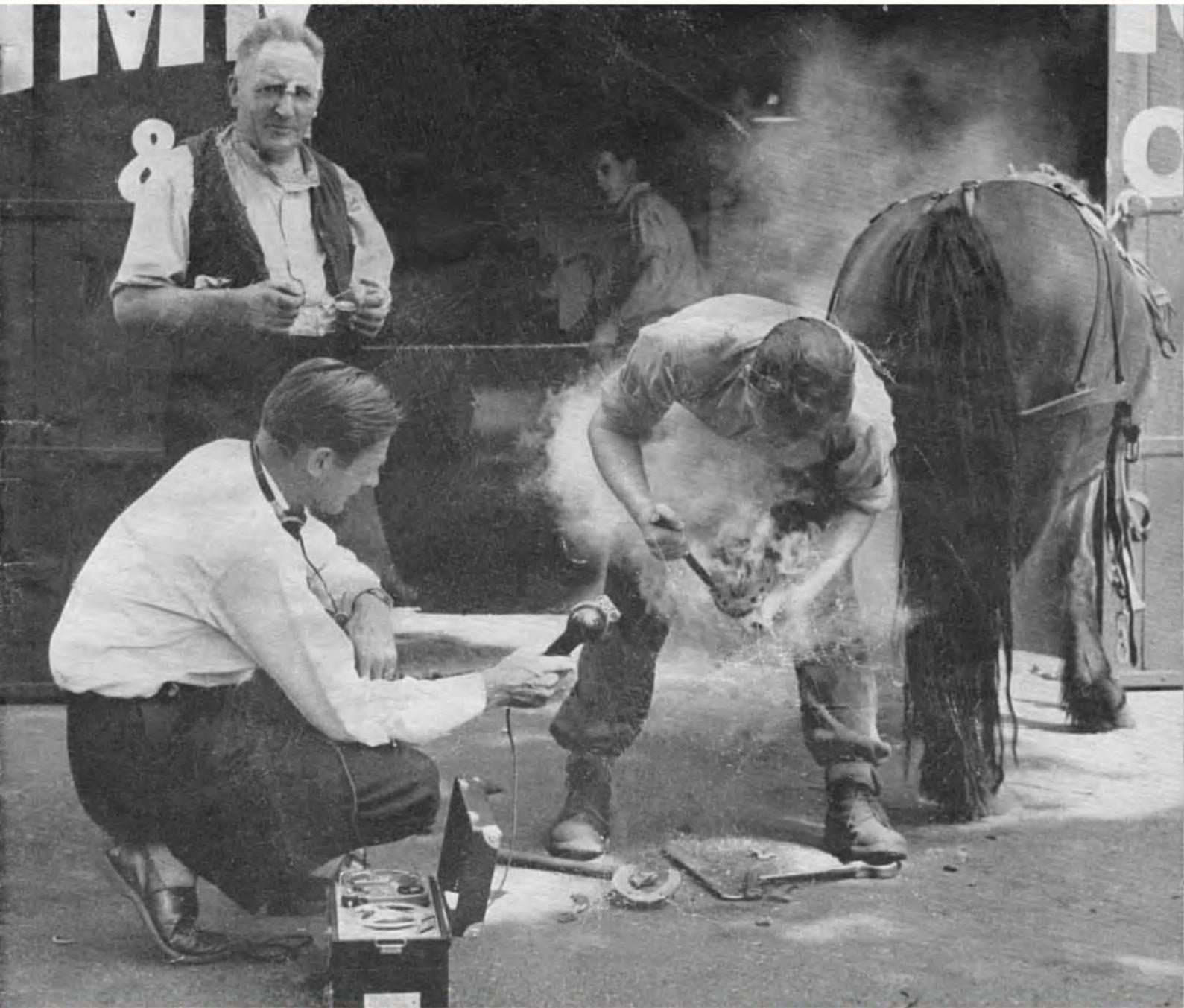


# the TAPE RECORDER

PRICE 1/6

MARCH 1959  
Vol. 1 No. 2



## In this number

- How to Splice Tape ( Part 2)
- The Interviewer....
- First report on the RCA Tape Cassettes
- Tape Club Notes and News
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- News Page
- Beginners' Page
- Wow and Flutter and the Tape User
- Reviews of Tape Records
- Building a Library of Sound
- Equipment Reviews
- Details of New Products
- Audio Fair Exhibitors

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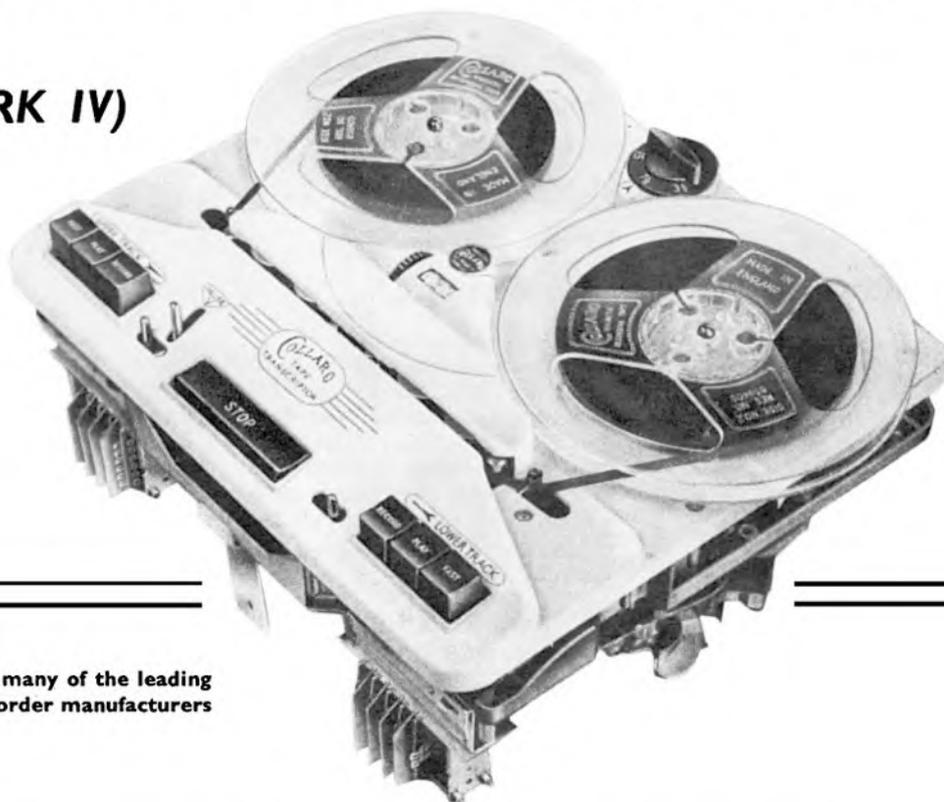
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BLOCK LETTERS PLEASE

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The whole mechanism is mounted on rubber which together with careful selection of motors reduces mechanical noise to a minimum.

Provision is made for the addition of a stereo head with both channels available either to an external stereo amplifier, or one channel through the internal amplifier and the other externally.

## TECHNICAL SPECIFICATION

Amplifier 30 — 25,000 cps  $\pm$  2 dbs  
(R20/30)  
15 — 50,000 cps  $\pm$  1 dbs  
(R40)  
3½ ips at 60 — 5,000 cps  $\pm$  3 dbs  
7½ ips at 50 — 10,000 cps  $\pm$  3 dbs  
15 ips at 40 — 16,000 cps  $\pm$  3 dbs  
(Signal/Noise ratio at 7½ ips—47 dbs)

The frequency range in the treble region has been limited to obtain the maximum signal/noise ratio compatible to a low distortion factor. Distortion introduced in the recording process is so small that the magnetic tape becomes the limiting factor. 600 ohm cathode follower line output socket, for feeding external amplifier.

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MODEL R30/40

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# the TAPE RECORDER

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 Editorial Offices - - - - 99 Mortimer Street, London, W.1  
 Telephone - - - - - MUSEum 3967 to 3969

★  
**EDITORIAL**

WHEN we launched *The Tape Recorder* last month, we had high hopes for it; but we confess that we had no idea it would prove so popular so soon. We thought that our planned print order of 10,000 copies would be more than enough to cover the demand. However, these were all gone within five days, and we were obliged to print a second edition of 3,500 copies to cover the flow of orders. This, too, was sold out; and we very much regret that we were therefore unable to meet the demands of many distributors whose orders arrived late. A small reserve stock has been set aside for the benefit of overseas readers who are at a postal disadvantage, and copies of vol. 1, numbers 1, 2, and 3 will be posted to those who were disappointed, and in strict rotation, not forgetting the needs of Home readers if supplies permit.

We send our sincere thanks to the hundreds of readers who have written to us, and we ask them to accept this as a Combined Operation, for unless letters have demanded a specific reply we were unable to deal with them all individually.

Many of these letters made suggestions for future articles, and quite a few reminded us that their writers had been readers of our sister journal, *Hi-Fi News*, since its first number nearly three years ago; and in this connection they pointed out that it could be a mistake to reprint articles which had appeared in that paper. This is an important point, and one which was debated very seriously in this office. The view taken was as follows: *Hi-Fi News* published some extremely valuable articles on tape subjects during the first twelve months (June 1956 to May 1957), and there must be many thousands of readers who would welcome the opportunity to read them. During that same period, the circulation of *Hi-Fi News* rose from 5,000 to 10,000; which means that the interest value must even now be potentially between 10,000 and 15,000 readers.

Because of this, we do hope that those readers who have already digested some of the early *Hi-Fi News* features will not condemn us for occasional reprints of really worthwhile material. For our part, we assure readers that these items will always be regarded by us as "extra reading", as and when space is available for them. And, with this point in mind, may we reassure all readers that our primary aim is to provide them with the best possible value on all counts, with the best reading content that we are able to secure, and with the best monthly balance of news, informative features, pictures and reviews that we can collect and commission.

Dealing with yet another matter, raised repeatedly in readers' letters, we also confirm our policy of "keeping both editorial feet" well on the ground, in order to make *THE TAPE RECORDER* a magazine that all tape enthusiasts will find easy and useful to read. For those who wish to read further, and often to dig deeper, we recommend *Hi-Fi News*, for its specialised features on tape and other audio subjects, with particular emphasis on stereo, which it covers most fully each month.

**MAKE SURE OF YOUR COPY—PLACE A FIRM ORDER**

MARCH - - - - - 1959  
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**COVER PICTURE**

ON our cover this month is the author of the article on page 60. B. R. Read, Assistant (Special Effects Recordings) in the BBC's Library Production Unit. The scene is a blacksmith's forge at Staines, Middlesex. The sound effect that he is recording is one which is now heard but rarely in these islands, where horses have already given way to cars upon the roads, and where they are rapidly being ousted from the farms by tractors. But listeners of middle-age and more will remember the exciting atmosphere of smoke and smell which are linked with the recorded sounds.

**NEXT MONTH**

TO coin an adage, there is many a slip between a "Next Month" announcement and what actually appears. Please accept our apologies for two such slips. The first was an out and out editorial clanger. We announced the first article of Maurice Brown's series on Editing to appear this month. It should have been "next month". We deliberately switched the programme on item two, for it seemed more sensible to hold over *Recording Bird Song* until there was some to record. Instead, we introduced B. R. Read, and we hope to publish the first article by Eric Sims "next month". In the April number, too, I. W. Jarman continues his fine series on *Tape Splicing*; there will be another *Tape Deck Analysed*; reviews of tape records; more "New Equipment", and more "Equipment under review". In addition, all the regular features, such as *Readers' Letters*, *News Page*, and *Club News*.



**LOOK FOR THIS COVER!**

**SUBSCRIPTION RATES**

The subscription rate to *The Tape Recorder* is 21/- per annum (U.S.A. \$3.00) from The Tape Recorder, 99 Mortimer Street, London, W.1. Subscription + Index, 24/- (U.S.A. \$3.25).



## we get such glowing letters!

Yes, we receive many letters congratulating us on the quality and fine performance of our products also the excellent service we maintain. Being the sole manufacturers of Brenell recorders, we are naturally pleased to receive such praises which fully justify our claim that the equipment we manufacture and sell is the finest value money can buy.

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... again I would say that we are more than pleased with the instrument itself and it is nice to know that one is dealing with manufacturers who have the interest of their customers after sale so much at heart F.G.C.

### A MEMBER OF U.S.A.F

... having investigated tape recorders manufactured in the United States, Germany, the Netherlands and Great Britain I was greatly impressed by the performance and quality of your product: it is, in my opinion, one of the finest instruments of its type available in this wide market . D.B.

### TAPE CLUB FOUNDER

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### A PROUD OWNER

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### A WARDEN

... a member of the management committee of our Centre was at the Show last week, and came back full of praise for your equipment, Brenell Mk. 5 Stereophonic Record Playback. He has interested us to the extent that we would like to add this item to the Centre's equipment A.B.



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GD17a

By Stephen Grenfell

# THE INTERVIEWER WAS . . . YOU

★ Stephen Grenfell has had one of those story book careers. On leaving school in South Africa, he walked round the coast line for a year looking for a ship to take him to England. He has served in the Regular Army, with and without a commission; sold vacuum cleaners from door to door; and tried his hand at kerb-side busking. His scores of B.B.C. scripts include the "Our Day and Age" series, and "It Happened to Me". His most recent television appearance was as interviewer/comper in "A Slice of Life".

**D**URING the last few years assembly-belt production of tape recorders within the reach of most pockets has caused a revolution in home entertainment. Most of us today who have reached forty-five can probably remember the awe and wonderment with which we listened to our first gramophone at a time when that creaking, hand-cranked box with its enormous tin horn was as new as the aeroplane. All of us in our middle years can no doubt recall the amazement and breath-taking excitement with which we fiddled with crystal and cat's whisker when sound radio was a child and the station identification 2LO was an adventurous call-sign to the future. And there can't be many teenagers in the country who haven't got imprinted vividly on their memories the fascination with which they first looked at a television screen.

## The New Home Entertainer

Now the tape recorder has come to take its place among those mechanical inventions in the home that help to while away mankind's increasing hours of leisure. Whereas, however, the gramophone, the radio and the television set demanded little in the way of co-operation except switching on a mechanical device and sitting back placidly to look or to listen, the tape recorder offers the members of any family circle a chance to participate actively in group entertainment—a sort of do-it-yourself home-built show business on its own.

And yet, in a way, the tape recorder, rather than being a device of the future, harks back to the past. Long before paper, printing presses, typewriters, gramophones, radio receivers and television sets were invented man down the ages preserved the chronicle of his activities by word of mouth. He was a teller of stories, and our early history has been handed down to us by the graphic stories that father told son, and son grandson over century after century.

The tape recorder gives the ordinary man the chance once again to preserve by the spoken word the account of his trials, his tribulations, his achievements, his joys and his despair. The modern tape recorder gives Henry Bloggs of Battersea the chance to be a latter-day Boewulf.

## A Record of the Spoken Word

No device perhaps offers richer opportunities for preserving the light and shade of a family occasion, the exquisite clarity of a baby daughter's voice, the minute but unforgettable personal achievement of a son or a nephew, the pain of farewell or the ecstasy of reunion after long absence than the compact little box with its two revolving spools that has come to be almost a part of the furniture of so many homes today. And the best technique of doing this is the interview.

So switch on your tape recorder and start interviewing the people who make up the background to your daily life . . . those in your own family circle, the friends you have made at school or at work, the men, women and children you meet on holiday.



*The author interviews Jim Beckley of the General Steam Navigation Co. at Margate for the B.B.C.'s "Holiday Hour"*  
(Photo by courtesy of "Isle of Thanet Gazette.")

Begin to build up a library that will reproduce vividly for your grandchildren at the flick of a switch the brief and violent times in which you lived as a child or a man—word-pictures of the contemporaries of your day and age who march into the future at your side.

## Interviewing . . . Hardest job of all!

It so happens (although practically everybody in show business believes he is a past master at it) that interviewing is one of the more difficult techniques of radio or television. During the years since the war I've interviewed some thousands of men, women and children (interviews ranging from recalcitrant and almost inarticulate film stars to a talking dog, a singing cat and an uncompromisingly lethal polar bear), and it occurs to me that if I pass on to you some of the tips I've learned during this long and talkative stint you may find them helpful.

There are very few people who can't be successfully interviewed, unless they are chronically shy or suffer from speech defects—provided of course they are properly handled. Proper handling means they must have confidence both in the interviewer and themselves. They must know what is expected of them and they must know something about the subject they are going to discuss. There isn't much point in shooting a loaded question about the differential calculus, or Red China's brand-new commune-system of living, to eleven-year old David. A boy that age can hardly be expected to come up with a brilliant Malcolm Muggeridge dissertation on a something beyond the scope of his, the child's, years and experience. Instead ask the boy what he thinks about the Eleven-plus examination, and you're likely to pull a full and interesting taped interview out of the bag.

## First, Choose your Subject

The cobbler, then, to his last. When you are going to interview somebody choose a subject that your victim has knowledge of. Don't be too ambitious at first: not everybody is a born Richard Dimpleby, Michael Ingrams or Daniel Farson. Sixty-year-old Auntie Flora may have very little to say on the specific types of liquid fuel used to propel inter-continental ballistic missiles, but she'll probably be a riot if you ask her to describe how she cooked for a family of seven children when supermarkets and frozen food were unknown; when three meals a day had to be prepared on an open range, and when Mrs. Beeton's lavish cookery book was every housewife's bible. Uncle John may come up with an excruciatingly tongue-tied interview on the subject of the Zimbabwe ruins; but he'll very likely turn up trumps if you ask him to describe what life and death were like in the trenches of Passchandaale, when he was young and one single minute particle of the flower of a nation's manhood.

Remember that the subject most people can talk about best is themselves and their personal history. Remember, too, when

you are interviewing someone who is an expert on a particular subject, that it is very likely that you will be able to ask him a question he is unable to answer. Everyone is an expert on himself and his opinions. Stick to a man's life and his experiences and you won't go far wrong.

### **Good Preparation Counts**

Like every job in life, interviewing is usually more successful when it is based on solid preparation. You may, of course, obtain a brilliant interview from someone you've never talked to, or even see until the instant you switch on the tape recorder; but it's unlikely. I once successfully interviewed Billy Wright of *Wolves* when we had never met; I was sitting in a BBC Studio in Manchester, and he was similarly incarcerated in a studio in Birmingham. On the other hand, one Saturday some years ago, when I was introducing "Sports Report", an Australian boxer whom I had never met was brought into the studio while I was actually on the air. Still talking I nodded to him; he sat down and we began a six-minute "live" interview. It was a shambles during which I worked harder than I have ever done, before or since, to drag some sort of information out of this laconic Aussie. Afterwards we got on like a house on fire, and I realised that if he had not lost his way coming to the Studio, and we had been given five minutes together over a cup of tea in the canteen beforehand things would have turned out very differently.

By "preparing for an interview", I don't necessarily mean that the whole thing must be rehearsed. One of the fascinating features of tape is that the rehearsal can be recorded, as it were. It will probably turn out to have a pace and a spontaneity that a rehearsal interview will lack. However, this isn't always the case; as I'm afraid I have proved only too conclusively in the past. But if the first attempt is a diabolical failure, then the tape can be "washed", and you should both be able to approach the second attempt with more confidence and the knowledge of the mistakes you both made during the first run.

### **Don't Miss the Spontaneous**

First "takes" often repay the effort put into them by bringing to the surface little flashes of spontaneous unrehearsed wit and colour that cannot be successfully repeated after a rehearsal. Once, in Rye, I asked a ninety-odd-year-old fisherman if Rye had changed since he was a boy. "Aye", he replied. "How has it changed, Shad?" I enquired. "The people", he said with a lugubrious face. "How have the people changed?" I persisted. He paused for a moment then: "The so-and-sos are all dead", he said with a casual finality.

More recently, I was tape recording an interview with a ten-year-old girl and her small brother, in Margate on a rainy day. I asked this young woman if she and her brother had been enjoying themselves that morning. Oh, indeed they had. Had they been playing on the beach? The child looked at me with surprise. "Oh, no, sir", she said clearly. "We been playing in the ladies. We do that every day."

When you are setting out to interview anybody you must be prepared to sink your own personality—however strong it is—beneath the personality of the person you're interviewing. The people who are going to listen to the interviewer will want to hear what he, and not you, have to say. Your job is to be a sort of shepherd and unobtrusive catalyst combined. You've got to introduce him, ask him sensible and straight-forward questions (single questions; not a portmanteau of Why? How? and When?), bring his answer reasonably and unobtrusively to an end if you think he is devoting too much time to it; and lead him on to his next answer. To do this you have to develop a sort of split mind. Half your mind should be concentrating on the way the interview is developing, what further questions you intend to ask; the other half must be absorbing what your interviewee has said and is saying. Nothing confuses a person in these circumstances more than being intently asked a question that he had done his best to answer fully for the last two minutes.

Without necessarily rehearsing your interview, or telling your subject the actual questions you intend to ask him, put him in the picture. Discuss with him the subject you are going to talk about. Give him some idea of the sort of questions you are going to ask him. Put him at his ease. Gain his confidence. Let it be quite clear to him that you know what you are doing and that nothing he can do or say is going to throw you off balance. Tell him clearly what length of interview you are aiming at. Recording miles of tape with a person rambling on in 45-minute "idiom" isn't much good if you intend afterwards to try and edit four or five reels down into a brisk and snappy three minutes.

### **Beware of Note-makers!**

Make your physical preparations too. He may prefer to stand. He may want to sit at a table, or at your side on a settee. He may want to make notes. Discourage this particular foible because probably most of the people you will interview are amateurs, and amateurs, unlike professional actors, find it exceedingly difficult to keep up an easy ad-lib conversation while they are peering down at a scrap of paper and trying to decipher a hastily scribbled note. If you're sitting at a table, remove any cigarette lighters, or sauce bottles, or packets of cigarettes. Half way through your most important question he'll start trying to make out what the small print on the packet or bottle says, or he'll begin to play with the lighter.

Don't wave the microphone in his face like a tennis racquet. That will scare him out of his wits. Hold it somewhere between you where both your voices balance. Keep it, if possible, lower than his mouth, with the "live" surface upwards, so that he can look into your face and speak directly to you while his and your words "fall" into the mike.

Then switch on and go ahead. And may your interviews within the confines of your family circle and your friends afford you as much fun and interest as my years of interviewing men, women, children (and animals!) have afforded me.

## **BOOK REVIEWS**

"Tape Recorder Circuits"—By Herman Burstein and Henry C. Pollak. Published by Gernsback Library Inc. Distributed in U.K. by The Modern Book Co., 19-23 Praed St., London, W.2.

This book is No. 67 in the Gernsback Library of paper backed semi-technical books written for the information of the technician and hi-fi enthusiast. Economies in backing, printing, and paper, enable this book to be sold in this country for 23s., about half the price of a similar book employing conventional techniques and standards of printing and binding. Despite these economies the quality of both text and diagrams is above average.

Within the limits indicated by the title, the book is comprehensive and free from serious technical errors. Some precision in explanation must generally be sacrificed if a readable account of a technical subject is to be produced, but the authors have managed to maintain a very acceptable balance between readability and technical accuracy. The scope of the book is well indicated by the list of chapter headings:

1. Elements of a tape recorder.
2. Characteristics of a high-quality tape amplifier.
3. Head characteristics.
4. Tape characteristics.
5. Bias current.
6. Equalization requirements.
7. Equalization circuits.
8. Oscillators.
9. Record-level indicators.
10. Minimizing noise and hum.

Each chapter gives very good coverage of its subject at about the same technical level as the *Hi-Fi News*. Thus, Chapter 6, "Equalization Requirements", discusses the need for equalization in tape recordings, its distribution between recording and playback circuits, tape hiss and noise, and the derivation of the American N.A.R.T.B. equalization curve. As the book is of American origin it omits any reference to the European C.C.I.R. equalization standard, but as the basic reasoning behind both standards is the same—the omission of any reference to C.C.I.R. standards is, perhaps, not so serious as it might otherwise appear.

As an introductory text to the subject, "Tape Recorder Circuits" can be recommended to the technician and hi-fi enthusiast.

**J. Moir**

# HI-FI YEAR BOOK

— 1959 EDITION —

**IN ITS FOURTH YEAR OF PUBLICATION**

HI-FI YEAR BOOK WILL BE A BIGGER AND MORE  
COMPREHENSIVE MANUAL THAN BEFORE, WITH  
SPECIAL SECTIONS FOR TAPE AND STEREO

**READY — MID-APRIL**

● **Hi-Fi Year Book** is scheduled for publication in its fourth annual edition at Mid-April. This year it will be bigger than ever, with several new features, and many informative articles covering the different sections of audio equipment. As its regular readers already know, Tape Recorders, Tape Accessories, Microphones, etc., have always occupied an important place in this invaluable annual; and this year the sections devoted to these products have been very considerably increased in order to take in the many new items of equipment which have appeared on the market. Tape recorders of all types will be illustrated and included in its directory sections—professional and domestic models, stereo and single channel.

The directory sections of **Hi-Fi Year Book** form the most complete published guide to the available audio equipment, and every section is thoroughly covered, with pictures, makers' specifications, prices, addresses and telephone numbers. The various sections are outlined in the opposite column.

● The main sections of the 1959 **Hi-Fi Year Book** will include *Pickups*, stereo and monaural: *Turntable units: Pre-amplifiers*, both stereo and monaural: *Radio tuners: FM and AM*, self-powered and otherwise: *Tape Recorders*, professional, semi-professional and domestic: *Tape Amplifiers: Tape Accessories: Tapes: Tape Decks: Microphones: Loudspeaker Drive Units: Speaker Enclosures and Complete Speakers: Home Construction and Kits*. Following its customary layout, **Hi-Fi Year Book** (1959) will also include its advertisement section, fully indexed, at the end of the book, as well as its directory of Hi-Fi and Tape Dealers.

**Hi-Fi Year Book** is the accepted annual reference book for the whole Audio Industry, and is read by enthusiasts, engineers and dealers alike, in all parts of the world. The 1958 edition is now out of print, but may be found in most libraries for reference purposes.

**To avoid any confusion with other publications note the short title—  
“HI-FI YEAR BOOK”**

Supplies of *Hi-Fi Year Book* (1959) will be available to dealers and booksellers in the early part of April, and is scheduled for general sale at the time of the London Audio Fair. Though the book is greatly enlarged, the price remains the same—10s. 6d. or 11s. 6d., post paid from the publishers below.

**HI-FI YEAR BOOK, 99 Mortimer Street, London, W.1**

# our readers write . . . . .

AS announced last month (page 12), in order to make this a lively feature we have decided to award three spools of tape for the best three letters published. 7-inch, 5-inch and 3-inch spools respectively, for 1, 2 and 3. And the winners this month are Ernest S. Walkering, Geoffrey Mitcham and G. E. Payne, in that same order. All letters should be addressed to *The Editor*, "The Tape Recorder", 99, Mortimer Street, London, W.1. Letters not intended for publication should be clearly marked, beneath the signature NOT FOR PUBLICATION.

## . . . about a useful gadget

From: Ernest S. Walkering, 98 Lessons Hill, St. Pauls Cray, Orpington, Kent.

Dear Sir:—May I take this opportunity of congratulating you on the excellence of your first edition. If it can strike an interesting equilibrium between the very technical and not so technical article, it should do very well.

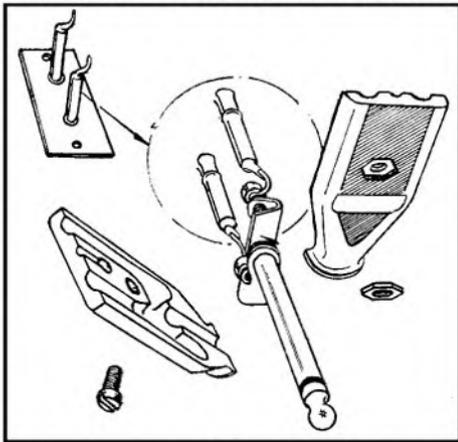
The plug adaptor illustrated is a useful additional accessory for tape recorder owners who have jack socket terminals, and friends whose tape recorder leads terminate with two wander plugs.

Material can be transferred from one tape to the other

without the tiresome bother of changing lead ends. The plug has done valiant service for the writer and his friends. The jack plug was three shillings and the wander plug socket sixpence, plus a little patience with a soldering iron.

Removing the sockets from the bakelite strip, the ends can either be soldered straight on to the jack terminals or as illustrated, a small piece of wire soldered to the socket and held by the jack terminal screws, can be accomplished. Whatever the method the result is a neat adaptor.

Yours faithfully



## . . . about manufacturing standards

From:—Geoffrey Mitcham, 21 Crofton Road, Woodside Estate, Grays, Essex.

Dear Sir:—As a relative newcomer to tape recording, I would like to express an opinion on what I think is a bugbear to users of tape recorders, especially those people who are interested in "Tapesponding", or whom at one time or another have exchanged tapes with friends. I refer to the position of the head gap on various types and makes of recorders.

I wonder how many times borrowers of tape have found that when playing back on their own machines, their friend's tape on which an excellent recording has been made, the music sounds quite flat and gives a very limited frequency response, simply because his recording-playback head is out of adjustment with that on his friend's machine.

"Tapesponding" enthusiasts will be only too familiar with this type of problem, and although with some of the semi-professional models an azimuth adjustment of the head is quite a simple matter, on other models this can quite often involve a major operation with a screwdriver removing quite a few parts in order to gain access to the recording head.

Whilst manufacturers advertise their tape recorders being made to CCIR specification, could not this specification also cover a universal test tape of which every manufacturer of tape recorders could first adjust their replay heads before dispatch to the wholesalers?

We could then know with a reasonable certainty that a tape recorded on one machine would give the same response when played back on another machine and would save that annoying fiddling

around with the azimuth screw on the recording head before we can get the maximum response from the tape of which our machines are capable of reproducing.

Yours faithfully

Note: We offer a 7-inch spool of recorded tape (any title from the EMI catalogue—stereo or monaural) for the best word to replace "Tapesponding", which is neither correct for what it is meant to imply, nor pleasing to the ear. Send entries on postcards only. Up to three suggestions per card. Name and address at foot of card. Nothing else on card (except our address and the necessary stamp on the reverse.) Entries close first post April 16th. Judging will be by a panel. If winning entry is sent by more than one reader, prize will be increased and shared. (Editor).

## . . . about tape, spools and splicing

From:—G. E. Payne, 43 Hanworth Road, Earlswood, Redhill, Surrey.

Dear Sir:—I should like to congratulate you on a splendid first issue of *The Tape Recorder*. Being a reader of *Hi-Fi News* since its inception, I welcome this companion publication and feel sure that it will quickly acquire the high esteem that the *Hi-Fi News* already has, and that *Hi-Fi* and Recording enthusiasts such as myself, will derive from them the finest knowledge and pleasure to be found anywhere in print.

I should like to raise two points. Firstly, tapes and spools. There are two continental manufacturers now supplying double-play tape to the British market, and in the United States double-play tape has been on the market for several years. Yet no British tape manufacturer has yet marketed double-play tape, despite the fact a British manufacturer claims to be the largest tape producer in Europe. If I remember correctly it was from the Continent that we first received lp tape, and it seems that once again British tape manufacturers are lagging behind, and that the United States and continental manufacturers have given the lead in producing this much needed and useful extra thin tape. I have often wondered, too, why some manufacturer has not had the bright idea to produce unbreakable plastic spools. One of the bugbears of sending tapes through the mail is broken spools. Whilst this can be overcome by metal or cine spools, it would be far better if we could buy our tape on unbreakable spools.

Finally, I should like to ask Mr. Jarman, or any reader, if they can offer a foolproof method of tape splicing for blind persons. I am one of many thousands of blind tape enthusiasts and my most difficult problem is easy efficient splicing. It is difficult to use narrow splicing tape, and not too easy to trim the wider variety. I once tried jointing compound, but didn't seem to get satisfactory results. Perhaps somebody could advise me how to get excellent results with this solution.

Yours sincerely

Note: We suggest that the jointing tape method is your best answer. Admittedly the operation is fiddling, but the editing block described by Mr. Jarman, versions of which are now available, is a terrific help. First of all, it holds the loose ends of the tape—when their natural tendency is to curl up. Secondly, the overhung edge of the channel cut in the block is of great assistance in guiding the thin jointing tape into correct alignment with the tape. (Editor).

## . . . about standards generally

From:—Bruce Stephens, 29 Manor Road, Barnet, Herts.

Dear Sir:—Congratulations! You referred, in your announcement in *Hi-Fi News*, to the *Tape Recorder* as "the magazine that all tape enthusiasts have been waiting for". For my part, this could not have been more true, and your first number could not have set the ball rolling more propitiously. While avoiding being over-technical, your presentation is thoroughly adult and at the same time delightfully friendly. I am certain that in its sphere this is going to be just as successful as *Hi-Fi News*. May I be permitted two pleas?

1. That you will set, and maintain, as high a minimum standard on the mechanical side of tape recorders as you always have on the audio side in *Hi-Fi News*. A tape deck is a relatively complicated piece of mechanism and only the highest standards of mechanical engineering design and execution will yield an efficient and dependable product. I hope that, especially in your reviews, this crucial factor of

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### TSL HIGH FIDELITY NEWS LETTER

No. 3

WE ARE PROUD TO INTRODUCE THE WORLD'S FINEST AND MOST VERSATILE TAPE RECORDER

### THE NEW TANDBERG QUADRUPLE 4-TRACK MODEL 5 STEREO PLUS

This machine is unique. The sensation of the recent New York Audio Fair Double the recording and playing time of any other machine available in the world today. Uses standard  $\frac{1}{4}$ " tape and carries 4 tracks instead of 2, thus giving two entirely separate stereo recordings or four individual monophonic recordings.

**Extra Facilities**—Two built-in balanced stereo amplifiers with individual controls capable of playing stereo discs as a normal high fidelity stereo amplifier

Stereo amplifiers for high fidelity live use, either paralleled for monaural with twice the output, or separated for stereophonic use.

#### SPECIFICATION

#### Frequency Response—

From 30–18,000 cps. within  $\pm 3$  dB at  $7\frac{1}{2}$  i.p.s.

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From 30–6,500 cps. within  $\pm 3$  dB at  $1\frac{7}{8}$  i.p.s.

**Wow and Flutter**—Total wow and flutter better than 0.15% at  $7\frac{1}{2}$  i.p.s.

**Amplifiers**—Two built-in high fidelity amplifiers constructed within close tolerance limits. An output of  $3\frac{1}{2}$  watts is available from each amplifier

**Signal to Noise Ratio**—55 dB below recording level.

**Valve Line-up**—2x EF804. 2x ECC83. 2x EL84. EM71 magic eye and 3 bridge circuit metal rectifiers.

**Speeds**— $7\frac{1}{2}$  i.p.s.,  $3\frac{3}{4}$  i.p.s.,  $1\frac{7}{8}$  i.p.s.

**Recording and Replay Characteristics**—Corrected to C.C.I.R. or NARTB standards.

#### Recording Facilities—

Monaural recording on each of 4 tracks or  $\frac{1}{2}$  track system.

Monaural recording on each of 2 tracks or  $\frac{1}{2}$ -track system.

Stereo recording on 2 pairs of tracks or  $\frac{1}{2}$ -track system.

Stereo recording on 1 pair of tracks or  $\frac{1}{2}$ -track system.

#### Playback Facilities—

Four-track or  $\frac{1}{2}$ -track stereo.

Four-track or  $\frac{1}{2}$ -track monaural.

Two-track or  $\frac{1}{2}$ -track stereo.

Two-track or  $\frac{1}{2}$ -track monaural.

Full-track monaural.

**Reel Size**—7 in. reels maximum.

**Heads**—Record/Replay head: specially made in line stereo quadruple. Head gap: 0.0016 in. Two-track erase head. Cross-talk between the two head halves better than 60 dB.

**Inputs**—(a) radio (b) microphone (c) disc (d) amplifier

**Loudspeaker Facilities**—Built-in monitoring loudspeaker

**Distortion**—A recording level 10 dBs below the saturation point results in less than 1% distortion of a 400 c/s signal on replay.

**Speed Tolerance**—Better than  $\pm 1\%$  for all speeds.

**Erase Safety Switch** fitted to prevent accidental erasure.

**Tape Playing Time** with double play tape—

$\frac{1}{2}$ -track monaural.

2 hours at  $7\frac{1}{2}$  i.p.s.

4 hours at  $3\frac{3}{4}$  i.p.s.

8 hours at  $1\frac{7}{8}$  i.p.s.

$\frac{1}{4}$ -track monaural.

4 hours at  $7\frac{1}{2}$  i.p.s.

8 hours at  $3\frac{3}{4}$  i.p.s.

16 hours at  $1\frac{7}{8}$  i.p.s.

Note.—On stereo recording or playback above times are halved.

**Size**—Recorder in portable case:  $12\frac{1}{2}$  in.  $\times$  16 in.  $\times$   $7\frac{1}{2}$  in.

**Weight**—Recorder in portable case: 27 lb. **Price 124 gns.**

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To record stereo on either two tracks or four tracks from live sources, stereo discs, or from stereo programmes now being transmitted by the B.B.C., TANDBERG presents the STEREO RECORDING ADD-ON UNIT This is a 3-valve recording amplifier to match the TANDBERG Model 5 recorder with built-in magic eye indicator to permit perfect balance with the main recorder

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## readers letters—(continued)

mechanical reliability will receive first consideration. (A slap on the side, or an extra powerful thrust on a Start button *may* be effective, but, dammit, it may well be too late!)

2. As one of the vast body of users of tape for utilitarian purposes, may I ask for lots of guidance in the fields of (a) Amateur Dramatics and (b) Amateur Cinematography? And the best of Luck!

Yours sincerely

### ... about the BBC's "Sound" programme

From:—N. P. Turner, 26 Brookland Hill, London, N.W.10.

Dear Sir:—It is no doubt churlish to complain about the BBC's fine effort in producing "Sound" I managed to hear the last ten minutes of the first broadcast and wished I could have heard it all. And thereby hangs my complaint. We cannot all get home by 6.45, and some of us have other engagements on Mondays. Surely then, since the BBC are prepared to repeat the programme, it would be more sensible to repeat it on a different night and/or at a different time, to cater for those of us who are not available at 6.45 p.m. on Mondays. I should be interested to know what your readers think of this; they should provide a good cross section of those who will wish to listen to this programme.

No doubt many of your readers will say that I can always have the programme recorded for me; but how many of them trust their wives with the tape recorder? (This may well prove another interesting survey.)

Yours faithfully

Note: With paragraph one we agree. But, Mr. Turner, are you not sticking your neck out in para two? (Editor.)

### ... about duplication

From:—R. Fairweather, 18 Lancaster Court, West Norwood.

Dear Editor:—Congratulations on the first number of the *Tape Recorder* It supplies a long felt need! But in order to cater for all, don't forget that a good many of us have been with you from number one of *Hi-Fi News*, and have already read and retained articles like "The Story of Tape", now reproduced in full in the new magazine. Granted, it made me turn up my back number of "H.F.N.", and I also read the second part, too; so that one article in next month's "Recorder" has been studied in advance. Tell the newcomer where to find the information by all means, but please don't forget the Old Boys have had this, and "Microphones" and kindred articles before. I am certain that you've got enough to tell us, without too much repetition.

"T/R." could, no doubt, help us all by telling us how to service our machines. For example, one month, **braking**, might be covered, and tips on adjusting the better known make of decks listed. Another journal has covered various recorders, but one recorder per month, and if your particular recorder is not up for treatment until next November, say, it leads to impatience. How about it "T/R."?

We now have our "Sound" programme on Network 3. Is this not an ideal place to transmit those lost BBC Test Frequencies? (*Hi-Fi News*, Vol. 2, No. 9, page 471). Tape recordists need not be told the implication of this. Maybe another campaign started by "T/R." could achieve transmission of the test tones once more, at least, in our own programme? There's another job for you!

Wishing you all the good luck you deserve for "T/R.", I am,

Yours faithfully

Note: See our Editorial. (Editor.)

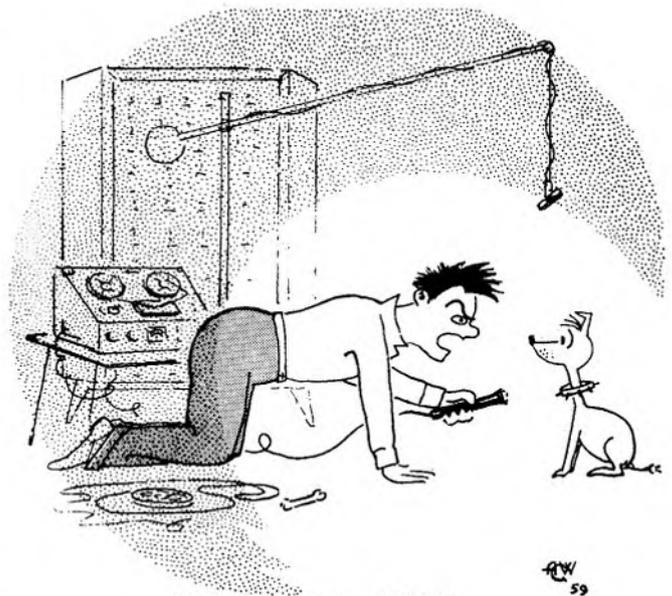
### ... about Zoo-phonics noises

From:—David M. Ogden, 128 Boundary Road, Newbury, Berkshire.

Dear Sir:—I have received the first edition of your new magazine and very nice too. I have recently been experimenting with a loop of tape and I must say I have produced some weird and wonderful noises. For instance, the words "How's this" when recorded at 15 i/s and played back at 3 3/4 i/s sounds very much like what I imagine a cross between a snake and a lion would be. I wonder if any other reader has any brilliant suggestions to make on this subject?

Yours faithfully

Note: A member of our staff says: "Yes. Take recorder to Zoo and record lion and snake at 3 3/4 i/s. Then see what they say at 15 i/s." (Editor.)



"BARK, darn you—BARK"

### ... mainly about us

From:—Alan C. J. York, 5a Southbourne Grove, Bournemouth.

Dear Sir:—I was intensely interested in the first issue of *The Tape Recorder* and should like to take this opportunity of wishing the magazine the best of luck and of conveying my thanks to all those persons who made the first issue possible.

As a comparative "new boy" to the world of cine photography I have been introduced to the equally fascinating world of tape recording. The two subjects appear to go hand in hand, certainly a film show without sound can be likened to bread without butter. Naturally, my chief interest in recording is the preparation of musical background and dialogue for film, and I was particularly interested in your articles on "The Brenell Mark 5" and "Next Buy a Deck".

As an impecunious but inveterate "Do-it-yourselfer", with no technical knowledge, I am looking forward to further articles on the assembly of unitary equipment such as was described in your article on the Brenell. Please, for the sake of the many who like myself know not the difference between an amp and an ohm, publish at least some of your articles in terms that can be understood by the greenest of novices.

Whilst I appreciate that space is limited in any magazine may I suggest that a little more is devoted to "Tape Records" and a spot found somewhere for "Sound Effects"?

Yours faithfully

From:—Colin Francis-Griffiths, 4 Garden City, Penydarren, Merthyr Tydfil.

Dear Sir:—I feel that I must write and congratulate you on such a first class publication. The tape enthusiast has never before been catered for and if I may say so, taken seriously, until this publication made its appearance this month—not before time! Here in Merthyr Tydfil I am in the stages of forming a tape recording club, and with this new venture we have a new publication to help us along our way in *The Tape Recorder* I must say, that although I have been a tape enthusiast for some five years, I am very dull when it becomes technical in any way. There are very many publications that I just could not follow. I read this first copy of *The Tape Recorder* and was able to learn more from that publication in one hour than I have been able to get from other publications in three years. I do hope that you will remember the Tape Recording Clubs in this publication, and give space for their news and views.

Yours faithfully

### HOW NEW IS RECORDING?

(2) Not for the Home Service!

"But, sad as angels for the good man's sin weep to record, and blush to give it in . . . ."

(From "Pleasures of Hope" part ii, line 357, by Thomas Campbell 1777—1844)

# BUILD A LIBRARY OF SOUND

By B. R. Read

★ B. R. Read is very fully employed making recordings—on land, sea, and air—for the “Sound Effects” section of the BBC’s Recorded Programme Library, and has personally “bagged” many of the best of the Library’s 7,000 different sounds. He first became a sound enthusiast many years ago when working with the famous Dr. Ludwig Koch. The BBC’s best thunderstorm recording, for example, was collected by B. R. Read at 4 a.m. in pyjamas, with rain lashing down on to a plastic mac—which he laid out for the purpose!

**M**AKING recordings “in the field”, or away from your own home, is a fascinating occupation or hobby, with a different set of circumstances and problems to be overcome and solved each time you set up your equipment. Some disappointments are inevitable, but these can be minimised by attention to details. Really knowing your recording machine, its limitations and possibilities, and making a friend of it, is most important; and you should never be satisfied with your first “take”. Don’t be afraid to experiment, especially with microphone positions and recording levels; and, probably most important of all, *learn to attune your ears to unwanted and extraneous sounds*, so that you may take the necessary avoiding action and so save these unwanted sounds jarring on your ears when you play your precious recordings back.

In this tight little overcrowded isle of ours, extraneous sounds are the biggest enemy of the recordist in the field; and so, with this in mind, working when others are not becomes almost a must. Recording indoors may seem a simpler proposition, but here again do watch out for these extraneous sounds which, though fewer generally, loom larger in an otherwise quiet background. Ticking clocks come over beautifully when you do not want them, and chiming clocks are best consigned to the end of the garden! A busy wife washing up, even ever so quietly, should be bribed to leave it until the morning, and even the soft thud of iron on ironing board will “come over” in an otherwise quiet house. Possible exceptions are what we may well call “co-operative noises”, as for instance, on one of my recent assignments.

## Recording Pet Budgerigars . . .

Recently I had to get recordings of a prize talking budgerigar. All kinds of subterfuges were resorted to, so as to get the bird started, but in the end we found the only one which set him talking was the sound of washing up. As the budgie was in the living room, away from the kitchen, a system of hand signals was devised to stop the lady of the house from rattling the cups and saucers when the bird started his party piece—and to start her rattling cups and saucers again when the bird needed further prompting.

A complication on this particular assignment was the Western Region’s Main Line, with local expresses running past the bottom of the garden! I. W. Jarman’s tape editing technique was well tried on this job!

To prepare this budgerigar for recording (and this applies to all small caged birds) an object closely resembling the microphone in appearance was propped against the cage as near as possible to his talking perch, about a week or ten days before my recording day, in order to familiarise the bird with what is to him a frightening object. We used one of the small brush tools from a vacuum cleaner, but a torch, a piece of broom handle, or anything which resembles the microphone in size and brightness of colouring will do.

When I arrived, the cage was covered with its night cloth and the real microphone was substituted for the imitation one; and then, when the cover was taken off the cage, the bird was none the wiser. Before starting recording, though, the ticking clock was removed, the crackling fire damped down, and the creaking chair changed for one that didn’t. If there is a

squeaky door, lock it or oil it. It is bound to be opened by someone just at the wrong moment. (*But before you oil it, record it! It may well be a very useful recording to have at a later date!*) A snag with budgerigars is the low level of their speech compared with the very high level of their squawks and shrieks with which they punctuate their set-pieces. I have found that it is best to set the level for the speech, editing out the squawks which usually distort through overloading; although doing it this way there is often the danger of the “printing” of some of these squawks.

## . . . and Parrots

Just recently I have been making recordings of parrots. These are easier to record than budgerigars because of their louder and more confident voices. Microphone positioning is not so critical with so much more level in hand; and parrots, far from being nervous of the microphone, always seem curious of it and want to investigate it closely! Starting them off depends on the habits and idiosyncrasies of the individual birds but generally speaking, I have found it saves a lot of time and frustration to record them repeating their words and party pieces after their owners have spoken them. This means, of course, that some of the owner’s voice will be recorded, but by schooling the owner to stop speaking instantly when the parrot starts, and to leave a pause after the parrot has spoken, editing becomes quite straightforward if somewhat tedious.

A sign I have found useful with some parrots, and I do not know if it applies to them all, is that immediately (and I do mean *immediately*) before the bird speaks, the pupils of its eyes contract. This sign has saved me much time and tape. Others ruffle their neck and head feathers, but I have not found this signal very reliable. Many parrots like human company, and talk well with the hubbub of general conversation. If, however, after a while, everyone leaves the room, the bird will often show his disgust by letting forth. By leaving the microphone set up and the machine running, results can often be obtained in this way.

## Chickens and Ducks

Before leaving our domestic feathered friends, I would like to mention chickens and ducks. If there is a healthy cockerel in the neighbourhood (and you should know!) the agony of effort required to get up just before dawn in order to get a rousing recording of his majesty in full cry is really worthwhile, and your martyrdom is complete if you have to make several attempts at the recording! The clucking or cackling hen is much easier to record, and with very little effort you can have a nice friendly contented recording for the asking. Sprinkling some seed near the microphone position sets them off very well. Ducks are so obliging, the only real problem is to know when to stop recording! Singly they are more difficult, but with patience they will perform, especially if the one you wish to record has been separated from his friends. Otherwise a few snails fed to them at opportune moments will raise the equivalent of a duck’s cheer!

With chickens and ducks we have now gone outdoors, probably down to the end of the garden and we now come up

# BUILDING A LIBRARY OF SOUND

*The trouble with recording domestic pets, is they are so friendly. To a dog-lover, like the author, it is easy enough to record a "conversation". But how do you get a tape of fierce growling and barking, from an Afghan who just stands laughing at you?*



against other kinds of extraneous sound nuisances. Aircraft are big offenders, and even when out of earshot it is best to wait until all possibility of a returning wave of reverberation has gone. Watch out for the possibility of someone's lawnmower rattling its way into your recording, or a dog barking in the distance--and for any one of a hundred and one ordinary everyday sounds that generally pass unnoticed but which will spoil your recording if let go by. Someone emptying an ashcan, slamming a back door, scraping a plate, or getting a shovel full of coal.

## Dogs and Cats

And now let's get the chickens quiet and record the dog. On the whole dogs, being friendly creatures, are willing to oblige at almost any time and, because they are so much more responsive to us humans, they can be "taped" in many moods. I prefer to record them on their home ground, because then they do not seem so inclined to wander, scamper and explore as much as in a park or other open place; and I thus have more chance of deciding the distance and perspective, rather than have the dog forcing it on me by his harum-scarum running around. The dog's master, with a ball or stick, playing with the dog usually gets him barking happily, and a friendly tug-of-war will produce the growls and pretended snarls that sound so impressive on a recording. With his master playing with him in this way, I have found the dog is usually soon oblivious of the stranger with microphone and machine nearby.

This happened to me when I wanted to record a golden retriever's lovely deep-throated bark. No matter how absurd our antics, he just wagged his tail and nuzzled up to his master (and myself) as if to comfort us in our delirium! In the end his master, with an anticipatory gleam in his eye, suggested I pretend to attack his wife! This with much trepidation I started to do, with her reluctant consent, of course, to the accompaniment of much violent but silent encouragement by the husband. The dog thoroughly approved of this new game, barking, growling and frolicking all around us, enjoying it hugely. If you try this trick, take care you choose a consenting husband and a sporty wife! With the barking alternating with growling, levels will again be a problem, as the barks are very high level indeed compared with the growls; and "printing", I have found, becomes a real problem.

There is really no answer to this except to record one tape for the growls, and another for the barks; and once again editing came to the rescue. Cats are an especial problem, they are so independent and superior! Purring is fairly easy to record, given quiet surroundings. Simply get him (her) nice and comfortable in a well padded armchair, stroke lazily--and there you are! He will usually take no notice of the microphone at all until you want him to meow for you, and then he seems to meow just when you are not ready, and stops as soon as the microphone is produced.

Twisting tails and other forms of persuasion are out! You must be ready for him when he is hungry and wants his food; and watch out for him when he has had a saucer of milk, taking up your station by the back door ready for his meow when he asks to go out. But be content with just two or three meows at a time. Do not keep him uncomfortable too long! If you know from experience that a pugnacious tom cat is fond of a certain spot within reach of your microphone on the same night as his rival, then there is your opportunity to record them naturally in their environment at the cost of getting out of yours!

## Farm Opportunities

Generally speaking, sounds on farms offer most scope to people with battery driven recorders; but the farm yard is often within reach of a mains-driven job, especially since so many farms are fully wired and mechanised these days. There are no hard and fast rules here, just simply that opportunities must be watched out for and seized, and patience is the great virtue. Cows can usually be recorded when they are waiting to come in to be milked. Geese will "create" as soon as you look at them, and goats will nearly always oblige after one carrot or tit-bit!

If the farm has a five-barred gate, or local equivalent, it makes a lovely sound to get on record; and for a sound picture, the lorry calling to collect the milk, off-load the empty churns to the accompaniment of the farm dog barking is hard to beat. But it happens early in the morning! Very early!

Another nice noise is the tractor starting up, coughing and spluttering until warm, then approaching and passing away in the distance until lost. You may also be fortunate enough to find a bull in his pen in a belligerent mood. But do not tease him! And if it is possible that the farm still has a horse in service, together with a farmcart, try and get it drowsily approaching and passing once or twice, crunching, rumbling and jolting along a rutted lane.

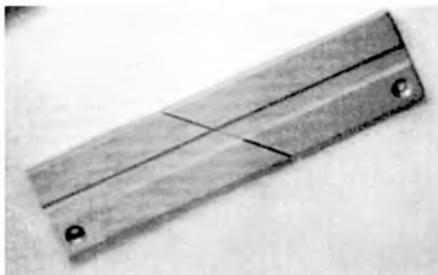
With the vast majority of amateur recordists, the equipment used will be mains-driven, and for recording in the garden and thereabouts, a long mains lead will be necessary. You don't really need me to point out the obvious precautions to take. Do use proper heavy rubber covered three-way lead, made up with proper connections. Those odd bits of flex and insulating tape are not worth the risk to yourself and the machine. The wind is a problem at all times, but in a garden you should be able to pick a recording position behind some kind of shelter; in fact quite often I use my body and a judiciously draped coat, and get away with it. And then, of course, for many microphones there are windshields available which are satisfactory in certain conditions, although I must confess I only use mine when there is no other way out as I feel there must be some loss of quality even if only slight.

In the next article I hope to deal with the recording of cars, aircraft, etc.

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# TAKING UP TAPE

AS with most hobbies or pursuits, tape recording has its own vocabulary of special words. Some of these are technical in origin, and others have "just grown". You should get to know these terms—or at least some of them—since it makes reading and conversing on the subject so much easier. This Beginners' Page will be devoted to the "Language of tape recorders", for the next three issues, and I have divided the discussion under three headings:—(1) the *recording system*, (2) the *playback system*, and (3) the *transport system*.

## Brief Description of the Recording/Playback Chain

Referring to the diagram, the relatively small electrical signals generated by the microphone, or other source, are amplified and passed through the coils of the record head. This sets up a proportionate magnetic field, which is concentrated at the frontal gap over which the tape passes. The net effect is to align the tiny magnetic particles, which comprise the coating of the tape, so that they form a record or "history" of the programme voltages.

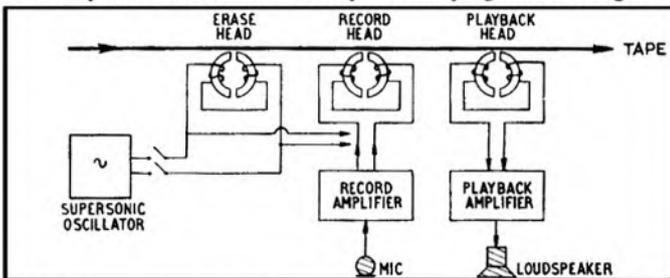


Fig. 1: Basic recording and playback chain. In many portable recorders, space, weight and expense are saved by combining the record/replay functions in a single head and amplifier

As the tape passes over the playback head, the varying magnetic fields from the tape set up alternating currents in the coils. These are amplified by the playback amplifier sufficiently to drive the loudspeaker. Clearly, when we are recording, the tape should reach the recording head in a uniform state of magnetisation or demagnetisation. This "erasing" process is nowadays nearly always done by applying a high frequency field to the tape, so that in the time taken to pass the erase head, the tape particles are subjected to several cycles of alternating field. As shown in the diagram, part of the oscillator's output is also mixed with the programme input to the record head as what is called "bias".

## The Tape

Now let us examine the various links in the recording chain in a little more detail, starting with the tape itself, and working back towards the programme inputs. The standard dimensions of the tape are 0.25 in. wide, by 0.002 in. thick, consisting of a 0.0015 in. cellulose acetate or PVC plastic base, and a 0.0005 inch coating which contains a finely ground iron oxide. In recent years tougher plastic materials, notably polyester, have made possible the production of thinner tapes (0.0014 in.) with a comparable performance, and the advantage of a 50 per cent. increase in the playing time for a given size of spool. These are termed "Long Play" tapes. When preparing the magnetic coating, tape manufacturers have to strike a balance between a material which is easy to magnetise, and one which is difficult to demagnetise. The former—the so-called low or medium coercivity tapes—require comparatively low bias and erase currents, but suffer from poor high frequency response due to the self-demagnetisation that takes place. The latter—high coercivity—are better for permanence of the recording and response to high frequencies, but may be difficult to erase.

The faint spurious echoes that are sometimes heard on tape recordings, due to interaction or "print-through" of the magnetic fields of adjacent turns of the tape, are less in evidence now that medium or high coercivity tapes are the rule. Nevertheless, they

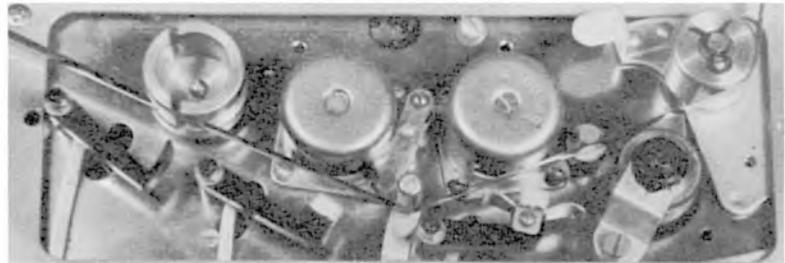


Fig. 3: View of the sound channel of the Wearite deck, showing (l. to r.) automatic stop; erase and record/playback heads each with pressure pad; drive capstan and pressure roller (disengaged).

must be guarded against by never over-modulating the tape, and by avoiding high temperatures.

## The "Record" Head

As indicated in the diagram, the *record head* is usually ring-shaped, with a break or gap at the front and back. The horizontal width of the front gap is approximately 0.001 in. (Except that in some domestic recorders a single head is switched to serve either as record or playback head, and a narrower gap is then employed—approximately 0.0005 in.) Thus the gap may well be invisible to the naked eye, and the front of the head may seem to be of solid steel—highly polished to ensure the closest possible contact between tape and head.

The vertical depth of the head determines the width of the track recorded on the tape. In many professional recorders this corresponds to the full 1/4-in. width of the tape; but it has become the rule with domestic machines to limit recording to a narrow track near one edge, to permit a second recording on the opposite edge. The dimensions for twin-track recording are shown in the diagram, and the standard mode of recording is to use the top track, with the tape travelling from left to right.

Mixed with the programme currents, through the coils of the record head, is the high frequency bias current already referred to. Frequencies used for this are 40–100 Kc/s—i.e. supersonic—and briefly the purpose of this bias is to give better linearity, and less distortion. The exact mechanism of this improvement in quality is not fully understood, even by experts; but it is known that the strength and frequency of the bias current have to be adjusted carefully for best results. This is why a variable bias control is provided on some recorders, and a specific type of tape is recommended for others.

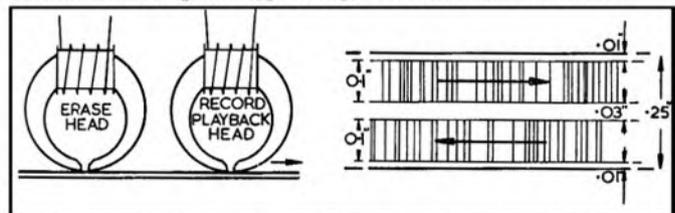


Fig. 2: Standard dimensions and direction of travel used in two-track tape recording.

The output of the bias oscillator is utilised also to erase the tape before it reaches the record head. The switch shown in the diagram may be interlocked with the Record/Replay selector switch, or it may be coupled with some form of safety switch to prevent accidental wiping.

## The Record Amplifier

The primary function of the record amplifier is to raise the voltages supplied by the microphone, gramophone pickup, radio, etc., to a value sufficient to give effective magnetisation of the tape. This may call for a very high gain amplifier for low level inputs, such as ribbon or moving-coil microphones (perhaps 100,000 times). For the higher input levels obtained from some gramophone pickups and the external loudspeaker sockets of a radio set, less gain is necessary. To cater

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## TAKING UP TAPE—(continued)

for these two conditions, many tape recorders have low and high level input sockets—the latter may incorporate an attenuator to reduce the level, or may by-pass the first valve of the record amplifier.

In addition to boosting the signals, the amplifier introduces frequency correction, otherwise known as equalisation, to compensate for the uneven frequency responses inherent in the magnetic recording system. Basically, this consists of pre-emphasis of the high frequencies. It is usual to switch in extra top boost for the lower recording speeds, at which the inherent losses are greater.

It is very important to have the correct setting of the volume or gain control when recording. Too high a setting will cause overloading on the loud passages, and consequent distortion. On the other hand, recording at too low a level will undermodulate the tape; and then the higher volume setting needed on playback will bring the background noise into prominence. The level indicator is designed to guide you in maintaining the correct signal strength. However, this device—magic-eye, level meter, neon lamp, etc.—has the disadvantage of responding equally to high, middle, and low frequencies, and may give unreliable indications of the *loudness* of the sounds as judged by ear.

You should therefore carry out a rough calibration of your particular machine, to find out what visual indications correspond to audible distortion. You might try the following experiment:—read into the microphone in a fairly level voice, increasing the volume setting at the end of each sentence, and noting the level indicator peaks at each stage. Then play back the recording to discover for which indicator readings noticeable distortion begins.

### Recording Inputs

The most obvious source of programme material, and the one which you will certainly try out first, is the microphone. It is the microphone's job to respond to the sound waves, and vibrate in such a way as to generate an alternating voltage at the input to the record amplifier. Ideally, this voltage will faithfully convey all the information that was present in the original sounds. That is, the strength of the voltage will follow the rise and fall in sound intensity, and the number of cycles per second will equal the rate of vibration (i.e. the frequency) of the sound source.

Any departure from this ideal conversion of sound to electricity is called distortion. The most common types of distortion are **overload distortion**, which results in the production of many harsh overtones or harmonics, and **attenuation distortion**, which occurs when the various frequencies present in the sounds are unequally reproduced.

The voltage generated by a microphone for a given intensity of sound is called its sensitivity. This varies considerably between the different types of microphone. For example, crystal microphones, which are widely used with domestic tape recorders, and are relatively inexpensive, are fairly sensitive. They produce an output of approximately 0.002 volts, i.e. 2 millivolts. Ribbon and moving-coil microphones are generally less sensitive, with outputs of about 0.0001 volts, i.e. 10 microvolts.

But these values depend too on the microphone's having been correctly "matched", i.e. connected to input terminals of the appropriate electrical "appearance" or *impedance*. Crystals are said to be "high impedance" microphones, and must be used with a high impedance input—roughly 500,000 ohms. Ribbon and moving-coil microphones on the other hand are low impedance devices, and must be used in conjunction with a step-up transformer. This transformer may be built into the microphone base, or a small connecting box, or be incorporated in the recorder itself, wired to a "low impedance" input.

The terminology of recording from radio, gramophone, and other tape machines, etc., will be discussed next month.

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# NEWS PAGE



● Billy Cotton, with his Grundig TK35 has a trial run through the script of one of his B.B.C. programmes *The "Billy Cotton Band Show"*

In a joint statement on the 28th January C.Q. Audio Ltd. and TSL announced that in future all the marketing of C.Q. products will be carried out by Messrs. Technical Suppliers Ltd., Hudson House, 63 Goldhawk Road, London, W.12.

### New Foot Control for Stenorette

An improved foot control for use with their *Stenorette* dictating machine is announced by Grundig (Great Britain) Limited. Simply designed to allow easy operation for both stop/start and back space, this entirely new unit has a single foot plate control, and is finished in two tones to match the *Stenorette*. It will be known as RCF 33—Mk II and the price remains unaltered at £3 13s. 6d.

In the reference to the **Tape Recorder Centre** (Sypha Sound Sales Ltd.) last month, the postal district was given incorrectly, the address is 75 Grand Parade, Harringay, London, N.4.

**Caplin-Hirst & Co.**, 122 Coram Street, London, W.C.1, are producing a new tape recorder "*The Balmoral*", using the Collaro tape deck; full details will be published next month, but any reader requiring a domestic recorder that is attractively styled, light in weight, and very easy to operate is recommended to write for further details. The price is 49 gns.

A sample has been submitted for review.

**The Tape Recorder Service Co.** have announced a 3-speed recorder selling for £46 4s., "*The Bromley*". It is also hoped shortly to introduce a de luxe model selling for around £65; this will incorporate an electronic timer. Further details from 43 Napier Road, Bromley, Kent.

**Multimusic Ltd.**, manufacturers of Reflectograph professional tape recorders, state that owing to increased demand for their Model 500, and to provide for the manufacture of stereophonic recording and reproducing instruments, they have had to expand production facilities.

An interest in an electronic engineering firm at Chelmsford has been acquired and all record and playback amplifiers will now be made in the Chelmsford works. Complete Reflectographs will continue to be assembled at Hemel Hempstead where a number of unusual soundproof rooms are now being used for individual calibration of each instrument. The recently announced annual maintenance and guarantee scheme, which is free for the first year, is now in operation as more than 120 E.M.I.—Home Maintenance Ltd. Engineers have been trained to service Reflectographs.

We understand that shortly Multimusic will be announcing details whereby owners of the Reflectograph Model 500 will be able to have their instruments converted for both stereo recording and reproduction

whilst being able to retain the facility for monophonic recording and reproduction. All the well known features of the Reflectograph will be retained including the variable speed drive, stroboscope and separate record and playback amplifiers for each channel to permit monitoring off the tape whilst recording.

As from 2nd February, 1959, the Head Offices and Showroom of **Stella Radio and Television Co. Ltd.**, will be located at:—Astra House, 121/3 Shaftesbury Avenue, London, W.C.2. Stella produce two tape recorders, the ST.451 single speed machine, costing £42; and the ST.450 3-speed model, price £69 3s.

**Philips Electrical Ltd.** have introduced a new 4-Channel Mixer (Type ET.1039) which supersedes the existing model ET.1027. The new version sells at £36, £11 less than its predecessor.

Intended not only for public address work, but also for those who are seriously interested in tape recording, the ET.1039 is of compact design and dimensions. It is basically a table mixer which can easily be converted for rack mounting by the fixing of a panel (Type ET.1040) available separately at £1, list.

The finish is of silver hammer enamel on steel and the instrument is provided with rubber feet.

**Getting the Game Taped:** Football coaches in the United States are getting their teams' mistakes literally taped—on *Scotch* video recording tape. The action of the game is recorded on the magnetic tape and during half-time fed through a closed circuit to television monitors in the locker room.

One professional team, the Los Angeles Rams, has been using this system for many of its games this season. During the half-time break the tape is "played back" so that second-half strategy can be adjusted to the performance displayed so far. Now tape has moved into American college football so that boys can sit in their dressing room after a match, watch a tele-recording of the game on TV monitors and study their mistakes. In Britain the use of this particular video tape is so far confined to Independent Television broadcasts.



★  
The new  
Fi-Cord battery  
portable described  
on page 83  
★

**The Minnesota Mining and Manufacturing Co. Ltd.** have introduced a new silicone dry lubrication treatment for their acetate PVC and Polyester-based *Scotch* recording tapes. They claim that this cuts down friction and permits smooth passage of the tape past the heads, thereby considerably reducing the wear on them. This wear on the heads can reduce the frequency response by a full octave. The lubrication properties will last the length of the tape.

**The M.S.S. Recording Co. Ltd.** hope that a thinner polyester film will be available early this year, making it possible for them to introduce Double Play tape, i.e. 2,400 feet on 7-inch reels. This will be a *Melinex*-based tape, which maintains excellent contact with the head. It clings whilst in contact, thus ensuring maximum response on playback.

# IFIFS ANDANDS

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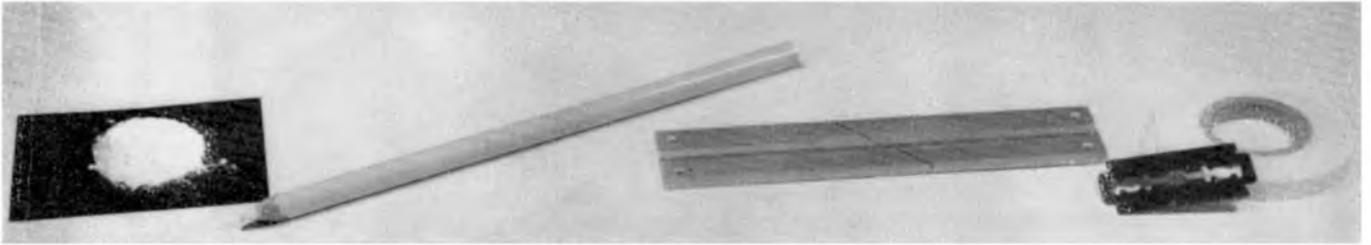


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# HOW TO SPLICE TAPE

## No. 2. CUTTING AND JOINING FOR EDITING



Accessories required in tape editing—french chalk, yellow wax or chinagraph pencil, editing block, razor blade, and jointing tape.

**L**AST month, in the first article of this series, I described the repair of a simple tape break, i.e. a clean break where the two ends match. The other type of break to be dealt with is much more difficult, i.e. where the ends of the tape have been damaged on breaking. In this case, in order to make a good joint, the damaged portions must obviously be cut away. If the tape has been recorded and you wish to preserve a reasonable continuity in your recording, your first job will be to play the tape and to listen carefully to find the most suitable cutting points to achieve this end. Some material is bound to be lost, but naturally there will be some good and some not-so-good points. Firstly, therefore, a "makeshift" joint is called for—one with which you preserve as much of the tape as possible.

Trim each end of the tape as close to the damaged portions as possible. This can be done by overlapping the two ends in the editing block over the 45 degrees slot. Holding the razor blade at an angle (see fig. 3), cut cleanly through both pieces simultaneously. Then joint the tape as shown in figs. 7 and 8.

Now play the tape and select your editing points. Mark them clearly with a yellow wax chinagraph pencil. The marks should be approximately  $\frac{1}{8}$  inch long and should be made at the bottom of the tape (fig. 1). If you always mark at the bottom of the tape, these marks will act as an instant indication of the beginning of a tape length, and whenever you edit in odd lengths, the speech or music will automatically be the right way round.

### Where to Mark the Tape

At this stage you must consider your own tape deck, and decide how you are going to mark the tape so as to ensure absolute accuracy. The obvious point is, of course, the centre of the replay head at which you select your editing point. However, you may find this difficult, since most domestic recorders employ pressure pads to keep the tape in contact with the heads; and nearly all of them are fitted with covers which make the face of the heads inaccessible. In such cases the mark must be made further along the tape, where it can be got at easily.

Let us assume that there is a clear space on your deck, say three inches to the right (or left) of the centre of the replay head. Mark

this point accurately on the deck with a pencil or (better) a small piece of jointing tape. If you intend to do a lot of editing, it will be worth while fixing a small upright pillar to the deck at this point. The pillar should be well polished to avoid friction with the tape. The distance between this point and the centre of the head should be measured most carefully; then make a mark on your editing block precisely the same distance from the 45 degrees slot, and in the same direction away from it. Such a reference mark can be seen on the editing block in fig. 2.

### Where to Cut the Tape

If your deck allows you to mark your spot over the actual centre of the replay head, you will obviously only have to place the spot over the 45 degrees slot and cut across its centre. If, however, you have been obliged to use the "offset" method described above, you will merely have to place the spot on the tape against the reference line on the editing block; the point to be cut will then automatically be in position over the 45 degrees slot.

Fig. 1 shows the first spot marked on the bottom of the tape (with a pin added purely as a photographic aid to indicate it clearly).

In fig. 2 the tape is shown marked each side of the piece to be removed. (The pins have again been used merely to draw your attention to the marks.)

Fig. 3 shows the actual cutting at the first mark on the tape. You will see the angle at which the blade is held. Avoid using a sawing motion, or a blunt blade, for these can cause ragged edges and consequently an unsatisfactory joint. Then overlap the second mark as shown in fig. 4 and cut again.

After cutting, remove the unwanted piece (see fig. 5), leaving the two ends to be jointed butted together. Make your joint as in figs. 7 and 8.

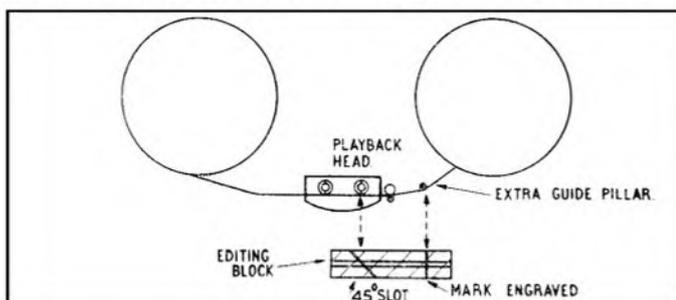
Fig. 6 has been included to show the piece removed, and to demonstrate clearly the point made earlier about marking the bottom of the tape.

### Removing Long Sections of Tape

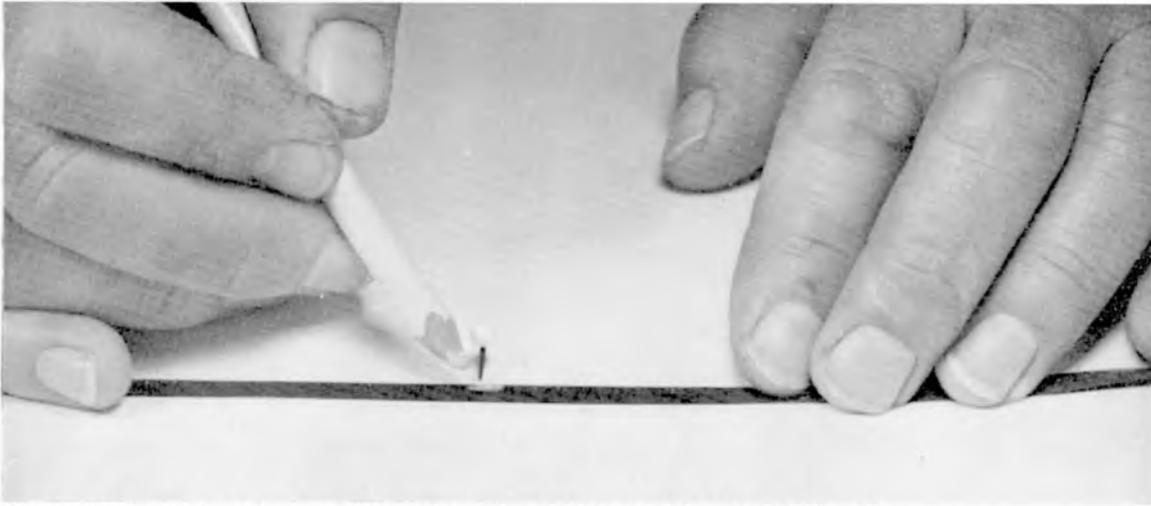
The piece removed, in the editing shown, consisted of only two words—about three inches of tape. If you were removing a much longer piece, e.g. thirty seconds or more, then a slightly different procedure would be adopted, as follows:

First mark and cut the start of the piece to be removed, and run this piece off on to a spare empty spool. Cut at your second mark, and make your joint. The piece removed can then be jointed on to the end of the reel and erased, so that no tape is wasted.

So far this discussion has assumed, for simplicity, that only one track of the tape has been recorded. But now we must consider the

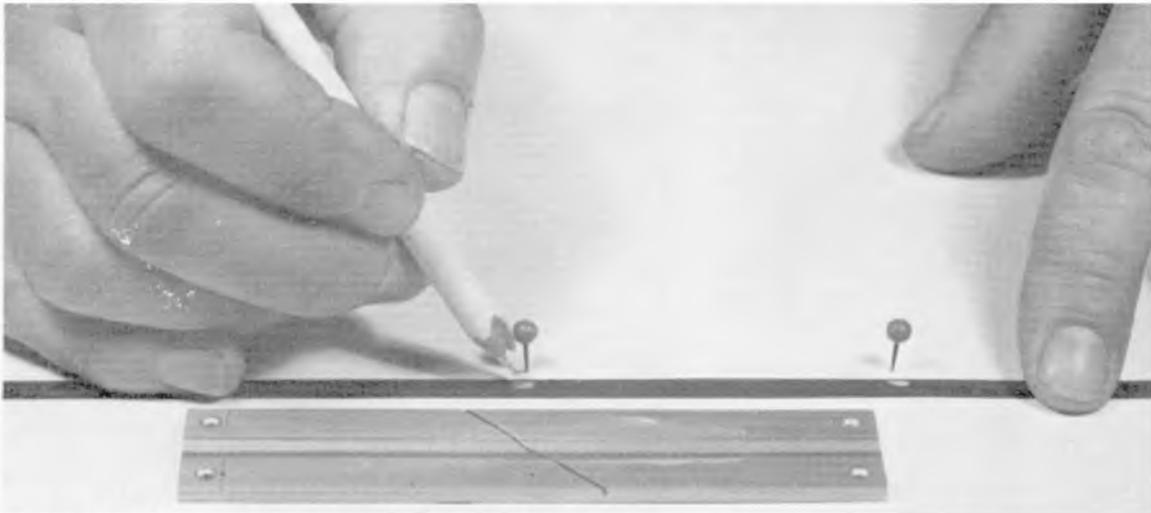


# ★ THESE 8 PICTURES SHOW



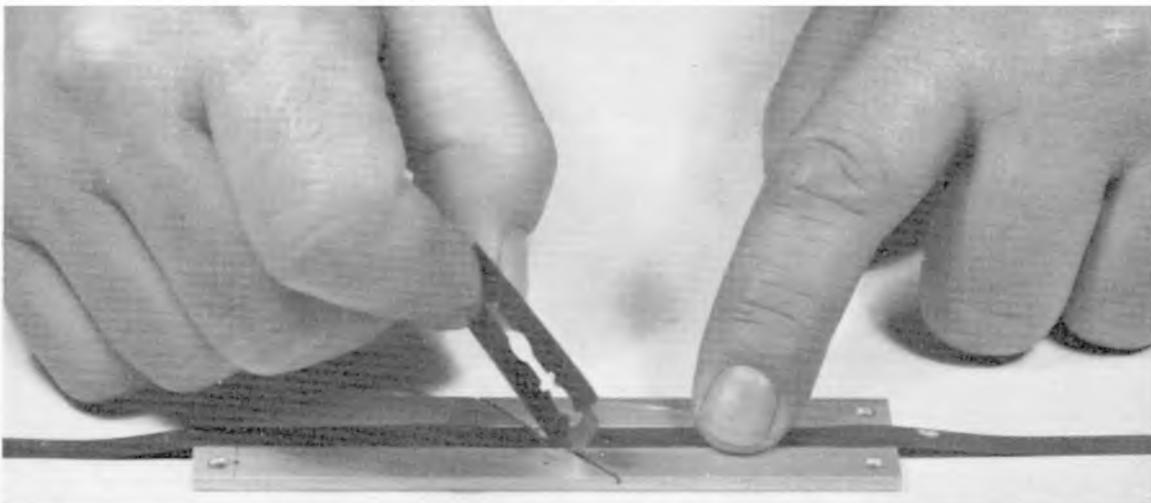
**1**  
Make  
First  
Mark

**Fig. 1:** *Mark with the yellow wax chinagraph pencil at the bottom of the tape as indicated.*



**2**  
Make  
Second  
Mark

**Fig. 2:** *Mark before and after the unwanted portion, before cutting.*



**3**  
Cut  
First  
Mark

**Fig. 3:** *Cut at the first mark. Note the angle of the blade and that the cut is made through the centre of the mark.*

# HOW TO CUT OUT WORDS! ★

We start in this article with the assumption that your tape has broken in such a way as to damage the ends, and you therefore have to cut away a portion of tape. However, the steps described for coping with this situation are equally applicable to the job of editing out unwanted words, coughs, etc. Developing a quick skill at splicing in this way is the first stage in becoming a virtuoso tape editor. The other requirements are a good ear, and plenty of practice.

probability that there will be recorded material on both upper and lower tracks.

Again, trim away the damaged portions and joint the tape. In making your joint, you may by sheer chance have cut at points which do not seriously affect the continuity of either track, but I'm afraid that the odds are heavily against this, and you will have to consider editing so as to effect an improvement.

Remember, before marking and cutting, that whatever you do on one track will affect the other. I would suggest therefore that, if you have the facilities (i.e. another tape deck and pre-amplifier), you copy one track to a new tape before attempting any editing. Thus each track can be edited separately. After editing both tracks, the uncopied track may then be copied to the second tape. Restoring the copied track to its original tape should be avoided, since this would involve

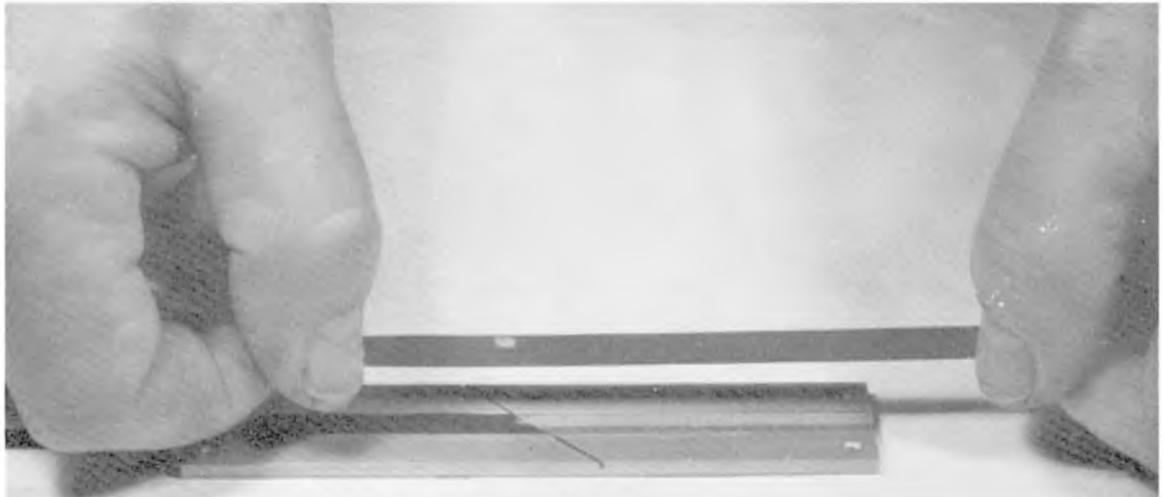
making a copy of a copy, probably resulting in an appreciable loss of quality.

To avoid cutting both tapes, the following procedure may be adopted: first edit one track, retaining the portion you cut out (this is most important), and copy this edited track to a new tape. Replace the portion removed on your first editing. It is then possible to edit the second track and to copy this to the new tape. Your original tape can then be serviced and used again.

In these first two articles, I have dealt with the temporary jointing of tapes; and this method you may well find adequate for your requirements. However, you may decide that a joint of a more permanent nature is required. This type of joint, and the servicing and care of tapes, I shall be dealing with in the next and final article on the mechanics of tape editing.

**4**

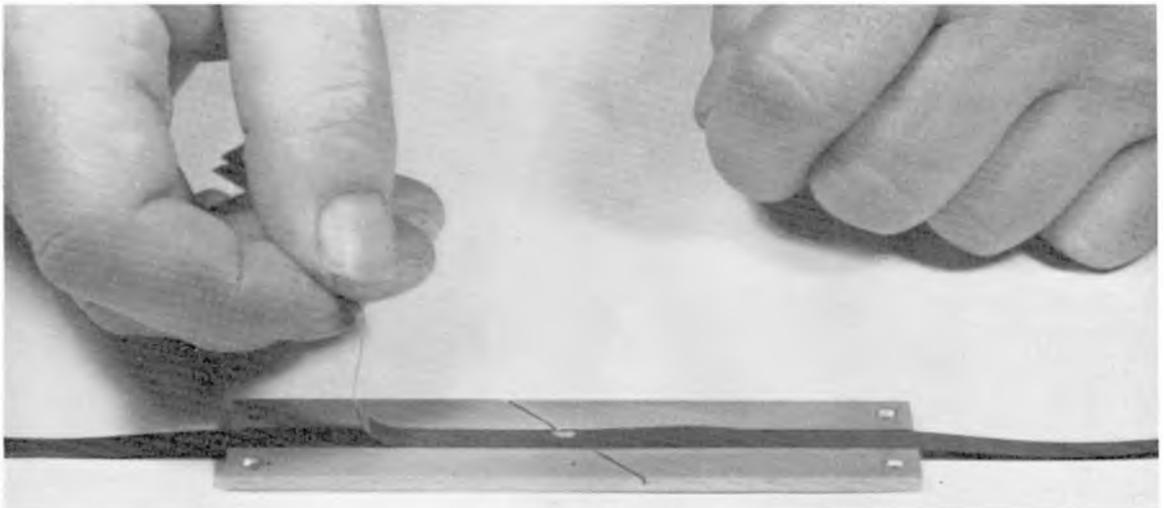
**Overlap  
Second  
Mark**



**Fig. 4:** *Overlap the second mark on the first, and cut as before.*

**5**

**Cut  
Again**



**Fig. 5:** *Removal of the unwanted portion will leave the two ends butted together ready for jointing.*

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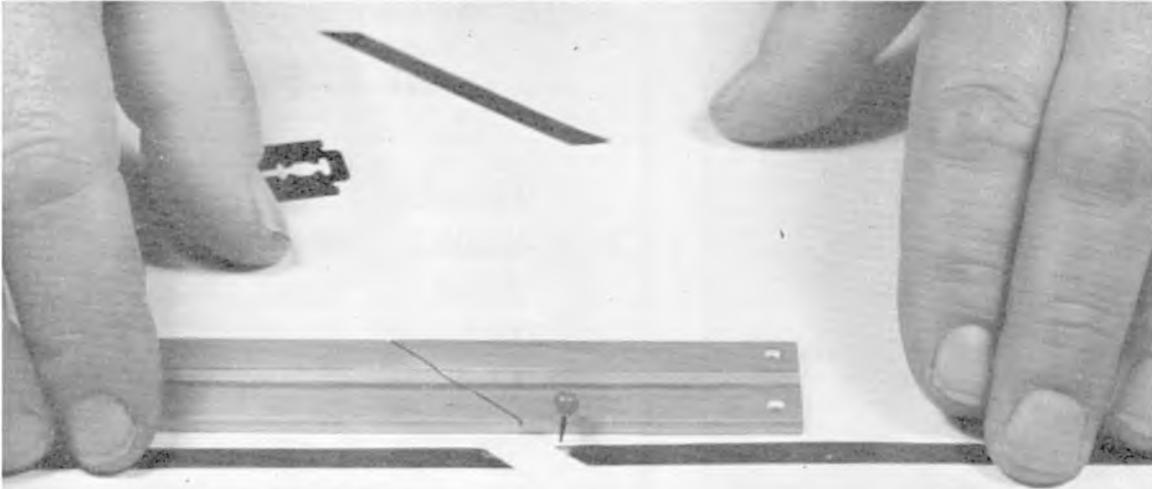
*Address .....*

*.....*

*.....*

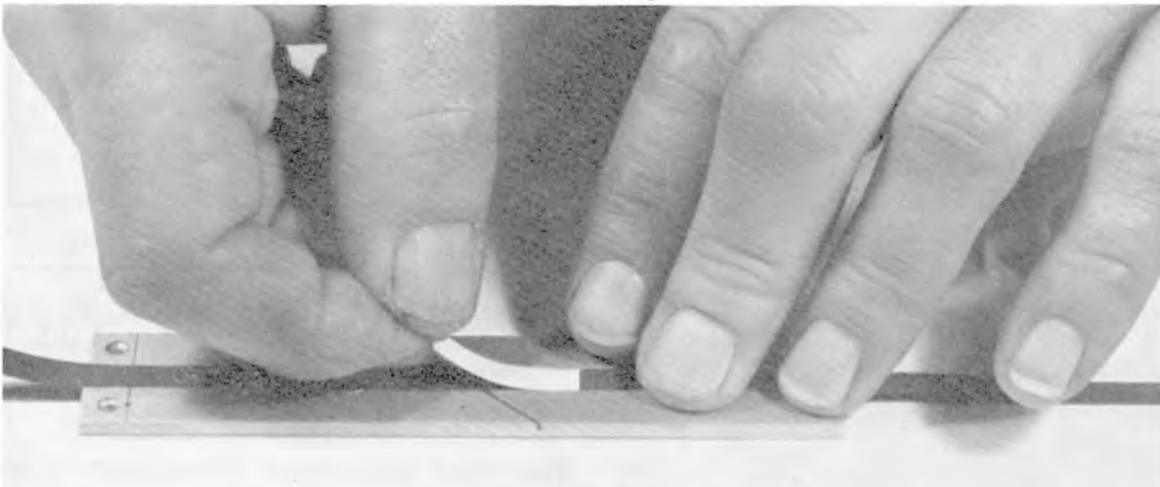


. . . and the splice is completed as before!



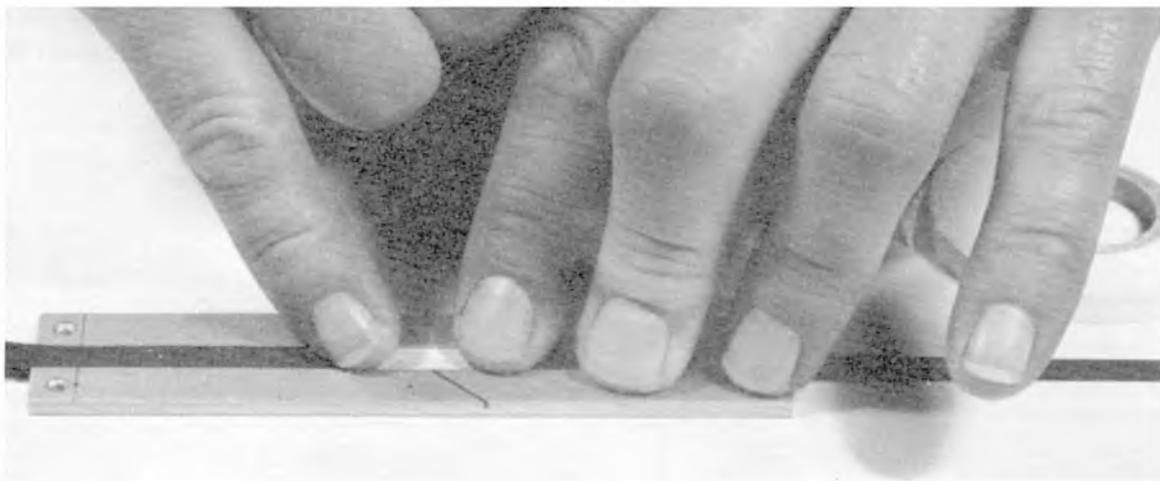
**6**  
Ends  
Match  
Exactly

**Fig. 6:** The unwanted portion removed and the two ends lifted from the editing block to show clearly the clean cuts and the marks remaining.



**7**  
Line up  
Jointing  
Tape

**Fig. 7:** Approximately 1 inch of jointing tape is placed over the break. Ensure that the jointing tape does not overlap the outer edges.



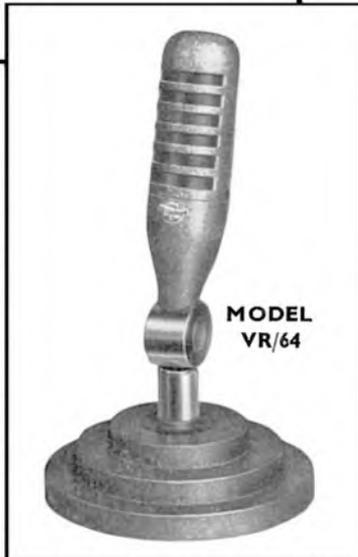
**8**  
Press  
Down  
Firmly

**Fig. 8:** Press down firmly to exclude air bubbles and ensure good adhesion, and finish off with a light application of french chalk, as described last month.

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## YOUR LOCAL CLUB? (2)

### The Literary Tape Circle

THE Circle is believed to be the first group of its kind. Circle members are interested in literature, chiefly poetry, and in tape as a medium for its discussion. The first circle was recently established, and other circles can be started for newcomers. The circle must be small; about six. Even with only six members if a recorded tape is posted to each member in turn and each retains it for a week, it takes twelve weeks before all contributions have been heard by all members. Personal correspondence is not included. Good listening as well as good talking is necessary in a successful tape circle, and the use of excerpts from radio broadcasts and from previous tapes are also useful for discussion or illustration, and these require a reasonably good technical management. Poor recording reduces the effectiveness of a contribution, this is where the clubs and technical press provide assistance. In their view an adequate tape technique is necessary before the purposes of a literary tape circle can be served. Careless management could be disastrous when the listener is interested in the technique as well as the art of reading. Tempo, tone and articulation are subtleties well within the compass of tape when it is well handled.

The Secretary suggests that a minimum of organisation to start a new circle would be necessary. The expenses are small: mainly members' postage. There should be a treasurer, and a secretary to prepare the rota and keep track of tapes. A Members' List with details of interests and equipment is desirable.

Those interested in literary matters and owning a tape recorder, but who require assistance in organising a small group of amateurs are invited to write to Mr. Albert Chapman, 31 Dulwich Village, London, S.E.21.

### CLUB ROUNDABOUT—

● **Coventry.** This month has proved quite a busy one for the Coventry Tape Recording Club. They have visited the International Club at the Quakers Hall, Hill Street, where a programme was arranged for the members. Tapes played included "Strange to your Ears", Part 1, and a number of overseas tapespondents in North America and Sweden. Members of the International Club were recorded also, so that they could hear their own voices played back. The evening was a success, especially as this is a new type of presentation for the Club.

At the Meeting held on the 22nd January, 1959, the matching of Members' microphones on Ron Longmore's "Spectone" Tape Recorder proved most interesting and the differences were most marked. Details of future meetings can be obtained from the Hon. Secretary, Roy Reynolds, 1 Thurlstone Road, Radford, Coventry.

● **Crawley & West Sussex Tape Recording Club** (in formation). It is hoped to hold the inaugural meeting in mid-March. All those who have submitted their names will be informed of time and place. New members are welcome, whether in possession of Recorders or not. Particulars from Acting Secretary, R. C. Watson, 32 Southgate Drive, Crawley, Sussex.

● **Edinburgh.** Alex. Whyte resigned as Secretary due to pressure of business, but remains on the committee. Mr. John F Tenman has taken over the office of Secretary. At their meeting on the 20th January the subject was the reading and recording of plays.

● **Etessa.** At the AGM held at the Club recently the existing committee were re-elected *en bloc* for 1959. The Club have been pleased to welcome nine new members in the past month.

● **Jarrow.** On the 29th January, 1959, a meeting was held and the Jarrow and District Tape Recording Club was officially formed. Mr. John Rippington was elected Hon. Secretary. Although no fixed Constitution has yet been decided, this will be done at a future meeting.

The last Meeting was held on the 12th February at 30 Breamish Street, Jarrow, Co. Durham, and for dates of future meetings, details, etc., please write to Mr. Rippington at 30 Breamish Street.

● **London.** The Abbey Community Association, where the Club meets on the first Thursday in each month, is holding a Spring Fair on April 18th. The object of this Fair is to raise money for the Association to carry on its good work. The Club is co-operating closely with the organisers and will be providing background music and announcements throughout the building. In addition it is

# TAPE CLUBS

## Notes and News

proposed that the Club will run a "Record your own voice" stand. Secretary—E. Roger Aslin, 29 Belmont Road, Uxbridge, Middx.

● **The Midland Counties Tape Society** have now changed their name to the **Tape Recording Society (of Great Britain)**. The Tape Recording Society is unusual in that it relies purely upon the medium of tape to maintain contact with its members, they issue to their members each month, a Sound magazine, a Technical magazine and an Opinion tape, and they are in the process of compiling an effects library. Full details of the Society may be had from the Hon. Secretary, John R. Walters, 29 Pitt Street, Broadwaters, Kidderminster, Worcs.

● **Rugby.** The membership is now twenty-eight, which includes five ladies. Mr. Campden, Mrs. Oxbury and Mr. Scott have been elected to the Committee.

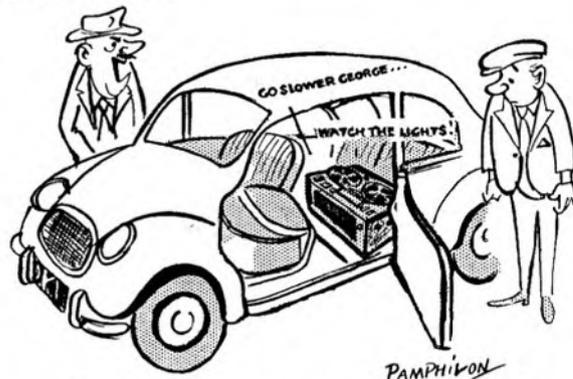
At a meeting on January 28th an entry was played over to the members of a tape that has been entered in the National Tape Drama Competition by the play reading section. A tape was made and every member spoke greetings for the inaugural meeting of the Leicester Tape Club held on the 29th January, 1959.

Three car-loads of members visited the BBC Sound Studios at Birmingham on February 3rd.

Their next meeting will take place on February 19th, at 7.30 p.m. at the Gatehouse, North Street. One item will be a technical film by Mullards. For details of future meetings please write to the Secretary, Mike Brown, 219, Clifton Road, Rugby, Warwickshire.

● **Tape Programmes for the Blind.** Those who would like to help a really worthwhile cause, please contact Mr. M. L. Chambers, Tape Programmes for the Blind, 139 Goldthorne Avenue, Sheldon, Birmingham, 26.

● **Tape Recorder Club.** In order to eliminate any possibility of confusion between The Tape Recorder Club and Messrs. Sypha Sound Sales Limited who also use the title Tape Recorder Centre, this Club will be known, in future, as "Lanes British Tape Recorder Club". And until their own premises are available all communications are to be addressed to the Secretary, A. Alexander, 123 Sutton Common Road, Sutton, Surrey.



"IT'S MY WIFE'S IDEA - SHE'S IN BED WITH 'FLU"

● **Voicespondence Club** (Noel, Virginia, USA). At the recent election of Club Deputies, Mr. Lee Lacy of 15 Fentons Avenue, Plaistow, London, E.13, was elected English Special Deputy; Sir Mark Dalrymple, Bart., was elected Celtic-British Special Deputy. All queries concerning the Club can now be sent direct to the representatives,

Membership enquiries should be sent to Mr. Ron Davies, the Publicity Representative of the Voicespondence Club, at 15 Fentons Avenue, Plaistow, London, E.13.

● Readers living in any of the following districts who are interested in joining clubs which are being formed in these areas are invited to write in for the name and address of the acting secretary: **Bristol**; **Birmingham** (2 clubs); **Eastam**, Cheshire; **Hereford**; and **Leigh**, Lancs.

# SOMETHING NEW!-(No. 2)



● Here is the new-style tape, as it is packed and presented for the dealer's counter. Each title is in a strong cardboard case which opens bookwise. The cover is attractively designed and printed in full colour, presumably to rank on equal terms with the universally popular lp disc sleeves when it comes to eye-catching appeal. In each box, also, is the equivalent of the disc's sleeve note—a printed sheet describing the contents of the tape. Our photo shows the cassette pulled slightly from the box. RCA (America) have already produced quite a catalogue of these tapes, ranging from classical works, through songs, to dance and Jazz. Rumour has it that they are offering manufacturing rights to various firms in this country. So far no one has made even a tentative announcement about British production.

Officially, there are no RCA tape cassettes in this country. Unofficially, there are dozens. We have seen them in many strange places—on 'lab' benches, in manufacturers' offices, etc.—and they are causing a lot of people a lot of thought So, we introduce you to:—

## THE NEW R.C.A. TAPE CASSETTE

FORECASTING developments in sound reproduction is a risky business at any time, and the changing fortunes of tape and disc constitute a particularly controversial topic at present. But if there is controversy in this country over this latest threat to the status quo, there is furious argument on the other side of the Atlantic.

Which is right?—the optimistic view, that the new cartridges combine all the advantages of tape, including good quality, quiet background, no deterioration with frequent playing, and the possibility of making home recordings, whilst being as easy to use as discs (a view to which Stanley Kelly subscribes here)? or the pessimistic view (perhaps not entirely "disinterested") that this new cartridge has only joined battle with stereo discs on equal terms of price and easy handling at the sacrifice of tape's principal advantage—superior quality and crosstalk figures?

All this the next year or two will reveal. It may be, as one authority has suggested, that all three forms will co-exist, stereo disc, two-track tape, and four-track tape cartridge. If the result is an improved quality/cost ratio, we customers shall perhaps feel that all the present confusion has been worthwhile.

**Important Note.** This report represents the views of the author, Stanley Kelly. It is an independent survey, and it does not necessarily reflect the opinions of the editorial office.

(Editor.)

FOR a number of years, many thinking engineers have prognosticated the doom of the gramophone record. At one time, it was the radio; later, it was talking films; then it was television. Just after the war, the long-playing record rescued the industry from what many people thought were the doldrums preceding final stagnation and, lately, twin-channel disc (erroneously called "stereo") has put off, at least for some short period, the final extinction of this mechanical monstrosity.

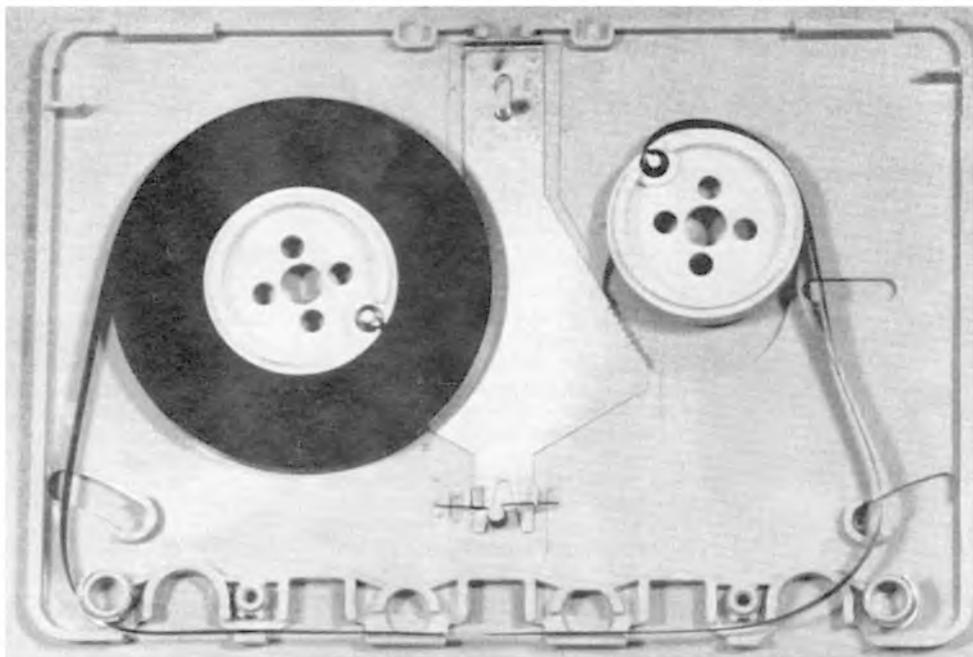


● The cassette is made from plastic in a dove grey finish, with the label in black and white. To the right and left of the spools are window slots which show the spooled tape, which can also be seen passing down to its tracking position through the curved slots, left and right. The five recesses at the foot of the cassette in the photo are used as follows: Left and right (semi-circular) accept the capstan and idler wheels. Centre fits round the erase head. Left and right of this fit round record/replay heads. The cassette is a turn-over product (like a disc!), and the recesses therefore work appropriately both ways. The recess at the top accepts a projection which releases a tape brake when the cassette is pressed into position on the playing deck. Access to the cassette is by the two screws shown at the bottom of the photo.

\*THIS IS NOT A REVIEW

## FIRST REPORT\*

● When the two screws are removed, the top of the cassette hinges back and detaches. We have moved the empty spool from its circular guide in order to show the brake mechanism—a series of serrations on the wedge-shaped metal plate. These grip a flange on each spool under spring pressure, until the brake is automatically released by mechanical pressure when the cassette is placed in playing position on the deck. As described in the text of Stanley Kelly's report, the tapes can be used for playbacks only—or for recording, with erasure as in normal practice—depending upon the type of machine the user decides to buy. For the former purpose, only one head would be fitted; and this would engage with the second slot in the photo.



The only reason why the gramophone record has lasted so long (and will probably last for another couple of generations) is because it is virtually foolproof. Anyone can put a record on to a turntable and place the pickup within  $\pm 10$  grooves of the start. But all tape enthusiasts, no matter how rabid, will agree that threading a spool of tape on the majority of domestic recorders is not an operation recommended for morons.

What is needed is a "packaged" tape cartridge, in which the user just has to drop it into position and everything else is taken care of. Some years ago, the National Institute for the Blind produced just such a system for their talking books, but it is only within the last few months that this same system has become not only a commercial possibility but an accomplished fact. R.C.A. introduced the 45 r.p.m. record nearly ten years ago which, despite the moans and groans of critics at its inception, now outsells practically every other type of record. Once again, R.C.A. have produced a startling innovation, namely, the "R.C.A. TAPE CARTRIDGE"

This consists of a plastic moulding holding up to 600 feet of standard  $\frac{1}{4}$ -inch  $\times$  one thou. tape. It operates at a speed of  $3\frac{1}{2}$  inches per sec. and carries four tracks. The tracks can be arranged to play in turn, giving a total maximum playing time of two hours or, if used as a stereo combination, giving a total maximum playing time of one hour. Prices are strictly comparable to those prevailing in the United States for stereo discs.

### The mechanics of the system

And now to the mechanics of the system: From the photograph it will be seen that the two spools are carried in a container with five cut-outs on the front face, and one cut-out and two blind holes on the back face. The purpose of the central cut-out at the back is to provide an automatic brake which is only released when the cartridge is pressed home into the playing deck. Thus, removing the cartridge from the deck automatically applies the brake to the spools. On the front face, the two outer semi-circular cut-outs are to take the capstan and idler. The two outer square cut-outs are for the "Record" (and/or "Replay") heads, whilst the centre cut-out is to take the "Erase" head.

Two types of tape transport mechanism are envisaged: Type A, the simple one, consists of one playback head and one capstan only; after the tape has been played on the first pair of tracks the cartridge is simply lifted from the mechanism, turned over, and re-inserted, the Replay head and capstan thus engaging on the other pair of slots. Where recording facilities are provided, there will obviously be the Erase head, which always engages the centre slot—but of this, more anon. The second, Type B, tape transport features an automatic reversing switch. This deck will have two capstans and two heads, and the tape reverses automatically when it gets to the end of the

spool, the curved slots in the cartridge being provided for the trip pins for this operation.

At the back of the cartridge, placed symmetrically about the slot covering the brake mechanism, are two blind holes, which, on decks provided with recording facilities, operate an interlock switch thus preventing accidental connection of the Record/Replay head to the recording amplifier and the Erase head to its oscillator. This makes it impossible to accidentally erase recorded material. Cartridges fitted with blank tape have these holes filled with removable "knock-out" pieces, the interlock switch then allows the normal "record" facilities to operate. After recording, the "knockouts" are removed and the cartridge is used for playback in the normal manner.

The tape, which is standard  $\frac{1}{4}$ -inch material is provided with four tracks, each of 0.043 inch wide and separated by 0.025 inch. Tracks 1 and 3 operate in one direction, whilst tracks 2 and 4 operate in the other direction. When used for dual channel recording, tracks 1 and 4 are recorded with information for the lefthand speaker, and 2 and 3 feed the righthand speaker. The optimum dimensions for the heads are 0.043 inch wide, spaced 0.136 centre to centre, whilst the Erase head is also a dual unit, having a nominal width of 0.051 inch with a 0.136 centre to centre spacing. Where the Erase head is used with the automatic reversing deck, a cam lifts it into the correct position for initially erasing the tracks being recorded.

The design of tape and tape heads has progressed considerably during the last few years and, with present day techniques (which for the head consist of lapping the gap faces of each half of the core to within optical limits and then precisely plating (usually 2 microns) the non-magnetic spacer on to the core face) has enabled a frequency response up to 15 Kc/s  $\pm 3$  dB to be obtained at a tape speed of  $3\frac{1}{2}$  inches per sec. for a signal to noise ratio in excess of 45 dB. The constant current frequency response for a typical tape running at  $3\frac{1}{2}$  inches per sec. gives a rise of 6 dB per octave to 3 Kc/s, and a gradual fall of 18 dB to 15 Kc/s from the maximum (3 Kc/s), the slope being about  $-9$  dB per octave. The 15 Kc/s level coincides with that at 180 c/s. For machines used for domestic conditions it is only necessary to put a constant  $-6$  dB per octave de-emphasiser up to 3 Kc/s and then allow it to flatten (normal RC network), giving an overall frequency response of 80 c/s to 8 Kc/s for  $\pm 3$  dB limits. Where it is desired to improve the overall high frequency response, standard equalising techniques well known in the tape field can be used.

To conclude: I think that this is probably the biggest single revolution in the tape field since the inception of plastic tape. If correctly applied (in a commercial sense) it can, within a few years, put the tape reproducer in the same position as the gramophone player unit is today.

# British Recorders meet the challenge . . .

With the spur of increasing and substantial competition from continental designers certain British tape recording manufacturers have well and truly accepted the challenge. To name but a few—REFLECTOGRAPH, REPS, VERITONE, VERDIK. Come to Audio House and see for yourself how well these British recorders perform.



## REPS

Practically a hand-made machine as a high quality tape recorder such as this cannot possibly be mass produced. Provision for stereo adaptation if desired.

R 20 62 gns. with magic eye record indicator.

R 30 66 gns. with meter record level indicator.

R 40 70 gns. as R 30 but with push/pull sound output.

## REFLECTOGRAPH

Model 500. Entirely self-contained. Separate record and replay heads—two independent amplifiers. Push button controls with safety latch for record button. Clock type tape position indicator. Complete with output amplifier, two matched loudspeakers. 94 gns.



## VERDIK

A fully monitored QUALITY tape recorder with a feature hitherto obtainable only in equipment costing double the price. Separate Record and Play-back amplifiers and heads allow playback as you record—no more ruined recordings. Speeds  $3\frac{3}{4}$ " / sec.,  $7\frac{1}{2}$ " / sec. Five valves plus magic eye level indicator. High flux internal speaker. Frequency 40 c/s to 12 kc/s. Corrected output for play-back through your Hi-Fi amplifier. Provision for 15 ohm external speaker. Complete with 1,200 ft. tape and microphone. 45 gns.

### Make full use of your recorder . . .

As a regular reader of *Hi-Fi News* you may be familiar with the excellent resources of our Tape Library and are enjoying the rich entertainment these facilities provide. There are still several users of tape recorders however, who are unaware of the hours and hours of pleasure afforded by this service. To those we say send for details today. 6d. in stamps. A grand selection of stereo and monaural recordings is available.



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## TAPE RECORDS

★ Last month we reviewed three tapes from the H.M.V. and Columbia catalogues—one stereo : two monaural. To our surprise, this feature brought us more than a dozen letters and telephone calls from readers asking where tape records could be obtained, and whether catalogues existed. The answer to the first is: from any record dealer who handles the E.M.I. disc catalogue. And catalogues of these tapes can be obtained from E.M.K. Records Ltd., 8-11 Great Castle Street, London, W.1. In addition, we understand that more lists of tape records from a catalogue named *Phonoband* are now available from T.S.L. Limited, Hudson House, 63 Goldhawk Road, London, W.12.

In view of this apparent uncertainty, sooner than review one or two tapes this month, we decided to select some notably good titles from reviews which have appeared over the past three years in our other publications, *Hi-Fi News* and *Record News*. These tapes may be bought without hesitation, speaking in terms of good musical performance and high quality recording.

### Stereo Tapes

**SDT 1750.** Prokofiev. *Classical Symphony*. Played by the Philharmonia Orchestra, conducted by Nicolai Malko. An H.M.V. tape. Playing time approx. 14 minutes. Price 42s.

**BTD 702.** *The Very Thought of You*. Played by Norrie Paramor and his orchestra. A Columbia tape. Playing time 14 minutes, price 42s.

**BTD 705.** The Music of Eric Coates (*Three Bears; Sleepy Lagoon; Queen Elizabeth March*). Played by the London Symphony Orchestra, conducted by Charles Mackerras. Columbia tape. Playing time, approx. 18 minutes, price 42s.

**BTC 503.** Waltzing with Waldteufel (No. 1) containing *The Skaters* waltz; *Mon Reve; Estudiantina*. Played by the Philharmonia Orchestra, conducted by Henry Krips. Columbia tape. Playing time 22 minutes, price 55s.

### Single Channel Tapes

**HTA 19.** *Operatic Arias*, sung in Italian by Victoria de los Angeles, with the chorus of the Opera House, Rome, conducted by Giuseppe Morelli. H.M.V. tape. Playing time approx. 49½ minutes. Price 84s. We are almost tired of recommending this tape, but will never tire of hearing it.

**HTA 23.** *Sorcerer's Apprentice*, by Dukas. *A l'apres-midi d'un Faun*, by Debussy. *The Three-Cornered Hat*, by Falla. *Pavane for a dead Infanta*, by Ravel. Played by the Philharmonia Orchestra, conducted by Guido Cantelli. H.M.V. tape. Playing time 38 minutes, price 84s.

**Footnote:** Readers are advised to "de-gauss" their tape heads before using tape records. Magnetised heads can damage recordings by introducing hiss. This subject will be dealt with next month. In the meantime, "defluxers" (made by British Ferroglyph Recorders Co., Ltd., 131 Sloane Street, London, S.W.1) are available from hi-fi dealers. Price 50s. All owners of tape recorders should consider such an accessory.

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Bargains, Equipment Sale—See our Classified Ad.—page 90

**Record Cabinets** as shown for 450 Lps. Price £14 12 6. Full range from £8 12 6.

# WHAT DO THESE THINGS MEAN TO YOU?

(2) WOW &amp; FLUTTER

★ If you are about to buy a tape recorder—or if you already own one—there are about six points in the manufacturers' specification which will concern you. But don't be blinded by them. Their importance varies, according to your own demands from your recorder. This series of articles is written in order to explain them in daily, matter-of-fact terms.

SOME manufacturers of tape recorders are also manufacturers of rods for their own backs. Not content with making a really good and useful domestic instrument, which is often capable of doing more than the average user will demand of it, they then spoil the whole picture by claiming the Earth, Moon and Stars for it. And by so doing, if only they could see it, they actually debase the product.

There are, roughly speaking, three grades of tape recorder. Domestic; Semi-professional; Professional. There is only one factor which separates these grades. It is price. There are tens of thousands of buyers for the first grade, thousands for the second, and perhaps hundreds for the latter. The price differences enable the designers and manufacturers to incorporate more costly parts, more precise electronics, more refinements, and far closer electrical and mechanical tolerances. Yet, reading the various claims made by manufacturers, one might well believe all this to be nonsense. Let us take an example or two:

### The Modest Claims of the Giants

The EMI TR90 Professional recorder, as used by record manufacturers, broadcasting companies and the like, sells for about £600. Its specification claims a frequency response of 50 to 10,000 c/s within 2 dB at the  $7\frac{1}{2}$  i/s speed, with a Wow and Flutter not greater than 0.15%. The American Ampex Professional model of comparable price is sold with comparable claims.

Skipping over the names of several semi-professional makes, we find similarly conservative claims in the price range of £100 to £200. But when we survey the domestic field, we find recorders in the price range of £40 to £60 with claims for a far better performance than the professional giants. Who is trying to fool who?

To quote the words of one of our *Hi-Fi News* reviewers: "The so-and-so is a jolly good machine. It is just what the doctor ordered, for anyone who wants a good, all-round instrument. Yet I have to criticise it, because it nowhere near meets the claims made for it. If these people don't want unnecessary criticisms, why on earth do they invite them by making such stupid statements?"

### What are the Acceptable Standards?

And so we come to the sub-heading of this article "Wow and Flutter". Writing in *Hi-Fi News* (June 1957, page 25), James Moir summed up the requirements as follows: ". . . it is difficult to put down any precise value that is acceptable in all circumstances without suggesting an unattainable figure. I regard 0.05% as the desirable target, 0.1% as very good indeed, 0.2% as acceptable, and 0.3% as tolerable in small machines where performance must be sacrificed to portability." And as a practical postscript to those well considered words of wisdom from an expert, let us add that we have never yet seen the first figure claimed, even for the most expensive professional machine made: similarly, we have yet to meet the modest claim of the latter figure, even in the most humble or miniature portable!

The articles in this series are being written to aid the purchaser. That they must often debunk the "specification" is as necessary as it is unfortunate. A manufacturer's "tec spec" was once sacrosanct: today, alas, it is all too often a sales gimmick. So, as was cautioned last month, beware of the fabulous claims. Ask yourself, in the words

of the title of the series: "What do these things mean to you?" And, in this case therefore, what does 0.1% Wow and Flutter mean?

First of all, the two terms must be examined separately. "Wow" is the very apt word coined to cover the relatively slow variations in pitch. "Flutter" covers the higher frequency variations. The former is probably heard at its worst when a sustained piano note wobbles rhythmically, sharp and flat. The latter can be heard at its most irritating limit in the rapid tremolo added to a high pitched note, as in song. The two are usually combined in a specification as "a percentage"; but unless one understands how the percentage was measured—and knows, in fact, "the percentage of what"—the statement is worthless.

Let it be taken for granted that manufacturers mean their percentage to be understood as the amount of speed variation which occurs around the proper speed. And since variation of speed means variation of pitch in sound, let us think in those terms. Therefore, a note recorded at 1,000 c/s can only be reproduced by a tape recorder at that strict frequency if no wow or flutter are introduced by the machine. If the often quoted 0.1% wow and flutter figure is truly quoted, then the 1,000 c/s note will only vary by 1 c/s each way, i.e. 1,001 to 999 c/s. It would take a good ear to detect that! But down towards the bass end, say at 100 c/s, with the same speed variation, it would be audible, just. And if the percentage were 3, it would be a bit wobbly, and definitely very annoying at 30 c/s.

In the end, it is the ear which must dictate to the purchaser what is acceptable and what is not; and therefore it is a good plan, before buying a recorder, to listen to the right kind of recorded sounds—not a brass band! If the "spec" claims 0.1%, and if you feel seasick when listening to a sustained piano chord, then listen again on another machine" But, again, do not be super-critical of the small portable that you intend to use primarily for speech. Provided that the price is right, and that it does the intended job satisfactorily, why look for the Moon and the Stars?

### How Wow and Flutter Creep In

Wow and flutter can be introduced through a number of loop-holes. Just because a machine is claimed to do this-and-that, do not assume that it will do it regardless of the treatment handed out to it. The points that are under the manufacturer's control are: accurately made flywheel, capstan, pinch roller and take-up mechanics. And, if tape-tension guides are fitted, they should move smoothly. Slight snatch in such rollers can introduce flutter. Points outside the manufacturer's domain include: uneven cores on spools, warped spools that snatch at the tape, bad spooling on the take-up side, often caused by careless threading at the start of the tape. This, even if only a slight lump, results in the successive layers of tape building up on the spool eccentrically, so that every turn of the spool adds a tug to the tape as it passes the replay head.

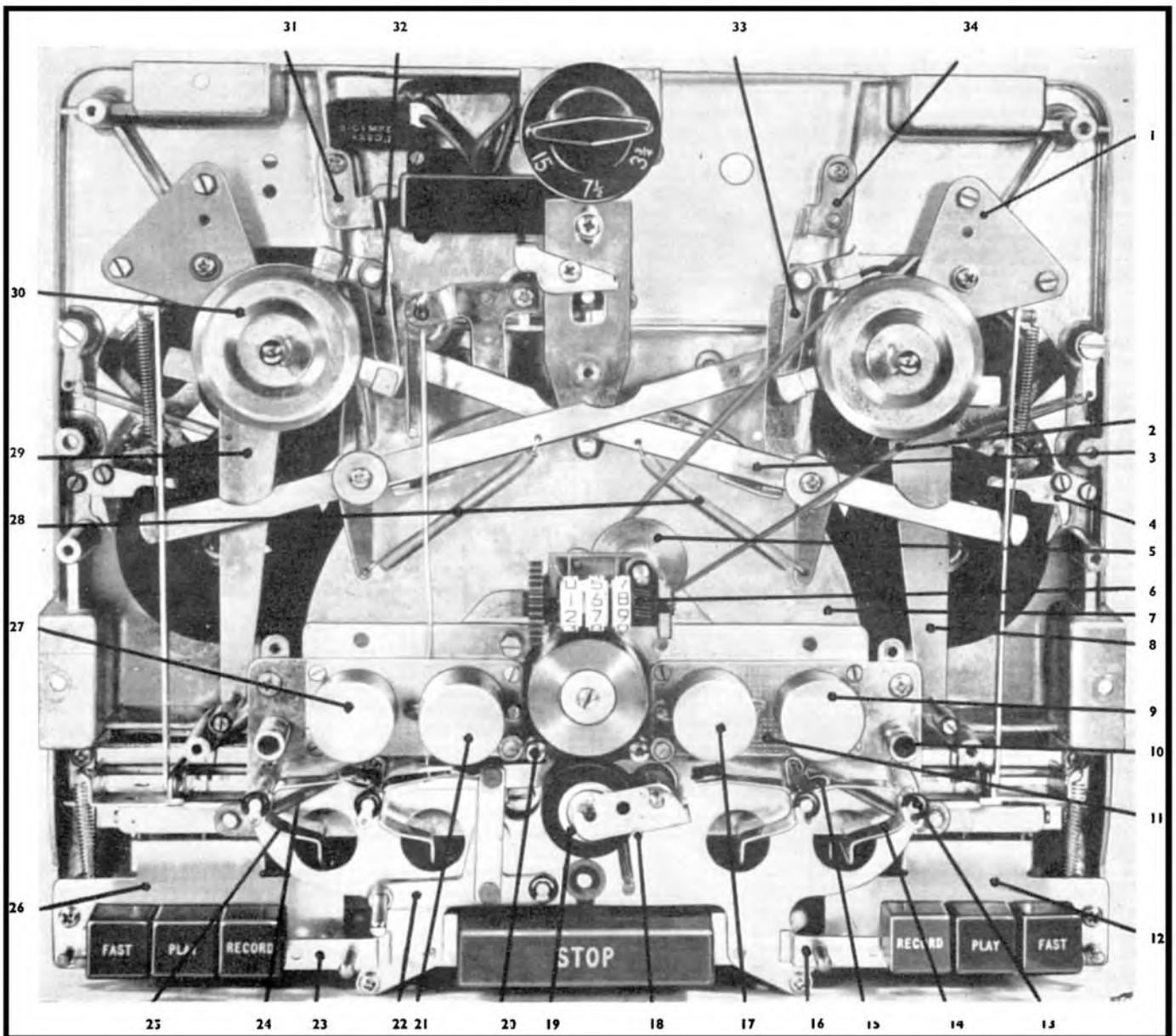
These and other points will be dealt with in *The Tape Recorder* in future numbers. They are very important if quality recordings and replays are wanted. But as a concluding note, remember that most domestic recorders on the market are more than capable of recording and reproducing sound of a pleasantly acceptable quality—even if some of them could not measure up to the claims made for them in terms of Wow and Flutter! It is also worth noting that, in order to measure accurately the Wow and Flutter percentage, apparatus costing several hundreds of pounds is needed—so the average purchaser has not a hope of checking the spec, anyway! And, repeating the advice given earlier, the figures don't mean a thing if the ear is not satisfied. If your intended tape recorder does not introduce an artificial tremolo to your favourite soprano, and does not add a disagreeably noticeable wobble to a bass piano note, then be happy that the wow and flutter content is better than the 0.3% which no one is modest enough to claim. Next month: hum and noise.

# THE COLLARO MARK IV

**T**HE Collaro Tape Transcriber is undoubtedly the best known tape deck in this country, it was the first deck to be mass produced here, and at the time of its introduction possessed a number of revolutionary features, the most outstanding being the ability to record on the second track without removing the tape spools.

The deck was introduced at the Exhibition of Radio and Electronic Components (R.E.C.M.F.) in May, 1955, but it was about a year before the first production models of Mk. I started to leave the assembly lines. Very few Mk. I's were produced, the latching mechanism was

soon redesigned and it became the Mk. II. The pause lever made its appearance during the run of this model. The Mk. III followed, and major modifications included the fitting of a three digit counter in place of the pointer and scale and a bit later the adaption of larger drive motors. The Mk. IV was introduced for the Radio Show, 1958, and saw a number of new features, a micro-switch was included which switches off the motors when the stop bar is depressed. This has been found desirable to help in keeping the running temperature of motors as low as possible, particularly where the deck is used in small portable



# THE COLLARO MARK IV

recorders where the amplifier and deck are positioned close together. A flywheel brake is now fitted, worked directly by the stop bar. Small motors have been reverted to and the rewind pulley spring arrangement of the tensioning arms has been altered.

After four years of development the deck is now easy to operate, pleasant to look at and, above all, reliable in use. This is well borne out by the number of independent manufacturers who incorporate the deck in their recorders, these are: Tape Recorders (Electronics) Ltd., "Sound". E.A.P. (Tape Recorders) Ltd., "Elizabethan". The Abbey Radiogram Mfg. Co. Ltd., "Sovereign". Repts (Tape Recorders) Ltd., "Reps". Kurland Recording Systems Ltd., "Kurland". Magnafon Ltd., "Diplomat". Sonomag Ltd., "Sonomag" and "Elon". Specto Ltd., "Specto". Wyndor Recording Co. Ltd., "Wyndor". Clarke & Smith (Mfg.) Co. Ltd., C.T.R.4. Ambassador, Baird Ltd., T.R.I. Winston Electronis Ltd., "Winston". Lee Products Ltd., "Elpico". Tutor Tape Company, "Tutor". Taplin-Hirst & Co., "Balmoral".

## Construction

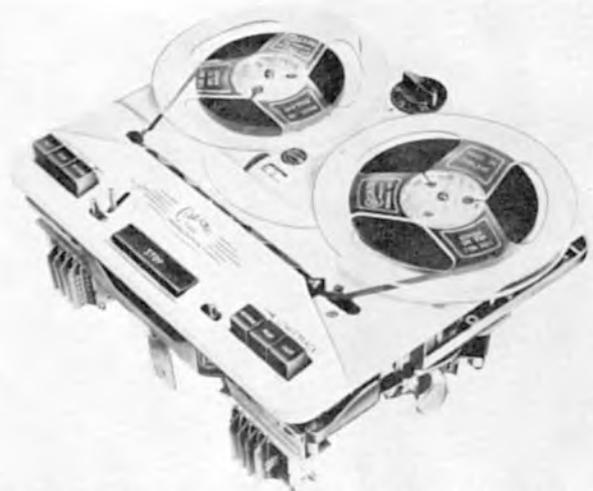
A robust and rigid die-casting is used as the basic foundation for the deck, on this all the components are assembled and it also provides bearing supports for the main spindles. Two motors are employed, one drives the take-up spool through a friction disc reduction gear, while the second drives the capstan shaft through a second friction disc reduction. The function of the two motors are interchanged when the direction of tape travel is reversed.

Choice of tape speed is made by a large knob at the back of the deck. Rotation of the knob lifts an idler shaft to allow the friction disc to contact the motor shaft on the appropriate diameter, thus fixing the capstan speed. The spindle on each motor has four separate diameters, the lowest step being the surface for the friction drive for the relative spool spindle, the upper three steps give the three speeds and provide surfaces for a friction drive between motor and capstan flywheel.

The capstan is of large diameter (1 $\frac{3}{8}$  in.), and together with the large flywheel on the same spindle is carried in a very long bearing housing

LEFT: 1. Spool carrier plate. 2. Counter drive belt. 3. Drive control lever ass. R.H. 4. Idler release lever R.H. 5. Counter pulley. 6. 3 digit counter. 7. Flywheel. 8 & 29. Tape tensioning arms. 9. Erase head R.H. 10. Tape Guide. 11. Head Plate. 12 & 26. Guide Plate ass. 13. Pressure pad carrier pivot. 14 & 25. Pressure pad carrier. 15. Pressure Pad 16 & 23. Record safety slide ass. 17. Record/playback head R.H. 18. Pinch Wheel carrier. 19. Pinch Wheel. 20. Tape Guide. 21. Record/playback head L.H. 22. Pause lever ass. 24. Pressure pad springs. 27. Erase head L.H. 28. Brake springs. 30. Spool carrier and bass ass. 31 & 34. Brake stops. 32 & 33. Brake ass.

RIGHT: Cut away chassis to show drive ass. rev counter not fitted.



• Manufactured by Collaro, Ltd., Ripple Works, By-Pass Road, Barking, Essex. Price £25.

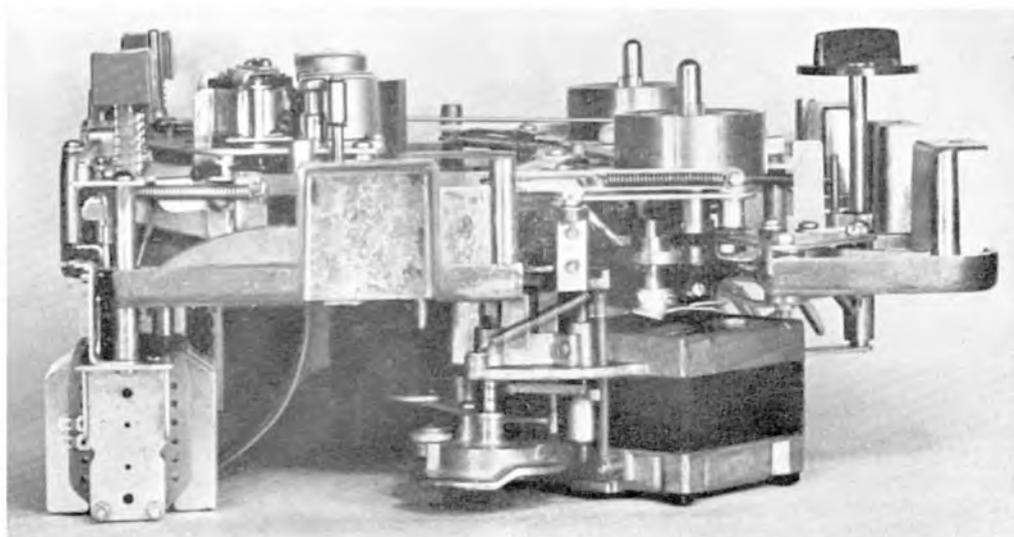
in the main die-cast body and runs on a ball at the bottom.

The flywheel is 6 $\frac{1}{2}$  in. in diameter and 9/10 in. deep and stores sufficient energy to run for a minute and a half (at 7 $\frac{1}{2}$  i/s) after the drive disc is withdrawn. A combination of large diameter tape capstan, large flywheel and a particularly effective tape tension compensator all help to produce a deck with commendably low wow and flutter figures and in practice the claimed figure of 0.15 per cent. at 7 $\frac{1}{2}$  i/s is nearly always bettered.

## Technical Specification

Track width, .087 in.—.091 in; Track Location, 12 ft. to right top track, right to left lower track; Number of Motors and Type, 2 Induction; Number of Heads, 4; Head Types, 2 Record/Playback, 2 Erase; Operating Speeds, 3 $\frac{3}{4}$  in., 7 $\frac{1}{2}$  in. and 15 in. i/s; Playing Time, 60, 30 and 15 minutes per standard 1,200 ft. reel; Rewind Time, 2 min. 40 secs.; Attainable Frequency Response, 12 Kc/s at 7 $\frac{1}{2}$  i/s  $\pm$  3 dB with record/playback equalisation; Record Head Gap, .0003 in.; Wow and Flutter, not greater than 0.15 per cent. at 7 $\frac{1}{2}$  i/s; Long Term Speed Stability, better than 0.5 per cent.; Recommended Erase and Bias Frequency, 45–60 Kc/s; Erasing Voltage, approx. 25 volts at 120 m/a; Erase Head Impedance, 200/300 ohms at 45–60 Kc/s; Recording Head Impedance, 30 K ohms at 10 Kc/s; Motor Voltage, as stated on voltage plate at side of motors; Power Consumption, 24 watts each motor at 250 volts A.C.; Dimensions, 13 in.  $\times$  11 $\frac{3}{8}$  in.  $\times$  5 $\frac{9}{16}$  in.; Weight, 16 $\frac{1}{2}$  lb.

★ This is a report—not a review.



by W. H. Y. Grainger

# THE STORY OF "TAPE"

THIS IS THE SECOND OF TWO ARTICLES  
PREPARED WITH THE CO-OPERATION OF E.M.I. LTD



Fig. 3—The film leaves the coating machine in a wide strip.

THE last article reviewed the history and post-war development of magnetic tape as a recording medium. This month the manufacturing technique of a present-day magnetic tape will be detailed. The particular process will be that used in the manufacture of "Emitape", which is made by Electric & Musical Industries Limited at Hayes, Middlesex, for professional and domestic users all over the world. In its most modern guise, "Emitape" is supplied in two forms, one with the normal P.V.C. base .0016 in. thick which is known as "general purpose", and the other with a thinner (.001 in.) base, or "long-play" tape. In each case, however, the oxide and method of manufacture is similar so the general process is applicable to both.

The red iron oxide which forms the basis of the magnetic coating is subjected to a lengthy and carefully controlled process to ensure that the individual particles are of an even, minute size and that their magnetic properties are within very close pre-determined limits. The furnaces in which part of this refining takes place can be seen in fig. 1.

## Tests by Electron Microscope

On the completion of this process, the oxide has been converted to an even particle size of the order of  $\frac{1}{4}$  micron, and at this point samples are taken from each batch and tested, not only in respect of all magnetic properties, but also for particle size and uniformity with an electron microscope.

On the successful completion of batch tests, the oxide is passed for production, and must then be converted into the form in which it can conveniently be applied to the base film—this is done as a fine suspension in a synthetic resin varnish. The oxide/varnish mixture is made up as a concentrate and dispersed in a ball mill for a period of 96 hours, after which time an extremely intimate mixture is attained. Each milling batch, when suitably diluted, yields 40 gallons of the dope used for coating purposes. This dope is then passed through a mechanically vibrated refining sieve of 350 mesh into sealed containers, which are then connected to a unit to pump the dope through a closed circuit to the coating

head. The ball mills used for this part of the process can be seen in fig. 2.

As a further check on the oxide, before the batch of dope is used for production, an experimental spread is made on the production plant to ensure that the finished tape resulting from the use of the oxide will meet the final tape specification in every way.

The P.V.C. base film is received in 5,000 ft. rolls, 15 in. wide, and either .0016 in. or .001 in. thick, according to whether it is to be used for the "general purpose" or "long-play" Emitape, and this is fed into the coating unit over a number of highly polished rollers in such a way that any local variations in tension are ironed out of the base film before it approaches the coating head.

The coating process itself is controlled by precision electronic equipment, and the extreme care necessary will be appreciated when it is realised that, as "Emitape" has an oxide coating of .0005 in., and the sensitivity must not vary by more than one decibel from reel to reel, this means that the coating thickness must not vary by more than .00005 in.

## Pressurised, Air Conditioned Room

The coating unit is specially designed for this particular application, being completely enclosed and pressurised by filtered air. The room in which the coating unit is operated is itself pressurised and air conditioned, air being drawn from the room, filtered for a second time, and heated to 120°F before being pumped into the coating unit, thus ensuring that no airborne impurities can possibly reach the newly coated surface of the base film whilst the coating solvent is evaporating. No persons, other than operators, are allowed in the coating room—the view in fig. 3 has therefore been taken from outside—supplies of uncoated film and "oxide dope" are fed into this room through special hatchways.

During all its 300 ft. journey through the drying section of the coating unit, the tape is maintained at a constant tension, and the coated surface has no contact other than with doubly purified air until it is finally wound up as a finished roll at the completion of the coating process. The roll of coated base film emerging from the coating unit can be seen in fig. 3.

After coating, the rolls are passed out, through an air lock, into another room where they are first printed with the trade mark on the back of the base film by an off-set rubber stereo process, and



Fig. 1—One of the cylindrical refining furnaces with control gear keeping a continuous record of the furnace temperature variations.

# THE STORY OF "TAPE"

then slit into the  $\frac{1}{4}$  in. widths in which the tape will be used. The operation of loading up the slitting machine in preparation for the commencement of a 5,000 ft. roll can be seen in fig. 4.

The slitting process is particularly important, since any imperfect edges will impair the smooth running of the tape through the mechanism of the recorder, and so reflect on the quality of the eventual recording. On these slitting machines, therefore, an electrical device is employed to control the tension throughout the length of a roll to ensure perfect slitting.

Throughout all these processes, such careful records are kept that each individual reel of  $\frac{1}{4}$  in. tape can immediately be identified with its particular batch of oxide, roll of film, time of coating, printing, slitting, etc., so that should any fault be detected during the subsequent inspection cycle, any other reels which are possibly affected can be instantly isolated.

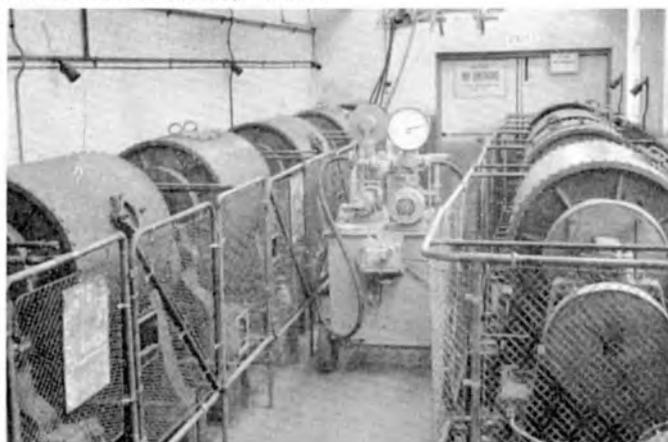


Fig. 2—Ball mills thoroughly separate the minute particles.

After slitting, the tape passes to the Inspection Department where every foot is subjected to a rigorous visual inspection, during which it is passed over a strong light and scanned by a photo-electric cell which detects any slight variations in coating thickness and also any slight flaws, pin-holes, etc., in the base film. This method of testing enables local faults over the  $\frac{1}{4}$  in. width to be isolated, as opposed to the coating inspection over the full 15 in. width.

Despite this rigorous visual inspection, the extremely precise control during the coating process, and the sample reels which are regularly extracted from the production at all stages to be electrically tested in every way and compared with the tests spread originally made from the batch of oxide; for some purposes, yet another inspection is applied.

## Tape for Very Special Purposes

To meet the very specialised requirements of certain professional users such as Recording Studios and Broadcast Companies. "Emitape" is supplied as a "pen tested" grade, known as "type 77", every reel having been recorded throughout its length with a test signal, the replay output being graphed by an automatic pen recorder, the chart from which is kept at Hayes as a guarantee of the absolute uniformity of sensitivity of that particular reel. The extremely close limits maintained on these tests ensure that slow variations within the reel are not greater than  $\pm\frac{1}{2}$  db on the mean sensitivity, and no instantaneous variation is greater than  $\frac{1}{2}$  db. A general view of the section in which visual inspection and "pen testing" is carried out can be seen in fig. 5.

It will be realised from these details of the process that such close control throughout manufacture, and care in inspection,

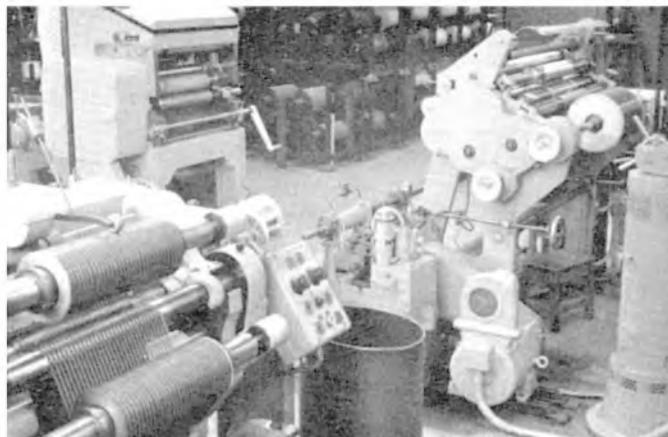


Fig. 4—The wide tape strip is slit and wound in 5,000-ft. rolls.

results in a tape which is in itself a precision material and capable, under proper conditions, of an extremely high degree of performance.

The necessity for reasonable care in handling magnetic recording tape is generally realised, as any physical distortion will obviously impair the quality of the recording, but what is not always recognised, is the fact that bad mechanical conditions in the equipment itself can also give rise to physical distortion which will prevent the best results from being obtained.

Modern magnetic tapes have been carefully developed to have the minimum print, or layer to layer transfer, and provided that care is taken that the tape is never subjected to undue heat, no trouble should be experienced in this respect. But even short periods under adverse temperature conditions can greatly accentuate print. In particular, it should be remembered that even a few moments in direct sunlight can often raise the temperature of a tape to dangerous level.

## The Speeds of the Future

Tape recording has made spectacular progress during the past few years. It is now possible to record virtually the same quality at  $7\frac{1}{2}$  i.p.s. as was only attainable at 30 i.p.s. ten years ago. How far away is high quality recording at even lower speeds?

Improvements in recording heads and the standard of perfection now achieved in the production of tape has already made possible good quality recording at  $3\frac{1}{2}$  i.p.s. At present  $7\frac{1}{2}$  i.p.s. is the standard speed at which high quality recording is attainable for normal domestic purposes, but with the steadily improving quality of the domestic tape recorder, the future for slower speeds holds great promise.

In conclusion, we should like to amend the figures given on page 19 last month for the width of standard tape. They should have been  $0.246 \pm 0.002$  in.



Fig. 5—The re-spooling machine (seen in operation in the foreground of the illustration) provides automatic inspection of the coating by a photo-electric system. In the background can be seen the machines for "pen-testing" Emitape.

(LANES)  
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February 1959

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# TAPE, RECORDERS & ACCESSORIES

## FIRST DETAILS OF NEW PRODUCTS

● We remind our readers that notices of equipment listed and illustrated in this monthly feature are in no sense reviews. When figures, specifications and diagrams are published, these data are extractions from manufacturers' lists. When samples of this equipment are submitted for test, they are passed to our technical contributors, whose reports are published in a separate section.



★  
The Veritone  
Venus portable  
recorder

★  
**V**ERITONE LTD. have produced a portable version of the Venus recorder. There are several features on this recorder usually

only found on machines of a much higher price. There are three heads, erase, record, replay, and separate record and replay amplifiers; there is full monitoring with a 1/5 second delay. Extra facilities include echo effect and superimposing of a second recording on an existing one; the problem of the bias partially erasing the first recording has been almost completely overcome. Output is 4 watts.

There are red and green lights to indicate recording and playback, separate bass and treble controls, straight through amplifier switch, digital counter, solenoid braking, extension speaker socket and outlet to feed external amplifier. By mounting the speaker in the lid it has been possible to use a large drive unit, a 10 in. × 6 in. elliptical with 10,000 line magnet, and yet keep the size to a minimum, 17½ in. × 15½ in. × 7½ in. It is supplied complete with an Acos mic. 39/1 microphone, 1,200 ft. of tape and radio lead with jack plug. The price is £60 18s. complete. Further details from Veritone Ltd., Avenue Parade, Ridge Avenue, London, N.21.



★  
The EAP  
Bandbox  
A miniature  
mains powered  
recorder

★  
**T**HE latest addition to the midget mains operated recorders is the EAP Bandbox. This measures only 10½ in. × 9 in. × 6 in. and weighs 12 lb. There are two speeds, 3¼ and 1½ i/s; 3½ in. spools are used but at 1½ i/s with two ft. of double play tape this will give about 42 mins. playing time on each track. There is a precision clock type tape indicator, and a magic eye level indicator, all operations are controlled by push buttons. The two inputs are for microphone and radio/pickup and there is a socket for extension loudspeaker and provision for monitoring from a high impedance output. An audio output of 2½ watts is claimed. The built-in speaker is a 7 in. × 4 in.

It is contained in a strong wooden cabinet covered in two-tone

rexine. The price complete with microphone, tape and leads is £30 9s. Manufactured by EAP (Tape Recorders) Ltd., Bridge Close, Oldchurch Road, Romford, Essex.

### ★ A New Battery Operated Portable ★

**A** NEW pocket-sized tape recorder worked off batteries and containing its own full-volume playback has just been introduced by Fi-Cord Ltd. It costs £61 19s.

The recorder weighs only 4½ lb.—the same as Fi-Cord's first pocket model introduced last year—and measures 9½ in. long × 5 in. wide × 2½ in. deep. It records at standard speeds of 7½ and 1½ i/s and has a claimed frequency response of 50 to 12,000 c/s (± 3 dB) at 7½ i/s. Fi-Cord is particularly suitable for adding sound to cine films: its light weight and independence of mains power ensure mobility and freedom for recording on outdoor location.

The set is fully transistorised and an automatic charger is supplied to recharge each of the four 2 v. accumulator batteries from normal A.C. supplies of 110–240 v. The batteries weigh only 5 oz. each and have a life of 1½–2 hours without recharging during recording at 7½ i/s and 3–3½ hours at 1½ i/s.

The recording time varies from 18 mins. per spool (9 mins. each track) at 7½ i/s to 72 mins. (36 mins. on each track) at 1½ i/s. There is a hi-fi output socket for linking the set to a hi-fi reproducer, and the microphone is carried in a pocket on the shoulder strap. The Fi-Cord records in any position—even upside down with the lid open or shut. Further details from Fi-Cord Ltd., 40a Dover Street, London, W.1.



★  
Two Mixer  
Units

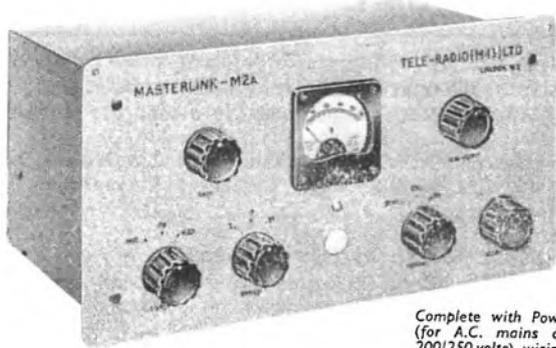
★  
**T**WO new mixer units are announced by Sound News Productions, these are the Unimixer I and the Unimixer II, these are similar externally.

The Unimixer I has provision for three inputs, two microphones and one radio/pickup. The mic. inputs are duplicated so that either high or low impedance mics. can be used, the impedances are 30 and 400 K ohms approx.; recommended load impedance not less than 500 K ohms. The frequency response from a 30 ohm input is claimed to be 50–10,000 c/s ± 3 dB. If the user wishes to take all the inputs and outputs from one socket a cut-out in the rear panel is provided for a miniature 6 pin socket. The price of this unit is £9 9s.

The Unimixer II is designed for the more serious user and provides amplification on the two mic. inputs prior to mixing, this is claimed to reduce noise and interaction, in addition the input impedance for crystal mics. is said to be high enough to prevent bass attenuation. This unit needs an external power supply of 200–300 v. at 5mA and 6-3 v. at 0.3 A. There are special cables available, V/I and F/I, to obtain this supply from Vortexion and Ferrograph recorders. Both units are suitable for all types of microphone, except capacitor types, likely to be met by the average user.

The low impedance inputs are approx. 30 ohms and the high impedance 5 M ohms, radio pickup input 500 K ohms; frequency response 40–12,000 c/s ± 3 dB. Amplification, mic. 1 and 2, 6 dB; pickup —27 dB. Noise level, —55 dB (with reference to 0.775 v. output). Recommended load, not less than 500 K ohms. Price £15 15s. Connecting cables V/I or F/I 10s. each. Manufactured by Sound News Productions, 10 Clifford Street, New Bond Street, London, W.1.

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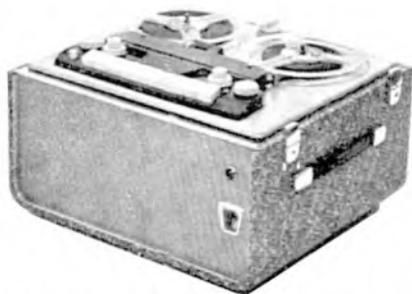
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# EQUIPMENT REVIEWED



★  
THE  
SIMON SP4  
TAPE RECORDER  
★

★ **Manufacturer's specification:** Tape speeds:  $7\frac{1}{2}$  and  $3\frac{3}{4}$  i/s. Spool size: 7 in. Mains supply: 110, 125, 200, 220, 245 volts, 50 c/s A.C. (60 c/s American). Rewind time: 1,200 ft. tape—2 minutes. **Wow and flutter content:** better than 0.2% peak to peak. **Mixing facilities:** Inputs: high impedance mic., sensitivity 2.5 mV., low imp. mic., sensitivity 40 uV., radio pickup, sensitivity 350 mV. **Output:** amplifier distortion: less than 0.5% at 1 Kc/s at rated output. **Tone controls:** treble at 12,000 c/s + 6 -18 dB; bass at 50 c/s, + 6, -18 dB. **Frequency response:** direct amplifier 30-18,000 c/s  $\pm 1$  dB, from tape at  $7\frac{1}{2}$  i/s, 30-12,000 c/s  $\pm 3$  dB, 30-15,000 c/s better than  $\pm 5$  dB. At  $3\frac{3}{4}$  i/s 30-7,000 c/s  $\pm 3$  dB. **Push-pull oscillator. Amplifier hum and noise level:** (referred to 10 watts output from fully modulated tape) -52 dB. **Tape position indicator, 3 digit counter. P.A. Button,** allows use of the high fidelity amplifier direct for reproduction without tape from microphone, record-player, tuner unit, etc. **Internal loudspeakers:** 10 in.  $\times$  6 in. elliptical, 4 in. tweeter with diffuser. **Erase level:** at 1 Kc better than 70 dB. At 300 c/s better than 60 dB. **Monitoring facilities:** Independent control to permit of either silent or monitored recording at user's option. **Size:** 17 in.  $\times$  10 $\frac{1}{2}$  in.  $\times$  15 in. **Weight:** approx. 46 lb. **Price:** £99 15s.

Manufactured by Simon Sound Services, Ltd., 48 George Street, London, W.1. Welbeck 2371.

THE price of 95 guineas places the Simon SP4 tape recorder in the semi-professional class, and suggests that the performance and the facilities are likely to be a great deal better than the small ultra portable machines that appear to be intended for the well heeled teenager. A short glance at the specification confirms the expectation, for there are few other tape recorders with such facilities as an automatic end-of-reel reverse or an amplifier with an output of ten watts.

The machine is moderately heavy 44 lb. but is not unduly large (approx. 16 in.  $\times$  15 in.  $\times$  10 in.), and is thus portable if it does not have to be taken too far by hand. The case is well finished but the choice of colours aroused some difference of opinion among the family, the "flecked" finish hardly doing justice to the machine, and there was universal agreement that the appearance would have been improved by making the top deck plate the same colour as the push-buttons (cream).

## Adequate Storage Space

Adequate storage space is provided for the long mains lead but, as with many other machines, there is insufficient space for the plug, with the annoying result that the trap giving access to the space could not be closed, and the lead and plug were free to fall out. The extra space required for storage of a 13-amp. plug is obviously difficult to find, but a small "niche" in either door or case just sufficiently large to trap the mains lead when the access door was closed, leaving the plug outside the case, would be a simple solution to the problem.

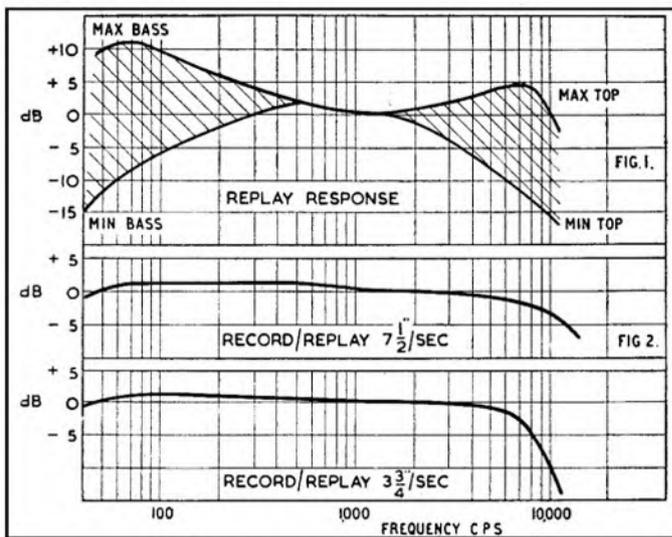
Push-button control of tape motion in both directions is provided, with other button switches to select "record", "replay" and "P.A." facilities. All the push-buttons are reasonably light in action, are of large area, and have a nice engineering feel about them. The Simon is one of the few machines using a deck mechanism of the manufacturers' own design, that allows the tape to be played in either direction of

travel, a facility so useful that its appearance on all machines appears inevitable. But the Simon SP4 goes further; it provides an automatic end-of-reel reverse mechanism actuated by the usual short length of foiled tape. Thus, at the end of a reel the tape travel is reversed, and the second track replayed without any need for the user's attention.

Two tape speeds,  $7\frac{1}{2}$  and  $3\frac{3}{4}$  i/s are provided, selection being made by a large diameter knob at the rear of the top deck, very easy in action but with a slightly confusing indication of the action to be taken to change the speed. 7-inch spools can be accommodated, allowing nearly 1 $\frac{1}{2}$  hours of playing time per track at the lower tape speed, particularly adequate in view of the easy way in which the tape motion can be reversed without having to remove the spools from the machine. If the speeches at a long conference were being recorded, no more than four or five words need be missed during the short interval required to reverse the direction of tape travel. For a professional user this is invaluable.

## Four Control Knobs

Four controls are provided, two of these serving a double purpose. The two left-hand knobs provide mixing for two microphones and a radio or gramophone signal during recording—unusually generous facilities in a domestic machine. Replay volume is controlled by the inner knob. The third control also has a dual function, the inner (top) knob adjusting top response and the outer (lower) section adjusting bass response.



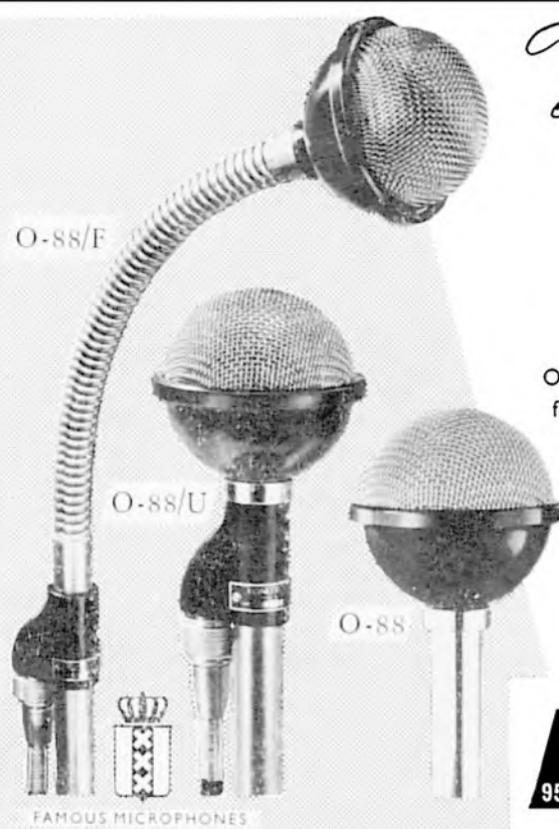
● Response curves of the Simon SP4

The tone control settings giving a flat overall curve are indicated on a separate calibration tag provided with each machine, a useful feature for the professional user. A monitor volume control and the mains on/off switch are ganged on the fourth knob. The usual 3/digit tape footage indicator is mounted in the centre of the top deck while a neon type EM81 volume indicator appears in a rather unusual place on the front of the machine below the mains indicator lamp.

## 10-watt Push-Pull Output Stage

Two EL84s are used in a 10 watt push-pull output stage, adequate power for public address used in a hall seating several hundred people. The SP4 includes facilities for P.A. work including a socket for a low impedance microphone that allows the "mike" to be used a few hundred feet from the machine.

Many owners use their tape recorders as dictating machines. When transcribing from the tape it is almost imperative to have a remote control device that allows the tape to be started, stopped or reversed. This is a facility that appears almost universally on continental machines but the SP4 is almost unique among British machines in including such a feature.



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### Technical Details of Performance

The replay response, important when playing commercial recorded tapes, is shown in fig. 1, any response within the shaded areas being obtainable by appropriate adjustment of the bass and treble tone controls. With the tone controls in the positions claimed to give the C.C.I.R. standard response, the curve did in fact meet the specification to within the tolerances on the test tape.

When recording your own material, it is the combined record and replay performance that is important. This is shown in fig. 2 for both tape speeds and it is seen to be within the manufacturers' claim for  $\pm 3$  dB between 30 and 12,000 c/s. at  $7\frac{1}{2}$  i/s. and  $\pm 3$  dB between 30 and 7,000 c/s. at  $3\frac{3}{4}$  i/s. Some fiddling with tone control settings might even improve on the manufacturers' claims for frequency response, a most unusual state of affairs in the tape recorder field.

The signal-noise ratios measured by recording a 1 Kc/s tone at full modulation as shown by the magic eye volume indicator, checking the output level on replay and then erasing the tape on the machine before replaying the wiped tape, are shown in table 1. These are very satisfactory values.

Table 1—Signal/Noise Ratios	Table 2—Wow and Flutter
$7\frac{1}{2}$ in./sec. Unweighted—40 dB	$7\frac{1}{2}$ in./sec. 17%
Weighted —47 dB	
$3\frac{3}{4}$ in./sec. Unweighted—36 dB	$3\frac{3}{4}$ in./sec. 2%
Weighted —44 dB	

This method of measuring signal/noise differs somewhat from that adopted by the manufacturers and results in slightly different figures.

Wow and flutter figures obtained at both tape speeds are quoted in table 2. These are RMS values whereas the manufacturers quote peak-to-peak readings. Flutter waveforms are of such character that there is no very satisfactory correlation between peak-to-peak and RMS readings but irrespective of this the wow and flutter values are reasonable for a portable machine.

### General Comment

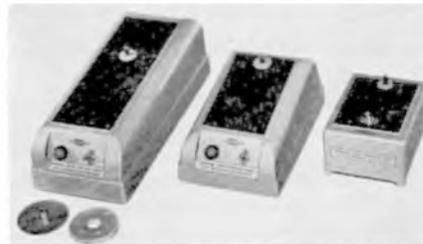
It is always impossible to be completely objective in assessing the performance of a tape recorder. One is objective where possible, but in many things one gets a feeling about the smoothness and "handability" of a machine that is difficult to convey to a reader. The SP4 was found easy, pleasant and convenient to handle. The recording facilities were appreciated. Preliminary adjustment of the recording gain controls can be made and the signal monitored after pressing the "record" button but before starting the tape with the "safety" button, a most useful feature to a professional user.

The novel features incorporated in the SP4 are generally of real value to the user, and are not gimmicks put in to please a Sales Director who must have something different. It is only sheer laziness on the part of the user that results in annoyance at having to get up and reverse the direction of tape travel at the end of a reel. Nevertheless this laziness is well catered for by the automatic tape reversal at the reel end, though your tapes will need a short length of foiled tape spliced into them to actuate the reversing mechanism. It was a feature that was liked by the family.

The special facilities—such as automatic tape reversal, tape run out stop, remote control, etc.—lead to a machine that is more complex mechanically than a "basic" tape recorder, and in consequence needs more skill in design. None of the "automatics" gave trouble during a month's regular use. The breaking system worked perfectly under all conditions of tape loading, and the high speed wind and rewind were exceptionally smooth. Two minutes are required to rewind 1,800 ft. of tape, and either by accident or clever design the torque characteristics of the motors have been nicely balanced to produce a high speed wind with a low speed end to the process. Undue stress on the tape is thus avoided.

A minor point but one worthy of note, the instruction book is an unusually good and comprehensive guide not only to the machine but to its use. The Simon machine is not cheap but it has exceptional facilities, a good performance and is undoubtedly good value for money.

J. Moir



★  
THE  
"LEERASER"  
BULK ERASER

★

★ Manufactured by Leavers-Rich Equipment Ltd., 78B Hampstead Road, London, N.W.1.

IN last month's *Tape Recorder*, the basic construction and method of operation of a bulk eraser was discussed with reference to the Instant bulk eraser. It was mentioned that a high quality eraser would cost between £5 and £10 and the Standard Leeraser, reviewed here, is in this class. Three models are available according to the size of the tape spool, the Senior for 12 in. at £15, the Standard for 7 in. at £9 10s. 0d. and the Junior for 5 in. at £6 5s. 0d.

The model submitted was found to have a strong cast frame finished in grey stove enamel. This carries a generous block of laminations, a mains switch, an indicator lamp and a length of good quality three core cable for mains connection. The top of the eraser forms a platform with a spindle to take the tape spool and the laminations cover a wide area of the platform so that two or three revolutions of the spool was found sufficient to cleanly erase a high level recording. The toggle switch with warning lamp was preferred to the press switch found on some other erasers. This is unquestionably a well designed and well made eraser which can be recommended with confidence.

H.L.Y.

## BOOK REVIEWS

"How to get the Best out of Your Tape Recorder"—by Percival J. Guy, 1958, 128 pages, illustrated, 8s. 6d., Norman price (Publishers) Ltd.

The subject of tape recording, with all its ramifications, can be covered completely only in a very, very large book. The author of a small book—128 pages including Glossary and Index—must therefore give at least as much thought to what to leave out as he does to what to include. P. J. Guy has many years' experience of recording in all its aspects and is now lecturing on the subject at the BBC's engineering school.

The things he has sensibly left out of this book are the usual block diagrams and general talk about recording which are already duplicated in too many text books and instruction booklets on tape recorders. He has thus been able to concentrate on the parts of the subject which usually present the newcomer with the most difficulty. There are chapters on distortion, matching, filters, equalisation, mixers, acoustics, microphone balance and control, loudspeakers, fault tracing and general maintenance. In addition the Copyright and legal aspects are discussed and the book opens with simplified treatment of magnetic theory.

This first chapter is particularly thorough and provides just the right foundation for understanding the rest of the book. In chapter 8 you will find useful hints on microphone positioning and other practical matters. I would disagree on one small point that testing the vertical response of a microphone should be carried out "with the aid of a tall step-ladder" I would prefer to tilt the microphone, and keep the speaker's feet firmly on the ground.

To sum up, the selection of specific subjects in this book is original and avoids duplicating existing small handbooks. If you possess an "operating instructions" booklet which describes the general working of your tape recorder, this small publication will help you to take tape further, both the theory and the practice.

J.N.B.

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## WHAT DO YOU KNOW?

HERE are a few more mental exercises—not all of them to be taken seriously—to get you thinking. The answers are printed at the foot of the column, upside down, as before.

- \* \* \*
- Two grand pianos played in unison produce 5 dB more power than one. How many pianos are needed to give + 18 dB?

\* \* \*

  - Rust, pinch, idle, stagger, flat: although these words may be used in a different connotation, they also apply to tape recording. Can you say how?

\* \* \*

  - How do the faint echoes due to "print through" between the magnetic fields of adjacent layers of recorded tape differ from post- and pre-echo on disc?

\* \* \*

  - Which of the following microphones may be used as a loudspeaker?—crystal, moving-coil, condenser.

\* \* \*

  - These "package" words seem to have been miss-sorted. Can you put them right?—pick-through, built-over, play-up, change-in, print-back.

\* \* \*

  - In a 3-head machine, which head has (a) the narrowest, (b) the widest gap?

\* \* \*

  - Is it better to record radio programmes through a microphone or via the External Loudspeaker sockets?

## THE ANSWERS

7. Recording from the Ext. L/S socket is preferred, since it eliminates the loudspeaker and microphone from the recording chain, both of which are liable to impart the recorded quality. In addition, the room acoustics and extraneous noises are avoided. For best results, the radio signals are usually picked up at the output of the detector (diode) stage, so that the radio's audio-frequency amplifier is by-passed too.
6. (a) playback head, 0.0005 in., or less, (b) erase head approximately 0.015 in.
5. Pickup, playback, built-in, change-over, print-through.
4. A moving-coil microphone is in effect a small loudspeaker and this fact has sometimes been used to relay instructions to a commentator, in lieu of headphones. Many office inter-communication units use a loudspeaker-cum-microphone.
3. In disc recording these echoes are due to mechanical deformation of the groove wall on extra loud passages, and occur at a fixed time interval before or after the original namely, 1/33 $\frac{1}{3}$ , 1/45 or 1/78 of a minute. In tape recording, magnetic print-through produces echoes whose time lag is longer at the outside of the reel than the inside.
2. Rust is iron oxide, a particular species of which forms the sensitive coating on a magnetic tape. Pinch roller is another name for the pressure roller, which holds the tape against the drive capstan. It is also referred to as the idler. Staggered record/replay heads were once the accepted method of recording stereo, especially in America, and produce two tracks which are vertically a few inches out of step. Stacked heads (one above the other) are now in vogue. A flat, or any departure from a true circle, on the rubber edge of the pressure roller or capstan is a frequent cause of wow.

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The rate is 6d. per word, with a minimum charge of 7s. 6d. Box numbers may be used for an extra charge of 1s. 6d. The trade rate is 9d. per word, 2s. will be charged for a box number, conditions on application.

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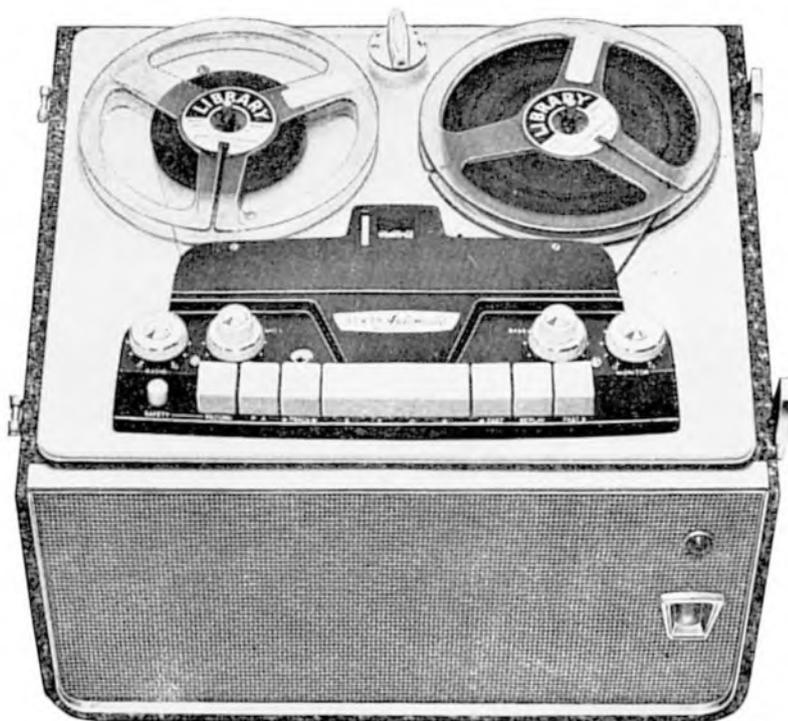
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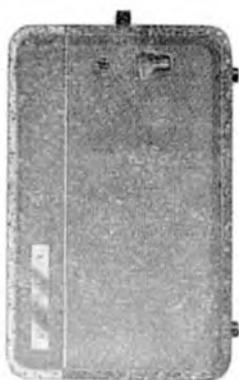
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