuring 12 by 18 feet, and resulting in appearance like *Fig.* 1.

Here is a hi-fi system complex yet flexible; massive, yet compactly contained; tractable in its operation to the point of robotism, yet mood-responsively versatile. It is, in short, a system where ingeniously placed relays have parlayed a

Fig. 1. Music wall takes a modest nine-foot square corner in room 12 by 18 feet, houses compactly a complex of hi-fi equipment, including professional tape recorder. Finish is sandalwood on mahogany-faced plywood. Clock at top is independent of audio system. Note Plexiglass hoods over tape reels and turntable. Remote TV tuner is in magazine rack.

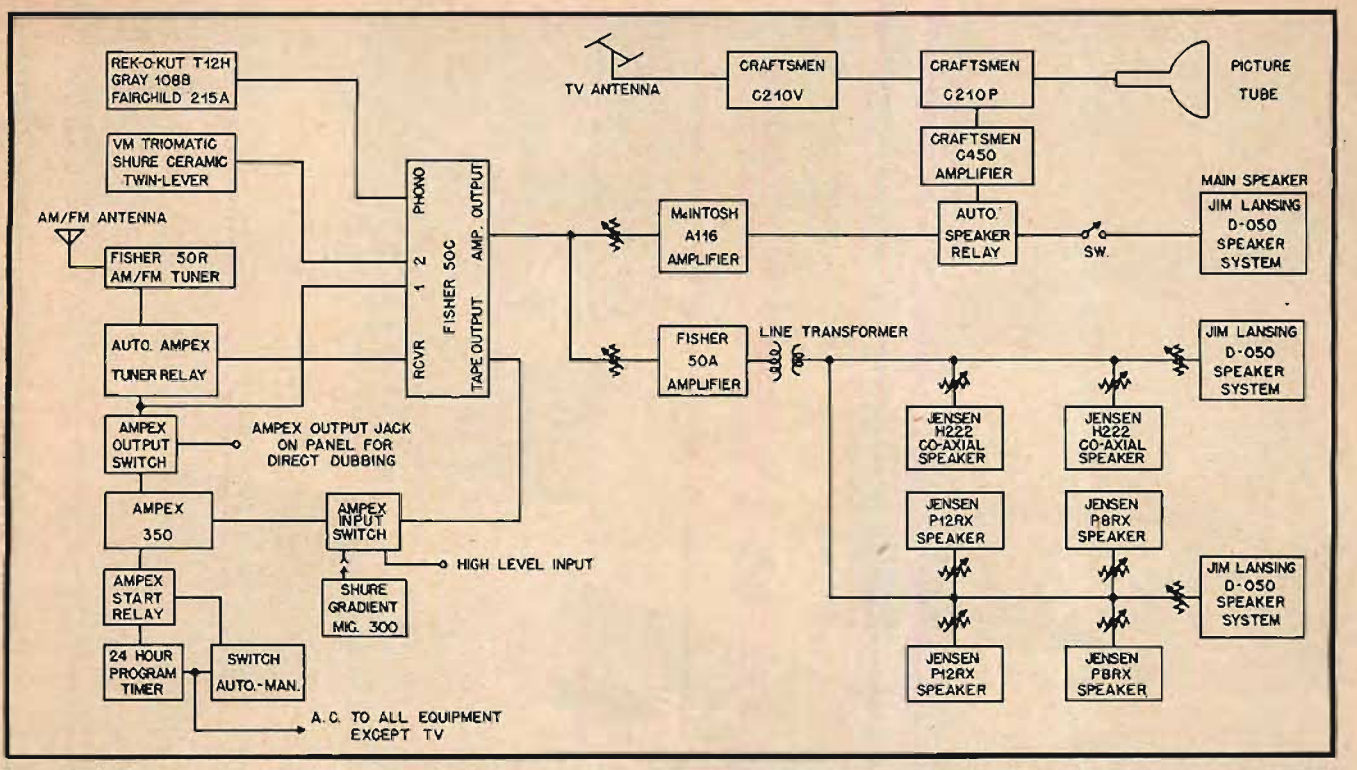


Fig. 2. Block diagram indicates a fullsome handling of one family's high-fidelity and TV requirements. Installation features relays for fully automatic operation, with individual switching at each speaker, master control in master bedroom.

music-wall construction—a pleasingly styled adjunct of the home environment—into an eloquent return on the (not inconsiderable) investment. Our wall's opacity is only optically so, for it offers no barriers to the inner ear. You can grant, can you not, that this kind of wall with its very special hi-fi equipment, as thoroughbred as any in the field, is graced with the capacity to loosen tendons tensed from the day's desk and briefcase concerns, when it translates electronic impulse into music or recitative that can open wide the casements of the soul?

All the more reason, then, so to avail yourself of the best in electronic devices that the playback or program transmission can be effortless, spontaneous, akin in its presence and responsiveness to anybody's dreams of wish fulfillment. To accomplish this remotely controlled apparatus honors directly, automatically and with the greatest of ease any draft you may present upon the program-banks which you have laid in to the enrichment of your archives of recorded sound on tape. The tape recorder is the functioning core of the whole scheme of this undertaking.

Our communication implies that broadcast music is reeled in by automatic relays, tape recorded through FM tuner at a preset time and later, at will, channelled through to any one, or combinations, or all of the nine speakers of the house. Each of these can be independently "included" in or out by direct switching. And, by low voltage relay, the entire array of equipment may be brought to full voice, or silenced, from the master bedroom.

In this room the programs sifted by a Fisher 50-C preamp from either tape, radio, phonograph, turntable or microphone are heard through a Jim Lansing three-unit D-050 speaker system. This is identical with the main speaker components contained in the music wall aggregation in the study. A like speaker system is in the living room. The entire system is shown in block form in *Fig.* 2.

20,000 cps with Bath

Effortlessly, high fidelity sound is everywhere. With the ease of tapping water from the house lines for a warm bath is program or playback sound piped to both bathrooms through wall-mounted Jensen P8RX speakers. Where body lies in its bubble bath, there also can spirit be soothed or stimulated. And when relaxed-dry on bed or couch, the program is still heard with full presence, yet mild volume. An automatic relay operates to bring a continuity of music from one source or another. Ordinarily, when the tape reel runs out its full hour, the Ampex stops automatically as the tape tensioner arm swings free. It is then that a relay comes to life, switches the number one input of the preamplifier to the output of the tuner (both are of Fisher pedigree) and, again automatically, the radio serves up its preset dish of programming, with hardly a noticeable pause as one instrument gives way to the other.

In its robotish phases, this system can provide complete program continuity. But this is no Frankenstein monster, imposing itself relentlessly and uncontrollably upon our natural inclination and need for quiet. That state you achieve with a manual switch, located at each of the extension speakers, wherever they may be in the apartment, including the kitchen. The system is designed to inscribe a preselected radio program onto the tape recorder in the owner's absence, by means of a 24-hour timer which is set into the apron of the Ampex just below the tape transport plate, as seen in *Fig.* 3.

An ingredient had to be added, according to system designer Irving Rose, in the way of an automatic relay to close the start switch momentarily when the time clock turns the Ampex on for a preset program take off. Since this machine has only the one input available, an input switch was added to provide choice between microphone or high level line feeds, or both.

Life with Hi-Fi

This hi-fi system is lived with daily by a well known manufacturer in the electronic industry and his family. The broadcast station log does not always accommodate itself to their listening or leisure habits. So the clock-and-relax mechanism records daily favorite news or musical programs for later listening. Especially on Sunday, while the family is visiting or golfing, do they appreciate their robot

Fig. 3. Audio equipment grouped for convenient manual operation, also works completely automatically. Note 24-hour program timer below tape reel plate and controlling toggle switches alongside. Amplifiers feeding main and extension speaker systems are housed below 24-inch picture tube; also relay chassis and separate amplifier for TV sound. Main speaker system is behind screen over picture tube. Tuner and preamp are placed between tape recorder and turntable, with record changer on slide-out below.

hi-fi system. No one is home, the apartment is still. Under orders from the clock, the automatic switches, the relays, the radio, and the tape recorder all come to life, silently and diligently to imprint the desired program on tape for later playback when the family is home to hear it.

Sometimes phonograph records—particularly hard-to-find collector's items which may occasionally be borrowed—are mounted on the Rek-O-Kut turntable with its complement of Gray viscous-damped tone arm and Fairchild pickup cartridge, and played into the tape recorder. Both 7½ and 3¾ inches per second speeds are available with the Ampex tape machine. The frequency response at the lower speed is reported to be ±2 db at 50 to 7,500 cps. Adequate for recording, say, jazz and folk music, which is exactly what this family does when tape recording popular music. By the same token, the classical record numbers and programs get the 7½ ips tape play treatment. At this speed, the response is said to be ±2 db from 40 to 10,000 cps, and ±4 db from 30 to 15,000 cps. This last rate of frequency response is hardly distinguishable (by the ear, though instrument-measurable) from the ±2 db produced at the doubled speed of 15 ips for the identical frequency response. Our knowledgeable electronic manufacturer is quite aware also that the more moderate tape speeds mean one full hour per side of tape reel (2400 ft.) for the 7½ ips, while the 3¾ ips rate keeps each side of the tape reel going for a full two hours. Economy!

With the tape recordings from discs usually go comments identifying the composer, the selection to be played, and so on. These are spoken into a Shure Concert-Line Gradient "300" micophone. For straight disc playback a VM Triomatic changer is used, fitted with a Shure Twin-Lever hi-fi Ceramic Cartridge.

Obviously, the rack mounting units of the Ampex 350 have been used in this undertaking. They are quite neatly mounted in the wall housing, in company with the other components of equal quality. For ready access when that becomes necessary, all the components are mounted on separate slide-out assemblies. The tape transport swings up on two 3-inch loose-pin hinges mounted at the back. Over it a Plexiglass cover, domed to clear the equipment, is held up by a sliding bracket, closes down protectively with a light hand pressure. (This is one of the very few parts of the system not automatic). A similar covering serves to give protection (with full visibility, in both instances) to the turntable and its precious pickup. The control panel of the Ampex machine tilts up when the outer panel of the cabinet is pulled out (flour-bin fashion) and this too, can be opened up to reveal its electronic insides. If not always for servicing, then for the ego-satisfying curiosity of your envious friends as they pop their eyes upon their well-ordered complexity.

For those able tool-handlers to whom no installation is without challenge, including their own, we include in *Fig.* 4 some dimension sketches of cabinetry. Basically, a shelf job it is, and who is it hasn't done one? Does your ambition for the best grace (alas!) a high reluctance pocket book, then will you take the hi-fi path on a lower road. But without compromise. Better to proceed with the carpentering of the shelves yourself, than to shelve the idea wholly. Better to proceed monogamously at first, than take on a whole harem in one avaricious swoop. Electronically speaking, that is. There are, in this communication, enough components described and placed, and the ways they are lived with reported. Sufficient, is it not, to sharpen your appreciation that thorobred fitments are in a class by themselves?

There need be no mystery of choice. This is no "lady or the tiger" deal. You can saw your wood to cut your costs. You could, to begin with, erect a half-wall, for instance. Most of the working thorobreds are "stabled" in the lower parts of the music wall, anyway. Draw on these components, or their like (there's today plenty of the thorobred breed in hi-fi equipment available) for your first steps on the hi-road to hi-fi. And verily, your last (steps) shall be as the first.

But perhaps we are spending your money too fast. In your ambition for the absolute in hi-fi, do not, then, minimize the virtues of the median. There is fun in the pilgrimage to progress, say, from first choice of what will later be your second (or auxiliary) speaker—when you have made, that is, final choice of your "first" or main speaker. And if it is preset on-off programming or listening you want right off, why then a speaker system like the "University" Companion fitted with a Sessions electric clock, could serve. And so on, as a beginning. All you need to do is to decide what facilities you want—practically any type of service *can* be provided, so just name it and roll up your sleeves.

Details of the System

Beginning with the "receiving centers," of speakers there are nine, each in a different room. The main speaker, in the study, is the three-unit Jim Lansing D-050 system, with two 15-inch low-frequency units and one high-frequency driver equipped with a horn and Koustical lens assembly. These work from a 1200-cps dividing network. Two more systems of the same type are used, one in the master bedroom and one in the living room.

Wall-mounted in the dining room and kitchen are Jensen H-222 coaxial speakers, Jensen P8RX 8-inch speakers in both bathrooms, and two Jensen 12RX speakers in the remaining bedrooms.

Amplifiers: The main speaker system is fed by a McIntosh A-116 30-watt amplifier. A Fisher 50A 50-watt amplifier serves the extension speaker line.

Tuner is the Fisher 50-R, AM-FM.

Preamplifier is Fisher Model 50CH. This is the control center of the system, providing selection of program for tape, radio, television, phonograph changer, turntable, or microphone. Sound from video has a separate 10-watt Craftsmen C450 amplifier.

Microphone is the Shure Model 300 Concert-Line Gradient[1].

Tape Recorder is 2-speed Ampex Model 350, 10-inch reels.

Record turntable is Rek-O-Kut T12H, three-speed, with Gray 108-B viscous damped tone arm and Fairchild 215-A pickup cartridge.

Automatic changer is VM Triomatic, with Shure "Twin Lever" hi-fi Ceramic Cartridge.

Program timer clock, Automatic Electric Company, Chicago; the relay system was custom designed.

Cabinetry Details

The music-wall is made of ¼- and ⅞-in. lumber-core architectural mahogany-faced plywood. The thicker sections are used for support areas and end pieces. Over-all dimensions: 9′-0″ high by 8′-8″ wide. Bottom compartments are 20½″ deep. The top portion is stepped back to make a depth of 16 inches. The finish is in warm "Sandalwood."

All cabinet doors, including the clock-mounted panels in upper section, are operated by "Tutch-Latch," including the flour-bin tape recorder door, which is also fitted with a spring-loaded assist to move the mass easily.

Heat given off by the equipment is dissipated by flue action created behind the units, as shown in Fig. Cold air is brought in through toe kick at the floor, vented through an opening in the upper section of the cabinet.

Note: For a check list of woodworking and other tools, do-it-yourselfers are referred to "at home with Audio" in AUDIO for April 1954.

Credits

Installation by Voice and Vision, Inc., Chicago. Designed by Irving W. Rose, through whose courtesy this undertaking is reported here. Photographs by Idaka, Chicago.

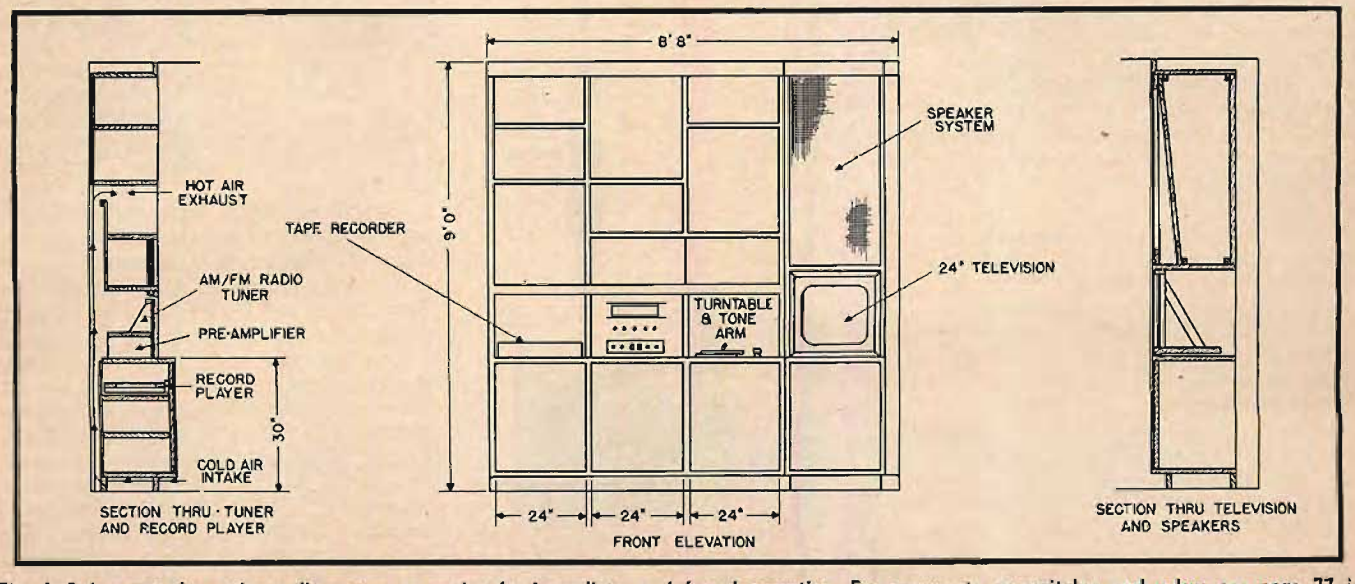


Fig. 4. Relays put the entire audio system on notice for immediate or deferred operation. For comments on switches *and relays see page* 77 in The 2nd Audio Anthology.

Techniques of Microphone Calibration

ALEXIS BADMAIEFF*

A discussion of the problems involved in the testing of microphones, together with a description of the equipment required and a comparison of rating systems.

DURING THE EARLY DAYS of sound transmission, microphone measurement consisted only of evaluating through a loudspeaker or earphones the microphone's ability to reproduce understandable sounds and judge the departure from the original. Such things as articulation and excessive distortion were judged by listening for adequate performance. Present day microphones are precision instruments. During the years of their development and time spent in research to achieve the ultimate in sound transducers, calibration techniques also had to be refined because those techniques are the basis of evaluation of a product offered to the user.

Microphones that are used for broadcasting and recording on such media as discs, tape, and film, must have an extremely wide frequency range to transduce sounds over the entire range of frequencies to which the human ear is receptive. That frequency range is at least from 30 to 15,000 cps, having a logarithmic center reference frequency of about 800 cps, at which point the effective loudness is determined. To avoid the distortion of the highly complex wave forms found in speech and a groups of instruments, the frequency response variation over the wide range must be held to narrow limits. The ability of a microphone to fulfill this requisite must be measured against a primary or secondary standard. The departure from this ideal response determines the quality of that instrument. Frequency response of a microphone is probably its most important specification because not only its range, but particularly the smoothness, is of paramount importance.

Waveform distortions generated by the microphone under any conditions must be held to a minimum and measured to establish its dynamic range. The low limit of the dynamic range is established by measurements of the electrical output when no sound is present to determine the noise generated. This means that the magnitude of the electrical output between the point of distortion and the point of noise determines the dynamic range which is also the ratio of minimum to maximum sound levels which the microphone translates without interference from extraneous or unwanted sounds. Measurements of directivity represent an essential specification in such specialized microphone types as the cardioid. The ratio between front and back, which is the discrimination figure, is measured and can be represented on a polar chart or expressed by a group of curves. These curves generally will show the difference between the front and back pickup output of the microphone over its entire useable frequency range. The front response should, of course, be flat to provide a well balanced reproduction. The rear response, even though it is attenuated by the amount of the discrimination figure, should likewise be reasonably flat. If it is not and some peaks appear in its response, annoying acoustical feedback conditions will exist at those points if the microphone is used for sound reinforcement.

Measuring Equipment

Much expensive and very special apparatus is required to measure and calibrate microphones properly. Some of the essential apparatus needed are:

(a) Primary acoustical standard
(b) Anechoic chamber
(c) Plane-wave tube
(d) Standard test loudspeaker
(e) Oscillator with its necessary amplifiers
(f) Standard reference microphone
(g) Measuring voltmeter
(h) Automatic sound-level recorder.

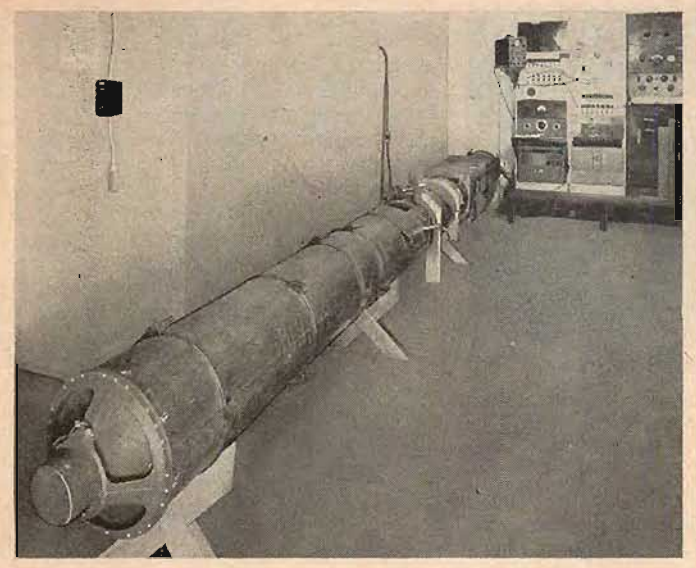
Fig. 1. The pistonphone—the primary acoustical standard.

If such equipment is not available, concrete and reliable calibration is not possible. Some published curves on microphones seem to be exceptionally good; however, when those microphones are re-evaluated with the test equipment described, it is found that their frequency response curves do not compare with published data. Quite obviously, either the measurement equipment used was at fault or some of it was omitted. The tool that is most susceptible to faulty operation is the anechoic chamber. It can be either too small or insufficiently absorbent, which results in standing waves being formed, in which case almost any response can be measured erroneously by merely shifting the microphone from one place to another.

A pistonphone is an acoustical standard. It consists of a small chamber in which a piston—driven by a husky loudspeaker driver mechanism—pumps air in and out. By adjusting the stroke of the piston when the cavity and all other dimensions are known, it is simple to calculate the amount of sound pressure built up within the cavity where the microphone is placed. The pistonphone is a primary standard and it can be used over a great dynamic range. Its limiting factor is the ability of a microscope to measure the excursion of the piston. The typical pistonphone shown in *Fig.* 1 represents the standard against which all secondary standards are calibrated.

The next most important tool in acoustical measurements is the anechoic chamber, *Fig.* 2. As its name implies, it is a room wherein no echoes can occur. Such a room is usually built large enough to permit entry for placement of microphones and contains a known sound source. All inner surfaces are lined with heavy wedges of soft Fiberglas, such as the Owens Corning OC4. Since reflections from these surfaces can occur if the damping material's thickness is less than ½ the wave length of the frequencies measured within that room, the thickness should be at least two feet. Such a room, then, would be completely anechoic from about 250

* *Altec Lansing Corp., 9356 Santa Monica Blvd., Beverly Hills, Calif.*



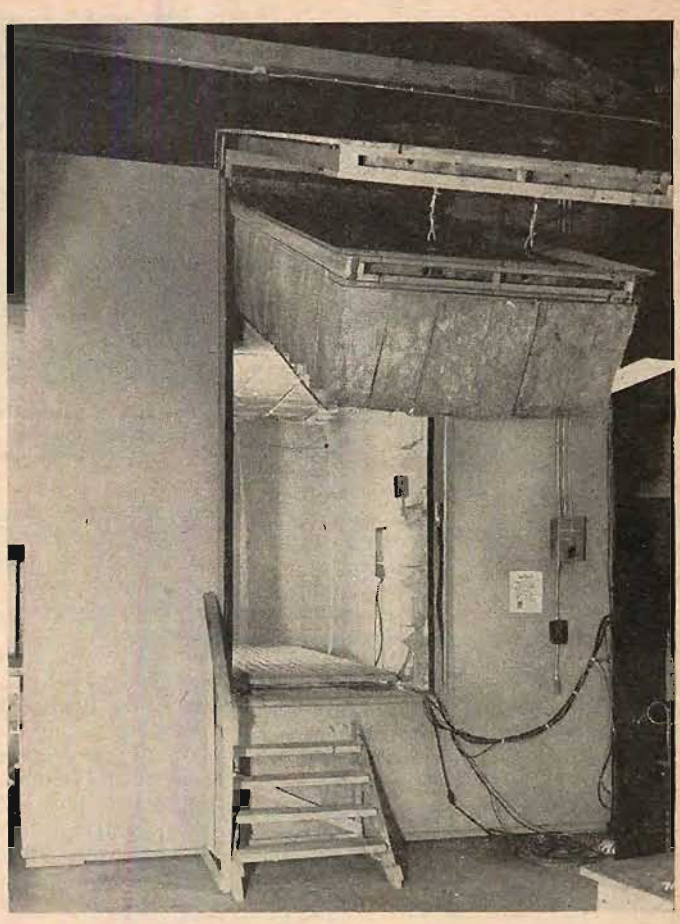


Fig. 2 (right). The anechoic chamber. The fiberglas wedges on door are shown uncovered. Fig. 3 (above). The plane wave tube with its associated equipment.

cps to the limit of the high-frequency range. Since the floor is absorbent to sound, an acoustically transparent floor of interlaced wire netting is suspended in the lower half of the chamber to permit a person to enter. The door is also padded to absorb sound.

Since the anechoic chamber is used only for frequencies above 250 cps, the plane-wave tube fills that gap for measurements below and to the low limit of the acoustical range. *Figure* 3 shows a plane-wave tube. It consists of a wooden pipe, 15 in. in diameter and about 18 ft. long. The sound source is at one end of it, and the other end is damped by several stages of felt. This tube is used to measure frequencies from 20 cps to approximately 300 cps. The microphone to be measured is placed in the linear center of the tube where it receives sound pressures emanating from the source, but all echoes are completely absorbed by the acoustical filter in its opposite end.

The next tool is the sound source. The sound source usually consists of a specially designed speaker having a very smooth response and able to radiate all frequencies to which the human ear is sensitive. Our test loudspeaker consists of two drivers. The low-frequency driver is a 15-in. cone especially treated for a very smooth response. The high-frequency driver, which is an open diaphragm type, radiates all frequencies from 1,000 to 22,000 cycles. Instead of using crossover networks, a mechanical crossover is used which is in the form of a multiple switch that switches the electrical energy from one driver to the other. This oscillator and its switching element are shown in *Fig.* 4.

Standard Microphone

A standard calibrated microphone is used to evaluate response runs in the anechoic chamber or the plane wave tube in respect to the sound source. This radiation, as measured by a standard microphone such as the Western Electric Type 640AA, is used to compare the response of a microphone tested under identical conditions. Having two response curves, one of which is standard, it is simple to convert the response of the microphone under test to a free field response when the performance and errors of the standard microphone are known. It is necessary, of course, that the calibration of the standard microphone be maintained rigidly and carefully, and it should be checked by a qualified laboratory at least twice a year.

The output of either the standard microphone or the microphone under test is electrically connected to an accurate vacuum tube voltmeter that is capable of responding to all frequencies in the audio spectrum without discrimination. The output of the voltmeter actuates an automatic sound-level recorder, *Fig.* 5, that plots a trace on a strip of paper by a pen that is driven by a servomechanism that has been previously calibrated to follow a logarithmic travel. In this case, the pen traces db *vs.* frequency.

When frequency measurements are made, the microphone can be calibrated at either parallel or perpendicular incidence to its normal axis. If, for instance, one would measure a microphone such as the Altec 21C having a diphragm approximately 0.6 in. in diameter, the sound arriving at a parallel incidence to its normal axis would follow the frequency characteristic of that microphone, except where the wave length begins to equal the diameter of the diaphragm. At that point, some cancellation takes place, resulting in the attenuation of the high-frequency response. In perpendicular incidence, however, this does not happen because the diaphragm's sensitive axis is pointing directly at the loudspeaker source so that the pressure wave strikes all parts of the diaphragm at the same time. Normally all calibrations are measured in parallel incidence because that is the normal way a microphone is used. In actual practice, however, parallel incidence is often disregarded and the microphone is "talked to" into its front. The result in this case would be a more pronounced extreme high-frequency response. Examples of the parallel incidence and perpendicular incidence are

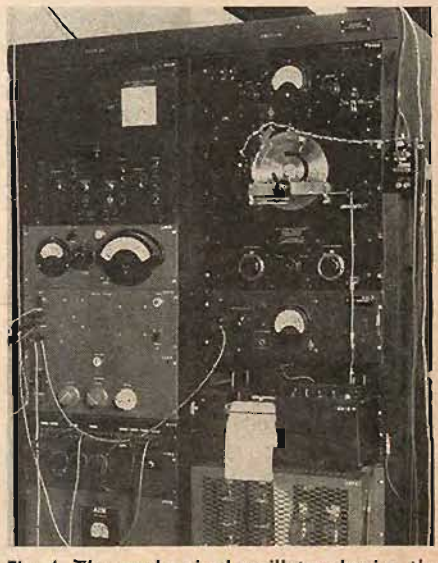


Fig. 4. The synchronized oscillator showing the crossover and limit switches on its dial. The vertical shaft synchronizes the oscillator with the pen recorder.

shown in *Fig. 6*, which is the free field response of the Altec 21C microphone. The exception, however, is in the case of the ribbon and cardioid microphones where their perpendicular axis is normal.

When testing cardioid microphones, one of the most important measurements is the difference in amplitude between the front of the microphone and the rear. This measurement shows the ability of the microphone to discriminate between the sounds received from its front and rear. In certain cases and for certain uses, discrimination might be even more important than the frequency response. Sometimes unusually good claims are published that show a superior discrimination characteristic of a cardioid microphone. However, when such specifications are re-evaluated in a well constructed anechoic chamber, those claims are not substantiated. An example of this is shown in *Fig. 7*, where the Altec 670A cardioid microphone is compared to two other microphones of similar type. These tests were conducted impartially and automatically where no human factor entered into the picture. As is readily seen, the discrimination of the competitive microphones is excellent at several points of the spectrum, but lacking in others. As mentioned before, this condition will give rise to acoustical feedback that will occur at frequencies where the peaks of the back response occur. A more elaborate form of evaluating the cardioid pattern of the microphone is by the use of a polar chart, whereby the amplitude of a constant sound pressure is plotted on a polar axis as it is transmitted by the microphone. When the microphone is rotated along its vertical axis, the shape of that polar pattern represents a heart-shaped figure and shows the ability of the microphone to discriminate loudness *vs.* its rotation. This pattern is evaluated by comparing it to an ideal cardioid shape.

Sound Source

When conducting frequency response measurements, the standard loudspeaker source is adjusted to radiate a known sound pressure level in the mid-dynamic range of the average sounds encountered for which the microphone is designed. Usually a sound pressure level of about 90 db above a reference of .0002 dynes /cm² is used for all frequency-response and discrimination measurements. Since

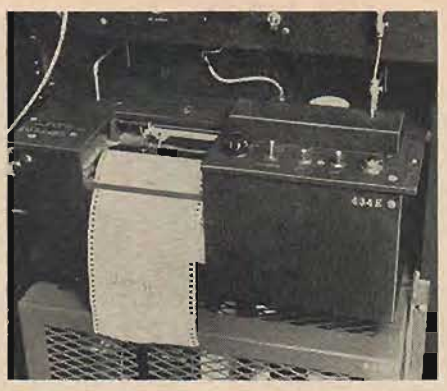


Fig. 5. The recorder automatically records frequency response on a calibrated chart. The recording pen is servo-driven.

the anechoic chamber absorbs the energy of all frequencies above 300 cps, the radiation from the loudspeaker source obeys the inverse-square law. This means that if the distance between the source and the microphone is increased by two, the sound power level at that point is diminished by a factor of four. If, however, the loudspeaker source has a horn attached to any of its driver units, such an inverse square law is not followed due to the beaming effect that the horn produces. This is the reason why standard loudspeaker sources are usually made of the open diaphragm type.

Microphones that are used for average purposes—such as music, speech, sound effects, and other sound sources that are encountered during recording for entertainment—have a dynamic range fitted for that range of loudness. Test microphones, however, sometimes are designed to handle much louder sound levels. An example of an extremely loud noise source to be measured is the jet of our modern fighter airplanes. To analyze such noise, the microphone is placed within a few feet of the exhaust of the jet engine. A normal microphone would be damaged from the excessive sound pressures. The Altec Lansing 21BR microphone was designed to receive tremendous pressures such as explosions, jets, and other high-level sound sources. The 21BR type microphone has a very thick glass diaphragm designed to be stiff enough so as not to distort the original wave form at sound pressures that exceed 220 db. In measuring such a microphone, loud sound sources are required which are beyond the scope of a test loudspeaker. The calibrated pistonphone, which is capable of producing great sound pressures within its small chamber, is used in this case.

When microphones are over-driven, they usually distort the wave form of the original pressure wave that actuates its diaphragm. Distortion can be measured by several well known means, one of which is the analysis of the resultant wave shape *vs.* the original wave shape. Such analysis can be achieved by the examination of the wave shape by means of a cathode ray oscilloscope. Also, special instruments that measure total harmonic distortion and intermodulation are used. These measurements are made in a standard way that is familiar in the measurements of amplifiers but taking into account the distortion of the test amplifiers being used.

One of the ratings for sensitivity calibration of microphones is the ratio of the sound pressure level to the electrical output of the microphone. The electrical output, however, depends on the impedance of the microphone. The rating, since it incorporates the impedance, must be computed on a power basis. The almost universal rating for this sensitivity is decibels referred to one milliwatt of electrical power. The sound pressure level, also in decibels, is referred to an arbitrary standard of .0002 dynes/cm².

Sensitivity Ratings

Unfortunately, the sensitivities of microphones are sometimes specified in different systems. These systems are based on either open circuit voltage or power response or the RETMA sensitivity rating. The formulas for each respective system are as follows:

Open circuit voltage sensitivity in db:

$$S_e = 20 \log \frac{E}{P}$$

where E = open circuit voltage
P = sound pressure in db (ref: 1 microbar)

Open circuit power sensitivity in dbm:

$$S_w = S_e - 10 \log R + 44$$

where R = nominal impedance

RETMA sensitivity rating in dbm:

$$G_m = S_e - 10 \log R_c - 50$$

where R_c = nominal impedance (center value)

The open circuit output voltage of the microphone S_e is in decibels and is referred to one volt/microbar (which is 1 dyne/cm²). The power response S_w is also in decibels and is referred to 1 milliwatt for 10 microbars of sound pressure level.

Sensitivity rating established by RETMA is the available power in decibels to a reference of 1 milliwatt for .0002 dynes/cm². In short, the sensitivity rating is the voltage or power output referred to the sound pressure level in dynes/cm². Whichever system is used, whether it is dynes, bars, or microbars, the rating is still the same provided, of course, it is stated whether or not that

(*Continued on page 60*)

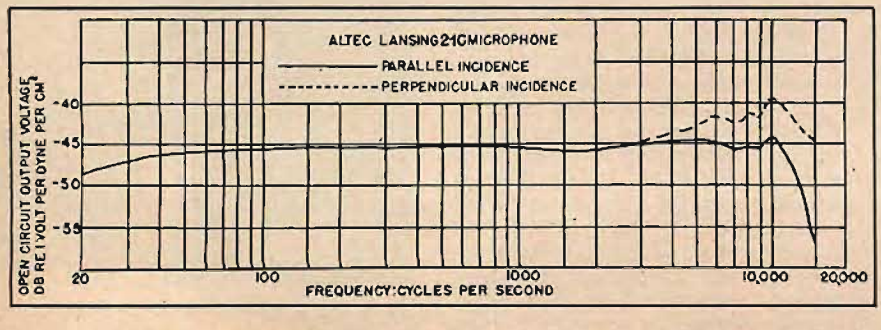


Fig. 6. Frequency response of a miniature condenser microphone for perpendicular and parallel incidence.

The Juke Box Goes *Hi-Fi*

C. G. McPROUD

Combining good amplifier design, a two-way speaker system with both units compression horn loaded, and an excellent phonograph mechanism, the new AMI Model F coin-operated music machines bring high-fidelity sound into public places.

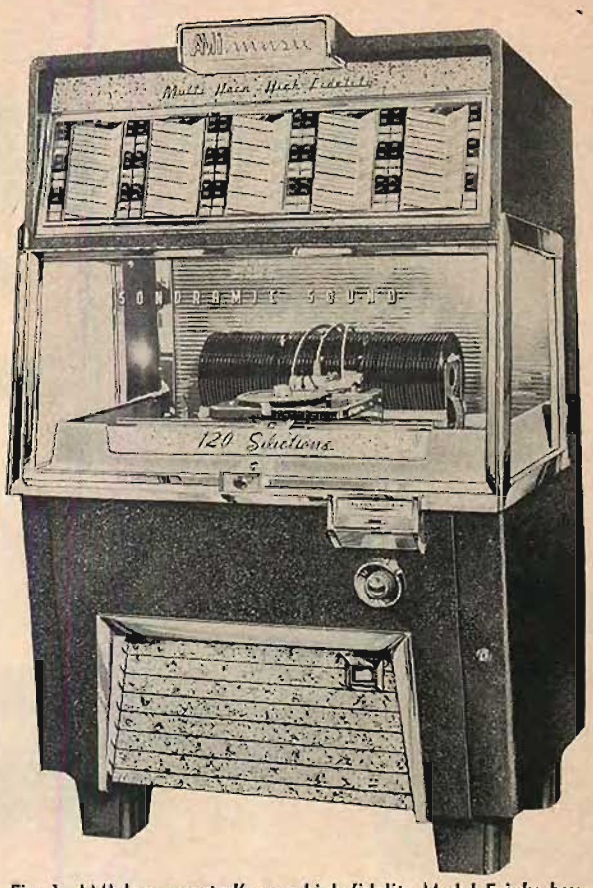


Fig. 1. AMI Incorporated's new high-fidelity Model F juke-box.

THE WORD "JUKE-BOX" as an adjective takes on a new meaning. Long used by audio engineers to describe boomy bass, insufficient treble, and high distortion, the term has been understood by everyone. But the newest instrument just introduced by AMI Incorporated bears a much closer resemblance to a high-quality home music system than to the juke boxes of the past, and its electrical and acoustic characteristics are well worth study by anyone interested in high-quality sound reproduction. For in this instrument are incorporated features which may well find their way into home-type equipment.

The new AMI juke boxes are available in three record handling capacities, but all three utilize the same loudspeaker system, the same amplifier, and the same coin collection equipment. Model F-40 plays 40 selections from 10-in. 78-r.p.m. records, and models F-80 and F-120 play 80 and 120 selections respectively from 45's. All three use similar record handling machinery, differing only in size and accommodation. *Figure* 1 shows the external appearance of the F-120 model.

Several of the physical features of these instruments are notable. One of the important conveniences of Model F is the accessibility to all of the working parts from the front so it is never necessary to move the instrument away from the wall to service it. The coin collection equipment, the amplifier, and the selection control mechanisms may be reached by removing the bottom front of the cabinet, while the front and side glass doors may be opened to service the phono mechanism or to change records and title strips. All interior lighting may also be reached from the front of the instrument.

The cabinets are functional in design and free from dust-collecting "gingerbread." A new "Miracle Finish" can be wiped clean with a damp cloth, and is available in eight smart new attention-getting colors. Trim is either extruded polished aluminum or heavy die castings, chrome plated over copper and nickel, and will remain bright and attractive over long periods in any location.

Heavy legs serve two purposes—they hold the cabinet up from the floor, thus allowing sound from the low-frequency speaker to be distributed throughout the room, and they hide the casters which make it easy to move the instrument when necessary for cleaning. The casters are designed to permit easy leveling, simply by placing one or more flat washers on the shank to raise any of the four corners as required.

Speaker System

To the audio minded reader, the "Sonoramic" loudspeaker system employed in the Model F will be of considerable interest. It is a two-way system, crossing over at 500 cps, and consisting of a 12-in. cone mounted at the throat of a folded horn 50 in. long, and with the back in a completely enclosed rear loading chamber. *Figure* 2 is a phantom view showing the arrangement of the speaker and the folded horn, which is located in the lower compartment back of the heart of the instrument —the coin collecting mechanism. Low frequencies are radiated from the mouth of the horn at the bottom of the cabinet, and take further advantage of the location against the wall to increase effective low-frequency output. The high-frequency speaker is also compression horn loaded, using a molded flat horn located at the top of the cabinet where it can radiate the sound above adjacent tables or booths. The horn is formed of thermosetting plastic, the two halves being held together firmly while they are cemented. This construction eliminates resonance, and provides a lightweight structure which is easily mounted in the top of the cabinet. *Figure* 3 shows the construction of the high-frequency horn, with the driver unit at the throat.

The two speakers are fed from the outputs of a constant-resistance dividing network with a crossover frequency of 500 cps. The increased efficiency of the horn-loaded low-frequency unit, driven by the 22-watt amplifier, gives a sound output comparable to that from a 50-watt amplifier with conventional speakers.

Technically, the dividing network comprises two 5-mh inductances and two 17-μf capacitors connected in a conventional parallel circuit, as shown in the insert in *Fig.* 4. The high-frequency output is padded down with a resistor network to balance the efficiencies of the two units.

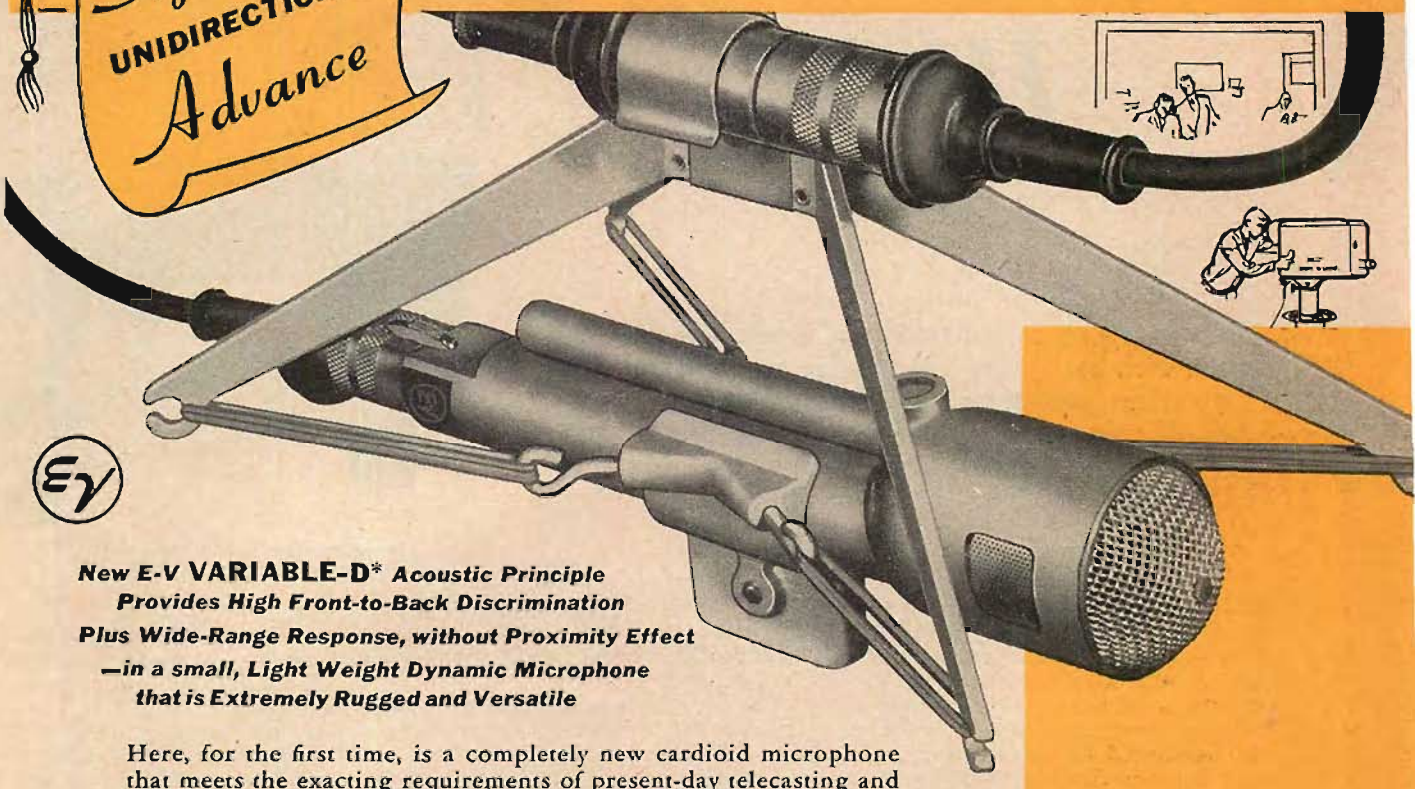
The Amplifier

The amplifier, shown pictorially in *Fig.* 5, and schematically in *Fig.* 4, em-

NEW 666 VARIABLE-D* CARDIOID

OUTPERFORMS ALL OTHERS

Significant UNIDIRECTIONAL *Advance*

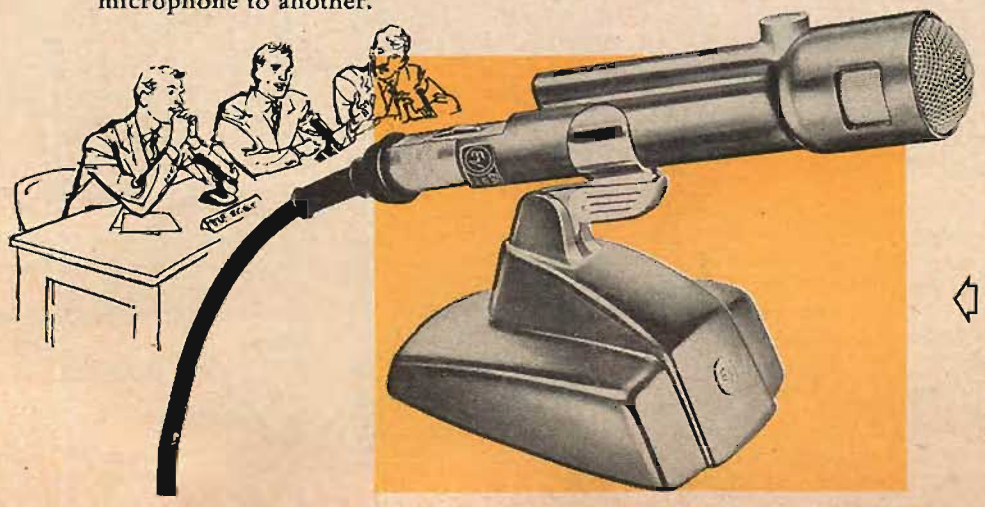


New E-V* VARIABLE-D ***Acoustic Principle***
Provides High Front-to-Back Discrimination
Plus Wide-Range Response, without Proximity Effect
—in a small, Light Weight Dynamic Microphone
that is Extremely Rugged and Versatile

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

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

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



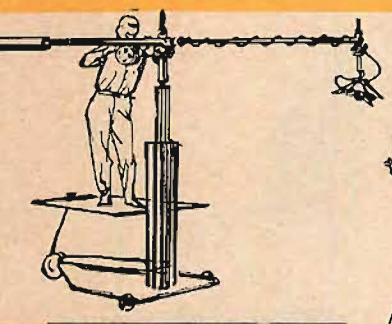
***PRINCIPLE OF OPERATION**

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

*E-V Pat. Pend.

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

DYNAMIC
FOR TV and BC



IDEAL FOR BOOM WORK

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

EASY STAND OPERATION

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

THESE E-V FEATURES MAKE THE BIG DIFFERENCE

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

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

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

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

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

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

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

Microphone Case: Made of aluminum and finished in durable TV gray. 7¼" long x 1¼" diam. Weighs only 11 ozs. Uses detachable clamp-on stand adapter for ⅝"-27 or ½" pipe thread. Swivel provides for tilt up to 90°.

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

Try the E-V "666" Now

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

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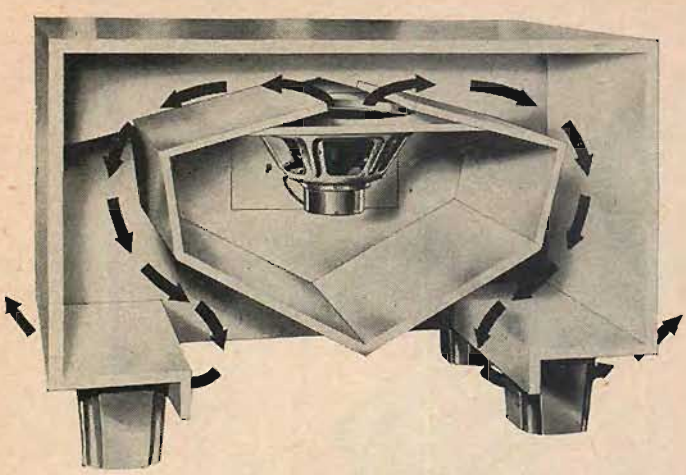


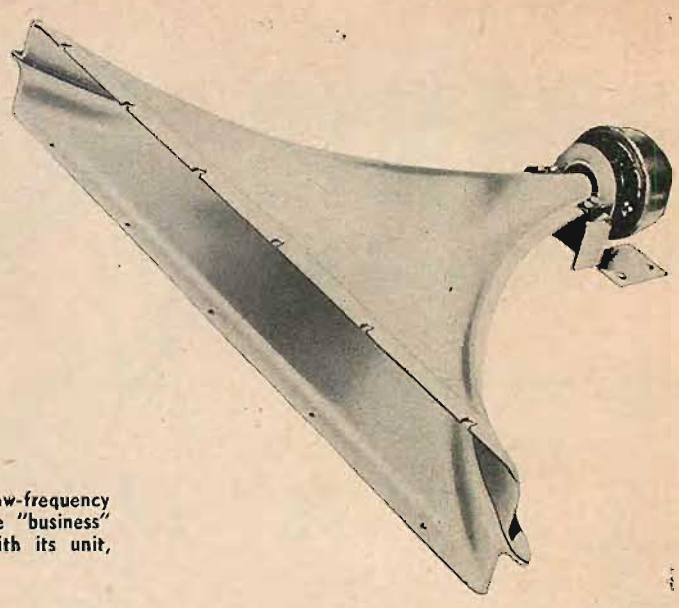


Fig. 2 (left). Phantom view of the folded horn for the compression-loaded low-frequency speaker. This horn is located in the base of the instrument behind the "business" machinery. Fig. 3 (right). The molded high-frequency horn, together with its unit, which is located at the top of the cabinet.

ploys two 6L6's in an ultra-linear type output stage, providing a power output of 22 watts. The power stage is flat within ± 1.5 db from 10 to 20,000 cps. Playback equalization is of necessity fixed, and conforms to the RIAA characteristic. Part of the equalization takes place between the halves of the 12AX7 preamplifier tube and part of it occurs in the input network to the cathode-follower volume-control stage. In addition, a 12-db/octave rolloff filter is formed by a resistor-capacitor network in conjunction with the inductance of the pickup cartridge. Three positions of rolloff are provided, best described by the title of the control, FREQUENCY RANGE. These are FULL, MODERATE, and LIMITED, selectable by a switch on the amplifier chassis. In the FULL position, rolloff begins at approximately 10,000 cps; in the MODERATE position, 6000 cps; in the LIMITED position, 3500 cps.

These adjustments are made when the instrument is installed, and it is recommended that the frequency-range switch be set to the highest position permitted by the condition of the records. If new records are used throughout, and are not played beyond the point where the noise level becomes excessive, FULL response is preferred. As the records become worn, the high-frequency response may be reduced as required.

The frequency balancing network—called the FIDELITY EQUALIZER—is adjusted to suit the normal volume level and the existing room acoustics. Thus, for a live room the bass is boosted appreciably, while for a highly absorbent room the bass response is left nearly flat. This gives, in effect, a compensation for the listening level prevalent at any particular location. This control is operated by a knob on the amplifier chassis.

The FIDELITY-EQUALIZER network feeds the grid of a cathode follower, with the volume control being a variable resistor from the cathode to ground. This permits running the volume-con-

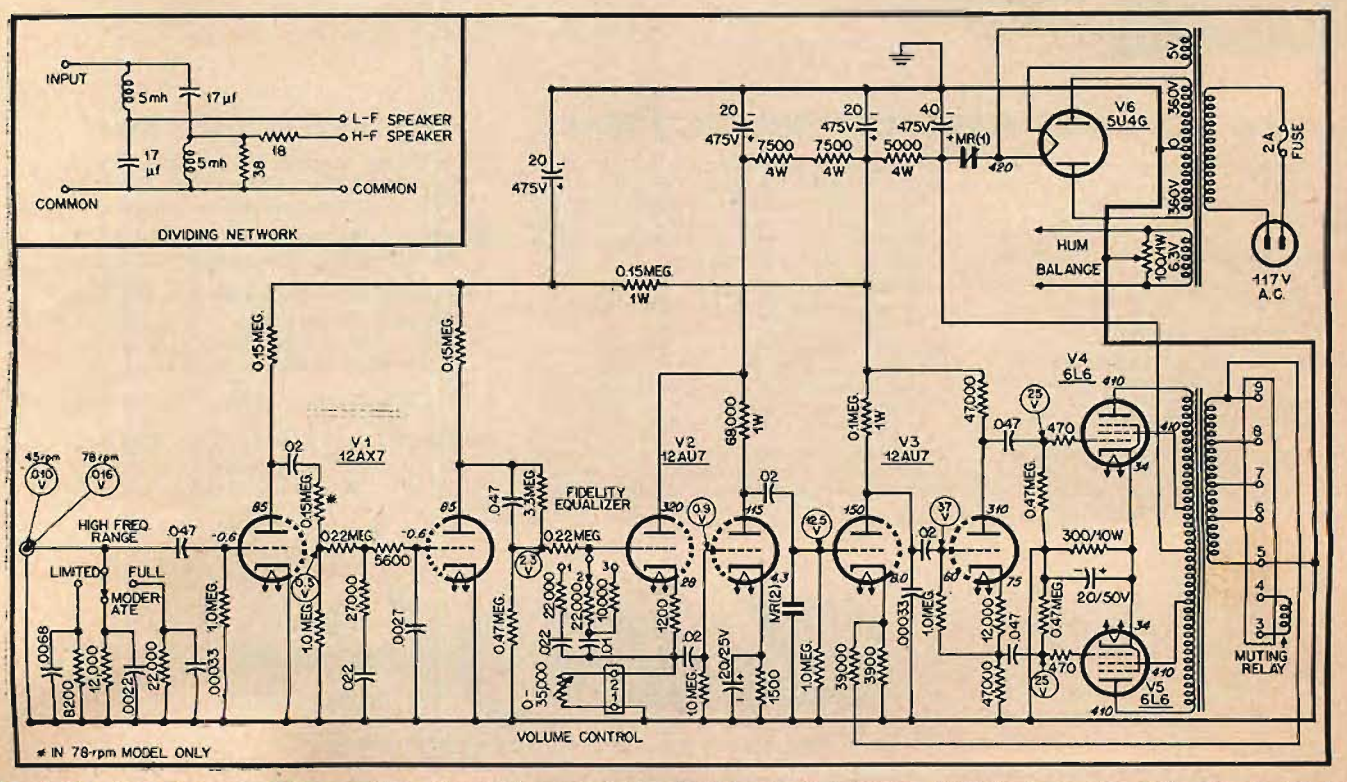


Fig. 4. Complete schematic of the amplifier. Circled figures indicate signal levels from typical phonograph records. Italic figures are d.c. voltages. Insert—the dividing network.

Why

ıe life of your precious records is prolonged with the

RACORD XA·100

Record Changer

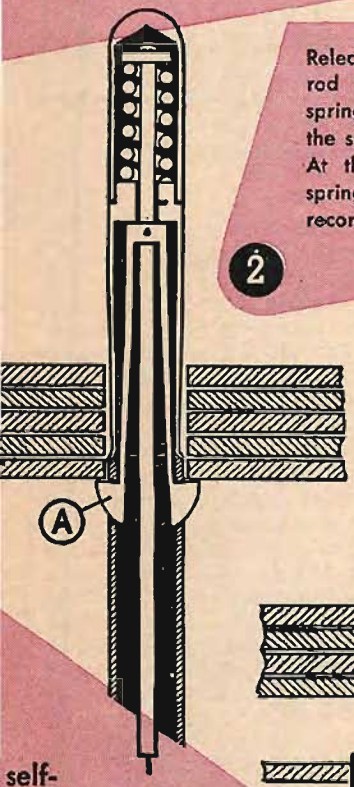
ɔrinciple of the "Magic Wand"

In designing the Miracord XA100 Record Changer particular attention was paid to the perfection of the spindle. Conventional spindles often caused the central hole of records to be dangerously enlarged, and sometimes "egg-shaped". This distortion results in irregular revolution of the record and consequent distortion of sound.

After exhaustive research the straight "MAGIC WAND" spindle was developed. This revolutionary spindle is used exclusively on the Miracord XA100 Record Changer.

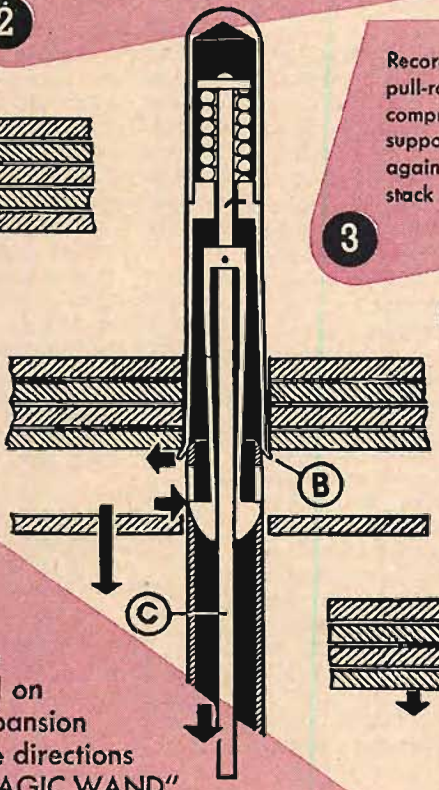
The "MAGIC WAND" spindle positions the stack of records horizontally on three resilient supports. During a change of records, at *no* time is the load on any record greater than the weight of a **single record.**

Normal position: The record stack is resting on 3 resilient supports (A). Important: uniform horizontal position. No need for a stabilizing weight with this 3 point support.



Release: The downward-drawn pull rod (C) stretches the expanding spring (B) in three directions so that the stack of records is held firmly. At the same time the retracted spring supports release the bottom record, so that it can drop.

2



Record stack moves into place. The pull-rod is drawn up again by compression spring (D) the sprung supports are thereby extended again and receive the returning stack of records.

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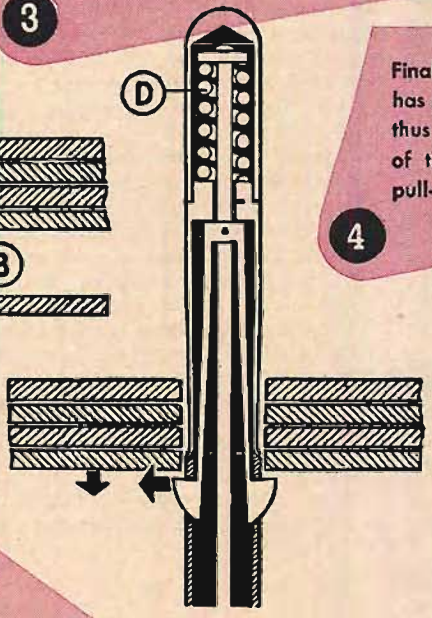
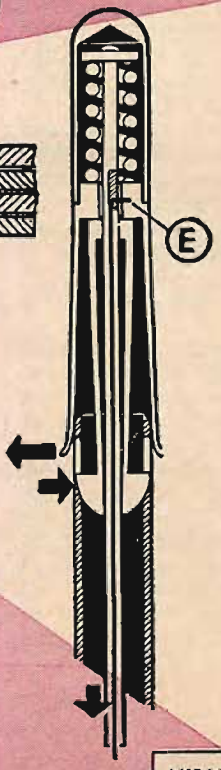


Final switching-off: The last record has dropped. The expansion spring thus has greater lift and by means of the wire-release (E) inside the pull-rod, effects the final switch-off.

4



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r the record is released the stack remaining on the spindle
gain held by the three resilient supports, so that the central
of the bottom record is subjected to *no* dimensional strain.

ıuse of the construction of the "MAGIC WAND," the life of your
rds is extended and preserved, and distortion of the record is
inated. Only the Miracord XA100 has the "MAGIC WAND"
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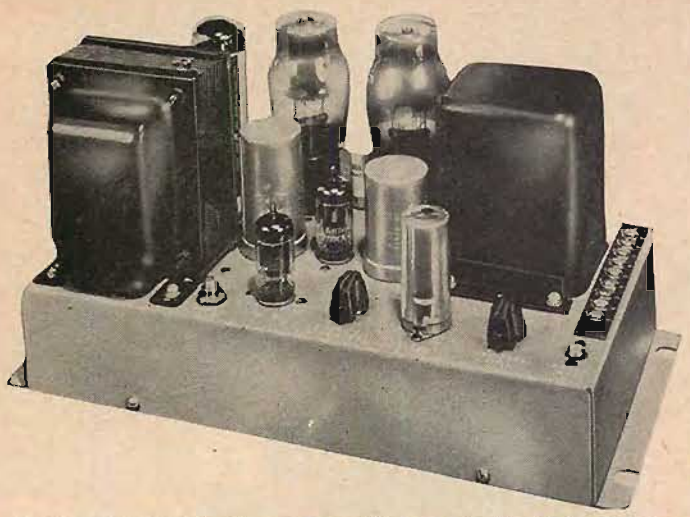

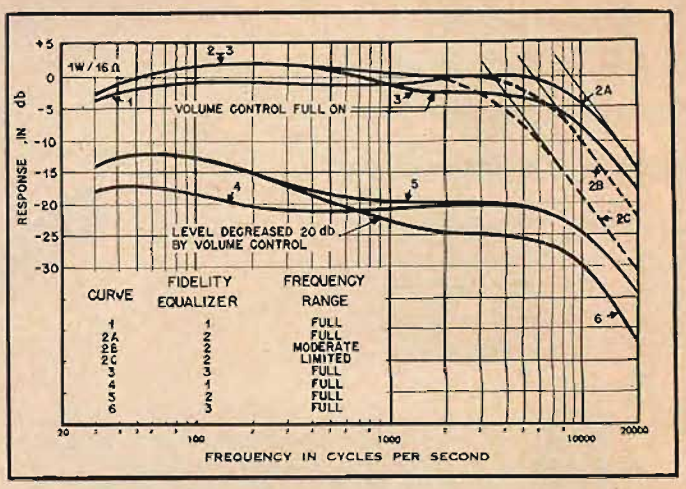

Fig. 5 (left). The 22-watt power amplifier used in the Model F. This unit would make a good amplifier for a home system. Fig. 6 (right). Frequency response curves for the amplifier of Figs. 4 and 5.

trol leads a considerable distance from the instrument without appreciable effect on the high-frequency performance. The volume control is a 35,000-ohm rheostat and requires only two wires. Being in the cathode circuit, the impedance across the control is never over 2000 ohms.

The volume-control circuit provides compensation for the Fletcher-Munson effect. At maximum volume setting of the control, the output of the amplifier is substantially flat regardless of the setting of the FIDELITY EQUALIZER. This permits operation of the phonograph at the highest possible loudness level before amplifier overload occurs. As the volume level is reduced, the bass is automatically increased—the amount and region of the increase dependent upon the setting of the FIDELITY EQUALIZER.

The curves shown in *Fig.* 6 tell the story of the controls far better than mere words can. The upper curves show the performance of the amplifier when playing a test record cut to the RIAA characteristic, and with the volume control at the maximum-volume position. Also shown in the upper curves are the effects of the FREQUENCY-RANGE control, giving two degrees of rolloff below the optimum-quality position, thus making it possible to play records after their surface noise would be objectionable on the full-range system.

The lower curves show the response with the volume-control setting reduced to lower the maximum volume by 20 db. Here the effect of the FIDELITY EQUALIZER becomes noticeable, and in practice, the sound quality at the lowered volume retains adequate bass for good listening.

The volume control is followed by two voltage amplifiers, a cathodyne or split-load phase splitter, and the output stage. Feedback from the secondary of the output transformer is returned to the cathode of the stage preceding the phase splitter.

The secondary of the output transformer is wound to a total impedance of 250 ohms to feed a *70.7-ohm* constant-voltage speaker line when desired, and is tapped at impedances of 0.7, 5, and 20 ohms. Combinations of these taps are used to feed external 500- and 8-ohm speakers as well as to provide the phonograph speaker system with four levels of maximum power input.

Three types of remote speakers are available—one is a high-quality corner speaker using an 8-in. dual cone; another is a wall-type enclosure using an 8-in. cone; and the third is a ceiling-type housing with a 12-in. dual cone. Grille work on all of the remote speakers is of perforated metal, eliminating the possibility of damage by insects or over-exuberant patrons. All speakers have a six-step volume level control.

The filaments of the amplifier are excited whenever power to the instrument is turned on; when a record is being played, the muting relay contacts MR_1 close the plate supply circuit and contacts MR_2 open a shunt across the signal circuit. This muting relay is controlled by the operating mechanism, and serves to eliminate noises of cycling or the dropping of the stylus on the record. A hum-balancing control—a potentiometer across the heater circuit—adjusts for minimum hum, and the whole amplifier chassis floats on rubber grommets to reduce microphonic noises to an absolute minimum.

The power supply is conventional, using a 5U4G as a rectifier with resistance-capacitance filtering—a total of 120 μf of capacitors being used in the smoothing circuit.

A simple chart in the instruction book explains how to connect the phonograph speaker system and the remote speakers to equalize the volume throughout the room, and eliminates the need for any calculations on the part of the operator. Recommended settings for the FIDELITY EQUALIZER are also given in chart form so as to provide a starting point in arriving at optimum sound quality.

The features of this amplifier that are likely to be of greatest interest to the engineer and the experimenter are those of tone-quality control. While there are no tone controls, as such, it is possible to make a semi-fixed adjustment for the acoustics of the room, and unless records are played beyond their normally useful life they may well be reproduced with FULL frequency range. For home use it should be possible to mount the FREQUENCY RANGE control on the panel, retaining the advantage of remote volume control. It is probable that in the long run better reproduction would result, for this amplifier would eliminate the objections often heard regarding a multiplicity of controls. Most modern micro-

(Continued on page 42)

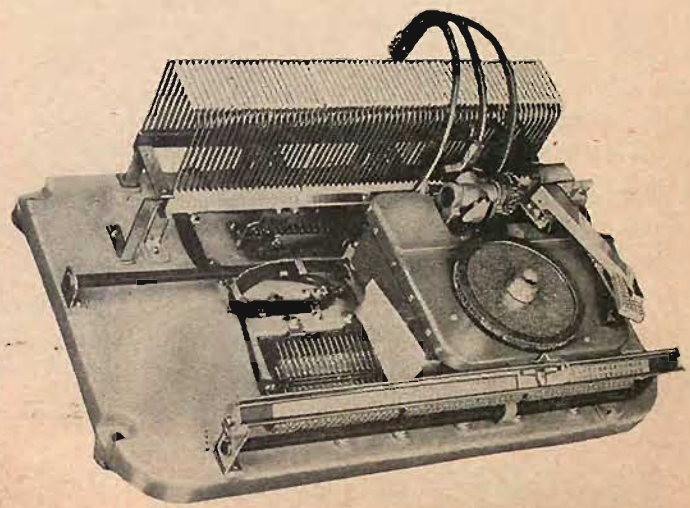

Fig. 7. The complete record changer mechanism of the Model F juke box.

there are Lady Bugle and Captain Jollyboy. The ending, incidentally, is "Gothically" eerie. Finally, Berners had a predilection for intriguing titles: *The Lady in the Pauper Ward, Bourgeois Waltzes, Funeral March for a Rich Aunt,* etc. Unlike those of Erik Satie, all of Berners' titles have a point, or rather a barb in most instances.

Berners' varied, non-musical interests naturally encourage the belief that he was a sort of ingenious Jack-of-all-trades who dabbled in the arts. After all, any composer worth his salt should "live, breathe, eat and sleep" music. Nevertheless, Berners was decidedly a professional. His command of orchestration was thorough, his theoretical training was deeply ingrained, e.g., the *Fugue in C Minor for Orchestra* (1924), and he possessed a keen understanding of the demands and potentialities of the keyboard. The main point about Berners' works is that, no matter how clever the intent, brilliant musical satire is only effective in the hands of a real craftsman—and Berners was a musician down to his fingertips.

Berners' humor, therefore, is not the one-dimensional variety of the cartoonist or caricaturist. It often becomes a devastating commentary on contemporary society. Let's return, by way of illustration, to that set of piano pieces, *Three Little Funeral Marches*: 1) *For a Statesman,* 2) *For a Canary,* and 3) *For a Rich Aunt.* The first March, to quote the MGM jacket notes "is appropriately pompous, but it also contains an element of sincere commentary. All statesmen exist in an unreal atmosphere of pomposity and are buried in that atmosphere, but, occasionally, dependent upon the statesman, the pomposity becomes true grandeur." And there is a hint of grandeur in the statesman's dirge, just as there is real pathos in the canary's end.

Lord Berners' supposed musical godfather was Erik Satie who was born in Normandy and settled in Paris to eventually assume a position of great importance among the avant-garde musicians of the second decade of this century. Virgil Thomson even went so far as to "parallel the three German B's—Bach, Beethoven and Brahms—with the S's of modern music *in descending order of significance* [the italics are mine]—Satie, Schönberg and Stravinsky. Mr. Thomson may have gone just a little overboard in his evaluation of Satie, but there is no disputing one point: Satie's influence was much greater than is generally realized. He anticipated Debussy's harmonic innovations by some fourteen years in his *Sarabandes* and *Gymnopédies.* He later became mother hen to a brood of young musicians who already found the impressionism of Debussy and Ravel as old-fashioned as the faded *opéra-comiques* of Auber and Boïeldieu. Thus, Satie was the musical prophet of not merely one, but of two generations.

Satie the pioneer, however, is a less familiar figure than Satie the humorist. His Lewis Carroll-like titles are still refreshing: *Pieces in the Shape of a Pear, Really Flabby Preludes (for a dog), Unappetizing Chorale,* and *Bureaucratic Sonatina.* Even more entertaining are his "instructions" to the player: "Arm yourself with clairvoyance," "In the manner of a nightingale with a toothache," "A little bloodily," and "Without blushing a finger,"

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REL Precedent FM tuner, latest model, never used, best offer. Roberts, 33 Sky Top Dr., Bridgeport 29, Conn.

KLIPSCHORN, $185; Klipsch high-frequency horn with Stephens P-40 driver, $90; RCA and Fairchild 16-in. two-speed turntables, $35 and $45. Phone PE 8-3911 (New York) Box CD-1, Audio.

CANADIANS—FM Antennas, Model RS-52-M. Sold through leading jobbers. Suggested list $7.65. Write for details. Tenatronics Limited, Newmarket, Ontario.

FOR SALE: Three Magnecordettes. 2 years old, little use. Excellent electrical and mechanical condition. One blonde, two mahogany. Cases scratched. $175 each. Also PT6-J and PT6-AH with 10-in. reel adapter in portable cases. 4 years old, nominal use. Perfect mechanical and electrical condition, cases and adapter worn. $275. Items guaranteed as represented by Electro-Voice. Electro-Voice, Inc., Buchanan, Mich., Attention Cullen H. Macpherson, Reproducing Components Division.

ALLIED 16-in. Professional Recorder (same as Presto 6N), like new, bargain. Box CD-2, AUDIO.

WANTED: Tapesonic professional tape recorder. Must be sound, reasonable, carefully packed when shipped. Also wish price on Stephens 206AX 15-in. coaxial and/or Altec Lansing 603B 15-in. speaker. Phone EM 2-3574 or wire John A. C. Callan, 3819 Military Road, N.W., Washington, D. C.

NEW Rek-O-Kut B-16B, $199. B-12H, $99. Altec 820A system, $399. Pedersen PRT-1 Preamp, $85. Craftsmen C1000 tuner, $139. Box CD-4, AUDIO.

TUBES—70% to 90% DISCOUNT. Government, manufacturers, jobbers, etc., surplus. Guaranteed 1 year. Free catalog on request. Cadillac Trading, Dept. A, 231-07 Linden Blvd., Jamaica 11, N. Y.

SELL: Presto 75A recorder, 87B amplifier. Very little use. New $775, sell $450. Central Recording Studios, 934 Kansas, Topeka, Kansas.

Additional Classified Ads on page 64

The electrical circuitry of microphones is usually quite simple. In the majority of cases where inductive microphones are used, such as dynamic, ribbon or other moving conductor types, the circuitry involved consists only of a transformer and possibly an impedance changing switch. In microphones such as the Altec Lansing 21 type condenser microphone, however, an impedance transforming device such as a cathode follower is necessary to transform the tremendously high impedances of the condenser microphone (several hundred megohms) to a useable impedance that can be coupled to an input transformer.

Conclusion

There are no perfect microphones. The best achievement is a compromise and the choice of important aspects in a specialized microphone. An ideal microphone would be absolutely flat in the range that must exceed somewhat the hearing spectrum of the human ear. Its dynamic range, which is its maximum signal-to-noise ratio, must be at least 60 db. In this range, no distortions should occur. Microphones that are omnidirectional should show no discrimination around their polar axis. However, directional microphones should show the same discrimination throughout their frequency range, having a front to back difference of at least 18 db. An ideal microphone should also have a high output so that less amplification would be necessary to bring its level up to useable proportions. To judge and evaluate the shortcomings of microphones, good acoustic measuring tools and good laboratory techniques are an absolute necessity, without which some characteristics of the microphone would remain unknown factors. Good measuring tools are also essential in developing and designing microphones and maintaining their quality in production. Without proper use of these instruments, microphone design is partially guesswork and specifications are to a certain extent, arbitrary.

It is hoped that this article will serve as a guide to those persons who are interested in basic functions of standards used to evaluate the many characteristics of a microphone. Because of its shortness, the scope of this paper does not allow specific details to be described.

ABOUT MUSIC

(from page 20)

among the people. Cartoons of Cleopatra were scrawled on buildings throughout Alexandria. During trips into town, she was jeered at with cries of "Nosey!" Cleopatra finally fled the capital and underwent successful plastic surgery. The rest is history. Another novel, *The Camel*, is an even more fantastic tale dealing with the arrival on a winter's dawn of a camel in the little English town of Slumbermere. The animal rings the bell of the Vicar's house and, from that moment on, Berners describes the visitor's impact upon the community. A couple of the characters are given delightfully silly names; for example,

MICROPHONE CALIBRATION

(from page 32)

rating is on the voltage basis or the power basis. The unfortunate part, however, is that numerically these systems differ even though, when specified, the results are the same.

The dynamic range of any microphone depends greatly on the noise factor and random hum pickup emanating from house wiring and other electrical or electronic equipment. Since random noise is mainly due to thermal agitation and amplifier hiss, it is very low in comparison to hum pickup. To avoid interference from inductively picked up hum, the microphones are usually wired to avoid inductive loops. If transformers are used, they are usually well shielded. However, all hum cannot be excluded. The remainder is low enough so as not to interfere with the microphone's ability to pick up sounds without those offending factors being present. The measurement for hum pickup consists of placing the microphone within a loop of wire that produces a 60-cps hum field of 10^{-3} gauss. With no sound present which would otherwise interfere with this measurement, the microphone's output is directly measured in decibels and compared to a 1 milliwatt reference. This figure in decibels represents a rating that evaluates the ability of the microphone to cancel normal hum levels.

The most important electrical characteristic of the microphone is its impedance. Whether or not that impedance is terminated depends entirely on the design of the input transformer used in the amplifier. The present trend is to use unterminated transformers because of the resulting higher voltage output that is applied to the input of the first amplifier tube. In either case, however, the impedance of a microphone determines the amount of step-up ratio that can be tolerated without interfering lumped capacitance in the windings of the transformer and the capacitance and wiring involved in that circuitry. The rated impedance is the a.c. resistance of the microphone that is reflected by it. As an example, if a microphone is rated at 50 ohms, it should be matched to a primary winding of a coupling transformer that has a 50-ohm impedance. Most high-quality microphones have a choice of two or more impedances that can be either switched or selected by means of taps in their output terminals. The choice of impedance depends entirely on the type and length of the transmission line from the microphone to the input transformer of an amplifier. If low-capacitance lines are used, higher impedances are preferred. The reason for this is that any line has resistance and, therefore, acts to attenuate the electrical energy due to resistive dissipation. On the other hand, if high-capacitance lines are used, low impedances are preferred to avoid attenuation of the extreme high-frequency response.

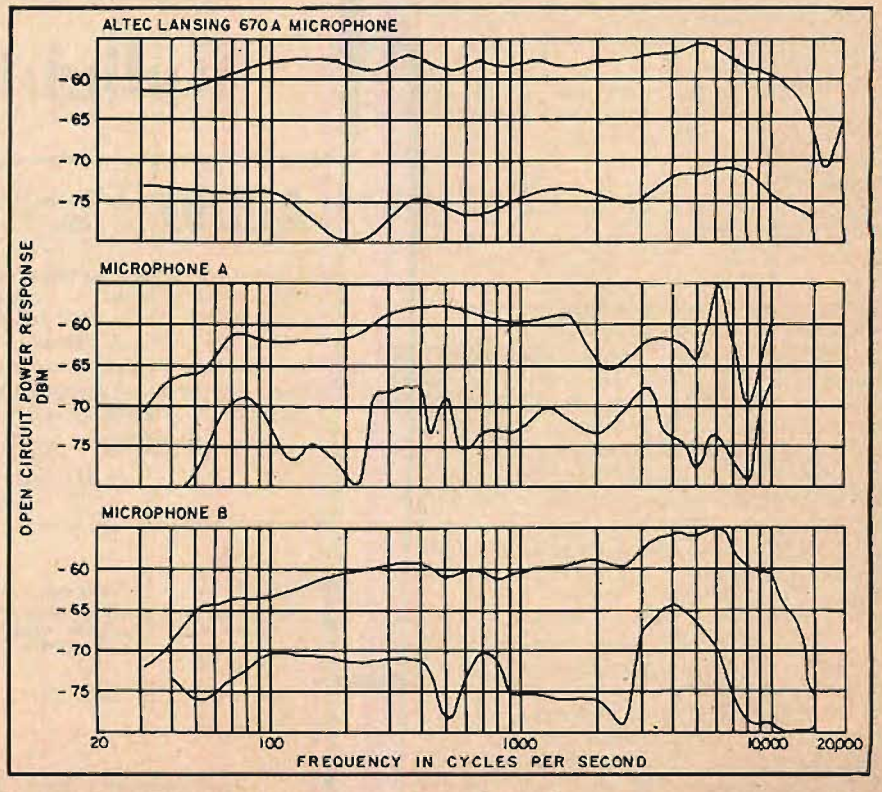


Fig. 7. Altec's 670A polydirectional microphone. Cardioid response compared to two other cardioid microphones.

provided by each recording machine which instantly changes over the monitoring loudspeaker from transmission to the reproducing pickup. The frequency range of records is considered to be 50 to 10,000 cps. Another switch enables a signal of constant amplitude and frequency to be fed into the recording head so that when required a check of speed and characteristics can be carried out.

The static tape recording machines are practically all of the same type being the E.M.I. Model BTR.2 which is claimed to have a frequency range of 50 to 15,000 cps at 15 in. per second. As these machines cost about 10 times the price of a good quality semi-professional tape recorder, it is expected that they should give superb service and they do so. A monitoring head is provided in each, and the machines are *usually* operated in pairs. Although they will take larger reels of tape, the B.B.C. have adopted as a standard 2,400 ft. reels and at the present time four different makes of recording tape are used.

Ferrographs, which are semi-professional tape recording and reproducing machines, are installed in various studios so that they can be operated by non-technical personnel to check artistes' performances.

Dubbing from Tape to Disc

As mentioned previously, all recordings which are to be kept over an extended period are required on disc and consequently, there is quite a large amount of re-recording from tape to disc. Although the Recording Department maintain three eight-hour shifts and work day and night, it is realised that sometimes urgent stories may be telephoned from abroad to the News Room and thus one machine is kept permanently threaded up and which can be operated instantaneously, by the News Editor several floors above the floor in which the majority of tape machines are located at Broadcasting House.

In summing up the advantages and disadvantages of discs and tape, the following comments were made to me by a B.B.C. official.

Tape costs less because it can be used again and again. It is not considered permanent enough for recordings to be kept for archive purposes. Discs are much easier to edit when sections of recordings are required for news transmissions or other programmes. For outside recording, tape equipment is generally much easier and simpler to use. On the other hand, when tapes are brought back to the Broadcasting Station, they are more difficult to identify than discs particularly with news broadcasts where only extracts from recordings may be required to be transmitted. Consequently, it is often more convenient to immediately re-record the tape on to discs before the recordings are passed to the News Editor. There is little to choose between the cost of the recording equipment but high-quality tape reproducing equipment, suitable for continuous use for transmission purposes, is considerably more expensive than disc reproducing equipment. It will thus be realized that there is a place for both disc and tape recording in the B.B.C. Recording Department and the general opinion is that eventually tape will be the most used recording medium.

LONDON LETTER

(*from page 14*)

dubbed ten times. The B.B.C. prefer to make disc records of those programmes which they wish to keep for posterity. With characteristic thoroughness to be on the safe side, they store the master records and the pressings in separate locations. All discs or tape which have been recorded and are not destined for the archives go into a current library for three months before they are destroyed or, in the case of tape, are used again for a fresh recording.

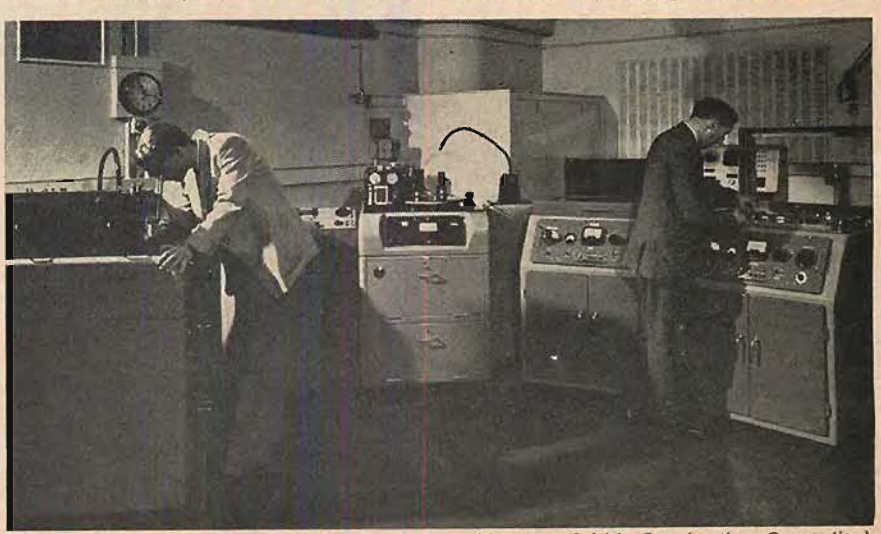
It should be appreciated that the main activity of the B.B.C. Recording Department is not to record programmes for posterity but to record programmes for the convenience of the artistes and the producers. It is obvious that many artistes cannot appear in the evenings when the peak programmes are transmitted and it is therefore advantageous for the programmes to be pre-recorded. The work of the Department is, therefore, divided into pre-recording programmes for transmission over the air and recording transmitted programmes for subsequent transmission and/or archive use. With disc machines separate units are used for recording and reproducing. There are, for example, 96 static recording mcahines which will record 78 r.p.m. or 33⅓ r.p.m. and 31 mobile units. The Department is responsible for reproducing 33⅓ r.p.m. records but not the 78 r.p.m. records. Consequently, Recording Department engineers also operate 65 reproducing units for 33⅓ r.p.m.

200,000 Discs per Annum

During last year more than 200,000 lacquer discs were recorded but this year will show a considerable decrease owing to the part change over from disc to tape. There are only two manufacturers in Great Britain of lacquer coated discs and some of each of these firms' products are used by the B.B.C. In making the masters, however, the services of 4 firms are available. The number of tape machines in use at present include 118 static machines, which are used either for recording and/or reproducing. In the near future the static tape machines will be augmented by the installation of additional models to be used exclusively for reproduction. There are 34 transportable machines which are large tape machines which can be taken from place to place and 100 small battery tape machines.

The disc recording machines are made to the B.B.C.'s own design and incorporate many novel features. Each motor is sprung and is balanced. The machines are completely self-contained and are always operated in pairs. An ingenious scrolling motor is embodied so that the last few grooves of each disc are recorded quite wide apart so that they can be indentified in cueing when the records are reproduced and a change-over has to be made from one record to another. This scrolling motor can be brought into operation during recording and causes the traversing carriage to move at about 15 times its normal speed. This produces a very large opening out of the groove spacing. When a changeover is being made from one machine to the other, the scrolling motors of both machines can be operated simultaneously from a single button on the control desk and if this button is pressed for a fraction of a second at the beginning and at the end of the overlap period, the overlap portion can be identified at a glance when discs are set up before transmission. The 16- and 17- in. records at 33⅓ r.p.m. provide about 15 minutes playing time. One disadvantage in using 33⅓ r.p.m. instead of 78 r.p.m. is that it is much more difficult to cue the slower speed records. It is considered that it is only possible to cue these records to an accuracy of ± 1 second, whereas with 78's, ± ½ second is comparatively easy.

The usual difficulty of dealing with swarf is overcome by removing it pneumatically. All recordings are monitored as they are made by placing a light-weight pickup on the disc just behind the recording head. For checking purposes, a switch is



(Courtesy British Broadcasting Corporation)

Combined disc and magnetic tape recording channel—Channel H4 in Broadcasting House, London. A view of the type D disc recording machines and the BTR/2 tape recorders. The linking console for the tape recorders can be seen behind the right machine.

general (and very slight) rise in prices generally outside of this field. Don't I know—I've just had to up-date all the prices in my book, which first appeared in March of 1953, less than two years ago.

These new prices are still nominally net, and the distribution, of course is still (in the large) via the net-price dealerships. But a big step in these two respects has already been taken towards an eventual new-type retail or "list" system. Just add it all up and see for yourself.

It is therefore with considerable interest that I note the first announcements to prospective exhibitors at the Audio Fair—Los Angeles—the Audio Fiesta—to come this February, 1955. A very careful policy is to be followed there that will exclude all exhibition of *wholes*. The show is to be a component show to the letter.

Exhibitors, as I understand it, will be able to demonstrate assembled units, for convenience and necessity, but with very pointed restrictions, which, in my own words, are about as follows:

1. They may demonstrate anything in any assembled form they want, as long as it is not for sale as a unit—a whole.

2. They may also demonstrate assembled units that are for sale, but only when the included components are also available separately through regular audiophile (net) channels—as parts.

Now, if I have this right, it is a very clear attempt to make a sharp list-net division, to separate the parts rigidly from the wholes, while at the same time recognizing the inevitability of the assembled unit's appearance at the Fiesta. Yes, you can have your assembled unit so long as it is not a retail item.

No "hi-fi" phonographs of the standard retail brands will be on hand, of course. Their insides aren't separately available. GE's assembled machines are OK, though, because they don't sell them that way, and if they did it would be OK because the insides are available as components, too. (But GE can't sell them.)

But I would hate to have to draw the line between "yes" and "no" in the case of any one of dozens of new items I have recently seen and heard, and I'm inclined to offer aspirin to the harassed officials who are going to have to decide. It would almost be worth the transcontinental fare just to see which items do get in and which don't.

I offer not the slightest criticism of the Fiesta management for this policy. I can very well understand, and so can you, why it might be necessary as a precaution at this point. There is no reason at all why an exposition management should be expected to solve audio's major problems for it in public—with thousands of the customers storming the joint! Establish a temporary *status quo*, a truce, a moratorium, and let the fight between net and list resume after the show is over.

But the fact that this careful separation, or attempted separation, of parts and wholes is necessary right now (and for next spring) shows how crucial has become the burning question—

—just what is a whole?

I'm willing to bet we'll know within two years.

discount that keeps the system as it is, basically. For "net" prices can easily be edged up until there is enough profit in them to make possible "net" sales through small dealers in small lots. That is now happening, right and left, though the big-volume sellers still predominate. What keeps the net net is a remarkably rigid business principle that applies to virtually all fields of consumer sales, far beyond the tiny province of the hi-fi area—the principle that *parts* are one thing and *wholes* another.

Net sales are, basically, parts sales. List sales, retail, are basically wholes. Most of our vast consumer industry is split straight through by this division. The large manufacturers have entirely separate parts divisions and wholes divisions, with huge separate dealership arrangements.

In these last few years what has happened is that the entire development of the audio home industry has been flying straight in the face of this principle—and now the crisis is reached. Beginning with *bona fide* parts, the net-price sellers have gradually added services, sales rooms, consultation, pre-wiring, package deals (all commented upon and, indeed, recommended in this department at length through the years, by the way), until the erstwhile parts are now so excruciatingly close to being grouped into wholes that the distinction has almost vanished! Yet it is still rigidly with us.

There are "record players" with built-in amplifier and controls, all but the speaker, there are speaker systems including cabinetry, there are chassis-type units with everything but a beginning section and an end. The newer "package" offerings include so many lumped units with components built-in that in a blink of an eye they could become complete wholes. They are—almost, but not quite.

And there is, this year, an almost ominous number of actual, ready-to-play, complete wholes made up of components. Ominous only in the sense their suggestion of impending things of vast importance to come in the home audio field.

For when does a collection of parts become a whole? That is the incredibly ticklish question that now arises! If it remains a collection of parts, assembled, then it is, according to present rigid standards, a net-price item, saleable along with the parts themselves. But if it is suddenly to be judged a whole—then what?

You'll note the many developing contradictions that are now providing a multitude of eloquent straws in the wind, forecasting what is to come.

The big companies, in varying degrees, are in the hi-fi market on both sides of the fence, retail (wholes) and net (parts)—and, if you ask me, they're having a h— of a time trying to figure out where they stand, if they do stand! Some farm out the parts end to parts makers and raise the price of the resulting product to what amounts to retail—yet sell it strictly on the net side of their own vast distribution fence (so as to avoid competition with their retail lines). Others, GE, for example, big makers who manufacture many of their own audio parts, find themselves in the odd position of competing, or trying not to compete, with their own manufactured products. GE's parts division in the audio field, which began operations a few years ago with no more than a cartridge and a speaker or two, now—thanks to its own enterprise and success—has branched out until it offers the parts for a virtually complete hi-fi system, even to the cabinetry, in which the parts can go. Yet it cannot take the last step and assemble these parts into wholes without conflicting with its sister department that makes whole (retail) home instruments. What to do?

GE exhibited its parts at the Fair nicely assembled into wholes. But the wholes were not for sale.

And meanwhile as a fiery goad—backed by a huge public demand—many small companies, especially the newer ones, are striking straight out at this middle ground where the big companies dare not tread, with complete hi-fi phonographs that, nevertheless, are basically assemblies of components, separate units, often described in detail. But at the same time, to add confusion, most of the strictly retail one-piece whole "hi-fi" machines are also now being described in similar terms—a 6-watt push-pull amplifier, special ultra-hi-fi six-inch speaker" and the like. The ad men learn fast.

Thus the pactical dividing line between retail-wholes and assembled-parts is increasingly hard to pin down, even with very careful investigation. Are these in-between items to fall into the retail-whole camp or the assembled-parts area? Are they to rate as net (and sell through the net dealership) or retail (and sell through a wholly different dealership); or can they sell in both ways at once and, if so, at one price or two prices?

It's rapidly becoming impossible to say. The divisions become more and more confused. Indeed, there is such variety in present offerings already, that the separation simply does not exist in respect to the equipment itself. The variants run all the way from genuine assembled separate-parts systems, each part identified and known, by maker and model, through to the straight retail "hi-fi" phonograph, its insides inextricably wired into one piece by its own manufacturer; the intermediate steps—the most significant of all for the future—include many new machines with some standard components and some "special" (i.e. not available also as a separate unit) and this would seem to be the probable norm for the future development of this new in-between area.

It's already happening in an indirect sort of way, this trend to retail. Prices are still net, but notice two significant things, directly and profoundly related:

1. Component hi-fi is getting fancier, with more trimmings, more service attached. Better looks, more direct application to the home and to home decor, more plush advertising. All of this—on top of the fancy-type show-rooms of the last few years—is *retail-type* merchandising. It's 90 per cent retail already, if you take "net" or wholesale selling for what it's supposed to be, and is in other fields. Hi-fi components are going retail faster and faster in these aspects.

2. For these better looks, for better performance, more trimmings, better service and sales-help—we are getting higher prices. There has been a very marked rise in the last year, beyond and above the

5. When are these Exhibitors going to get some common 'Horse Sense'? It's been a long time since Barnum."

You may laugh this person off as a crank if you will, but I would advise you (a potential 1955 exhibitor) not to. As you may read, he is both sharp-eyed and a purposeful shopper, who has already bought audio and intends to buy more. He is unlike many another Fair visitor merely in that he is brash enough to speak his mind—though naturally this was not intended for print! I have omitted a few other points he made, mostly because I couldn't disguise them and I, unlike him, have a responsibility towards exhibitors as much as towards the Fair visitor.

I wonder just how many people *did* think the Fair was a Barnum circus, though? I mean this entirely constructively. I am dead sure that a lot of potential audio customers did—once again. There are hundreds of thousands of them remember, all over the country, and the few who reached the Fair itself reported back to a vast number, at home, exactly how they felt.

Isn't it time that the Fairs and the audio industry completed the growing-up process? Should we not, at this point, look further forward and realize that, hi-fi boom or no, in the long run audio cannot depend on these short-lived crazes for mere sound, but *must* build on the far deeper, more permanent and more trustworthy values of real sound reproduction—the enduring interest in the *content* of the sound?

It seems to me that the various Fairs must somehow come to reflect this interest more than they now do. We're now attracting the lunatic fringe—a big fringe, but a mighty unstable one. Don't lose the solid citizens.

As I've said for many a year—

The Business of Audio is Music.

Yes, other kinds of content have made big gains—Sounds of Our Times (which are interesting in themselves, often), poetry and prose, complete shows, plays, documentaries, teaching records, and so on. But music is still 99 per cent of the *content* of recorded sound. And so—we need the music-lovers. Amen.

3. Crisis—The Whole vs. The Parts (Feb. 1955)

The great struggle of the net price *vs.* the list price—and all the complex system of manufacture and distribution that is represented by these two terms—is entering a decisive and exciting phase in the fast-moving history of hi-fi.

Hi-fi for the home (call it that for lack of a better term) started, as we all know, in the wholesale radio parts stores, where the few gadgeteer amateurs and side-lining professionals who wanted separate amplifiers, cartridges, and the like were perforce required to go—there wasn't any retail outlet for such "professional" items. The subsequent history of this remarkable and atypical business has been based, accordingly, on the net sales system, now renamed audiophile net or similar comfortable term. It still is based on the net, nominally, though the list price for separate parts now scarcely exists at all, even in advertising.

But it is not merely the supposed greater

AUDIO ETC.

Edward Tatnall Canby

Fairly Critical

1. Erratum

IT'S NOT TOO LATE to mend a dizzy error in the September "Tapes from Tube"—not in the description of the new means for playing tape but in my crediting my source as a "part of a column by R. D. Darrell." It was part of a column all right. But the author, Mr. Darrell tells me, was Robert Oakes Jordan, writing in his *Saturday Review* "World of Tape" department. All credit to Mr. J. as well as my apologies to him and Mr. D.

Darrell (who has had extensive library experience and would never be caught without complete information at his finger-tips) has sent me the original published discussion in *Electronics*, October, 1953, with interesting pictures and diagrams of the playback tube. Skellett's complete paper, from which this article was derived, was presented at an IRE meeting at San Antonio, Texas February 7, 1953, and later printed in full in the IRE-PGA *Transactions*, AU-2, #1, Jan.-Feb. 1954 along with another paper on related experiments. The official authors of this material are Skellett, Leveridge, and Gratian.

Oddly enough, Mr. Darrell says, he *did* write a description of this same electron-beam playback tube for the same journal, the *Saturday Review*, a good many months before the Jordan description—the one that I saw. Unfortunately, the Darrell item wasn't published, due to space difficulties. It is his impression, I gather, that some very tough matters of shielding will have to be solved before the tube gets into general use. It operates at a dreadfully low level. Its most immediately likely application, as already suggested, will be for high-speed tape duplication.

Finally, Darrell voices a hope that a lot of us have had, on and off, that—someday—somebody will invent a practical groove-scanning device, to play disc records without physical contact with the grooves. The principle would doubtless be similar to that of the magnetic playback tube, with the same advantages of inertia-less operation, minus all mechanical motion and minus the generation of a current. Possibly the Skellett tube is the beginning of an answer.

2. Barnum—again? (October 1954)

I suppose I could print again my remarks of several previous years concerning the annual New York Audio Fair in its louder and tinnier aspects, for they still apply. But rather than repeat the same old record, which hasn't seemed to have any great effect so far, I will try a better scheme and quote a slightly sobering letter I've just received. It's not the only one. Frankly, though as a whole I thoroughly enjoyed the Fair and marveled at its complexity, its wealth of interesting material and its excellent organization, I was really shocked at the crudeness of sound that some displayers persist in blasting forth for our supposed delectation. I don't mind saying that I walked out of three or four rooms in a fury at the insulting barrage of high powered noise inside.

Yes, the audio fans are possibly now the main target for the Fair; and definitely the audio fans are the ones who demand louder and louder music, who occupy all the front rows and do all the kibitzing. But there are hundreds and hundreds of musical people who come to the Fair to see what audio can do *for their music*, and who go away again bewildered. I once called these people "mousy"—they stay in the back and keep their own counsel and let the audio fans do the talking. But they think hard thoughts about many an exhibitor and the net effect, I assure you, is not good. But let my correspondent speak for me. I'll censor names; you can fill in with your own choice. Italics are my inserts.

". . . I've just returned home from a visit to the New York Audio Fair and must state I'm far from impressed, and had I visited one of these shows before I bought equipment I'd never have bought any . . . [the equipment was] overdriven to a point of annoyance and my ears are still ringing." (*Take that, my friends!*)

"A few notes on the Fair:

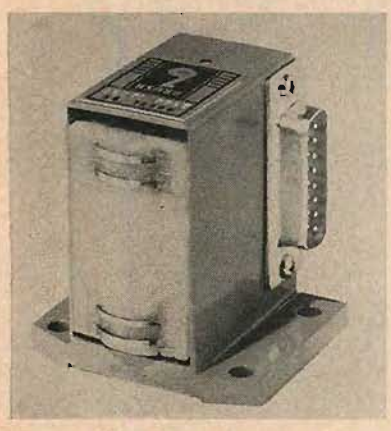
1. The ———— is a phony. (*These amateurs are not as dumb as we think they are.*)

2. ————'s speaker system was "blasting" too loud to pass on any merits one way or the other. (I have flesh ears, neither gold nor tin.)

3. How can a master (disc) cut sound better than the original tape, especially after so many plays? And the commercial copy, 2nd, 3rd, 4th printing? The equal of the master? Who's kidding who? (*This was the result of some not-too-well-calculated showmanship, I'd say; the actual demonstration was in itself reasonable, but missed its aim.*)

4. I really wanted to hear the ———— tuner but they were "out for supper" for quite a few hours. I want a new FM tuner to fit a certain cabinet; my [present one] is too wide. But I expect my money's worth.

• **CinemaScope Record-Reproduce Heads.** Recently added to the Brush line of tape recording accessories are the Model BK-1544-R recording head, and the companion Model BK-1544 for reproduction. Both heads are designed to meet the specifications of CinemaScope applications, and contain a number of features which have been developed by Brush engineers. Both heads incorporate a balanced magnetic



structure with gaps at front and back, all gaps being in precise alignment. Head assemblies are non-microphonic and impervious to moisture. Mu-metal shields isolate individual channels, and the entire unit is cast in high-temperature resin. Detailed description of the CinemaScope head may be obtained from Brush Electronics Company, Component Dept. RT-3, 8405 Perkins Ave., Cleveland 14, Ohio.

NEW LITERATURE

(from page 8)

• **Minnesota Mining and Manufacturing Co.,** St. Paul, Minn. is now distributing Bulletin No. 30 of their "Sound Talk" series which describes physical and magnetic specifications of the new "Scotch" brand No. 190 "Extra Play" magnetic tape, and is illustrated by two charts showing comparative frequency response curves and layer-to-layer signal transfer. Included in the data are optimum operating conditions and a comparison of operation at both high and low frequencies for different bias currents. Copy will be sent on request.

• **The Dubbings Company,** 41–10 45th St., Long Island City 4, N. Y. has just issued Bulletin C, a 12-page pamphlet describing the complete range of tape and disc recording services offered by the company's audio laboratory for broadcast stations, sound studios, record companies, recorded tape firms, and hi-fi enthusiasts, together with prices for small and large quantities. Copy is available free upon request.

COMING EVENTS

Jan. 8—Design Principles of Transistor Circuits, symposium. Engineering Societies Bldg., New York. Sponsored by New York Section of I.R.E.

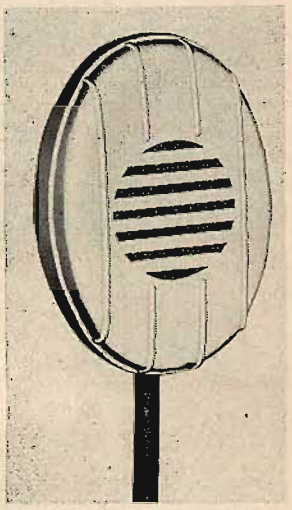
Jan. 20–21—Symposium on Printed Circuits, sponsored by R.E.T.M.A. Univ. of Penn. Auditorium, Philadelphia, Pa.

Feb. 10–12—Audio Fair—Los Angeles, Alexandria Hotel, Los Angeles, Calif.

Feb. 17–18—National Conference on Transistor Circuits. Irvine Auditorium, Univ. of Pennsylvania, Philadelphia, Pa. Registration, W. J. Popowski, Minneapolis-Honeywell Regulator Co., 176 W. Loudon St., Philadelphia 20, Pa.

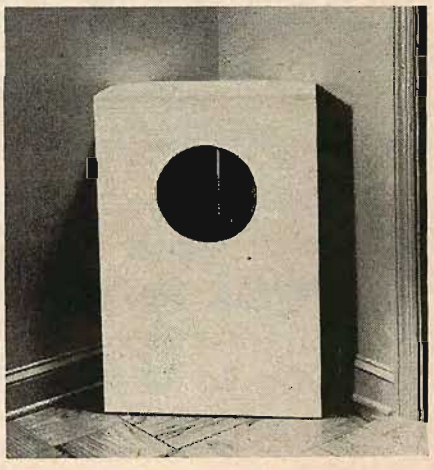
kit is priced considerably lower than the cost of three separate instruments. One set of input and output connectors serves for all functions, and comprehensive audio testing is simplified by adequate panel controls used in conjunction with a clearly-marked multi-scale meter. Complete specifications and price information are available from the Heath Company, Benton Harbor, Mich.

• **Low-Cost Microphones.** Excellent performance characteristics are combined with economy in the new Astatic ceramic Model M101 and crystal Model M102 hand microphones. Both units are housed in rugged plastic cases. Frequency response



of the M102 is stated by the manufacturer to be flat from 30 to 10,000 cps, while that of the M101 is 30 to 8000 cps with slightly rising characteristics at the upper end. Output of the ceramic unit is −53 db, that of the crystal unit is −46 db. The Astatic Corporation, Conneaut, Ohio.

• **Klipsch-Designed Enclosure Kit.** Known as the Shorthorn system, this new Klipsch speaker cabinet employs corner horn back loading to achieve extended bass response without undue peaks. As in other Klipsch enclosures, the Shorthorn is designed around coordinated acoustic elements, including filters, which enhance smooth response and minimize distortion. The unit



may be used with conventional single or coaxial speakers, or with three-way systems. Available only in kit form, the enclosure is supplied with all necessary parts, cut to size, and instructions for assembly. Exposed wooden surfaces are fine-grained hardwood plywood. A free four-page folder on the Shorthorn system may be obtained by writing Klipsch and Associates, Hope, Ark.

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Cathode follower output permits long line to main amplifier. An independent, isolated output is provided for recording on tape or disc. Furnished with power supply. Supplied in gold finished metal cabinet with stained wood end-blocks.

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A high quality speaker assembly ideally suited for home systems. Frequency response is substantially flat from 40 to 16,000 cycles with effective useful response extending to 20,000 cycles. Power rating is 15 watts (peaks to 30 watts). Consists of integrally mounted dual tweeters and a 12-inch woofer. Nominal impedance is 8 ohms **$76.50**

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Has separate erase, record and playback heads . . . and separate record and playback amplifiers. A direct-reading meter permits continuous checking of recording level. Tape speed is 7½ inches/sec. with a frequency response from 40 to 10,000 cycles ± 2db , and to 15,000 cycles ± 4db.

Other features include:

•Signal-to-noise ratio: more than 55 db • Flutter and wow: less than .25% • Fast forward and rewind: 90 seconds for 1200 feet • Microphone input: high impedance • Line input: for high level source (.5 volt level) • Separate level and mixing controls for microphone and line inputs • Monitoring: through phone jack or playback output • Playback output: 1.25 volts into 10,000 ohm load (matches input of most amplifier systems) Recording distortion is negligible. The Model 600 is extremely easy to use. Only one hand is needed to thread the tape. Can be operated either vertically or horizontally, and is readily adaptable for installation in home high fidelity systems.

Complete with tubes, less microphone **$545.00**

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PORTABLE AMPLIFIER-SPEAKER SYSTEM

Designed as a companion piece to the Ampex 600 Portable Tape Recorder. Weighs approx. 19 lbs. case included, and measures 13 x 16 x 8". Employs a 10-watt amplifier with push-pull output, and less than 1% total harmonic distortion. Frequency response ranges from 20 to 20,000 cycles ± .25db. Speaker is housed in built-in acoustically matched enclosure. An external speaker jack is also provided. Power supply is built-in, and front-panel controls included for volume level, equalization and power. **Complete** with tubes **$149.50**

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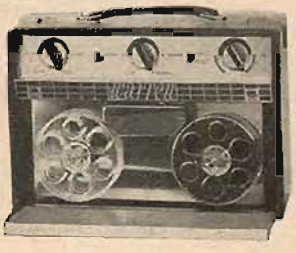
Model 777



A complete, compact tape recorder and playback unit designed to operate from self-contained battery pack or external ac power source. Batteries provide 5 hours continuous operation and are recharged with built-in battery charger. Weighs 22 pounds, and measures only 6 x 10 x 15 inches. Accommodates standard 5-inch reels. Available in two models: **Model 777**—1.87 inches/sec, dual-track, response 200-4000 cps. **Model 777-1**—3.75 inches/sec, dual-track, response 200-6000 cps.

Complete with microphone, battery, reel of tape, take-up reel, built-in playback amplifier and speaker, and instructions **$298.00**

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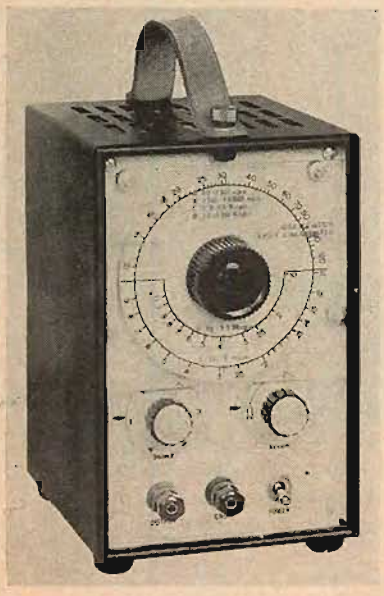
NEW PRODUCTS

• **Tape Collector's Cabinet.** Introduced as the "Collector's Cabinet," this new item recently announced by the makers of Irish brand recording tape will be a welcome gift to tape recording fans. The "Collector's Cabinet" solves two of the main problems of tape recorder users; (1) storage, and (2) identification of recorded reels. The cabinet holds six reels and makes a handsome storage chest. It contains three 600-ft. reels of Irish brand professional tape, one roll of splicing tape, one 150-ft. roll of leader stock, twenty reel tabs, one empty 600-ft. reel and one empty 150-ft. reel. ORRadio Industries, Inc., T-120 Marvyn Road, Opelika, Ala.

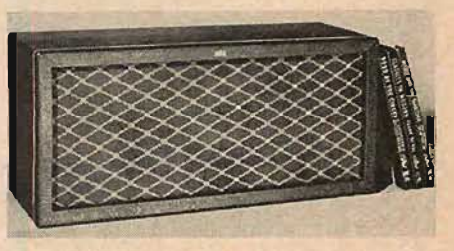
• **Audio Oscillator.** Essentially flat output over the range from 12 cps to 1 mc with six overlapping scales, makes the new Beckman Model 301 Utility Audio Oscillator an instrument of great versatility for laboratory and maintenance applications. Distortion is under 0.5 per cent at the lower frequencies. Hum level is down 52 db from 1000 cps to 1 mc, and down 43 db from 60 to 1000 cps. Each instrument is individually calibrated and maintains an accuracy of ± 2 per cent under normal operating conditions. Output is 10 volts into 600 ohms on all scales. Manufactured by Shasta Division, Beckman Instruments, Inc., P. O. Box 296, Station A, Richmond, Calif.



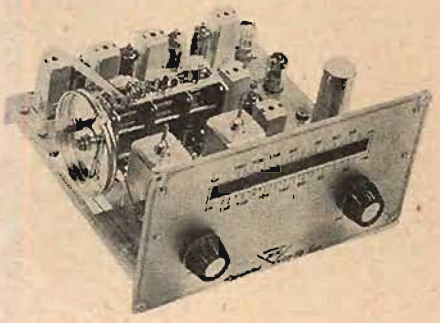
• **Brociner Mark 12 Amplifier.** In an effort to satisfy the need for a compact high-fidelity amplifier meeting professional operating standards, yet modest in cost, the new Mark 12 recently introduced by Brociner makes liberal use of printed circuitry. There is no chassis as such. The printed-circuit technique is here applied for the first time commercially to a complete audio amplifier, achieving exceptional compactness, stability of performance, and economical production. Power output is 12 watts with less than 0.1 per cent distortion. Frequency response is 20 to 20,000 cps within 1 db. Separate turnover and roll-off controls are supplied for record compensation. Continuous bass and treble controls permit 16 db of boost and cut. Dimensions are only 4¼" high x 10⅞" long x 8" deep. Brociner Electronics Laboratory, 344 E. 32nd St., New York 16, N. Y.

• **High-Fidelity Headphones.** Frequency response from 50 to 10,000 cps is afforded by S. G. Brown Type K precision headphones, manufactured in Great Britain and distributed in the United States by British Industries Corporation, 164 Duane St., New York 13, N. Y. Built around motor assemblies of the moving-coil type, the phones utilize Bakelized cone-diaphragms. Flux density is 6000 lines. Well-suited for critical professional monitoring, the Brown headset is supplied complete with foam rubber cushions and a one-piece rubber-covered connection cord with molded rubber crotch.

• **"Tri-Fi" Reproducer.** Although small enough to fit an average bookshelf and only two feet in length, the new Teeco "Symphonette" is a complete three-speaker reproducer system with built-in crossover networks. Separate speakers are used for low, middle, and high frequencies. According to the manufacturer, power handling capacity is 20 watts and frequency range is 20 to 14,000 cps. The Symphonette is available in three finishes; leatherette cover, blonde, and mahogany. Trutone Electronics, Inc., 812–14 N. Highland Ave., Los Angeles 38, Calif.



• **AM-FM Tuner Kit.** Bandwidth of 200 kc on FM, tuned r-f stages, two limiters, and discriminator, are among the features of the new Imperial V FM-AM Tuner Kit. FM sensitivity is 5 and 10 microvolts for 20 and 30 db quieting, respectively. AM tuning range is 530 to 1650 kc; FM tuning range is 88 to 108 mc. Chassis dimensions are 9¾" long x 5" high x 8" deep. The unit is supplied complete with all parts, tubes, and pictorial and schematic diagrams. Further information and performance data are available from Approved Electronic Instrument Corporation, 928 Broadway, New York 10, N. Y.



• **Audio Analyzer.** Virtually all of the basic tests necessary for the evaluation of audio performance of amplifiers, oscillators, and similar devices, may be performed by the Heathkit Model AA-1 Audio Analyzer. The unit functions as three instruments in one, an a.c. VTVM, a wattmeter, and an intermodulation distortion analyzer. Featuring built-in load resistors of 4, 8, 16, and 600 ohms, and built-in low- and high-frequency oscillators, the

cises! No more than are Bach's "Well Tempered Clavier" preludes and fugues. These simple little nursery-style tunes are captivatingly lovely if you are sensitive to direct, simple, intuitive music-making, and the playing by Kozma is miraculously beautiful. It takes a big artist to play simple music beautifully. Lovely piano tone, too.

Bela Bartok (Allegro Barbaro, Rumanian Folk Dances, 15 Hung. Peasant Songs, For Children, Suite, op. 14.) Gyorgy Sandor, piano. **Columbia ML 4868**

Twenty of the forty little pieces above also appear in this recording. Sandor, however, is a pianist of a very different sort, a big concert performer and dramatist with a dynamic, tense piano personality splendid for the more involved works but alien to the simple children's music, which under his fingers mistakenly tries to be "big stuff." Sandor brings out the vital barbarism in the furious Bartok temperament; but Kozma is in tune with the equally telling gentleness and compassion in the great Bartok soul.

Sandor is excellent in the showy and short Suite, the Allegro Barbaro, also short, and the popular and "concert-genic" Rumanian Folk Dances. The Peasant Songs, instrumental equivalents of the sung folk songs reviewed above, are again on the hard, dynamic side, lacking in simplicity in the playing. The piano recorded sound is hard, too, lacking in fullness, of the type current in Columbia's 30th Street studios in 1951 when these were made.

Oddities in Brief

Wagner: Symphony in C Major; Polonia Overture. Radio Berlin Symphony, Pfluger; Guhl. **Urania URLP 7116**

Yes—Richard Wagner, of the operas! The symphony was composed in his teens, after study of Beethoven and Mozart; the overture is from the same period and the two were revived in Wagner's last years (Wagner even re-composed some parts that had been lost) and again shortly after his death.

The symphony is a preposterous but virile imitation of Beethoven, a caricature, rather, full of pompous pronouncements in the style of the Beethoven overtures, but also strongly influenced by Weber. Silly stuff, but interesting—for it is a miracle that such a calculating but utterly unorganized musical talent could have perfected itself into the genius of fifty years later. The Overture is even more absurdly pompous, but also interesting for any Wagner-lover. Both nicely played.

Shostakovitch: Symphony #10 (1953). Leningrad Philharmonic, Mravinsky. **Concert Hall CHS 1313**

Hold on—for by the time this review is in print the Columbia-Mitropoulos version, made in New York, will be out. But this one has the advantage of being conducted by the man who led the premiere of the new symphony in Russia last year (and presumably the same players), which gives it a stamp of authority as an official Russian version.

As for the music—nothing at all sensational, alas. I like the 9th far better. This shows S.'s usual propensity for running a good thing into the ground; of all our more gifted composers he is surely the most undisciplined when it comes to conciseness. There are lovely things here, in detail, but much of it is more of the same old high-tension march stuff, and too much of it is monotonously, obstinately unvaried, at length.

Russian recording is getting good, except for the tell-tale presence of drastic limiter action (or monitoring?) that makes loud and soft parts about the same volume. (Leeds-authorized.)

[c] **Bartok: Concerto for Orchestra.** Minneapolis Symphony, Dorati.
Mercury MG 50033

This makes a fine companion hi-fi piece to go with the above; it has similar qualities, exaggerated. The recording is Mercury's most stunning, with the characteristic close-up almost dead sound—but for this very reason this is the first version since the old Reiner-Columbia on 78 and an early LP that does justice to the special kind of scoring in this now-familiar music, which features a constant play of orchestral detail-work, pairs of trumpets, oboes, clarinets, small "solo" groups of instruments, all within the larger orchestra. (That is why it is a concerto for orchestra.) Over-all distant miking, fine for Brahms and Wagner, is wholly wrong for this music and so Mercury's close-up job is, as a recording, much preferable to the Angel and London versions with their standard big-liveness sound.

I can't say as much for the performance, which, oddly, is entirely right style-wise, where other versions miss the whole flavor of the work, yet is remarkably hard and unmusical. Nevertheless, this makes exciting hi-fi listening and it's a marvelous look inside an orchestra and inside a fabulously well-made score.

*[d] **Bartok: The Wooden Prince** (ballet). New Symphony, Susskind.
Bartok BR 308(2)

Peter Bartok here continues his long-range project of recording all of his father's music that is unlikely to appear on other record labels. This is a vast and unwieldy early ballet score (1914–16) of positively enormous proportions and it was an ambitious and idealistic task to put it on records. Four long LP sides, an enormous orchestra.

The music, oddly enough, in spite of its dissonance, seems terribly dated and old-fashioned. Old-fashioned, I should add quickly, in a way that may please many listeners, for this is of the Fire Bird school, out of late Richard Strauss, a turgid, thick, highly-Romantic score for very large orchestra, playing up the typical late-Romantic preoccupation with elves and fairies and magic and princes and princesses with an only too typical lack of humor and lightness and conciseness, with that characteristic overblown sound, those great, gusty climaxes (with screeching strings and the inevitable cymbal crash at each "peak") that go with the tail-end of 19th century Romanticism. As you can by now guess, I don't like it much.

I would not deny that, as a score from one of our musical greats it has all sorts of special interest, in its orchestration, in its dissonant harmonies and powerful modern-type motives. The work of a big man—but it's unformed and fussy even so, and much too big for its boots. The Second Piano Concerto, above comes like a breath of sweet spring after this!

Hi-fi? From Peter Bartok, of course. Pickup is evidently single-mike, at a considerable distance and rather narrow in liveness, but technically the disc is top-rank. If you like modern-type big Romantic scores, this is your sound.

[ss] **Bartok: Songs, Opus 16; Hungarian Folk Songs.** Magda Laszlo, sop., Franz Holetschek, pf. **Westminister WL 5283**

The distinction between folk and "art" songs is neatly illustrated on the two sides of this disc. The "art" songs, modern of course, will be mostly incomprehensible to the average listener, though those who are grounded in the enjoyment of German lieder and French song will understand them and enjoy them. But the folk song settings on the reverse, though just as dissonant and modern in the piano part, are immediately enjoyable to anybody who "likes a good time"—or a good dance. Bartok is still the only major composer I know who can set folk tunes with dissonant accompaniments that are entirely in spirit and in harmony with the tunes themselves. Any listener can hear it.

The folk songs were also recorded by the tenor, Chabay, for Peter Bartok; this is a milder soprano performance though a lively one, and the pianist is excellent.

†* **Bartok: For Children, vol. 1.** Tibor Kozma, piano. **Bartok BR 919**

Forty little pieces, graded, for children's piano study—I used to play some of the simple ones myself—but don't think these are mere exer-

pressions of detail, I was definitely aware of a smoothness, an unpretentious naturalness of sound, an un-hurting quality, that clearly signals unusually low distortion components, and this was particularly noticeable in the louder passages, where distortion normally is at its worst. Clarity of detail work was a secondary product of this over-all smoothness, as I heard it.

I was unexpectedly pleased by C. G. McProud's straightforward and honest accompanying booklet, which sets forth the technical consideartions for a hi-fi recording and describes hi-fi listening from the engineer's point of view. We've had so much purple language concerning hi-fi of late, this little booklet is a pleasure to read and I recommend it to music lovers who would like to know how an engineer and confessed non-musician really feels about listening. Not a trace of the usual hi-fi publicity-type writing here. There's a running stop-watch-timed comment on the two pieces that is remarkably musical, thanks to Mr. McProud's extensive experiments with score following during his preparation of the notes.

H **Tchaikowsky: Romeo and Juliet; Marche Slave; 1812 Overture.** London Symphony, Scherchen. **Westminister WL 5282.**

I've reached capacity already on listening to these scores; I'll let you do the listening, thanks; but I mention the record for a reason of considerable interest, the fact that this recording (a) is a standard Westminster job with the same musicians and conductor as in the special "Lab" recording above, and therefore a good means of comparing the regular and special issues of the company; and (b) because in addition, an excerpt from this same recording is available on tape (9 minutes) as the first "Treasure Tape" offering from the Encore tape people. (50¢, returnable when you buy a roll of blank Encore tape.) The tape should be high quality 7½H (half-track), for Ampex-Concertone playback equalization. A fine chance to compare a top quality disc with its recorded tape equivalent and I advice anyone who wonders about junking his disc library for tape to make the test in person. Nothing like first-hand experience, on your own equipment.

(Note that the full-length RCA Victor tapes are also available on RCA Victor discs, though direct comparison will be pretty costly.)

* * *

Note also, by the way, that though recorded tape seemed to be booming at last fall's Audio Fair in New York and we are seeing a constant series of new announcements, the actual tapes are mostly still to come; we've had no new new review tapes. Not even the RCA Victors, which are still officially "out on loan" to somebody else, according to the company. (We'll just have to wait our turn.) It will be some time before recorded tapes begin actually to compete with discs in a practical way.

Hi-Fi Bartok

*c **Bartok: Piano Concerti #2, #3.** Edith Farnadi; Vienna State Opera Orch., Scherchen. **Westminster WL 5249.**

I suggest that every hi-fi fan who also happens to like the kind of brassy dissonance we get in much modern high-powered jazz and show music should now lend his couple of ears to Bartok as a hi-fi composer. Bartok, of course, had no more idea of hi-fi than did old Rimsy-Korsakoff and Piotr Ilyich Tchaikowsky, but all of them turn out to be hi-fi men for about the same reason—their use of a big orchestra and lots of orchestral color-stuff and power-stuff.

Of these two the earlier, number 2, is the most potent for hi-fi as well as the most dissonant. I once sat in the midst of a live orchestra rehearsing this piece and I shall decidedly never forget it—such brass and percussion you can scarcely imagine! The first movement is all-brass-percussion, the second all-strings, the third—the works.

This is the first recording to approximate the overpowering potency of sound that the live work contains and the louder you play it the more true it will be to the original. Not exactly an electric performance in the over-all and I've heard better; but the stunning close-up recording easily makes up for this deficiency.

The Third Concerto, a later and much more grateful (but not as exciting) work, is similarly miked and very nicely played, better, I'd say, than the Second. Hi-fi miking really suits this music musically.

men. It seems to me that Cook has found a useful in-between recording area, not quite mere sound-effect stuff (though the sounds are unusual enough) yet not quite altogether of purely material interest. It suits him to a T and he does the job well, with imagination, as is proved by the stimulating variety of subjects he has so far tackled.

* **Calliope and Carousel.** **Cook 5010bn**
* **Marimba Band.** (otherwise known as . . . to Hell with High Fidelity.) **Cook 5007bn**

These two super-hi-fi jobs are "duplex" records, which is a euphemism for "binaural"—that is, you can play only the outside band on a standard single pickup; the inner half is for "binaural" sound with a second pickup. It isn't mentioned that the duplex record gives you only half a record of monaural sound, but that won't deter fans who like exotic sounds—I'm one of them—for these are gems.

The calliope plays so gorgeously out of tune that if you're a good musician you can only gasp with pleasurable anguish, especially in "Jeannie with the Light Brown Hair" and an excerpt from "Carmen." The Carousel is somewhat less raucous—its bass is bizarrely out of order—but it, too, has a ghoulish mechanical robot quality that can hardly do less than titillate the trained ear!

Conversely, the Marimba recording (23-foot jobs) features some of the most musical playing I've ever heard, though outwardly the instruments aren't too far removed from the carousel in tone quality. Just shows what the human touch does for music.

Tiroro (best drummer in Haiti . . .). **Cook 5004.**

A one-man fiend of a drummer, who sings too now and then. Not exactly hi-fi but the drumming is very well recorded. Informal-style, with bits of interview, odds and ends of background noise, etc.

American Storytellers vol. 3 (Of Whaling and Shipwreck). **Cook 5009.**

(This is the only one of this series I've played so far.) Two old gents, a fisherman and a very elderly (89) whaling man, are interviewed, drawn out, about their seafaring past. Pretty disorganized and it takes a good while to pump up real interest in the "stories," but if you have patience the records are well worthwhile. Interesting accents, ways of speech.

These are not real story tellers, in the folk-tale tradition. They are simply men recalling their adventuresome pasts. We have not yet heard from the story tellers themselves, the ones who tell stories, not those who write them down.

(The Cook "Road Recordings," semi-informal tapings, are limited-edition discs, non-returnable. Better get the detailed catalogue, before you buy. Cook Lab., 101 Second St., Stamford, Conn.)

*d **Christmas Carols on the Organ.** Virgil Fox. **RCA Victor LM 1845.**
*l **Christmas in High Fidelity.** George Melachrino & Orch., **RCA Victor LM 1045**

Got to hand it to RCA for coming up very fast in pure hi-fi sound technique. I approached the organ item above with unmixed diffidence, being an old anti-Xmas carol-on-the-organ man, but I'll have to admit that it sounds remarkably good, the arrangements, bells and all, aren't bad, and the organ itself is superb, and beautifully recorded. (Aeolian-Skinner, Riverside Church, N. Y.) One of the best and most natural big-organ recordings I've heard.

When RCA's people get hold of a thing they surely plug away relentlessly. Now it's Xmas in High Fidelity, with the expected cascades of jingle-bells, triangles, brass and all the rest. But **—again I'll admit gladly**—the recorded sound is perfectly gorgeous, and I am thankful for RCA's big-liveness, mellow effect, where so many hi-fi records are close as a closet and as edgy and raw as—well, a steam calliope. (See above.)

I enjoyed several of these Melachrino pot-pourris of mixed Xmas music in a semi-pops vein. Sixteen, though, is too much for me. You try 'em.

*c **Rimsky-Korsakoff: Capriccio Espagnol. Tchaikowsky: Capriccio Italien.** London Symphony, Scherchen. **Westminister Laboratory Series W-Lab 7002.**

For long weeks after the Audio Fair I could not bring myself to open the all-plastic zipper bag that contains this special high-quality laboratory-standard disc, because of the incredible treatment it received in umpteen dozen rooms at the Fair where it was blasted forth at hideous, horrible, ear-rending, searing, painful high volumes. Does hi-fi have to be boiler-factory style?

But, at last, I've just played it through in my own living room—at a pleasingly low, sweet, lovely, lyrical, velvety-soft level—loud enough merely to drown out my speaking voice and certainly a bit louder than I have heard the same sounds from a good balcony seat in Carnegie Hall. Delightful! This is the real thing.

There are serious points made here, though my own musical tolerance for capriccios, Italien or Espagnol, was exhausted long before hi-fi was thought of. For good sales, the record is dolled up with a very fancy packaging, but it represents a new and quite legitimate attempt to reach ultra-high standards of disc processing, incidentally setting standards for future "ordinary" releases to aim at, and in this it is akin to the special auto models lately popular, those research experiments that are sold to the public as, in a sense, a part of the research itself.

The basic claims are for very low disc distortion of all sorts (in addition to top-quality recording and miking to begin with), particularly in respect to the "echo" effect of groove deformation that prints a loud passage faintly through close groove walls. Such distortion is eliminated here by wider groove spacing, and a generous center space allowance removes the distortions that come from grooves cut too near the center—all of this, of course, at a sacrifice of exterme long play. (15–16 mins. per side).

On the basis of listening, I'd say Westminster proves its claims handily. Above all other im-

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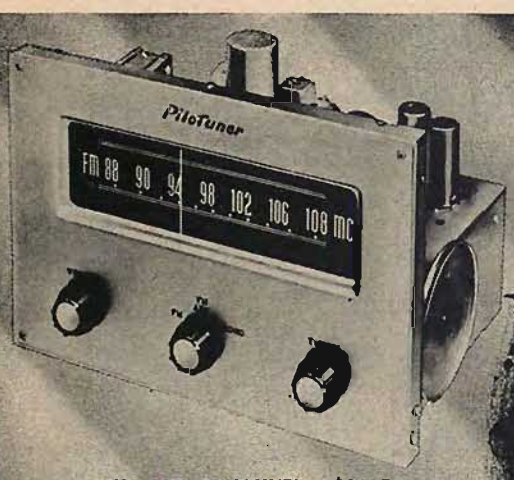

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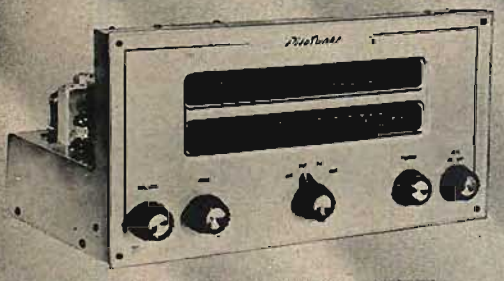

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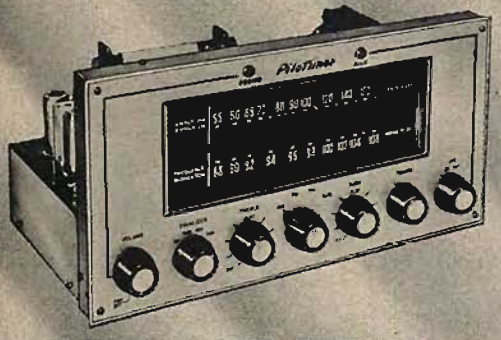

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EDWARD TATNALL CANBY*

The Hi-Fi Horrors

BEFORE I REVIEW a single hi-fi record more I've got to stop and blow off a bit of strictly low-fi steam about the current craze for high fidelity on discs. To whit: I'm thoroughly and completely tired of it.

That's personal, I admit. I've been a champion for good recording since 'way back and I'm one of those musicians who hails the recorded medium as a mature and important thing in itself—I'll jump quickly into any argument which suggests that records are a mere substitute for the "real thing" and I'll insist that a recording *is* the real thing, in one of its alternative forms. I will never look down on recordings, or on the business of recording, or on the engineering of records, as something beneath the true artist's consideration! But I'm still sick of hi-fi records.

I feel strongly that the sound of recorded music, moreover, has its own special aesthetic-acoustic laws. I do not believe, as many do, that the ultimate aim of hi-fi is to re-create an illusion of the concert hall. I will stand up vehemently for all experiments and all developments in hi-fi recording technique that explore these special laws, for all engineering tricks, hi-fi or otherwise, that bring better sense and clarity and beauty to the recorded material —whether it sounds like a concert hall or not. Mostly it won't and I'll love it. But I'm still sick of hi-fi records. My ears are sore with them.

I am delighted, for example, at the new techniques for recording opera that bring the singers up close and loud, in a big, live background, surrounded by the orchestral sound. No "live" opera ever sounded remotely like this, by the wildest stretch of imagination. But on records (and via broadcast) a vast range of operatic music has now been effectively projected, straight from the music to the listener, by these new recording methods. Opera on records is a vast success in terms of sheer direct communication and there isn't an opera recording in a carload that has an opera-house sound.

So, too, with many a concerto, many a symphony, many a string quartet, lieder recital; all of these can benefit by the special tricks of microphoning that have been worked out exclusively and deliberately for listening via the loudspeaker. Without these new hi-fi techniques (and the hi-fi engineering that necessarily goes with them all along the line) we would miss a vast range of listening pleasure, musical and otherwise. Without special recording techniques, records really would be a poor substitute for the omnipotent original.

KEY

* Outstanding recorded sound for the type of material.
† Unusually fine performance.
bb Bass end is rather thin.
bn "Binaural," for two pickups.
c Close-to, sharp-edged, but in big liveness.
d Distant, over-all miking; good liveness.
H Extreme "hi-fi" technique; played-up drums, triangles, ultra-close pickup in big liveness.
i Intimate, close-to recording in good liveness.
l Limiter (monitor) action: dynamic range restricted.
L Big, blown-up liveness.
s Solo part close-up and loud.
ss Accompaniment is in background.
x Distortion in louder passages.

Indeed, it is recording know-how, recording technique, that makes a record not a mere substitute but a power in itself with its own values. Hi-fi recording? It *is* recording—good recording.

But I still don't like hi-fi records and I'll tell you why.

1. Because recording technique is a means to an end, which is the most effective projecting of the material on the record. The hi-fi records that I don't like are the ones that—intentionally or not—reverse this principle. They don't project the material, they project the recording technique. It's not merely the cart before the horse; it's the catsup without the hamburger, the shaving cream without the whiskers; or more to the point, alas, it's the sound without the music.

2. Because recording technique is a means to an end, which is the most effective projecting of the material on the record—and many of the new hi-fi records do serious damage to the sense of that material. Over-playing the engineering hand may fascinate the fanatics but it does a lot of harm to recording itself, for it puts the entire field of recording into bad repute with those who love music. It obscures the plain fact that good hi-fi recording technique is *good* for music.

3. Because recording technique is a means to an end, which is the most effective projecting of the material on the record, and much of the material itself on recent hi-fi records is dull, repetitious, stupid, in bad taste, raucously over-orchestrated; many of the most sensational records bring us the same old war-horse pieces of music we've been hearing already for too many years. They are still dull whether hi-fi or low-fi, for some ears. No amount of technical ingenuity can make them appreciably more interesting. (Though sometimes an unusually good musical performance can bring them back to life.) This take it from me, is the music lover's viewpoint.

A good hi-fi record, I always say (and will say again and again . . .), combines good material, good performance *and* optimum recording technique for the material It is the over-all balance that counts.

With that said, let's look at some hi-fi records.

Cook's Tour

Emory Cook has found his métier. Or his latest métier, anyhow. D— it, he's scooped me on at least two pet projects of mine that I've never had a chance to play around with and he's found plenty more, as well, for his roving tape recorder. The Sounds of Our Times records, at first plain hi-fi sound-effects, have gradually spread out into wider fields of interest—content, material—and now, with the new "Road Recordings" (on-the-spot jobs) we have everything from calliopes to pedal harpsichords, Haitian drums to whale fisher-

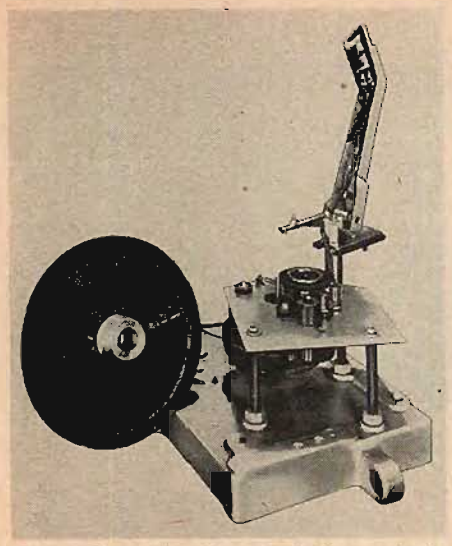


Fig. 8. Turntable drive mechanism and the pickup arm follow high-quality phono design.

a selector button for the record of his choice, some indication of his having expended a portion of his credit must be given him. As the customer deposits his money, then depresses the selector buttons one by one, a credit take-off knocker gives a good audible knock each time, so there is no doubt that the record has been selected and that one less credit is available. In these instruments, the credit mechanism normally gives one play for five cents, two plays for ten cents, and five plays for a quarter. However, the operator can change the crediting so that the instrument will give six plays for a quarter, if that is the prevailing custom in a community; or for high-class patronage, the machine may be adjusted to give one play for ten cents and either three or four plays for a quarter.

The slug rejector is a necessity—people being people—and the locked cash box is desirable. All the components of the mechanism are connected by means of plugs and receptacles so as to eliminate trailing wires as the individual parts are removed for servicing.

The mechanism is thoroughly proven in years of service. Screw adjustments permit setting the stopping switches for accurate record selection, and when power is restored after a temporary failure, the mechanism will not jam, but will continue its cycling. Placement of contacts and relays eliminates the possibility of dust or grease causing erratic operation, and the entire instrument is practically foolproof.

Conclusion

AMI's new Model F juke boxes signal the end of an era of poor sound in coin-operated music machines. Combining a high-quality pickup and amplifier with a two-way speaker system so placed as to overcome the disadvantages of many locations in which these instruments are required to work will serve to raise the public acceptance of these instruments. One need only hear one of these new models to be convinced that high fidelity has come to the juke box.

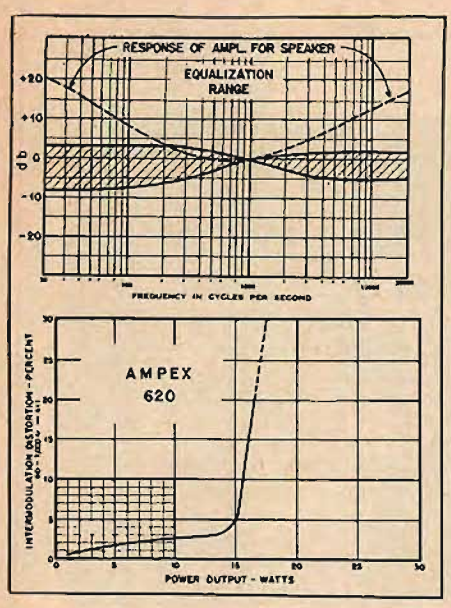


Fig. 7. Performance curves for the Ampex 620.

bend. Below 10 watts, the IM distortion is less than 2.5 per cent, reaching 1 per cent at the 2-watt level, which is more than sufficient level for the built-in speaker. This distortion is considered low for an amplifier using 6V6's.

On listening tests, it was noted that constancy of acoustic output was apparent from 60 to 12,000 cps at normal levels. As the volume was increased, the speaker seemed to "breathe" at the lower frequencies, the point at which the breathing started increasing in frequency as the level was raised. For normally usable levels, however, acoustic output was comparable to may larger speakers, and the whole idea of compensating the amplifier to match the speaker seems to work out to provide an exceptionally successful unit.

The 620 is housed in a Samsonite case which matches in size and appearance the Model 600 recorder, which was reported here in the July issue.

RONETTE TO-284P PICKUP CARTRIDGE

Interest in phonograph pickups has never abated, and with the introduction of each new one there is speculation as to the performance and its various characteristics.

Tests recently made with the Ronette TO-284P crystal cartridge indicate that it would serve well for high-quality phono reproduction, and to all indications this unit seems to offer some definite advantages.

The cartridge has relatively low output for a crystal—using the Dubbings D-100 test record the measured output with a 1-megohm load on the 3000-cps band is 80 mv—but the other characteristics of the pickup more than make up for this. When working into a load of 1 megohn, the frequency response of the pickup from the test bands of the D-100 test record show a response which is down 4 db at 30 cps, and flat within ±1 db from 1000 to 5000 cps, and with a gradual rolloff from 5000 to 10,000 cps of 5 db. Thus, when working into a flat amplifier, this pickup would reproduce the RIAA curve correctly with a rolloff of approximately 8 db at 10,000 cps and a boost of 3 db at 50 cps—both of which would be easy to obtain with typical tone control circuits.

If the cartridge is worked into a load of 0.12 megs, the low-frequency curve follows almost exactly the bass-boost characteristic of the RIAA curve, and the performance above 1000 cps remains the same as with the higher load. This means that the cartridge performs almost exactly as a constant-velocity device, and would work correctly with most preamplifiers if the input resistor were chanped to 0.12 megs. Curves of these measurements are shown in *Fig.* 8. The dashed line is the response into a 1-meg load; the dot-dash line is the response into a 0.12-meg load; and the dotted line is the response when feeding into a 0.5 meg load. The solid line is the RIAA characteristic—drawn so as to permit direct comparison. Thus it is seen that the low-frequency performance can be controlled quite readily by choice of the load resistor.

The Cook intermodulation test record shows no measurable distortion on either of the two bands, both of which were recorded with 100 and 7000 cps and at two different levels. This was to be expected, considering the exceptionally "clean" quality of reproduction on listening tests. No measurements were made on the 78-rpm side of the cartridge, but it is to be expected that the performance would be equivalent. The construction of the cartridge is such that the idle stylus is not actuated by the playing stylus, and consequently does not introduce the usual dip in the response curve which is the result of the resonance of the free stylus waving in the air.

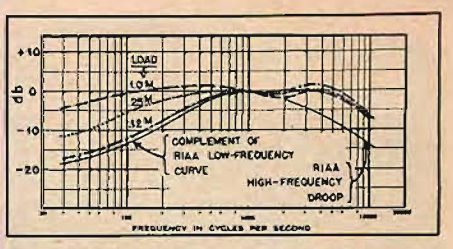


Fig. 8. Performance curves for the Ronette TO-284P crystal cartridge.

The cartridge can be mounted in any desired arm. Styli are readily changeable, and the pickup is neat and attractive in appearance. The arm and cartridge track the four lowest-level tracking-test grooves of the Dubbings record with a stylus force of 6 grams; an increase to 7 grams is required for perfect tracking on the "+ 15" band, which corresponds to a stylus velocity of over 25 cm/sec. Thus for almost any LP record, satisfactory tracking would result from a stylus force of 6 grams.

Since the Ronette cartridge is a crystal, it is not susceptible to hum pickup from magnetic fields—an advantage when used with some of the lower-priced turntables which have this trouble. This would make it especially suitable for use with the small 45-rpm changers, which are infamous for their strong hum field.

In direct listening comparison, this pickup proves that it is not necessary for a crystal pickup to have the typical "crystal" sound often referred to by Mr. Canby in his AUDIO ETC column, and it is probable that most listeners would comment on the "clean" reproduction obtained.

JUKE BOX

(*from page 38*)

groove records will reproduce quite satisfactorily with one equalization curve.

How well the amplifier and speaker system live up to the claims made for them can only be determined by listening to the instrument with high-quality records. There is no boominess, but a full rich bass, and the treble response is equal to that in any properly adjusted home system.

Phonograph Equipment

No amplifier and speaker system can perform properly unless the signal fed into it is of good quality. Standard GE variable reluctance pickups are use in these instruments, being mounted in a cast aluminum tone arm pivoted on needle bearings. The turntable drive mechanism and the pickup arm are shown in *Fig.* 8, and it will be observed that the type of drive is similar to the best of the turntables in home systems. In fact, the bearing surfaces are considerably larger and better finished than the average to ensure long life and reproduction free from wow and flutter. The conical center spindle provides easy location of the record from the lifter

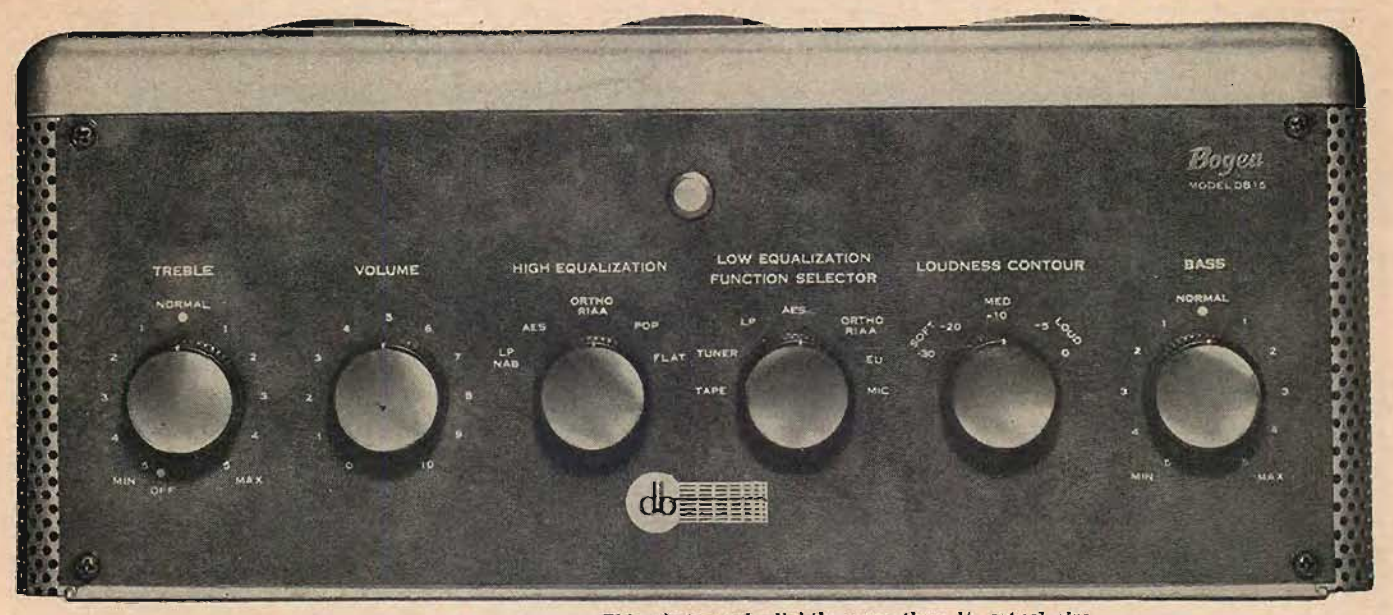
Changer Mechanism

Figure 7 shows the changer mechanism. The turntable chassis moves longitudinally along the record rack, being stopped at the desired record by magnet-actuated selector fingers. The drive mechanism for the turntable chassis consists of a roller chain which is driven by the silent gear motor. As the turntable stops adjacent to the selected record, the gripper bow picks the record out of the rack, lifts it up, turns it to the horizontal position, and places it gently on the turntable—the direction of the turn being dependent upon which direction the carriage was moving. After the record is played, the gripper bow lifts it off the turntable, rotates it to the vertical position, and places it back in the rack, after which the carriage moves to the next position and the operation repeats. Like all record changers, the entire action looks like a Rube Goldberg, but the same type of mechanism has been in use dependably for years. An indicator on the carriage shows the number of the record being played, and under the indicator plate is a popularity counter which shows how many times each record in the rack has been played. This is not visible to the customer, but is of considerable value to the operator.

arms, and the heavy cast turntable is felt padded with the record supported—and consequently driven—at the rim to eliminate slippage vibration, and chatter. The pickup arm lifts up to a vertical position to facilitate cleaning or stylus changing.

The Business Department

The important aspect of any coin-operated machine is the ability to accept the money, reject slugs, tally the receipts accurately, and allot the correct amount of "merchandise" to the customer. In the case of the coin-operated phonograph, this merchandise is a given number of plays and as the customer depresses



This photograph slightly more than ½ actual size.

A Little Fellow with a 15 Watt Wallop

BOGEN DB15G AMPLIFIER

Now you can own custom audio components which combine superb quality with a mechanical design so compact that they provide the solution to almost any installation problem. This DB15 amplifier, for instance, gives you a full 15 watts with distortion of less than 0.5% at full power. As for flexibility: the DB15 features a two-section record equalizer allowing a choice of 20 combinations of low frequency compensation and high-frequency roll-off, separate continuously-variable tone controls, exclusive Bogen Loudness Contour Selector, separate equalized inputs, and tape recorder output jack. **DB15G**—*Amplifier in Handsome Cage. Only 13½" x 9" x 6¼". No installation problems.* $99.00. **DB15**—*Same unit without cage. 12¼" x 8¾" x 3¾".* $89.95.

BOGEN R640G FM-AM TUNER

Perfect companion for high-performance amplifiers, this tuner is especially designed to avoid duplication of controls and to fit neatly into close quarters. Features high sensitivity (5 microvolts), high selectivity, negligible distortion and flat frequency response (within 1 db from 50 to 15,000 cycles on FM). A special, controllable AFC circuit prevents drift and simplifies tuning. **R640G**—*Tuner in Cage. Matches DB15G. Only 13½" x 9" x 6¼".* $112.95. **R640**—*Same tuner without cage. The ideal mate for DB20, DB15 or DB10A amplifiers when installed in cabinetry. 13¼" x 7¾" x 5½".* $105.50.

BOGEN DB20 AMPLIFIER

The magnificent DB20 is rated the "Best Overall Quality" by a leading consumer organization as well as by thousands of audiophiles all over the world. The DB20 combines 20 watts of undistorted power with remarkable flexibility of control. Even at full rated output distortion is only 0.3%! Other features include the exclusive 5-position Loudness Contour Selector, a 10-position input selector—phono-equalizer, output jack for tape recorders, and extremely effective non-resonant separate tone controls. $99.00.

DB20DF. The DB20 is now available with the new exclusive Bogen Variable Damping Factor. This built-in control provides cleaner bass response by reducing speaker distortion and "tuning out" resonant peaks. $108.00.

BOGEN DB10A AMPLIFIER

Here's Bogen's famous DB10A, priced to fit any budget. This compact marvel of tone delivers 10 watts of power at less than 3% distortion and has a flat frequency response (plus or minus 1 db) from 30 to 18,000 cycles. In addition to a built-in phono preamplifier, the DB10A features a special tape recorder output jack and a 3-position equalizer for LP, 78, and Pop. $54.45.

Note: All prices slightly higher in the West.

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V-M MODEL 700 TAPE-O-MATIC TAPE RECORDER

Reporting on the performance of tape recorders for high-quality home music installations becomes rather difficult when the type of equalization employed in the instrument does not make it possible to accommodate standard tapes satisfactorily. While practically any of the machines on the market provide reasonably good fidelity from microphone or tuner input to tape output, relatively few of them provide the type of equalization that permits playing standard professional-type tapes with a satisfactory response. For this reason, we have used the Ampex Alignment Tape No. 5563 as a standard, since any machine which will play this tape satisfactorily will play most (pre)recorded tapes in a manner that will be pleasing to the user.

The V-M Tape-O-Matic Model 700 has equalization controls which can be adjusted to reproduce the Ampex tape within ±3 db of flat from 50 to 8000 cps, which is adequate in our opinion. Response from radio input to playback out is slightly better than this on the high end, and about the same on the low end at optimum adjustment of the controls.

This recorder has several features which make it attractive to the serious user. It is the only non-professional machine we have observed so far that has a stop switch which turns off the mechanism when the tape runs out or breaks. Furthermore, it is equipped with a PAUSE control, which stops the tape without disengaging the drive mechanism, a feature that is desirable in transcribing or for specialized types of recording. A separate switch permits monitoring the incoming signal during recording —either from radio or phono or microphone —and this, too, is unusual on home-type machines.

Figure 5 shows the response curves from the Ampex tape, with the range covered by the tone controls shaded. For those who wish to "dub" from phonograph records, the built-in preamplifier provides equalization which is quite close to the RIAA curve when a slight amount of high-frequency boost is added. Full recording level is obtained at maximum volume control setting with an input of only .0003 volts from the pickup and from only .0013 volts at the radio input. IM distortion at full recording level is approximately 6 per cent from input to playback, reducing to 4 per cent at 15 db below maximum level. This is satisfactory for home use, since most professional machines will measure from 2 to 3 per cent through record and playback amplifiers and the tape. Fast forward measures 125 seconds for a 1200-foot reel, with rewind at 95 seconds. The bias frequency is approximately 70 kc.

Fig. 4. The V-M Tape-O-Matic tape recorder, with built-in two-way speaker system

The machine is attractively housed, and offers a two-way speaker built into the cabinet, with audible response down to 60 cps, and up to over 10,000 cps. Low-frequencies are apparently increased by the use of a circuit known as "synthetic bass," an arrangement which provides some positive feedback from the output-stage cathode to the driver cathode.

The keyboard operating controls are easy to use, and with the pause control provide complete facility of operation. A very precise tape index counter is provided which permits locating any previously recorded selections with accuracy. On the whole, this machine would be a convenient addition to the home system where portability and ease of operation are important.

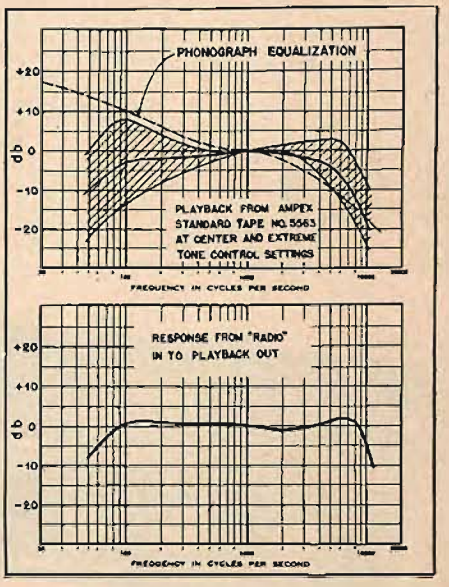


Fig. 5. Performance of the V-M Model 700

AMPEX MODEL 620 AMPLIFIER-SPEAKER

This is a rather surprising little "box of tricks," for one familiar with audio equipment is likely to be skeptical of a loudspeaker mounted in a cabinet about one half cubic foot in content. But the specifications claim that the unit as a whole gives an acoustic output which is essentially flat and free from dips and peaks from 65 to 10,000 cps, and performance lives up to the specs quite well. The loudspeaker mechanism is a heavy-duty 8-in. model with an unusually large magnet assembly mounted on a cast frame. It is enclosed in a compartment about 12 in. square by 5 in. deep, with rock wool acoustic treatment inside. The over-all dimensions of the entire unit are 13 × 16 × 8 in., which includes the amplifier.

The trick—if we may call it that—in obtaining good low- and high-frequency performance from such a small enclosure lies in equalizing the amplifier to complement the natural characteristic of the speaker and enclosure. This is done in the feedback circuit when the built-in loudspeaker is being used, but when an external speaker is plugged in, the equalizing network is replaced by a flat network—a resistor—which makes the amplifier flat within less than 1 db from 20 to 20,000 cps. However, when used with the internal speaker, the response of the amplifier—with the equalizing control set at 0 or flat—is modified to that of the dotted curve in *Fig. 7*.

The amplifier consists of three stages: a 5879, which is preceded by the volume and equalization controls, a 12AU7 "long-tailed pair" phase inverter and driver which is direct connected to the plate of the 5879, and a pair of 6V6's in push pull. Feedback is returned to the cathode of the first stage. 1-watt output is obtained from an input of 0.22 volts at the flat setting of the equalization control, with about 4 db less input being required at either maximum of the equalization control. This latter is not comparable to a tone control, for it has an over-all range only 11 db on the low end and about 7 db on the high end, and should be used only for minor corrections to suit acoustic conditions. The amplifier has a rated output of 10 watts, but delivers up to 13 watts before the IM distortion curve reaches its sharp upward

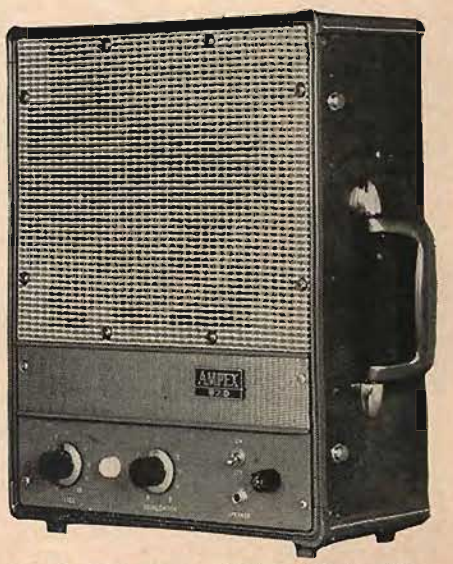


Fig. 6. The Ampex Model 620 Amplifier-Speaker unit in its Samsonite portable carrying case. The cover houses the connecting cords.

Equipment Report

Craftsmen C350 Equalizer-Preamplifier—V-M Model 700 Tape-O-Matic Recorder—Ampex Model 620 Amplifier-Speaker—Ronette TO-284P Pickup Cartridge.

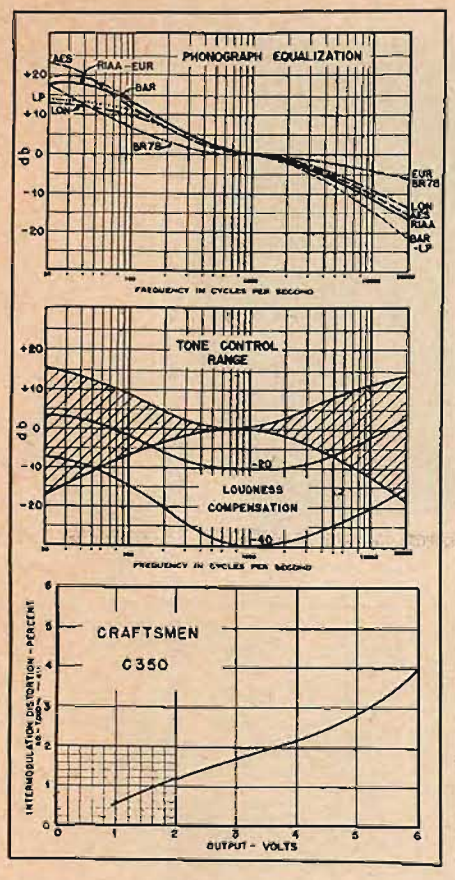
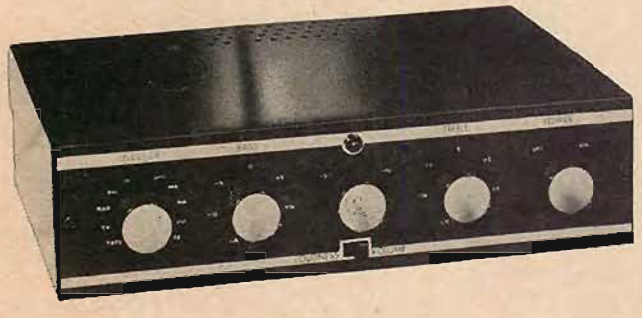
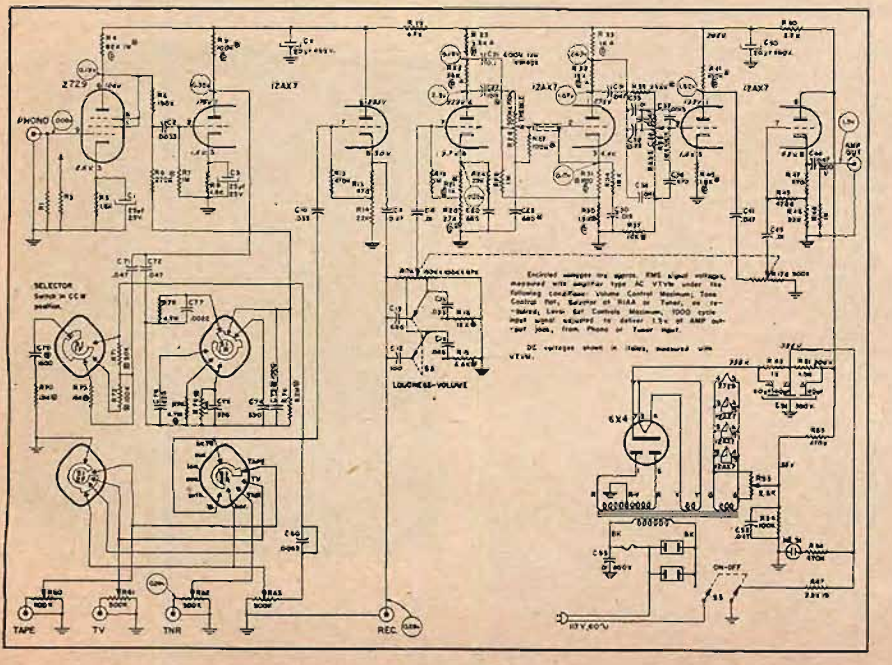


Fig. 1 (above). Performance curves for the Craftsmen C350. Fig. 2 (left). External appearance. Fig. 3 (below). Over-all schematic.





PROVIDING a complete centralized control unit sufficiently flexible enough to meet the most demanding requirements, and with features which give the user an exact knowledge of what he is doing, the Craftsmen Model C350 equalizer-preamplifier is one of the newest to enter the market. This unit is housed in a metal cabinet 3-7/32 in. high, 12-1/2 in. long, and 7 1/32 in. deep, and is self powered, drawing approximately 21 watts from the 117-volt line. The circuit consists of a Z-729 low-noise pentode as the preamplifier stage, connected as a triode, followed by a 12AX7 with the equalization furnished by feedback around the first section, and with the second section serving as a cathode follower to drive the first section of the volume control—which is designed to serve as a loudness control when the compensating networks are switched into the circuit. (The second section of the volume control is in the grid circuit of the cathode follower output stage so as to reduce hum to a minimum for low-level reproduction). The first section feeds the one half of another 12AX7, which in turn drives the treble tone control, while the second half drives the bass tone control. The two sections of the third 12AX7 serve as a voltage amplifier and the cathode-follower output stage, respectively, and provide a nominal output of 1.5 volts.

Seven separate equalization curves are available on the selector switch, with individual level-setting controls on each of the four inputs—TAPE, TV, TUNER, and PHONO. An output for feeding a tape recorder appears at the cathode of the first 12AX7, just ahead of the volume control, and at a 1.5-volt output provides a signal of 0.28 volts.

The equalization is based on a fixed droop of 4 db at 10,000 cps, which is introduced by selection of the proper load resistor at the input. Thus when measuring this amplifier, the curves will not appear to match those in the instruction sheet unless allowance is made for this difference. With suitable load resistors for the pickup, however, the curves match the specified characteristics quite closely, as shown in *Fig.* 1.

Figure 1 also shows the range of the tone controls, as well as the effect of the loudness compensation at 20 and 40 db below maximum settings of the control. Intermodulation distortion measured from the tuner input to the output is less than 1 per cent at the nominal output, and reaches only 4 per cent at four times the rated output. With the average power amplifier, distortion is likely to be less than 0.1 per cent at operating levels.

The two tone control circuits are somewhat different from the usual type, as will be noted from the schematic, *Fig.* 3. The boost end of both controls are driven directly from the plate, while the taps on the controls are driven from a voltage divider in the plate-load circuit. This permits shaping the curves more carefully, and in listening tests the controls provide good musical quality.

The power supply is fairly conventional, although the use of a neon indicator light is unusual and practical, since it shows that the equipment is ready to operate, rather than just that it is "on." In the off position, a bleeder resistor discharges the plate supply filter capacitors, extinguishing the pilot light immediately. Two unfused power receptacles are provided, but the unit itself is fused. A hum adjusting potentiometer is connected across the heater supply, and heaters are biased positively by 55 volts.

For rated output, 1.5 volts, an input signal of .0072 volts is required at the phono jack, and of 0.26 volts at TUNER, TV, and TAPE inputs. Hum and noise measure approximately 60 db below rated output at the maximum volume, on the phono positions, with tone controls flat; at the high-level inputs, hum and noise measure 73 db below rated output with normal settings of the volume control for average use, the hum and noise measure 20 to 25 db less than these figures.

Construction is readily accessible, with low-noise resistors being used in critical circuits. Extreme low-frequency response can be reduced if turntable rumble is objectionable—simply by removing the short from across C_{60}.

Satie once wrote down a report on "A Day in the Life of a Musician" which is worth quoting:

"An artist must regulate his life.

"Here is a time-table of my daily acts. I rise at 7:18; am inspired from 10:23 to to 11:47. I lunch at 12:11 and leave the table at 12:14. A healthy ride on horseback round my domain follows from 1:19 p.m. to 2:53 p.m. Another bout of inspiration from 3:12 to 4:07 p.m. From 5 to 6:47 p.m. various occupations (fencing, immobility, visits, contemplation, dexterity, natation, etc.)

"Dinner is served at 7:16 and finished at 7:20 p.m. From 8:09 to 9:59 p.m. symphonic readings (out loud). I go to bed regularly at 10:37 p.m. Once a week (on Tuesdays) I awake with a start at 3:14 a.m."

Satie's marginal comments and nonsensical titles have done much to spread the impression that he was a "farceur," a sort of musical clown, who wrote for the most part rather innocuous-sounding pieces in pale, impressionistic hues. The picture is false on both counts. First, Satie's titles represented a musical philosophy which ridiculed the preciousness of so many contemporary designations. Second, the simplicity of Satie's harmonic and melodic inspiration was plainly a rejection of the deliberate vagueness so fondly cultivated in the name of impressionism.

Satie's advanced ideas did not explode like Bastille Day fireworks on the horizon of the Parisian musical world. In view of his personality, that would have been impossible. For Satie was a gentle, retiring sort who abhorred "movements" and preferred the quiet life of a Paris suburb to the lively atmosphere of the heart of the city. He moved from Montmartre to the dingy *banlieue* of Arcueil when he was 32 and remained there until his death. While in Arcueil, he devoted much of his time to the poor children of the quartier and took part in local community activities. But he still traveled to Montmartre every day to see his friends. During one of these visits he fell ill and was urged to stay in town until he regained his health. He never recovered. On July 1st, 1925 the "solitary old man of Arcueil" died, his body narrowly avoiding a pauper's grave.

Until recently, Satie's music has been recorded in dribs and drabs, with the notable exceptions of *Socrate* and *Mass for the Poor* (Esoteric); *Parade* and *Three Pieces in the Shape of a Pear* (Columbia). At last, thanks to the imaginative planning of MGM's Classical A & R head, Edward Cole, the first LP devoted exclusively to the piano music of "le bon maitre" will be released in about a month. The pianist is William Masselos, who did such a fine job on Columbia's recording of the Ives Sonata.

By now, it should be clear that, although there are obvious similarities in approach between Satie and Berners—each was essentially a "miniaturist" with a piquant sense of humor—their paths more often diverged than met. There is no "Satie of England" (as Berners has been called) for the simple reason that Satie is unique. The two men, however, have one thing in common: bound up in their small forms is definitely more than meets the ear.

Industry People...

Richards W. Cotton, whose impressive background embraces virtually every phase of the electronics industry, has been appointed assistant to the president of National Company, Inc.—formerly served in same capacity for Philco Corporation . . . **Arnold Deutschmann** has been elected to newly-created post of executive vice-president and Morris M. Newman has been upped to a vice-presidency of Radio Shack Corporation, Boston. **Newman** will continue his duties as general manager. . . . **Forrest J. Beard,** a newcomer to the recording field, has been named assistant advertising manager of the Ampex Corporation.

Howard G. Haas, director of advertising and sales promotion for The Mitchell Manufacturing Company, Chicago, was voted a vice-presidency at a recent meeting of the company's board of directors . . . **David A. Kemper** is the new director of engineering for Stancil-Hoffman Corporation—will handle design of all magnetic recording and reproducing equipment for the firm; among projects under way is a new Minitape recorder.

Personnel changes at Fairchild Recording Equipment Corporation find **Ruben E. Carlson** appointed coordinator of high-fidelity products, **C. J. Bachman** named theater equipment products manager, **Robert J. Marshall** promoted from chief engineer to head the recently-established new product development group, and **Frank G. Mullins, Jr.,** joining the company as manager of engineering . . . **John G. Frayne** is newly-elected president of the Society of Motion Picture and Television Engineers. Other new officers include: **Barton Kreuzer,** executive vice-president; **Norwood L. Simmons,** editorial vice-president; **Byron Boudabush,** convention vice-president, and **Edward S. Seeley,** secretary. Regional governors are: **Gordon A. Chambers** and **George Lewin,** East Coast area; **Malcolm G. Townsley** and **W. Wallace Lozier,** Central area, and **Lloyd T. Goldsmith** and **John W. Duval,** West Coast area.

E. Alvin Rich has joined Permoflux Corporation as industrial sales representative for the New England territory . . . **Carroll W. Hoshour,** formerly with Raytheon, has been named products manager for Magnecord, Inc. He will be in charge of sales engineering, quality control, product service, and technical sales promotion for all divisions of the company.

Newly-added to the sound sales staff of New York's Hudson Radio & Television Corporation are **Robert Steindler** and **Edmond Ariessohn.** Both were formerly engaged as independent high-fidelity consultants . . . **Dr. K. C. Black** is new head of Raytheon Manufacturing Company's communications engineering department . . . **Dr. V. K. Zworykin,** television pioneer and inventor, was guest of honor at a dinner given by RCA marking his retirement as vice-president of RCA Laboratories and his appointment at the first honorary vice-president in the company's history; **Brig. General David Sarnoff** was principal speaker . . . **Paul Klipsch,** inventor-designer of various corner speaker systems bearing his name, chose the week following the New York Audio Fair for a press showing of his latest development, the Rebel 5, which is the smallest version of the Klipschorn yet to be introduced.

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AUDIO—1954

SUBJECT INDEX

AUTHOR INDEX

ADVERTISING INDEX

Announcing

the NEW

Collaro RC-54

fully automatic record changer with JPF

We had always considered the expression—high fidelity—as simply a connotation of audio quality in terms of faithful sound reproduction . . . a convenient abbreviation in a fast moving society . . . but, like the expression OK, having no substance or meaning within itself. That's what we thought—and that's what we thought everybody thought.

But, alas, the phrase became a cry of the market place. High fidelity became 'true' fidelity; 'true' fidelity—'ultra' fidelity. And then someone shouted—'super' fidelity—as if there were different degrees of fidelity.

Now, we come to you with a new record changer, the Collaro RC-54. It was designed and developed as an instrument for *faithful sound reproduction.* Its performance with good amplifier and speaker gives audible testimony that this objective has been achieved. Mechanically, it is ingenious for its simplicity . . . amazingly smooth and quiet in operation. It is fully automatic and intermixes *all* size records at *all* speeds—without any previous setting. Changing time is the same at all record speeds: 6 seconds.

At one time, we could have said—high fidelity—and you would have clearly understood that the Collaro RC-54 is top quality equipment. With the present trend in descriptive superlatives, we can't be sure that 'high' fidelity is high enough. Therefore, in the interest of clearer understanding . . . and the 'honest' truth . . . we take pride in announcing the new Collaro RC-54, the first record changer to offer

JPF . . . Just Plain Fidelity

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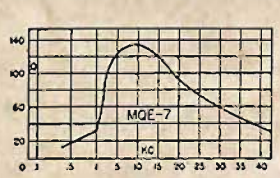
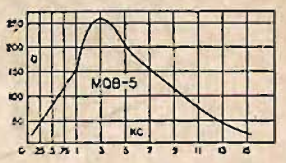
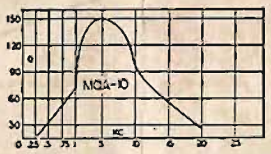


MQE
15 stock values
from 7 Mhy.
to 2.8 Hy.



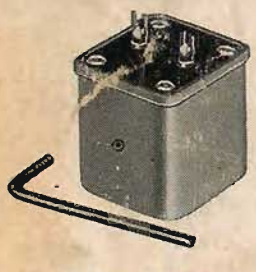
MQA
19 stock values
from 7 Mhy.
to 22 Hy.

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



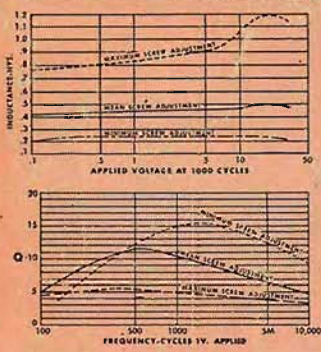
MQ drawn case structure.

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



VIC case structure

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



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

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

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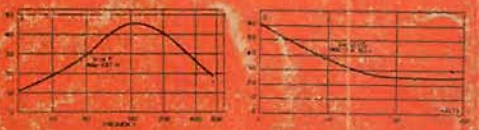
MQL-1	2.5/10 Hys.
MQL-2	5/20 Hys.
MQL-3	50/200 Hys.
MQL-4	100/400 Hys.

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



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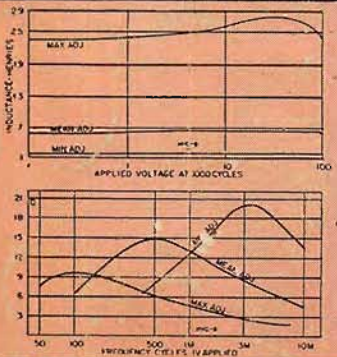
DI-1	Ten 10 Mhy. steps.
DI-2	Ten 100 Mhy. steps.
DI-3	Ten 1 Hy. steps.
DI-4	Ten 10 Hy. steps.

DI DECADE

Length	4 1/4"
Width	4 3/8"
Height	2 3/8"

HVC Hermetic Variable Inductors

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



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

HVC case structure.

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

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