

JUNE
1958

1'6

TAPE RECORDING

& HIGH FIDELITY REPRODUCTION
MAGAZINE



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THE CLASSIC	54 gns.
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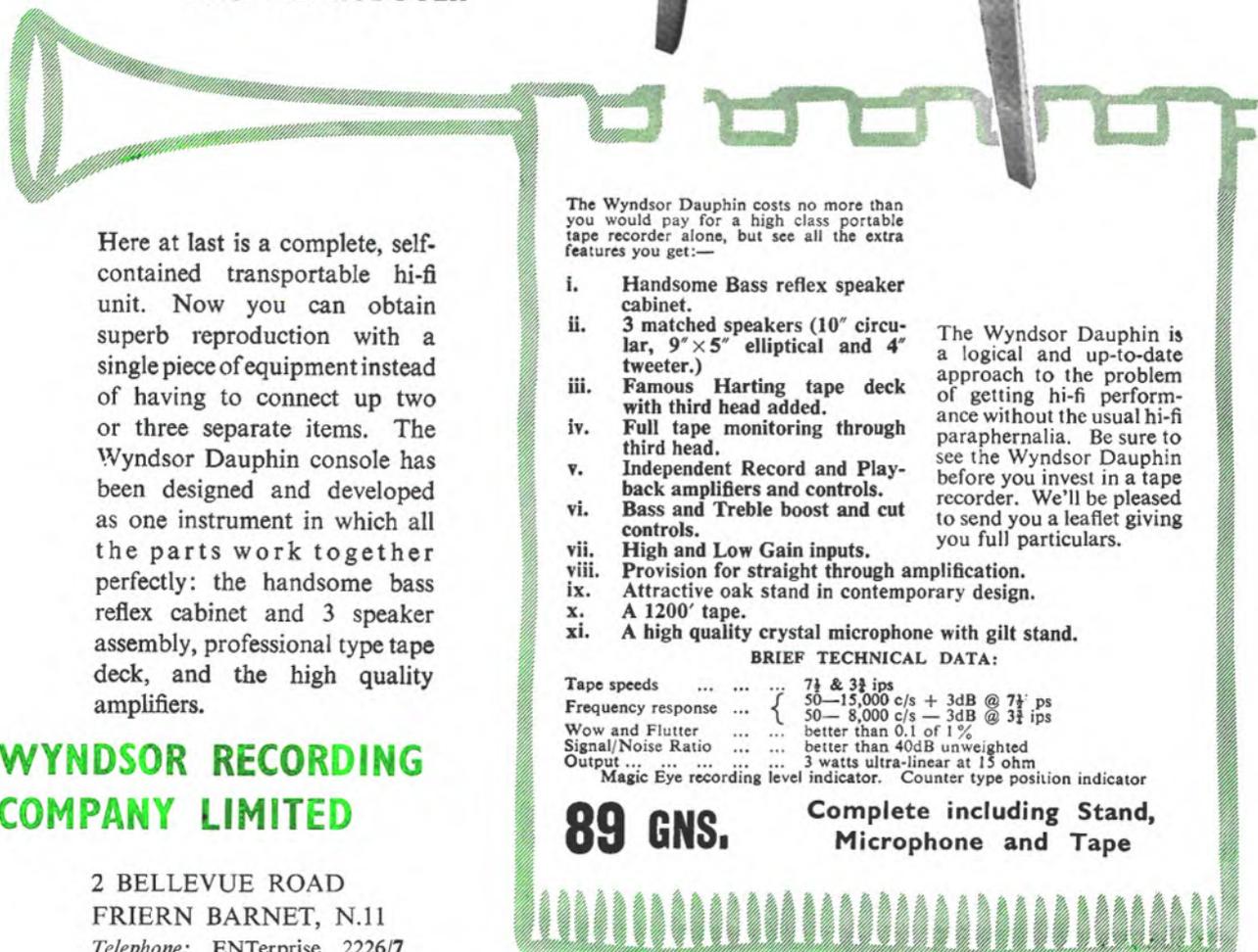
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HERALDING.....

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CONSOLE TAPE RECORDER AND REPRODUCER



Here at last is a complete, self-contained transportable hi-fi unit. Now you can obtain superb reproduction with a single piece of equipment instead of having to connect up two or three separate items. The WyndSOR Dauphin console has been designed and developed as one instrument in which all the parts work together perfectly: the handsome bass reflex cabinet and 3 speaker assembly, professional type tape deck, and the high quality amplifiers.

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- i. Handsome Bass reflex speaker cabinet.
- ii. 3 matched speakers (10" circular, 9" x 5" elliptical and 4" tweeter.)
- iii. Famous Harting tape deck with third head added.
- iv. Full tape monitoring through third head.
- v. Independent Record and Playback amplifiers and controls.
- vi. Bass and Treble boost and cut controls.
- vii. High and Low Gain inputs.
- viii. Provision for straight through amplification.
- ix. Attractive oak stand in contemporary design.
- x. A 1200' tape.
- xi. A high quality crystal microphone with gilt stand.

The WyndSOR Dauphin is a logical and up-to-date approach to the problem of getting hi-fi performance without the usual hi-fi paraphernalia. Be sure to see the WyndSOR Dauphin before you invest in a tape recorder. We'll be pleased to send you a leaflet giving you full particulars.

BRIEF TECHNICAL DATA:

Tape speeds	7½ & 3½ ips
Frequency response	...	{	50—15,000 c/s + 3dB @ 7½ ips	
			50— 8,000 c/s — 3dB @ 3½ ips	
Wow and Flutter	better than 0.1 of 1%	
Signal/Noise Ratio	better than 40dB unweighted	
Output	3 watts ultra-linear at 15 ohm	

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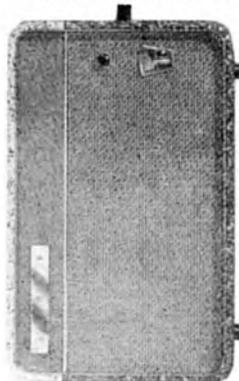
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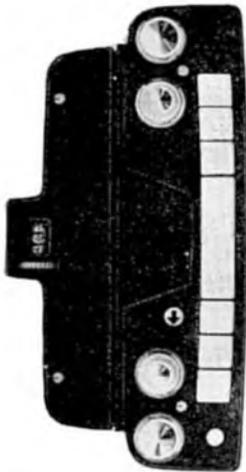
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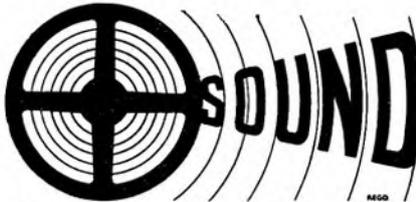
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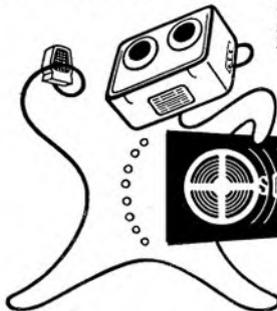
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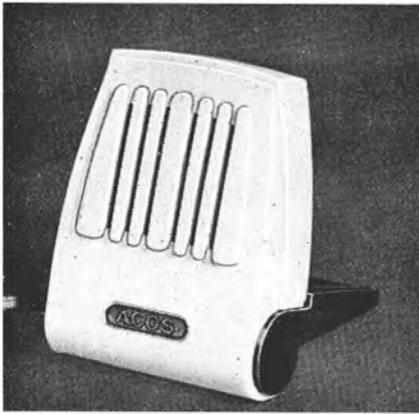
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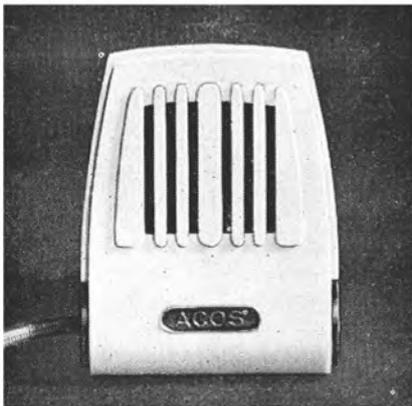
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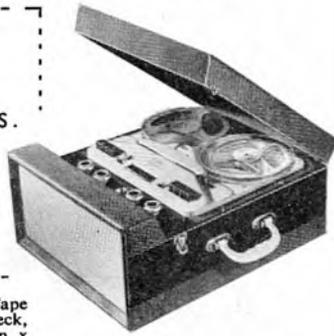
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Langton

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KNOW YOUR RECORDER

No. 5

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Working together

ONE OF THE MOST ENCOURAGING features of the growing popularity of tape recording is the tendency for enthusiasts to get together for joint activity. Individual effort and enjoyment is a great thing in itself, but communal work can bring even greater satisfaction. There are few other activities which lend themselves more readily to organised co-operation.

The obvious examples concern the hospital and blind services which devoted tape recordists are maintaining in several parts of the country. It would be impossible for individuals to create and sustain these services, but even a small group can do magnificent work.

In this issue we publish an article by Mr. Peter Kennedy about his work recording folk music. Here is another exciting field for group activity. In every part of the country, the East End of London or Glasgow no less than the rural fastnesses of Cumberland or Cardiganshire, there is wonderful material waiting to be recorded; and if it is not done now, it probably never will be, for television and modern transport are destroying it rapidly.

We hope our readers will heed Mr. Kennedy's advice and help the English Folk Song and Dance Society, and that some of the new tape recording clubs will try some group activity in furtherance of its aims.

Last year we drew attention to efforts being made to build up a National Library of Animal Sounds, and we hope that readers will not lose sight of the importance of developing the work of the International Committee on Biological Acoustics.

There are two places where the foundations can be laid for all these group activities. One is in the local clubs. The other is in the schools. That is why *Tape Recording Magazine* is resolved to make the maximum effort to build up both types of tape activity.

Elsewhere in this issue we report that a national conference of tape recording clubs is to be held in Coventry in July to discuss the formation of a National Federation of Tape Recording Clubs. We wish those who take part every success.

We are also hoping for a big effort this year by school teachers who use tape recorders as a teaching aid. The special schools section of the National Tape Recording Contest provides an opportunity and an incentive that has hitherto been lacking. Entries in the individual section of the Contest are obviously going to be heavy, but schools are slow in coming forward. We urge our readers to make an effort to spread interest among the youngsters.

RECORDER REVIEW

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ELIZABETHAN ESSEX

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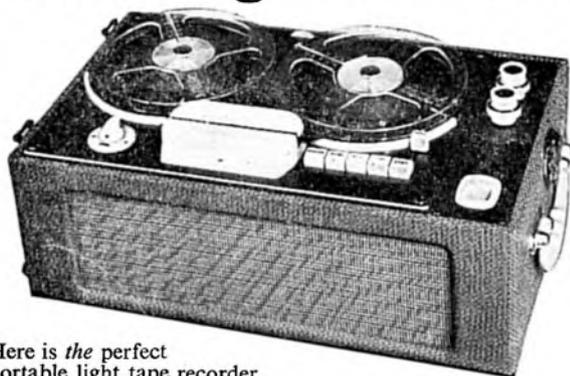
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REV. J. HEWITT analyses recording technique in the study of foreign languages

LEARNING to *speak* a new language—as distinct from learning merely to read and write it—is largely a matter of learning how to use one's vocal organs so as to produce new sets and sequences of sound. The study of the phonetic system, vocabulary, grammar and structural forms of the new language are all important, but they should be kept in their right place as aids to understanding and fluency. If they assume too important a place in language study, the learner tends to become slow and hesitant in his speech.

Constant repetition of phrases, and imitation of tone and voice inflection, play an important role in forming the new habits of speech demanded in the study of a new language. In the early stages, muscles soon grow stiff and tired and the ear goes "deaf" after about 20 minutes. It is therefore, far better to do half an hour's practice every day than several hours at a stretch every few days. The best teacher would seem to be a native speaker of the language one is learning. Tape recorders should be regarded as an *additional* means of learning the language, rather than a substitute for a native teacher; a method of hearing and practising the language when no living teacher is available.

The first thing to realise is that tape recorders can neither learn nor teach the language! Their use in language study must be imaginative and methodical. The advanced student may benefit from taping a broadcast talk in the language he is learning and playing it back frequently afterwards, until he has thoroughly understood and mastered it; the beginner is not likely to do so. In my acquaintance, some students seem to use their recorders simply as a means of providing background talk in the language they are learning, hoping that in this way they will subconsciously "absorb" the language while their whole attention is being given to some other work. They are heading for disillusionment. Language study to be effective requires mental and physical concentration and effort.

Some languages have a phonetic system which is hard for an English-speaking person to master. A series of recorded lessons with the progressively more difficult sounds systematically recorded may be helpful in such cases. Special attention should be given to mastering the phonetic system in the early stages.

The one great advantage which the tape recorder has over every other aid in language study is that it enables the student to hear and criticise his own voice; to hear and correct his own mistakes, particularly of pronunciation; and to continue repeating the sentence or passage until his intonation resembles very closely that of his teacher. This constant repetition forms abiding habits of speech.

The impression made in the early stages of language study is so deep and permanent that great care needs to be exercised in the matter of how the pattern recordings are made and used.

A speaker with good, clear diction should be engaged to make the recordings. To save the student from monotony, or from following too slavishly the pattern of one speaker, two or three speakers (men and women, if possible) may be employed. This familiarises the student with varying patterns of speech, but if too many voices are employed he may become confused.

Learning languages with your tape recorder

Usual everyday speech must be used. For instance, in English we say *What's this?* (not *What is this?*), and the answer is *It's my hat* (not *This [or that] is my hat*). In other words, a stilted and pedantic form of speech should be avoided.

Right from the start, all sentences should be spoken at the natural speed of conversational speech. No concession of speaking slowly for beginners should be made. The sentences should be short, natural and simple, growing progressively more difficult as new structural forms are mastered. *But they must all be spoken at speed.*

If the learner fails to recognise and correct his own mistakes, they must be pointed out to him immediately and he must be helped to put them right. Failure to do this will result in bad habits of speech, which will persist. This is one reason why the tape recorder cannot teach us a language; it helps us to be conscious of our mistakes, but it cannot itself point them out to us or help us to correct them. A live teacher is needed for this.

On standard tape recorders, only the voice that was last recorded can be played back. If another voice is recorded on the same length of tape, the original voice is erased. This means that a tape recorder may be used in four ways for language study.

1 The simplest and most obvious way, but the one that is probably the least effective in the process of language learning, is for the teacher to record a sustained passage of the language, so that the student may play it back and listen to it afterwards. If the student wishes, he can learn the passage by heart. Children's stories and the parables and miracles of Christ are convenient for this purpose, for the subject matter is easily understood or already known to the student.

The stories should be recorded in the current everyday idiom of the colloquial language, and not in a stilted, literary or old-fashioned style. In recording, the story should be read or recited with the natural expression of normal conversation. This is not easy to do, and I have found that even the most experienced teachers find it difficult to avoid reading the passage in a monotonous tone, or with exaggerated and unnatural expression. Such recording, of course, destroys the usefulness of this whole method, for it inculcates a monotonous or unnatural manner of speaking.

The student should listen to the recorded passage several times. He may then repeat it, or read it from a script, along with the recorded voice trying to imitate the tone, rhythm and speed, and other inflections of the recorded voice. He may be conscious of differences between his own voice and the one on the tape but, unfortunately, he can never hear his own voice recorded alongside the original. If he has two recorders, or can borrow one from an obliging friend, he could listen to the recorded passage through headphones and record his own voice on the second machine. Some recorder and language enthusiasts might feel it worthwhile to club together to do this.

2 Having practised a short passage (always going over it first with his teacher, so as to get the right phrasing and expression), the student can record it at his own leisure and then play it back to himself, or his teacher, for further criticism. If the teacher has recorded the passage, the student may record his attempt later on the same tape, so as to compare the two voices.

3 He can record the teacher's voice and his own voice in alternate sequences. The teacher will say a sentence and the student will repeat it after him, and so on through several sentences. Each sentence should be repeated three times. The student and teacher can then compare and criticise the two voices. This also forms a useful record of the lesson for the student to use again at his leisure. But it has this disadvantage: during the playback the student has to listen to his own faltering efforts, as well as the more perfect pattern of the teacher's voice. It is not good to hear these mistakes too often.

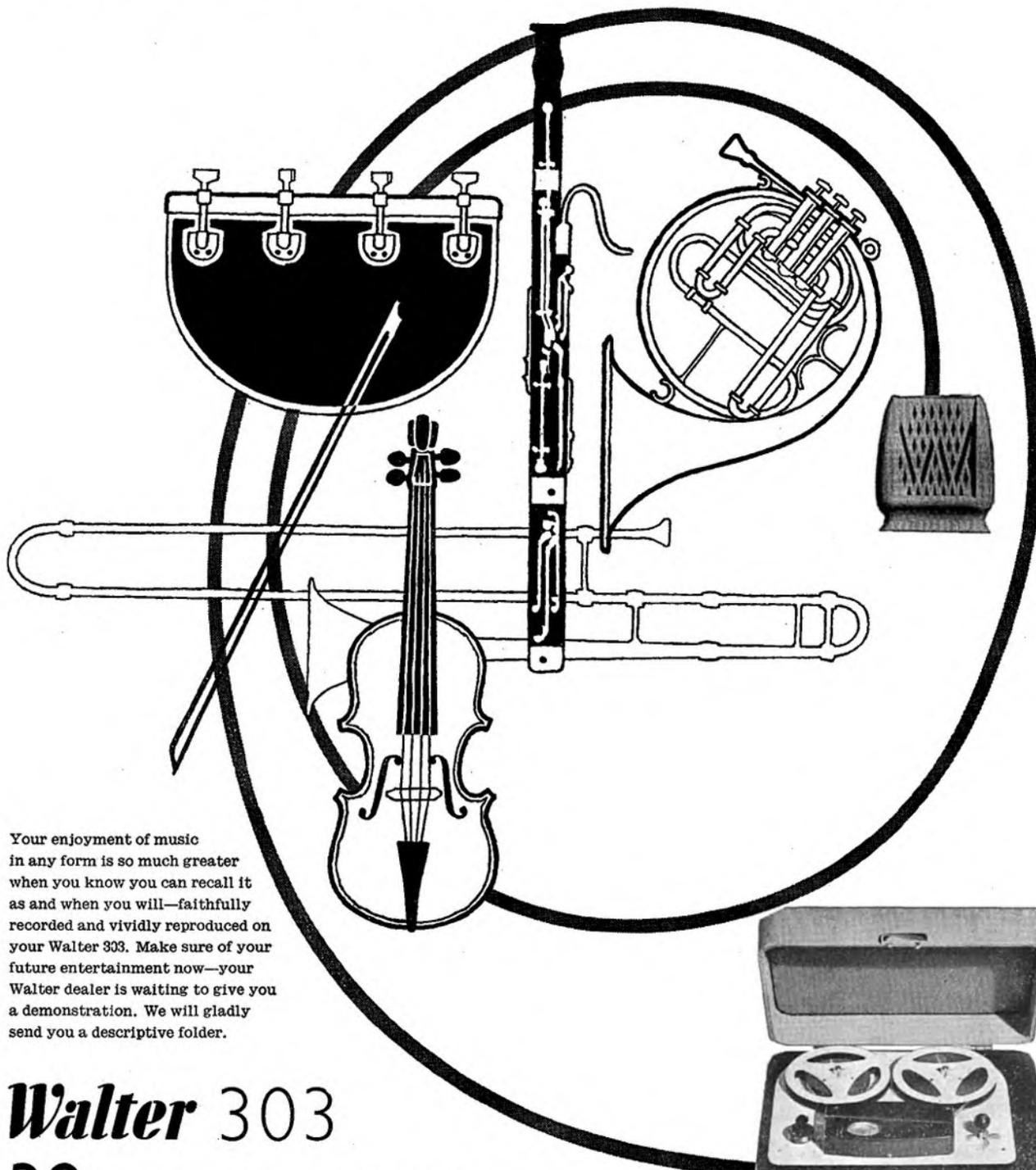
4 He may get the teacher to record several short sentences for him, three times each. There will be a silent interval after every sentence. When playing back, the student uses these silences to repeat the sentence which he has just heard. This tape can be used again and again with all the advantages of constant repetition. This method has the disadvantage that the student can never hear his own efforts and compare them with the teacher's voice—unless he has clubbed together with a friend to use both their tape recorders.

In this particular method, if two machines are available, it is an advantage not to use headphones. The teacher's recorded voice and the student's own imitation of it will both be recorded on the second machine and will afford a good opportunity for comparing the two voices. Fortnightly recordings on a special tape form a useful check on the student's progress and recurring faults.

Mr. Hewitt demonstrates a point with his recorder



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DEPT. F • WALTER INSTRUMENTS LIMITED • MORDEN • SURREY

PETER KENNEDY, seen here recording a country singer, has been tape-recording British folk music and customs for the last ten years. During this year he will be working on the establishment of the National Folk Music Archive.

This year the English Folk Dance and Song Society are launching an appeal for funds for this work and Mr. Kennedy asks all those who are interested in any aspect of the work to keep in contact with him.

In this article he explains the value of tape-recording our local customs, music lore and dialect; how to go about it; and the type of equipment to use.



How you can help to record our folk songs

*Oh, Maggie, Maggie May, they have taken you away
To plough upon Van Diemen's cruel shore;
For you've robbed so many sailors, and skinned so many
whalers,
That you'll never walk down Lime Street any more.*

I THINK it was hearing some fine old sea-songs and shanties from a retired "shell-back" which first started me off as a magnetic "tape worm." Stanley Slade sang his complete repertoire on to my first reel, on a Scophony-Baird. I was acutely aware that his way of singing could not be satisfactorily written down on paper in any way which would capture the tradition. But in this new method of recording, as it was then, I saw a wonderful way of preserving the style of singing. And then suddenly the urgency of the work was brought home to me when Slade died a few days after making his recording.*

Whenever I had a spare moment, I went off to the more remote villages in search of singers and musicians. My idea was not just to unearth new songs and tunes, but to prove that people still sang and played folk music, and that they had a particular way of doing it far removed from the modern academic approach to music, with its scientific harmony and imported vocal and instrumental styles.

I found there was plenty to record; not only music but annual customs, folk lore and local dialect speech. I began to learn not only the art of recording, but that of "collecting", and gradually I found I had the ability to bring material out of the back of people's minds which was a constant surprise both to their families and to themselves.

For the first few years I worked with my Scophony-Baird, both in England and abroad, and I found some strange comparisons. For instance, in 1951 I recorded an

album, for "Columbia World Library of Folk and Primitive Music", in Yugo-Slavia. I listened to epic ballad-singers performing to their own accompaniment on bellows-blown bagpipes. Imagine my surprise a few days later in Ireland to hear Frank McPeake, in Belfast, accompanying his own singing on the Irish Uilleann pipes in the same style.†

On nearly all these recording trips I have found local people to help me assess the importance of local culture, and I, in turn, have been stimulated by other collectors working in the same field in other parts of the world, most particularly by the American, Alan Lomax. His enthusiasm for this work has been largely responsible for some of the finest recordings of folk musicians in all parts of Britain and Ireland.

Since 1951 my equipment has generally consisted of the Wearite deck, with speeds of 15 and 7½ ips, with separate amplifier in a twin suitcase arrangement. When mains supply has not been available, I have used the Valradio vibrator converter, working from my 12-volt car battery. In recent years I have also started to make ciné-film recordings "in sync." with the tape recorder; using a synchronous electric motor drive on a 16mm Bolex ciné-camera linked to the bottom track of the tape. An appeal for a double track battery portable suitable for "sync." ciné work was successfully met by Magnetape Equipments Ltd. the firm who have constructed and maintained all my specialist field equipment. The first essential in field equipment is simplicity of design and operation, and I cannot say too much for the reliability of the Wearite deck over the last seven years. The rough treatment and continuous

(Continued on page 39)

* Stanley Slade's shanties can be heard on a 78 rpm disc H.M.V. B.10605.

† "A Manual for Folk Music Collectors" is published by the International Folk Music Council, 12, Clorane Gardens, N.W.3.

'Punch' dissects 'T.R. Mag.'

THE reputation of *Punch* has been built on the skill with which it recognises and dissects significant national trends and institutions, and we take it as a compliment, therefore, that the issue of 16th April, contained an article about tape enthusiasts, based on the contents of this magazine.

I recommend it to those with a sense of humour, who do not mind having their legs pulled gently.

As *Punch* comes out weekly, and consequently is much shorter of good copy than we are, we shall not quote from its pages quite as much as it has quoted from ours. One specimen extract may whet your appetite for a full reading next time you visit the dentist or barber.

I enjoyed most the *Punch* author's references to our recent article on musique-concrete:—

According to a contributor with the post-nominal letters F.R.S.A. and L.R.A.M., anything lying round the house is a potential noise-maker, and how right he is. He warns that electronic music is more cerebral than the ordinary kind, but it does arouse "an emotional response which is not directly antagonistic." A typical passage may involve "vague and unplaceable twitterings, disturbing rumblings, a mixture of sensuality and cold mathematics."

To one layman at least, this sounds uncomfortably like the accompaniment to a calculated, middle-aged seduction.

Earlier, the author describes the hapless efforts of a new recorder owner to get his fifty-guineas worth. "At this stage, with luck," he comments, "he will buy a copy of a magazine called *Tape Recording*, which will at once dissolve his frustrations and open up dazzling new vistas before him. Now at last, he can learn to put his tape recorder to constructive, creative use."

Let us cling to the conviction that there is many a true word spoken in *Punch*.

Meaning and purpose

I HAVE always found that anything to do with sound reproduction is sadly complicated by the popular urge to believe that one name can mean only one thing. How often does one hear, for example, such an expression of opinion as "I don't think much of tape recorders: I've heard one," or "High-fidelity is all very well for some people, but I like music to be quiet." Almost any demonstration of any piece of equipment in any queer combination of circumstances is only too readily accepted as a valid example of the best possible.

Stereo is a current case in point. Dozens of people who heard stereo demonstrated at the Audio Fair believe that it is a failure because they happened to stand almost directly between the two speakers instead of well back, and not a few are against it because they are not interested in the

noise of passing trains! In the same way any weaknesses that may be due to the special problems of stereo disc recording could be wrongly attributed to the stereo principle in general.

Fortunately, most visitors to the Audio Fair were intelligent and reasonably well informed on the subject and not likely to jump to conclusions either way. However, in spite of the generally favourable impression made by stereo, I feel that many who heard it demonstrated, left with reservations as to its value that only later experience will dispel.

HOMO TAPIENS

by

Douglas Jardine

SIR JOHN BARBIROLI is among those who have no doubts about the value of stereo at its best, and high fidelity reproduction generally, and when I came across him a day or two before the Fair he was unmistakably whole-hearted in his appreciation of the efforts being made through modern technical advances to get, as he perfectly expressed it "nearer and nearer to the truth."

He welcomes the fact, for instance, that with the high quality reproduction equipment now available, "great climaxes do not have to be played down." Above all, however, he seems to find joy in the finer musical subtleties that can be captured, such as the true note of the violin—including the sound of the hairs of the bow drawn across the string—and the distinctive breathy quality of the reed instruments. He described how excited and moved he was when he first heard these authentic sounds reproduced.

I wish everyone had his splendid clarity of mind over the supposed conflict between live and recorded music. Nothing, he said quite firmly, could ever equal the live performance: that must come first. But how sad he would be, he continued, if he thought he could never again hear the playing of his old friend Kreisler reproduced as faithfully as possible including, for instance, the almost imperceptible touch of his finger on the string in certain passages.

In fact, the endless pursuit of the ideal in sound reproduction is a good thing even if we are sure that we can never quite achieve perfection.

Lend me your spool

IS the tape recorder destined to take over the ancient role of the letter as one of the most popular contrivances in conventional drama? Instead of the line: "Give me pen and paper. I will write him a letter!", will future generations become accustomed to accepting

as the turning point of the play the words: "Fetch me my portable and a ten inch spool: I will send him a message that will wring tears from his cruel heart!"

Terence Rattigan in his new play "Variation on a Theme," shows that he has spotted the new opportunity. An E.M.I. portable that just happens to be around is used by Margaret Leighton to break the news to her lover that she is renouncing him and to tell him exactly why—with adroit use of the pause control to cover the moments when she might otherwise give herself away.

As Rattigan has realised, this system retains the advantages of the letter of signalling a climax and permitting something to be pronounced with dramatic emphasis that might seem too lengthy and embarrassing if said face to face, and it has the additional advantage of making vocal expression a rational part of the process. Furthermore as we never need to hear the actual replay, penurious amateur companies can make do with a dummy recorder.

Of course the hasty concealment of a spool in the breast can present difficulties, but on the other hand it can be thrown more easily up to a balcony with the whispered words: "Play it back at seven-and-a-half beloved."

It can't say 'no'

AS an example of how ways of using a tape can lie under one's nose for a long time without being noticed I mention an "inspiration" that came to me a few days ago when I was snowed under with several yards of proofs.

When large quantities of facts and figures have to be checked against their original source it is a natural thing to look around for a victim who will read the proof aloud while you keep your eyes on the original material, or the other way round. This saves constant dodging from one to the other—a frustrating and not very efficient process.

On the occasion in question I looked around automatically for a victim and saw—a tape recorder, complete with a pause control. You can guess the rest—and it worked so nicely that I have no hesitation in advising other journalists, proof readers and so on to enlist this uncomplaining and untiring helper when only complaining human ones, or none at all, are in view.

Offer from India

A MEMBER of the R.A.F. in Iraq has written to us to say that he has a Grundig TK5 with him and would be glad to make it available for replaying messages to anyone in the Habbaniya area. Readers in this country who know of anyone with a relative there might care to co-operate. They should write direct to 1922468 Cpl. Battershill, M., Billet A16 B East, R.A.F. Habbaniya, Iraq, B.F.P.O. 61.

Tape Types

by Alastair



Alastair MacLennan # 23



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EMITAPE *the world's finest magnetic recording tape*

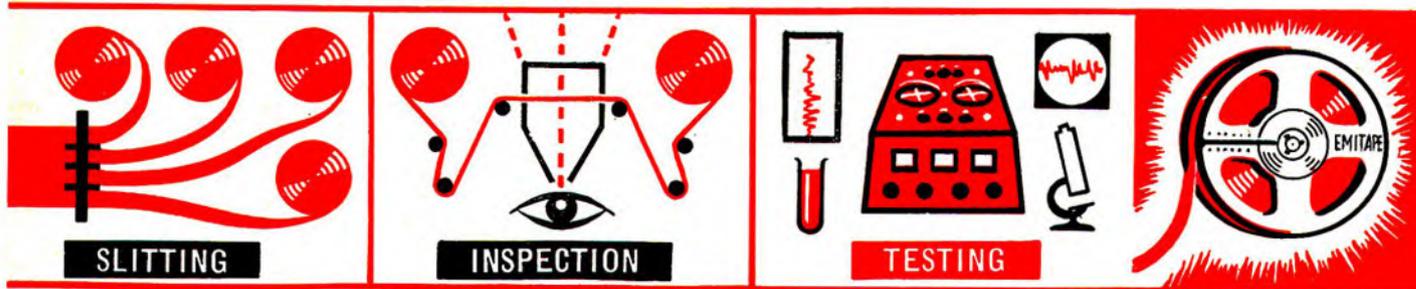
EMITAPE is produced at Hayes, Middlesex, by E.M.I. in the largest magnetic tape factory in Europe. E.M.I.'s technical skill and accuracy and over 60 years of research in sound recording ensure that EMITAPE is the finest magnetic recording tape in the world.

EMITAPE consists of a PVC base film coated with magnetic oxide particles. Heat treatment first renders the oxide particles magnetic and they are then mixed with special varnish for adhesion to the base. The coating

process is a highly critical operation where every effort has to be made to ensure that the tape surface is completely free from foreign particles.

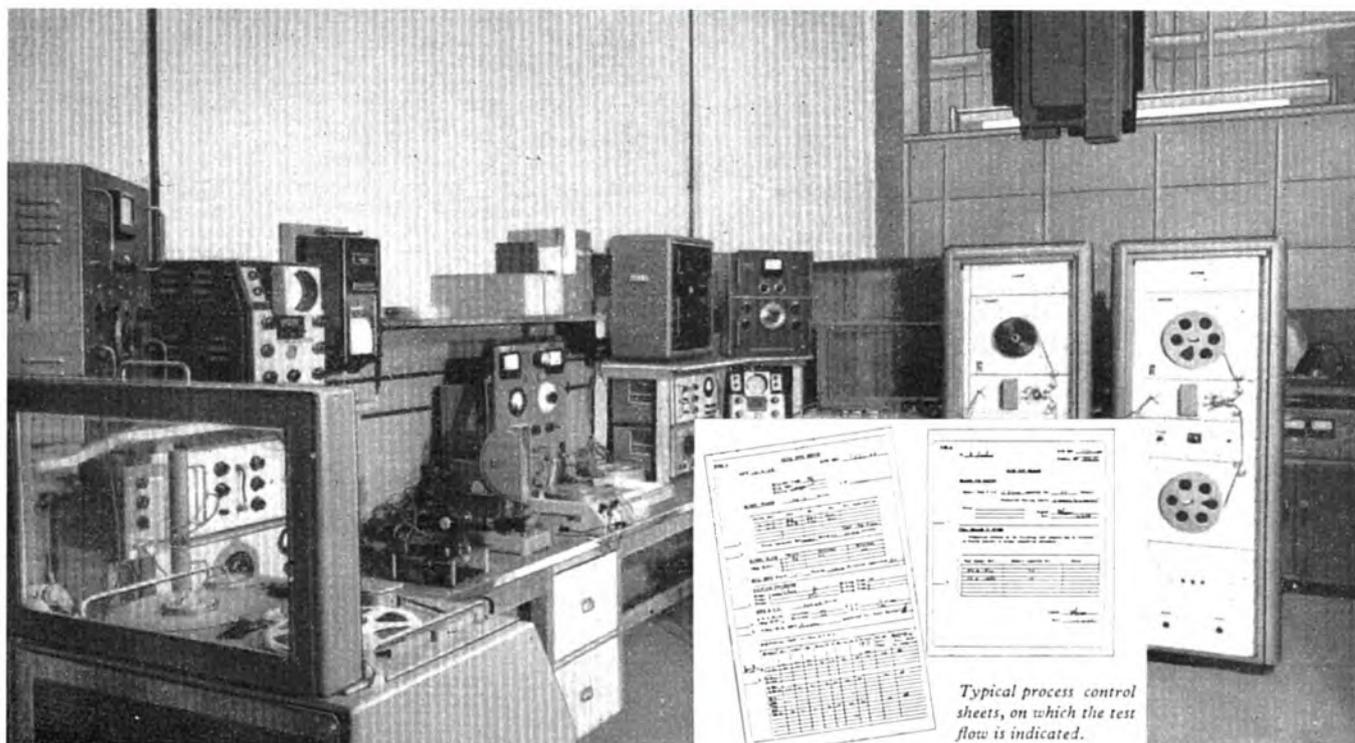
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STAGE 6

TESTING



Typical process control sheets, on which the test flow is indicated.

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Two new tapes worth having

THERE can scarcely be a more difficult task today than that of selecting music for the privilege of a stereo tape recording. Interest in stereo is mounting daily, and yet few can hope to have their fondest tape-dreams in this medium completely fulfilled in the near future. However, if production must be slow then it is a good thing that each issue should offer some tapes of work that must be almost universally loved and some that cater for rather more individual tastes.

Of three Stereophonic Tape Records recently issued by H.M.V. two are in the popular category—a Haydn Symphony and a Mozart piano concerto; and the third, a Sibelius concert suite, leans towards the specialist field.

First for the Haydn. His "London" Symphony No. 104 in D (SBT 1256), the last he ever wrote, is a work of considerable beauty. What is more it is one of the best of his larger products to possess, because it contains a full measure of his joy, exuberance and wit, for those who ask nothing more of him, and also a note of deeper seriousness, and a greater musical maturity than many of his other symphonies, for those who welcome these things in the interests of sustained appreciation. These additional aspects not only provide contrast of mood but give more substance to the work and enable it to be played far more often without exhausting its possibilities as a musical experience.

The playing of the Philharmonia Orchestra under Rudolf

Kempe is highly satisfactory. The line is firm and Haydn's richness and lyricism emerge naturally and spontaneously. Sound technical work contributes its quota and the result is a tape of delightful tones and textures properly exploiting the advantages of the stereophonic treatment.

The Sibelius "Pelléas et Mélisande," Opus 46 (SBT 1255), is the incidental music to the Maeterlinck play, a completely orchestral work with the only song of the play interpreted by English horn and clarinets. It is a concert suite, completed in 1905, which has long been accorded the right to exist as an independent work, and if it does not rank among the composer's greatest achievements, it is nevertheless true and typical of his character and musical genius. It also has diversity and much that is moving and beautiful.

One does not look to Sibelius for orchestral virtuosity but the eight pieces of this suite provide natural scope for many different instruments, and within the general mood of legend and fantasy the effects are varied enough to please even those who are not naturally attracted to the composer. The pieces are: At the castle gate; Mélisande; A spring in the park; The three blind sisters; Pastorale; Mélisande at the spinning wheel; Entre'acte; and The Death of Mélisande.

Above all, this tape provides a superb performance by the Royal Philharmonic Orchestra, conducted by Sir Thomas Beecham. Every thread of charm is made to catch the light, and at other times the work has a perfect, serene majesty. One can be especially grateful for stereo in the passages where the waves of sound are almost physical in character.

It has been said that Sibelius seems to be a fixed taste, that "it does not seem possible to acquire it or to become fatigued by it." This may be true in general, but it is difficult to imagine anyone not acquiring a taste for this particular example.

The Mozart release is the Piano Concerto No. 17 in G (K.453), played by Gina Bachauer and the London Orchestra (SCT 1523).—D.W.G.

New issues will be regularly reviewed as they appear.

The feature will be edited by Edward Greenfield, recorded music critic of "The Manchester Guardian."

Four new books worth buying

THERE have not been many books so far on tape recording, but the signs are that we are ceasing to be neglected. Four particularly good volumes have come to hand during recent weeks.

The first, **Magnetic Recording Handbook**, by R. E. B. Hickman (Newnes, 21s.), will already be known to some readers. This is a new edition of a work published two years ago. It opens with an historic sketch of the development of tape equipment and a clear explanation of the theory of recording. It then goes over the main features common to recorder construction, before examining in some detail a variety of the machines on the market.

There are then two particularly valuable chapters on recording technique and on maintenance and servicing. The book is well illustrated.

For those who already have the original edition, it is fair to make clear that the principal change is the inclusion of an up-to-date statement of the law on copyright. This is based on the article by Peter Ford published in the BSRA Journal early last year.

Some of the same ground is covered by the second book, **Elements of Tape Recorder Circuits**, by Herman Burstein and Henry C. Pollak (Gernsback Library, New York; obtainable in this country from Modern Book Co., 19-23, Praed Street, London, W.2, 23s. soft cover or 40s. hard cover).

But this is a rather more advanced work, with more technical detail, fewer photographs and more diagrams and circuits. It does not cover so wide a field, but concentrates on electronics. It seeks to explain circuitry in terms of what the designer is trying to accomplish. It deals with fundamental principles.

The book discusses the problems that have been met and solved, and those that remain. It considers alternative solutions

to given electronic problems and explains how cost determines the design of particular recorders.

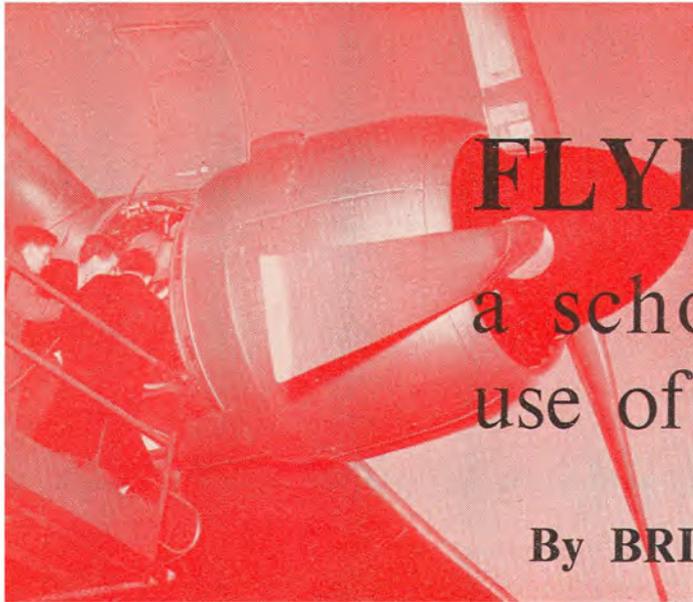
It is a book from which almost every one of our readers is likely to learn a great deal.

High Fidelity Loudspeaker Enclosures, by B. B. Babani (Bernards, 5s.), is a reprint of a 48-page booklet which first appeared last year, giving 26 practical designs and 40 drawings for a wide variety of speakers.

For audio engineers and technically-minded enthusiasts the name of the author, James Moir, M.I.E.E., is sufficient guarantee of the practical value and authoritative nature of **High Quality Sound Reproduction**; and all they will probably wish to know is the range of this new work, which appears as a contribution to the Chapman & Hall series of **Advanced Engineering Textbooks** (70s.).

The range can be indicated briefly by stating that he begins with an analysis of sound, hearing and the requirements of realistic performance, and goes on to deal with microphones, mixers, reproduction from disc and tape, amplifiers, transformers, negative feedback, tone control and rectifier circuits, dividing networks, loudspeakers, acoustics, sound reproduction in the cinema and stereophonic sound reproduction. There are over three hundred diagrams and illustrations in this work of nearly 600 pages, and another valuable feature is the glossary of acoustical terms and definitions.

The difficulty comes, naturally enough, in trying to suggest the degree of technical knowledge called for on the part of the reader. On this point it can be said that although a great deal of the work is inevitably above the heads of all but the professional engineer and knowledgeable amateur, the thoroughness of the author's approach and his lucidity of thought and explanation make it possible for every sound enthusiast to benefit considerably from it, and in fact to comprehend far more of even the difficult sections than would be imagined at first glance.—R.B.



FLYING HIGH

a school's dynamic use of magnetic tape

By BRIAN T. GORWOOD

WHEN my tape recorder appeared in the class room for the first time, it was used merely to acquaint the children with the sound of their own voices. They read from a book or recited a poem in front of the microphone. It was not long before this approach to recording ceased to satisfy them. They wanted to do something more ambitious.

This they achieved in the "radio" play. Most of the plays available had been written for the stage and were not at all suitable for sound treatment without being adapted. The children arrived at the obvious solution after a few weeks. They decided to write their own serial play.

It required little debate to establish that it should be of the "Journey into Space" type, but the writing of sufficient material for a fifteen minute episode each fortnight, as had been planned, proved to be too difficult for them. Reluctantly, therefore, I decided that I should have to write the plays myself, using their ideas wherever possible.

The school building had already been tested in order to find a room suitable for the "studio." In all the classrooms, we discovered a wonderful echo effect which proved useful on occasions but ruled out the possibility of recording plays in them, generally. The staff room was the only room which was satisfactory acoustically, and traffic noises and the shouts of street hawkers made even this room far from ideal.

By now, one boy was trained in the technique of recording, two boys were in charge of sound effects and about eighteen other children from my mixed class of thirteen-year-olds were ready and eager to read a part. The episodes were recorded in the evening after school and on Saturday afternoons. Only short sections of three or four minutes duration were attempted at one session and these were pieced together later on.

The sound effects boys experimented and produced the required noises. The various hums on the radio, particularly on the short wave, were used to simulate the sound of space ships. Bicycle and car pumps were used for anything from pneumatic doors to rockets.

* * *

Three commercially produced effects records were used, but even these had to be played at the wrong speed to satisfy the effects specialists. Most of the effects were produced by using the simplest of materials; stones shaken in boxes; marbles rolled around in tins; sheets of sandpaper rubbed together—and so on.

Likewise, the main equipment was simple. Background music, from a radiogram, was recorded through the microphone, as no mixer unit was available then. This microphone, the one supplied with the cheap, single-speed recorder had to suffice for everything—effects as well as voices.

The recordings were played back to individual classes during school time. There were six episodes, each of which lasted about twenty minutes. They were eagerly followed, particularly by the younger members of the school.

"The Long Ride," as the serial was called, proved to be far

better than anyone had dared to expect, so, boldly, we sent a copy to Trevor Hill, B.B.C. Northern Children's Hour Organiser.

The tape came back. But with it came an encouraging letter which promised to "get coverage" for our efforts on a children's news programme.

One evening a few weeks later we discovered what the B.B.C. meant by "coverage." They sent to the school, a recording van, two technicians, a producer, three microphones, two gramophone units, a mixer unit and an outside tape recorder.

* * *

The children were a little overawed by the occasion but Mr. Michael Barton soon put them at their ease. In a very short time, he had a five-minute interview taped. Then came the more difficult task of recording an extract from the serial.

The explosive sound effects which had been so carefully worked into the script would have shattered the sensitive B.B.C. microphones. Disappointed but undaunted, the effects boys had to improvise. They used mouth effects instead of their beloved car-pump "rocket." They had to simulate the sound of bomb detonations by slamming a door some way along the corridor outside the "studio." Again, the B.B.C. vetoed their effect—a marble rolling in a tin which was dropped within inches of the microphone.

The actors too had to learn a new technique. In the past, full use had been made, on our own machine, of the ability to erase a word, or even a syllable. But, for the B.B.C., the children had to produce long passages of perfect recording.

Several takes were needed before a satisfactory result was obtained but it was difficult to account for the three hours spent in recording a ten-minute programme. The broadcast itself was indeed a thrill for the children. And there was also an article in the local paper.

After all this excitement, an anticlimax was inevitable. But, with the new school year came renewed enthusiasm. "Tape Recording Club," now had a membership of fifty or sixty children of ages ranging from eleven to fifteen.

New equipment was introduced. The smaller tape recorder was replaced by a more powerful one. A mixer unit and high quality ribbon microphone, added to the basic equipment, now gave us a much higher technical standard.

The first venture using the new equipment has been the production of a monthly 45-minute magazine programme, dealing with activities both in and out of school. The three or four main items in each programme are linked together by dialogue, poetry, sketches and music.

Full use has been made of the mobility of the tape recorder. In the first programme, four children went to a local theatre for Lonnie Donegan to add his expert knowledge to a discussion on skiffle music. For the Christmas edition, the manager of a toy department forfeited his free afternoon and opened up his

(Continued on page 39)



SUGGESTIONS

RECORDING A WEDDING

I HAVE been asked by two very good friends who contemplate marriage to record the Church Service. I am wondering if anyone can supply me with a few tips. I have a Grundig TK5 and accessories with literally miles of tape.

Should I have to go to the expense of a mixing unit for this or would one good microphone, well placed, be sufficient? And would rehearsal be essential? If you or your readers can help me in this matter I would be obliged. The tape of the wedding would be transcribed to a LP disc for use with record player.

ALAN J. KNIGHT.

Bristol 6.

LESS WEIGHT

WILL someone produce a non-breakable (rubberised) 5-in. spool that obviates extra weight in packaging, etc.? And what about some cheap featherweight cartons with imprinted address label and other tape exchange data for 3-in. and 5-in. tapes? Some of us spend more time in packing a tape than in recording it.

WO II FRANK X. MICALLEF.
Feltham, Middlesex.

A BUZZING NOISE

RECENTLY I purchased six yards of microphone extension cable, intending to record birds in the garden. I joined it the correct way, white to white and outer wire to outer wire, but all I got was a horrible buzzing noise. I tried joining numerous other ways, but without success. Can anyone tell me the remedy?

IAN D. WOODWARD.
Barnard Castle.

THE IDEAS POOL

More and more readers are helping one another. If you have a problem, write to "The Ideas Pool" about it. And if you think you have an answer to any of the

queries, let other readers share your knowledge and your own experiences.

HELPING THE BLIND

FOR the blind it should be readily possible to provide rev. counters with the numbers executed in braille, or some other code.

Another little trick that occurs to the writer is something which would be less accurate but, of course, simpler. This would take the form of markings along one of the spokes of the tape reel so that by running a finger along the spoke and feeling where the tape is one can tell how much tape there is on the reel.

K. SHORT.

Recording Devices Ltd.,
London, N.W.2.

RECORDING THE SEA

WHERE we live on the N.E. coast I have every opportunity of making recordings of the sea. I use a Boosey and Hawkes battery-operated portable tape recorder with Acos lapel microphone. I have recorded waves on many occasions and usually the recordings have left much to be desired, the general effect being a more or less continuous roar. One drawback is that the input to the machine is uncontrolled.

Determined to get good sound, I went down one very calm night about 11.30 p.m. The sea was relatively calm with well-spaced waves, probably not more than a foot high. By recording from different distances it was possible to imagine that they were huge breakers or, by moving back, waves which were just lapping the shore.

It is a simple matter to add the sounds of gulls and similar effects later.

With regard to wind noises, I have had the hissing effect when recording the sea on calm days. I do get a wind rumble on my mike, as we all do, but the hiss I always associate with the sea.

If any of your correspondents would like to hear my results I should be pleased to "dub" them a copy if they send the tape.

JOHN RIPPINGTON.

30, Breamish Street,
Jarrow, Co. Durham.

AND QUERIES

TAPE RUNNING TIMES

LIKE Mr. Bidmead, I find that the pleasure of recording symphonies and so forth is spoiled by the anxiety caused by wondering if the tape will last the duration of the work. I wonder if there is any publication which lists the most popular classical works against their approximate running time. A service of this kind would assist greatly in judging the amount of tape to be allotted to a particular recording, especially if the time for each movement were given.

M. HOSEY.

Glasgow.

CIRCUITRY PLEASE

IN *Wireless World* for April, 1955, J. E. Price and R. A. Frewer described a tape selector mechanism which can stop the recorder at any desired position (which has to be marked in the first instance). The provisional patent number is 33963/54.

Now I have a query. Does anyone have the circuit diagram of a really hi-fi 3-way mixer unit suitable for three microphones? It must be an electronic mix and not a pure resistive one.

E. JONES.

Cheltenham.

A DANGER?

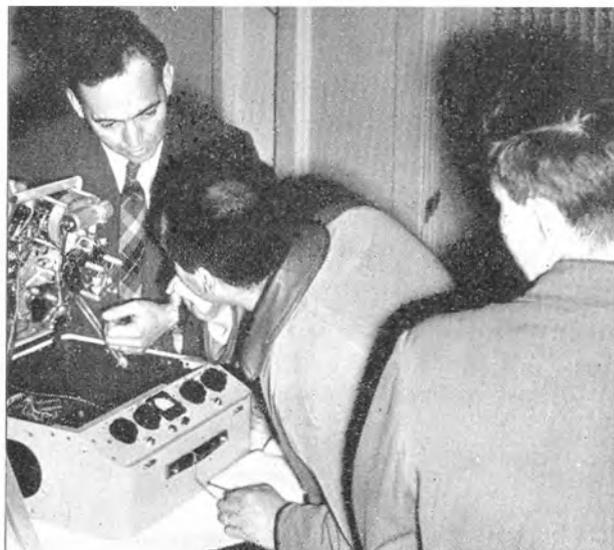
I HAVE heard from quite a good authority that if some recording machines are switched to "record" while no microphone is connected, a noisy sound head can easily result due to the fact that there is no bias in the circuit. I should be pleased to have help on this matter and an explanation of the "electronics" involved.

D. TOWNSEND.
London, S.W.15.

AUDIO FAIR BROUGHT MANY NEW PRODUCTS



THE 1958 Audio Fair, which had a larger attendance than ever, helped to demonstrate the further growth of interest in high quality sound—including, to a greater degree than ever, the equipment associated with magnetic tape. It is also evident that this growth is going to continue, and the problem in future years will be to cater adequately for the number of visitors who wish to have demonstrations of the latest equipment in conditions that approximate fairly closely to those of the home.



In our May issue we gave, in advance of the Fair, details of a large number of new recorders and items of equipment in which the tape enthusiast is interested. The actual opening of the event, however, naturally produced a further crop of innovations including such things as the new small battery-operated Fi-cord recorder, the neat Brenell 3-input mixer at £2 18s., and a number of new loudspeakers and amplifiers.

Rather than attempt to cram the information concerning these items into a few pages, we have decided to spread it over the next few issues, and our July issue will accordingly contain a special review of recently introduced loudspeakers. In the following month we shall deal with new amplifiers and similar equipment. Other features in the near future will deal with microphones and mixers.



Next month, also, we intend to include fuller details of the Fi-cord, the new Verdik recorder, a tape recorder now being placed on the market by Regentone, the new RD Junior Stereo control unit and a review of the Zeiss Moviphon.

STYLE, TOUGHNESS AND PERFORMANCE ●

Three shots of the Audio Fair at the Waldorf Hotel which illustrate the chief aspects of interest for the tape enthusiast. In the top picture the machines shown by E.A.P. (Tape Recorders) Ltd. emphasise the importance of appearance; the middle picture, showing a Ferrograph under appreciative scrutiny, illustrates the regard for good design and quality of work "below deck"; and the shot on the left, taken during a session in the Brenell demonstration room, illustrates the ultimate test of quality—a good performance



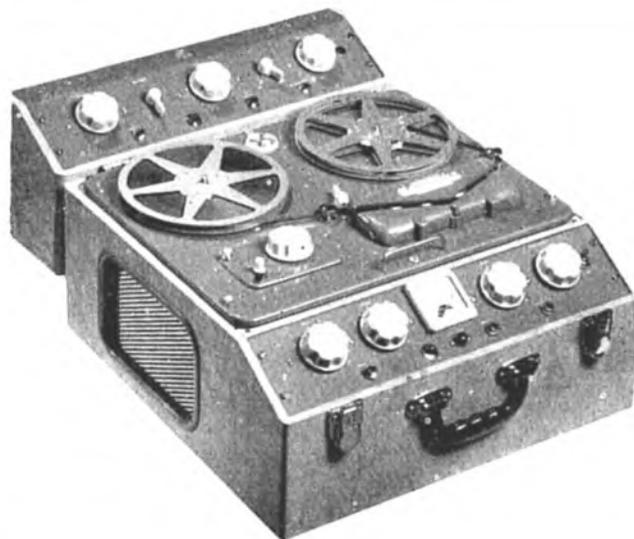
Grundig launch TK20 - lightest, smallest, cheapest

A NEW Grundig tape recorder is a matter of considerable interest, and it is in keeping with the current tendency to cater separately for the confirmed enthusiast and for the seeker of economy first that this model, known as the TK20, should be not only the lightest and smallest of the Grundig range but also the cheapest.

The dimensions of the TK20 are 13½ x 12 x 7 in., and its weight is 20 lbs. The price of 50 guineas includes the six-guinea Grundig condenser microphone and a 1,200 foot spool of the new Grundig Polyester L.P. tape giving an overall playing time of more than two hours at a speed of 3½ ips.

Economy is assisted by the fact that this is a single speed model, using a speed of 3½ ips, but a high quality speaker is employed and a claimed frequency response is achieved of 60 to 10,000 cps.

As the accompanying photograph shows, the TK20 has the attractive finish that is a feature of all Grundig products, together with the straightforward, easily manipulated controls which characterise the other models.



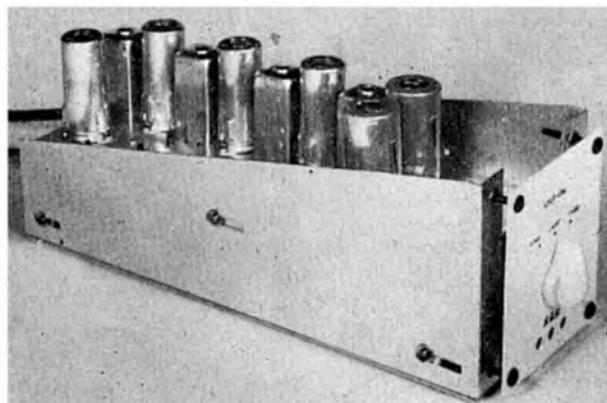
Ferrograph Stere-ad gives stereo at 119 gns

THE new Ferrograph stereo equipment attracted a great deal of attention at the Audio Fair. The accompanying photograph shows the new 3S recorder together with the Stere-ad unit. The 3S consists of a standard type 3A/N or 3A/NH recorder, giving the normal single-channel recording and reproduction, with the addition of a stereo inline head connected to a rear socket. The Stere-ad unit consists of two matched pre-amplifiers—one for each stereo channel—and a single channel amplifier giving 2½ watts output; plugged in to the 3S this brings into use the 2½ watts amplifier in the recorder for the second amplification channel, and a total of 5 watts is then available for stereo reproduction. Model 3S/N is priced at 89 guineas and Model 3S/H at 96 guineas. The Stere-ad unit costs 30 guineas.

Model 77 Ferrograph has been discontinued in favour of the Series 3S, but Model Stereo 88, the stereophonic recorder and reproducer, continues in its present form.

Switched FM Tuner by G.E.C.

THIS is the BCS1352 VHF/FM Tuner Unit introduced by the General Electric Co. Ltd., at the Audio Fair. It is a pre-tuned switch-selected receiver unit for use with an external power supply, and consists of a six-valve superhet chassis designed for high quality domestic amplifiers. The main feature is the three position pre-set selector-switch tuning system with the associated automatic frequency control stage. Each of the trimmer controls covers the B.B.C. Band 2 range of 88 to 98 Mc/s, and a two-stage limiting circuit provides a constant output at high impedance, obviating the need for a volume control. A low distortion temperature compensated Foster Seeley discriminator circuit is another important feature. The tuner is supplied complete with twin mounting brackets and a front escutcheon designed to permit easy fitting to any normal cabinet or panel. The price is £28 7s., including tax.



BATTERY-OPERATED STUZZI WITH MAINS PERFORMANCE

A FULLY portable tape recorder with all the facilities of a high quality mains operated machine, but entirely operated from batteries, is the achievement claimed for the Austrian Stuzzi Magnette now being marketed in this country by Recording Devices Ltd., 95, Villiers Road, London, N.W. 2, at a price of 69 guineas.

Using tape speeds of $3\frac{1}{2}$ ips and $1\frac{7}{8}$ ips, and incorporating revolution counter, magic eye, fast running facilities and push-button controls, the Magnette runs from four torch batteries, and the running cost is given as just over a penny an hour.

The size of the machine is 11 in. x $4\frac{1}{2}$ in. x 8 in., and the weight, including batteries, is 8 lb. It is attractively designed, and has a transparent plastic cover



Brenell Equipment for B.B.C.-Stereo Recording

THE B.B.C. is organising further experimental stereo programmes, and before long stereophonic sound transmissions may well become a regular feature of broadcasting. Tape recording enthusiasts will consequently be looking for suitable equipment to record these transmission for home reproduction on tape.

The new Brenell Mark 5 tape deck and associated equipment enables this to be done quite easily. It can be used also for stereo recording from microphones or disc.

The full equipment for the purpose, apart from the two loudspeakers for reproduction, consists of the Mark 5 tape deck, with two extra heads, and two Mark 5 record/playback amplifiers, with power packs, costing a total of £81 16s. A special mounting rack for the equipment is extra to this.

Features of this system include claimed elimination of cross-talk, independent frequency correction on each track, independent recording level to each track, and independent playback volume and tone control from each track.

The system used by the B.B.C. at present is to use one programme, such as the Home Service, for one channel (say the left hand section), and other sources, such as the Third and TV Sound, for the other channel.

IN BRIEF

The new British polyester film made by I.C.I. under their registered trade name of Melinex is now being used by the M.S.S. Recording Co., Ltd. as the base for their new Master-tape long play tape. The company claim that it makes tape breakage "a thing of the past," and add that the print through factor has been considerably reduced. The Showroom and Studio of the M.S.S. Recording Co., Ltd., is now at 21, Bloomsbury Street, London, W.1.

The Autumn Audio Fair is to take place from Friday to Sunday, 24th to 26th October, inclusive, at the Grand Hotel, Harrogate.

Mr. William Strange, formerly of Grundig (Great Britain) Ltd., has joined the Wyndor Recording Co., Ltd. as Production Manager.

Polythene covers to protect tape from atmospheric fogging, dust, dirt, etc., are now being marketed through trade channels by Soundrite Ltd. These Magnetic Recording Tape Protectors are sold in packs of twelve 7 in. covers priced at 2s. 6d.

Emitape 99 was used by the B.B.C. for their new TV development, Vera.

Fi-Cord Ltd., manufacturers of the Fi-Cord Recorder, have offered a machine as a prize in the documentary and reportage section of the Second British Amateur Tape Recording Contest.

to protect the tape deck, easily removable for changing spools. An optional accessory is a plastic carrying case with shoulder strap.

The frequency range claimed is 80 to 9,000 cps at $3\frac{1}{2}$ ips and 80 to 4,000 cps at $1\frac{7}{8}$ ips. There are input facilities for microphone, radio, pick-up or telephone adaptor. There is a built-in high flux speaker and connections are provided for feeding to an external amplifier and to earphones.

The push button controls operate for stop, record, replay, fast forward, fast reverse and to give amplifier-only facilities.

The amplifier is powered by two 4.5 v. flashlamp batteries, and the drive unit by two more of the same type. They are positioned separately inside the recorder, which helps to avoid interference and promotes long battery life. Frictional losses have also been kept to a minimum.

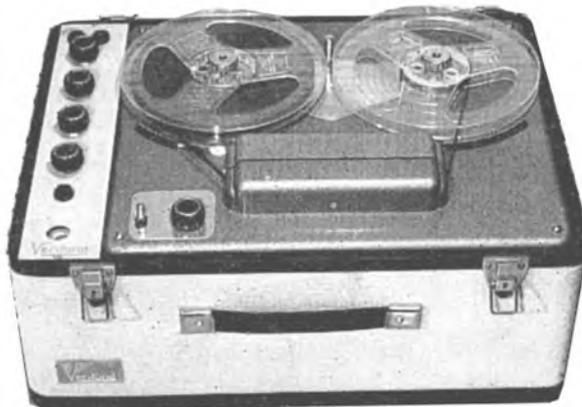
Powered from the bias and erase oscillator, the magic eye serves as a modulation indicator and in addition shows the state of the amplifier batteries. When these are getting too low for satisfactory operation the indicator fails to glow.

The design of the drive unit is simple and despite the limitations imposed by size and weight, there are two accurately maintained tape speeds which, it is claimed, enable recorded tapes to be removed from the machine and played on any other, mains or battery operated, without loss of fidelity.

The centrifugal regulator does not interrupt the motor or any other substantial current, but, instead, acts on the transistor which works like an electronic switch. In this way contact wear is virtually eliminated.

An electro-magnetic indicator on the tape deck is also connected to this control circuit and gives advance and final warning of the need for battery replacement.

The machine is supplied with a moving coil microphone matched into the first transistor. A special adaptor is also available as an extra to enable recordings to be made from telephone or radio without direct connection to the set.



The new Veritone tape recorder, which was fully described in our May issue. It has a built-in Rola Celestion speaker, mounted on a large baffle, and the price is 52 gns.



C.Q. Audio Ltd., present a range of equipment of original and attractive design in which true standards of high-fidelity are assured, yet both size and price are well within the requirements of the modern home. The "Q-Flex" is a new instrument of unconventional form characterised by a very wide, smooth response and omnidirectional properties. Three speaker units are used and the unique Deflector Baffle helps greatly in matching the speaker with its environment. The "Q-Flex" comes in kit form for easy home assembly, and a pair will be found ideal for stereo. The Standard and Senior speakers are housed in wooden cabinets of similar appearance, and the Deflector may be added to the latter to good effect when the speaker is positioned face upwards. Again, either of these models will give excellent results in stereo and prices are greatly on the user's side. The "Tetraq" is a high-note reproducer to add to any existing speaker system; a 10-watt quality amplifier and an F.M.-tuner complete the range. Models shown here are the "Q-Flex," Standard (or Senior) Reproducer, 10-watt Amplifier and the "Tetraq."

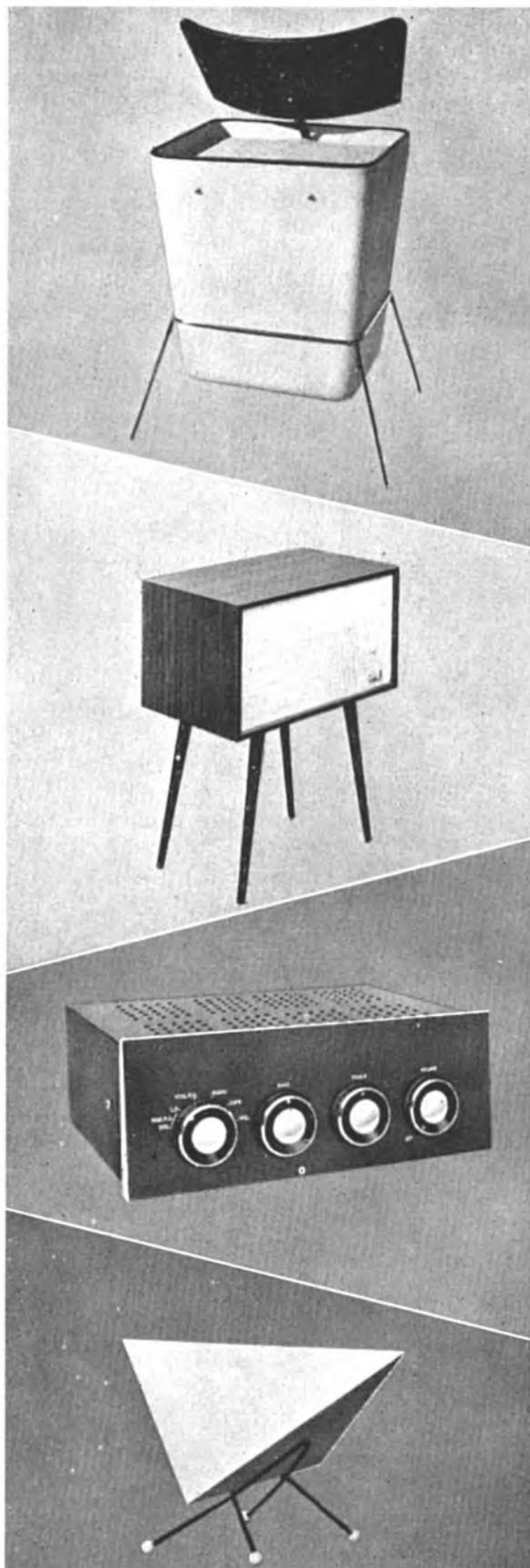
- "Q-Flex" kit complete with stand, 14gns.
- C.Q. Standard Reproducer, 13gns.
- C.Q. Senior Reproducer, 17½gns.
- "Tetraq" High-note Reproducer, £6 15s.
- C.Q. 10-watt Quality Amplifier, 19gns.
- C.Q. F.M.-Tuner with variable A.F.C., £26 19s.
- C.Q. Deflector Baffle and hinge, 3gns.

C.Q. Equipment is sold by leading high-fidelity stockists. Fully descriptive leaflet gladly sent on request.

C.Q. AUDIO LTD.,

2, Sarnesfield Road, Enfield, Middlesex.

Telephone: ENfield 8262



the rest of hi-fi

Tape recording usually begins as an isolated activity, but almost inevitably leads on to developing interest in the whole world of hi-fi. We propose to publish each month a special section dealing with associated equipment for use with tape, and the article below serves as a light-hearted introduction to the series.

NOW IS THE TIME FOR A FRESH START

FOR years I've wanted a comprehensive hi-fi system and haven't been able to afford it. Now my hand is being forced. My old radio is packing up. No good tampering with a problem like this, I tell my wife. Better spend a little more now and do the job properly. Cheaper, too, in the long run.

It's difficult to make these things clear to wives who want washing machines and refrigerators. And not always easier to explain the finer points to men, either. I've just been talking to a chap who has bought, separately, in the last three years, a tape recorder, a record-player and a radio. He has a sneaking suspicion that he should be able to use them together in some way. The record player has the best speaker, he points out. Surely there must be some way of using it with the recorder and the radio?

All those suave salesmen we saw at the Audio Fair aren't doing at all badly but, my word, they've a lot more ground to plough. The majority of people who will go out and buy a tape recorder this year will never think of tying it in with a comprehensive hi-fi system.

There are obvious explanations of this behaviour. For one thing, I think there has been far too much emphasis on the portability of recorders. How many of them really are portable? In my view, only those which can be operated independently of a mains supply and which weigh less than twenty pounds. One doesn't buy a recorder for the sake of weight-lifting exercises. But the idea has been spread about that a tape recorder is essentially a thing to carry around with you; and that's nonsense. For those who do that kind of recording, a battery portable is the answer. For the rest, portability doesn't matter. So they can concentrate on fitting their tape equipment into a permanently and neatly installed home system.

I say neatly, because of the widespread legend that home hi-fi involves the transformation of a sitting-room into a junk-shop (a loosely-used, feminine term).

This past year we have seen some most encouraging developments. Firstly, the appearance of a number of genuinely

portable recorders from the Continent has begun to expose the myth of the 50 lb. "portables" we had heard about before. Secondly, the manufacture of console recorder-reproducers and of contemporary cabinets for hi-fi equipment is quickly killing the idea that quality of reproduction depends on the yardage of cable on view or the weight of sand in the baffle.

So, as my old radio conveniently packs up, I feel I'm not alone in making a fresh start. The circumstances are such that thousands should be doing the same. And many of them have still to learn the elementary facts of life with a loud-speaker.

A lot of the cash customers want their recorder to be capable of giving good quality musical reproduction. As more pre-recorded tape records appear on the market, this need will grow. Yet how much care is taken to point out to them that they should think in terms of an external speaker?

I'm not at all confident that many tape recorder owners appreciate the improvement in results they could achieve simply by investing in a better-quality microphone.

The mass market doesn't take at all to talk of *mics* and *pre-amps* and *enclosures* and *tape decks*. But if they can by-pass the technical jargon, they'll take to the results these things produce; and be willing to spend money on them instead of on the more familiar alternatives.

The job of the retailer, if I may dare to make a suggestion to my betters, is to provide a more comprehensive ready-made service of hi-fi equipment. Their bespoke service is first-class, but it pre-

supposes that the customer knows how to speak!

These are the thoughts that occur to me as I day-dream in my armchair about the hi-fi system I am going to buy.

Of course, I know exactly what I want. Two really good amplifying channels supplying a couple of electrostatic speakers; one of the latest stereo tape decks; a good FM/AM tuner unit; two or three microphones, a turntable. . . . The cost: probably soaring towards £400.

A pretty day-dream now, but a nightmare if I was ever called upon to find the cash.

So I am settling for a tape recorder and FM radio tuner which will cost me about £80 together. Yes, I tell my dear wife, a little more than we'd have to pay for a straight-forward replacement of our orthodox radio; but wait until you hear the difference.

I do not tell her—yet—that on this nucleus I propose to build. The recorder will have stacked heads for stereo reproduction. After another bout of saving, I plan to add an external speaker. After that, a second amplifying channel and second speaker. Then, I hope, the turntable.

If those who draft the advertisements which appear in *Tape Recording Magazine* should read these words, I ask them to do me a favour.

Will they just emphasize that my £80 is going to bring me a tape recorder, a tape record reproducer, and a radio, so that I shall be getting them for about £27 apiece—and that's one of the best of current bargains?

And then, over the next couple of years, will they hammer home how much better my equipment will perform with an external speaker, and a better microphone? And then explain the natural evolution to stereo?

After all, there are a good many million wives to persuade and, as I've already hinted, quite a few unimaginative males as well.

RUDOLPH DYNER

Next month:

A SURVEY OF THE LATEST SPEAKERS

The first principles of tape recording

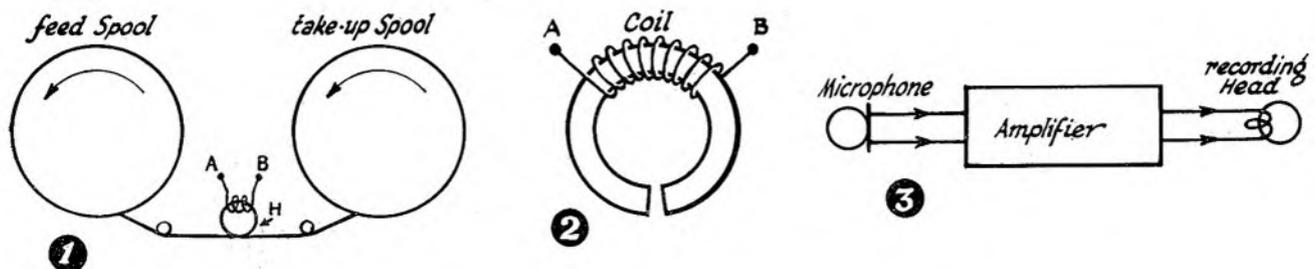
THIS series of articles is being written as a guide for the newcomer into the fascinating realm of tape-recording. It is intended to show how, from modest beginnings, an enthusiast can develop his equipment along logical lines until eventually a very high degree of performance may be obtained. Contrary to belief, this may be accomplished for quite a reasonable outlay, and with a minimum of technical knowledge. The following points will be covered:—

- (1) Brief outline of the principles of tape recording and reproduction.
- (2) The units which comprise a complete tape recording system.
- (3) Improving the performance of the portable type recorders.
- (4) Choosing an amplifier for a tape-deck.
- (5) Fitting an F.M. tuner. How to receive high quality B.B.C. programmes through your amplifier or tape recorder.
- (6) Recording radio broadcasts.
- (7) Playing gramophone records through your amplifier or recorder.
- (8) Fading and mixing devices.
- (9) Fitting a time switch for recording programmes when unable to listen at the time when broadcast.
- (10) Rectifying faults.



A VERY simple form of tape recorder is illustrated in figure 1. Both spools rotate anti-clockwise, so that the tape is wound from the feed spool on to the take-up spool, passing in light contact with the magnetic head H on the way. This head is assumed to be capable of recording or playing back at will, and in the simplest case could be a ring of magnetic material, having a small gap, and carrying a coil of insulated wire* (fig. 2).

* See "Design and Characteristics of Magnetic Heads" by M. R. Jackson, Grad. Brit. I.R.E., in *Tape Recording Magazine*, February, 1958.



When an electric current is made to flow through the coil from A to B, the resulting magnetic field which appears across the gap magnetises the portion of the tape that happens to be near the gap at the time. If the current had been made to flow from B to A, then the tape would have been magnetised in the reverse direction. In either case, the tape will retain its magnetism indefinitely.

Consider now the situation when a varying, or alternating, current passes through the coil and, at the same time, the tape is made to move smoothly past the gap. It will be seen that as each portion of the tape is passing the gap, it will become magnetised to an extent depending upon the strength and direction of the current at that instant. Thus, the section of the tape which has moved past the gap may be considered to consist of many tiny magnets of varying strengths and polarities. The tape so magnetised will, of course, wind on the take-up spool.

Now, a microphone is a device which converts sound waves into varying electric currents just like the magnetising currents spoken of above, and this suggests that recording could be achieved merely by connecting a microphone directly to a recording head, and setting the tape in motion. By speaking into the microphone, the electric currents would magnetise the tape instant by instant, and this would eventually result in the whole conversation being stored on the tape in the form of thousands of minute magnets.

Unfortunately, the output from a microphone is far too feeble to energise the recording head satisfactorily, and so it has to be amplified, or magnified. This necessitates the use of an amplifier, which increases the microphone output to a level suitable for recording, the arrangement being as shown in fig. 3.

Although recording may be accomplished by the use of a microphone connected by way of an amplifier to the recording head, as above, the results will be highly distorted. This is because the magnetic characteristic of the tape is only undistorted under certain input conditions,

CHARLES LANGTON, A.M.Brit.I.R.E. introduces a new series of articles explaining the place of tape in a hi-fi system

and these conditions are not realised in the simple arrangement above.

To make use of the undistorted part of the tape characteristics it is necessary to apply a magnetic "bias" to the tape. This "bias" is obtained by passing a high frequency (H.F.) alternating current through the recording head in addition to the normal audio current from the amplifier. This H.F. current is generated by an oscillator circuit known as the H.F. oscillator, and the frequency of the current is so high that, although actually recorded on the tape, the human ear will not respond to it. Therefore no audible interference is caused.

The block diagram of fig. 4 shows the simplest practical set up. The amplifier and H.F. oscillator are connected to the recording head, whilst the microphone is connected to the amplifier input. As both amplifier and oscillator will each require a supply of high-tension and low-tension voltage, the diagram shows the two units connected to a power pack, which is in turn plugged in to the mains.

Referring again to fig. 1, if we now wish to play back our recorded tape it will first of all be necessary to rewind the magnetised tape back on to the feed spool. This is usually accomplished by reversing the driving motor, and increasing its speed in order to complete the rewind as quickly as possible.

The rewind completed, we are now ready to commence the playback. The motor is adjusted once again to drive the spools anti-clockwise so that the tape passes across the gap at the same speed as when recording.

As the take-up spool winds on, the previously recorded magnetic elements will pass across the gap in the same order as when being magnetised, and in so doing induce a voltage in the coil which is proportional to the strength of each tiny magnet.

Thus, as the tape moves along, a varying electrical output is provided by the coil, which is identical with the original electric currents from the microphone. So much so, in fact, that if a pair of headphones is now connected to the coil as shown in fig. 5, the recorded sounds may be heard.

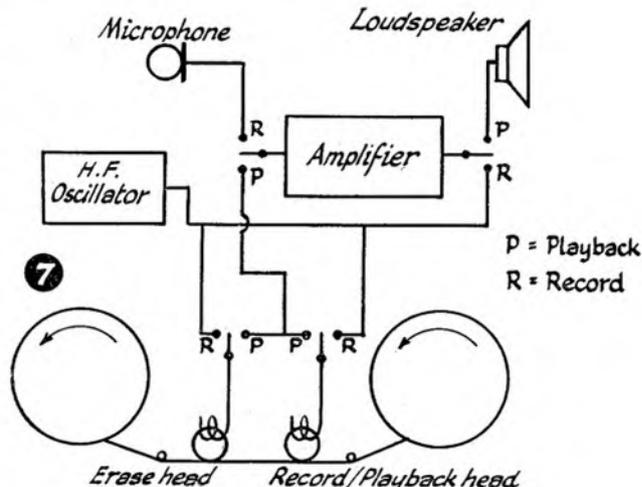
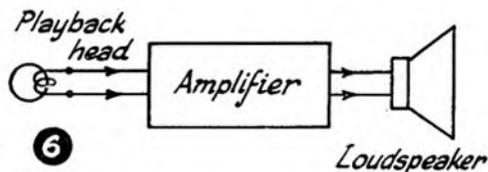
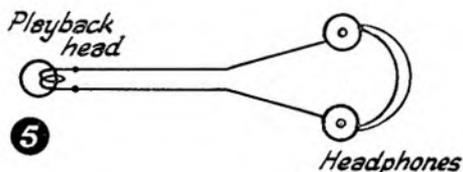
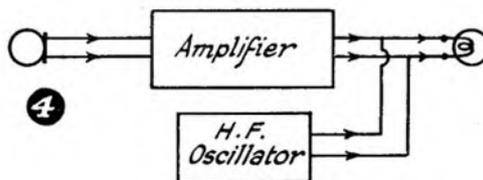
Needless to say, the sounds will be very weak, and as it will be desirable, in any case, to operate a loudspeaker, an amplifier is called for once again. The complete playback arrangement is shown in fig. 6. In practice, the same amplifier, magnetic head, and power supply are made use of for both recording and playback, by means of switches or relays.

To re-use an already magnetised tape for a different recording, the original recording must be "wiped off." This is normally carried out in one of two ways; by holding one or more permanent magnets close to the moving tape, or by allowing the tape to pass an erasure head. This head is similar to the recording/playback head, but is supplied only with a fairly large high-frequency alternating current. As the tape passes the erasure gap, the strong alternating magnetic field removes the original recording. The H.F. bias oscillator generates a suitable current for this purpose, and so is made to serve both purposes.

The layout of a simplified tape deck is shown in fig. 7 to indicate the relative positions of the various heads; and

the tape is seen to pass by the erase head before reaching the recording head. If the erasing current is allowed to flow when recording, the tape will be cleaned off automatically before it reaches the recording head. This precaution removes the risk of ruining a recording, and so manufacturers arrange for the erase current to be switched on when recording, but, of course, switched off during playback.

If it is necessary to erase the tape when not recording, the usual method is to switch to "record"; but remember to turn the recording level control to zero. The tape can now be run through.



The C.Q. Reproducer

THE C.Q. Reproducer is a very neat loudspeaker, well designed and a pleasure to listen to on speech or music.

Design is of the slot loaded principle. Air is sharply tuned in the tunnel of the enclosure and the magnification is controlled at the lower frequencies to produce sound which is resonance free down to the lower limits of the human ear. This type of loading enables large power to be handled without distortion.

An elliptical loudspeaker unit is mounted with its long axis vertical, which takes advantage of the long, narrow tunnel and gives a very wide distribution to the higher frequencies.

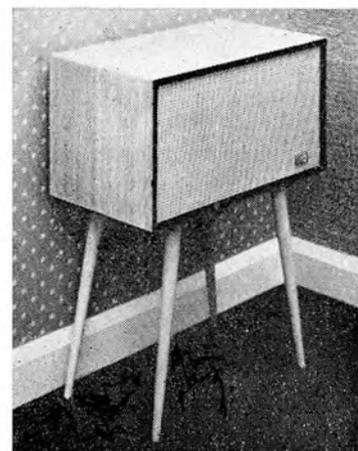
A tweeter of the extended range type is mounted in the centre of the cabinet. These two units, combined with the excellent design of the enclosure, provide a quality of reproduction of both speech and music which is usually only associated with more costly and larger installations. The response of the C.Q. Reproducer is maintained to a low

frequency of about 35 cps. At the other end of the scale the response is well above 16,000 cps—a most pleasing balance to the ear.

The cabinet is finished in cream and red leatherette. Optional extra, is a set of four black, contemporary style legs, 18 inches in length and complete with screw in fittings and screws. Overall dimensions are 22 in. x 12 in. x 13 in, and the weight is approximately 23 lbs.

The C.Q. Reproducer would be an asset in any home. It is an excellent speaker to use in conjunction with tape recorders. Two such reproducers would be a worthwhile investment for stereophonic reproduction.

The price is 17½ gns. The makers are C.Q. Audio Ltd., 2, Sarnesfield Road, Enfield.—G.P.



IT STARTED IN THE FRONT ROOM

One man's experiments in his front room at home laid the basis for the remarkably successful C.Q. Audio speaker. Mr. Rupert Neve, the firm's designer, started with a conviction that, by assiduous application of accepted acoustic principles, he could produce a really high quality reproduction system without making it too large or too costly for the average modern home.

The first front room experiments were made in the autumn of 1946. Orders

began to come in, a company was formed, and steady progress led to the establishment of the present Enfield factory early last year.

Now a 10-watt amplifier and an F.M. tuner are being produced and the attention of enthusiasts has been caught by Mr. Neve's latest excursion into the realm of speaker design. This is the new Q-flex, supplied in kit form for home assembly. It uses three moving coil units and costs fourteen guineas complete.

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Tape news digest

IS your doctor up-to-date? In America a tape recording service gives doctors a chance to keep up with new publications while shaving or driving. An hour-long tape costs about £1. Now in Britain the College of General Practitioners is backing a similar "learn-while-you-listen" service to help busy G.P.s with little time for reading.

An audience of about 200 attended a lecture and demonstration on stereophonic reproduction given in Manchester recently by Mr. Higham of High Fidelity Developments Ltd., Oxford Road, Manchester. The equipment used consisted of an E.M.I. stereosonic tape deck, LHF twin channel stereo amplifier and LHF loudspeaker enclosures fitted with Wharfedale units.

Sales-talk on tape really pays. Hatherley's of Shepherd's Bush, London, recorded a commentary spoken by technicians for a film of a German factory. The factory sold to America for £11,000,000.

"Tape Recording Trends," published in our last issue, contained a suggestion that it was the introduction of polyester tape that opened the way to 1,800-foot seven-inch reels of tape and led to enhanced high frequency response.

This may have caused some misunderstanding and it should be pointed out that a number of manufacturers produced their first 1,800-foot seven-inch reels in Britain during 1955.

Of course, frequency response is not necessarily related to the type of plastic base used.

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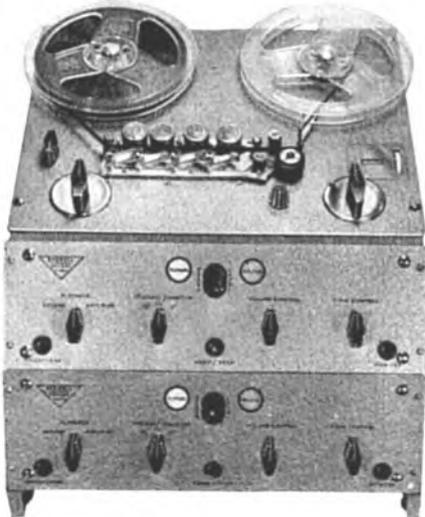
BRENELL and STEREO

With the introduction of Stereo Discs and the B.B.C.'s Stereo transmissions, a new phase of interest in home tape Recording is developing.

Using Brenell equipment, the RECORDING of STEREO from Microphones, Radio or Disc is very easy.

The Brenell system gives: (a) Elimination of cross talk; (b) Independent frequency correction on each track; (c) Independent recording level to each track; (d) Independent playback volume and tone from each track.

A combination which assures high quality results.



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Pre-Amplifier type T.P.2	17	17	0	Heads-Erase and Record/Play-	2	0	0	Simple Mixer Unit	2	18	0
Mark 5 Record/Playback				back				Pressure Pads	0	4	0
Amplifier with Power Pack...	24	0	0	Power Unit	4	18	0				

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THE BRENELL DESIGN

A digital revolution counter is an optional extra.

Precautions are taken to prevent accidental erasure. When the R/PB switch is in the Stop or Playback position the erase oscillator is prevented from working by short circuiting the low impedance winding of the oscillator coil. Also a safety button, situated near the R/PB switch knob, must be depressed before the switch can be turned to the Record position.

The amplifier is a complete high gain record/playback type giving an output of 4 watts. It can also be used as a high quality straight through amplifier for reproduction of gramophone records, as an amplifier for a radio jack or tuner unit and as a public address amplifier, the usual care being exercised, when amplifying the microphone, to avoid acoustic feedback between loudspeaker(s) and microphone(s).

Five valves are used, EF 86, ECC 81, EL 84, EZ 80 and EM 34 (recording level indicator).

On record, the input signal from the microphone is fed to the grid of the EF86, amplified and passed to the first half of the ECC 81 valve by way of the volume control. The two halves of the ECC 81 are operated in cascade, the resultant signal being passed to the EM 34 record level indicator by way of the germanium rectifier OA 71, and the pre-set eye sensitivity control. Also the signal is supplied to the record/playback head together with a bias voltage from the EL 84 anode (via coupling condenser). The radio or pick-up signal is fed into the grid circuit of the first half of the ECC 81 and thence as the microphone signal. The EF 86 grid is earthed unless a jack plug is inserted into the microphone socket.

The amplifier signal besides being ap-

plied to the record/playback head and magic eye is also available (through a 100 K series resistor to prevent any upset of the circuit loading) at the monitor socket where it can be heard on high impedance (2,000-4,000 ohm) headphones or used to feed an external amplifier, enabling the programme to be monitored after passing through the various amplifying circuits in use, but not providing tape monitoring.

On playback, the record/playback head is switched to the grid of the EF 86, by way of the volume control to the two triodes of the ECC 81 to the EL 84 and so to the loudspeaker.

The playback signal is also available at the monitor socket for headphones as before, but chiefly for driving an external amplifier if more than 4 watts is required. If this signal proves too great, causing overloading of an external amplifier, it can easily be reduced by connecting a suitable resistor (5 K to 10 K) across the monitor socket or take off jack plug, so introducing a "potential divider" in conjunction with the 100 K resistor.

Bass and treble controls (close ratio) operate on playback and amplifier only, and not when recording. They will not affect a signal taken at the monitor socket, but the volume control, will affect this output.

A low value signal, uncompensated, may be obtained from the radio/gram socket; this is significant in view of the fact that some amplifier manufacturers are incorporating C.C.I.R. playback compensating networks in their pre-amplifiers.

The power unit is on a separate chassis from the main amplifier, being connected to the amplifier by way of a cable terminating with a 9-pin plug. The power unit should not be operated with this plug disconnected, otherwise the H.T. voltage is liable to rise to excess and damage the electrolytic condensers mounted on the unit.

If the fused mains adjustment plug is removed, this unit cannot be inadvertently damaged.

The power unit contains the mains transformer, rectifying valve, reservoir and smoothing electrolytic condensers, smoothing resistor, humdinger (heater supply variable earthing), fused mains adjustment plug, mains switch, extension loudspeaker socket and 3-hole non-reversible socket for mains input to deck.

The internal speaker (15 ohm) is an elliptical 10 in. x 6 in. unit. This speaker is automatically disconnected when a jack plug is inserted into the extension speaker socket to feed the output to a 15 ohm external speaker.

The cabinet is covered in a hard wearing and washable plastic material. The lid is completely removable, and a small door gives access to a pocket sufficiently large to store a small microphone and the 3-cored mains lead.

The Brenell tape recorder is designed for quick and easy accessibility. Plugs and sockets are used for coupling power unit to amplifier, power unit to deck and deck (heads) to amplifier.

The removal of four wood screws enables the amplifier to be withdrawn from

the cabinet and after removal of two plugs (heads and power) the whole deck can be removed when four plated screws are removed.

How to Cure Troubles

BEFORE attempting to make adjustments, disconnect from mains supply. To gain access to the deck, first remove the amplifier so that the head plug (5-pin) may be disconnected to avoid damage to the leads.

Tape spilling. Due to incorrect brake adjustment. Invert the deck and with rewind and R/PB switches to stop (central) positions, adjust the two 4 BA screws in the brake arms until 1/32 in. gap separates them from the actuating bar. Relock the screws with nuts provided.

Spools failing to rotate. Due to spool holders being loose on motor shaft. Tighten 4 BA screws in spool holder. Deck need only be eased up a little to gain access to screws.

Revolution counter not working. Due to belt having slipped off. Shorten or replace belt (see note on Replacements).

Wow and flutter. Due to uneven tape transport. Check the following: (a) Buckled tape spools; (b) Uneven surface on rubber pinch wheel; (c) Flywheel brake is free and not fouling; (d) Eccentricity of capstan shaft and/or sleeves due to deck being dropped or given rough usage; (e) Tension of stabilising brake on "feed" spoolholder. Should be very light; (f) Undue movement in capstan motor or shaft most likely to be due to bearing wear; (g) Free running of flywheel in bearings. There should be about 1/8 in. vertical movement; (h) Rubber driving belt (may be cracked); (i) Correct tension of pressure pads; (j) Foreign matter in tape guides and heads (this will also cause lowering of output).

Whistle when recording from radio. Retune the local oscillator (variable core—near output transformer) until whistle disappears. Only little movement should be necessary.

Replacements

Drive belt. Invert the deck with speed at 3 1/4 ips. Remove 4 BA screws (4) holding motor and capstan plate to deck pillars. Carefully reverse the plate with capstan in position and change the rubber belt. Reverse above procedure when re-assembling.

Revolution counter belt. Remove feed spool holder (4 BA screw clamping it to motor shaft), belt can now be slipped over motor shaft, spool holders replaced and belt coupled to rev. counter. A stretched belt may be shortened and the ends re-joined when heated (soldering iron).

Pinch wheel. Single screw only need be removed to enable pinch wheel to be slipped from its shaft.

Heads. Unsolder from anchorage tag-strip, remove single fixing nut. Check height of new head to avoid "cross talk" and to give complete erasure. If record/playback head, adjust Azimuth screw for maximum signal using pre-recorded tape at approx. 8 kc/s—(T.B.T.I. Test Tape).

The Components

VOLTAGES MEASURED WITH AVO 7			
	V1	V2A	V3
Anode	33	56	135
Sc. Grid	25	—	165
Cathode	0.35	0.35	1.4
TUBULAR CONDENSERS			
1—5MF 250V; 2—.02MF 350V; 6—.02MF 350V;			
7—.04MF 150V; 8—.1MF 500; 9—.04MF 150V;			
11—.001MF 500V; 14—.003MF 350V; 15—.005MF			
350V; 20—.04MF 150V; 25—.1MF 350V.			
ELECTROLYTIC CONDENSERS			
3—50MF 12V; 5—16MF 350V; 12—16MF 350V;			
13—50MF 25V; 21—32MF 350V; 22—32MF 350V.			
SILVERMICA CONDENSERS			
4—1000PF; 10—2000PF; 16—100PF; 17—150PF;			
18—5000PF; 19—470PF; 23—22PF; 24—200PF.			
RESISTORS 1/2 WATT			
1—1M ohms; 2—2.2K; 3—220K; H5; 4—1M			
ohms; 5—47K; 6—56K; 7—1.2K; 8—100K; 9—1M			
ohms; 10—470 ohms; 13—100K; 14—330K; 15—			
68K; 16—10K; 17—680K; 18—150 ohms; 19—220K;			
20—56K; 21—10M ohms; 24—1M ohms; 25—47			
ohms.			
RESISTORS 1 WATT			
11—33K; 12—10K; 22—33K; 23—470 ohms.			
VARIABLE CONTROLS			
VR1—1 MEG. ohms LOG.; VR2—250K LIN.;			
Fitted Single Pole Switch (S2); VR3—1 MEG.			
ohms LIN.; VR4—1 MEG. ohms LIN. (Preset).			
OTHER COMPONENTS			
T1—Output Trans.; T2—Mains Trans.; L1—Osc.			
Coil; S1—3 Position 8 Pole Fuse; J1, 2, 3 and 4—			
Jack Sockets; PL1 and PL2—6.2V., 2 Amp Pilot			
Bulbs; MR1, V1, V2, V3, V4, V5, WX6, EF86,			
ECC 81, EL84, EZ80, EM34.			

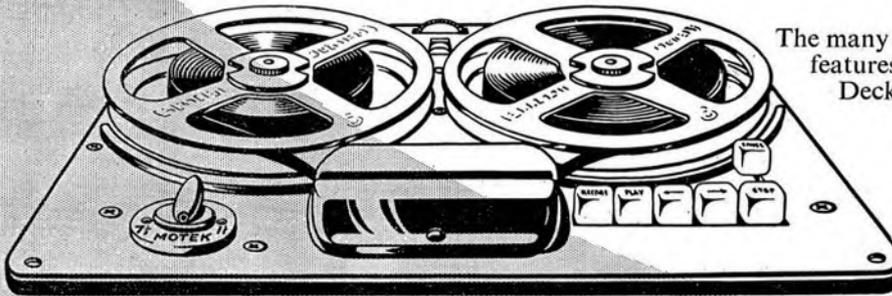
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FOLK SONGS

(Continued from page 19)

daily use over that period has not resulted in any kind of break-down.

For those who are interested in this type of field recording, there are many different types of material to be recorded, and many areas where the work is "crying out" to be done. Story-telling, children's rhymes, local dialect and slang, annual customs and superstitions, as well as all kinds of different song and instrumental traditions need to be recorded.††

Whenever such recordings are made, it is important to make notes at the time and to take photographs as well. Your local university should be interested in dialect recordings, the Folk Lore Society in customs and superstition. In Scotland you should get in touch with the School of Scottish Studies, 27 George Square, Edinburgh; in Ireland with the Irish Folk Lore Commission, St. Stephen's Green, Dublin. At the National Folk Music Archive in London we are preserving copies on tape of field recordings; in this way we can free the tapes of field collectors who want to go out and do more work of this kind. For study purposes the recordings will be on disc.

I shall always be ready to help with any problem, if any reader wishes to get in touch with me at The National Folk Music Archive, Cecil Sharp House, 2 Regent's Park Road, London, N.W.1. (Telephone GULliver 2206).

†† Further recordings of folk singers made "in the field" by Peter Kennedy are available on an LP by HMV-DLP 1143 and an EP 7EG 8288.

FLYING HIGH

(Continued from page 25)

shop to the children, who recorded an item about choosing toys for Christmas.

Our sports reporter went along to the local football ground and interviewed some players and the manager of Hull City A.F.C. for the January programme. In the same edition was a recording made at the works of the Blackburn and General Aircraft Co., where the children captured on tape the thrill of a visit to an aerodrome.

This then has been our experience of tape recording, so far. Debate and discussion have been extended beyond the limit of the school. Something of the outside world has been brought into the classroom, and the children have done most of the bringing themselves. To them it has seemed like an interesting game, but it has been of much greater value than a game.



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NEWS FROM THE CLUBS

National Federation plans

SUPPORT for the proposed Federation of Tape Recording Clubs has been very encouraging. Many clubs will be sending delegates to a meeting to be held in Coventry on July 5th. Secretaries of clubs who have not yet written to Mr. J. E. Amphlett and who wish to be included in the list of founder-members should write immediately to him at 12, Stanhope Gardens, Highgate, London, N.6.

Coventry

COVENTRY Tape Club intend to produce each month a tape which they are calling "This is Coventry," in which prominent residents and visitors to the city will be interviewed. The tapes will be circulated amongst other clubs at home and abroad. Members of the Warwick and Leamington Society were guests at a recent meeting when tapes were heard of the Russian Sputniks recorded in New York, and of the Ripple Rock explosion in British Columbia.

In formation

PLANS are advanced for the formation of a tape recording club in Bristol, and those interested should get in touch with Mr. E. C. Evans, 2, Southfield Road, Nailsea, Bristol. A letter to the *Bristol Evening Post* outlining the proposal brought a surprisingly good result.

A start has been made on the formation of a club in Belfast, and Mr. W. J. Scott, 41, Haypark Avenue, Ormeau Road, Belfast, is acting as temporary secretary pending an inaugural meeting. Those interested should get in touch with him.

The inaugural meeting of the West Middlesex Tape Recording Club was held on 13th May. Inquiries may be addressed to Mr. W. Patrick Copinger, 20, Sherborne Avenue, Southall, Middlesex.

Glasgow

GLASGOW now has a tape organisation entitled the Glasgow and District Tape Society. It was formed on 26th April, and the following officials were elected: President, Mr. Gray; Treasurer, Miss Shelley; Secretary, Mr. D. Craig, 55, Ledaig Street, Glasgow, E. 1. A city-wide publicity campaign is being conducted to bring the society to the notice of others likely to be interested.

Bournemouth

THE activities of the Bournemouth Amateur Tape Recording Club are gradually building up and the membership reached 26 at the end of April. At recent meetings members heard talks on "Microphones" and "Electronic Music." Further talks are planned dealing with "Recorder Faults and Adjustments," "Bird Watching with a Tape Recorder" and "Frequency Response." The fortnightly Club Competition is going well. Members have been given details of the Copyright Laws.

Tape contact has been made with a number of clubs and it is hoped to start Inter-Club Competitions soon. The Club has purchased a bass-reflex speaker for use in the clubroom.

Voicespence Club

MR. LEE LACY has very successfully launched "Voices in the post" the Sound Magazine of the Voicespence Club. Circulation of the tapes has doubled after the first issue in March. The magazine material is heard on one track

while members themselves take part with comments and suggestions on the other. Mr. Lacy has already received many articles from home and abroad.

Steps are now being taken to inaugurate a blind service for U.K. members.

Secretary Charles Owen, of Noel, Virginia, reports that he received 55 applications for membership from the U.K. alone in the three-month period ending March, and with membership swelling daily the new Manual, due in July, will be considerably enlarged. London Representative, Ron Davies, 99, Caulfield Road, East Ham, London, E. 6, writes that he would be grateful for a s.a.e. for membership inquiries, but will gladly send literature free on request. Fees remain at only 6s. a year.

B.T.R.S.

THE BTRS has asked, in its Tape Bulletins, for nominations for all offices in the Society. Ballot papers were due to be circulated this month. Where there is no nomination an "official" may be returned unopposed.

The Society has indicated its support for the formation of the National Federation of Tape Recording Clubs. BTRS delegates hope to attend the inaugural meeting.

The BTRS Call Book has now been circulated.

Warwick and Leamington

AT a recent meeting of the Society, two films were shown by one of the members demonstrating the use of magnetic and tape recorded sound track. Several members visited the Audio Fair, and the Society Chairman, Mr. T. Draper, gave a report on the exhibits. The Society's Hospital Scheme, now launched, will enable patients in local hospitals who are long distances from their homes to talk on tape to their relatives and friends, and to receive recorded replies. Even if the patients concerned have relatives overseas every effort will be made to contact tape enthusiasts abroad and get taped messages exchanged.

Membership increases each month due to the growing popularity of tape recording.

The Society recently welcomed the Chairman and other members of the Coventry Tape Club, and an invitation for the Society to visit the Coventry Tape Club was accepted. A tape has been received from Mr. B. Harrison, Chairman of the Middlesbrough Tape Recording Club, and a reply, on tape, was sent back. It is hoped that inter-club competitions will be started in the near future.

The Bournemouth Amateur Tape Recording Club has also received a tape from the Society in reply to a letter from the Bournemouth Secretary, Mr. F. T. Gaymer.

Dundee

TWENTY-FIVE members attended the second meeting of the Dundee Tape Recording Club. Its chairman, Mr. Alan Wheen (of Larg & Sons Ltd.) announced that his firm is to allow the club to use one of their former recording studios as a clubroom. Several recordings were played through a Grundig TK830/3D and a Telefunken 65/TS.

Charles W. Aitken gave an account of the World Tape Pals and a discussion took place on recorder faults. The secretary is Mr. William Steele.

Edinburgh

AFTER the "Know Your Neighbourhood" exhibition sponsored by the Corstorphine (Edinburgh) Rotary Club, members of the Edinburgh Tape Recording Club, which had a stand there, have been editing tapes describing the event, mainly made by E.T.R.C. secretary Alex Whyte. The finished programme is being circulated to Rotary Clubs in different parts of the world.

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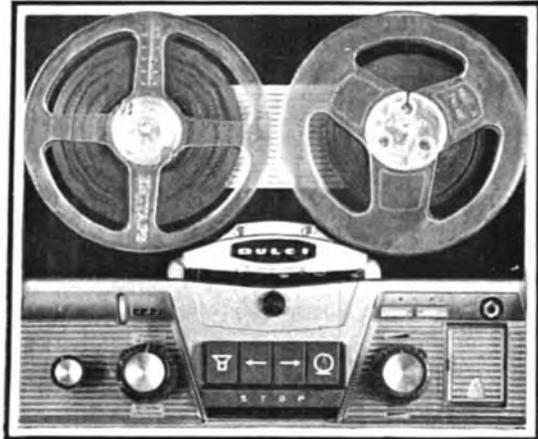
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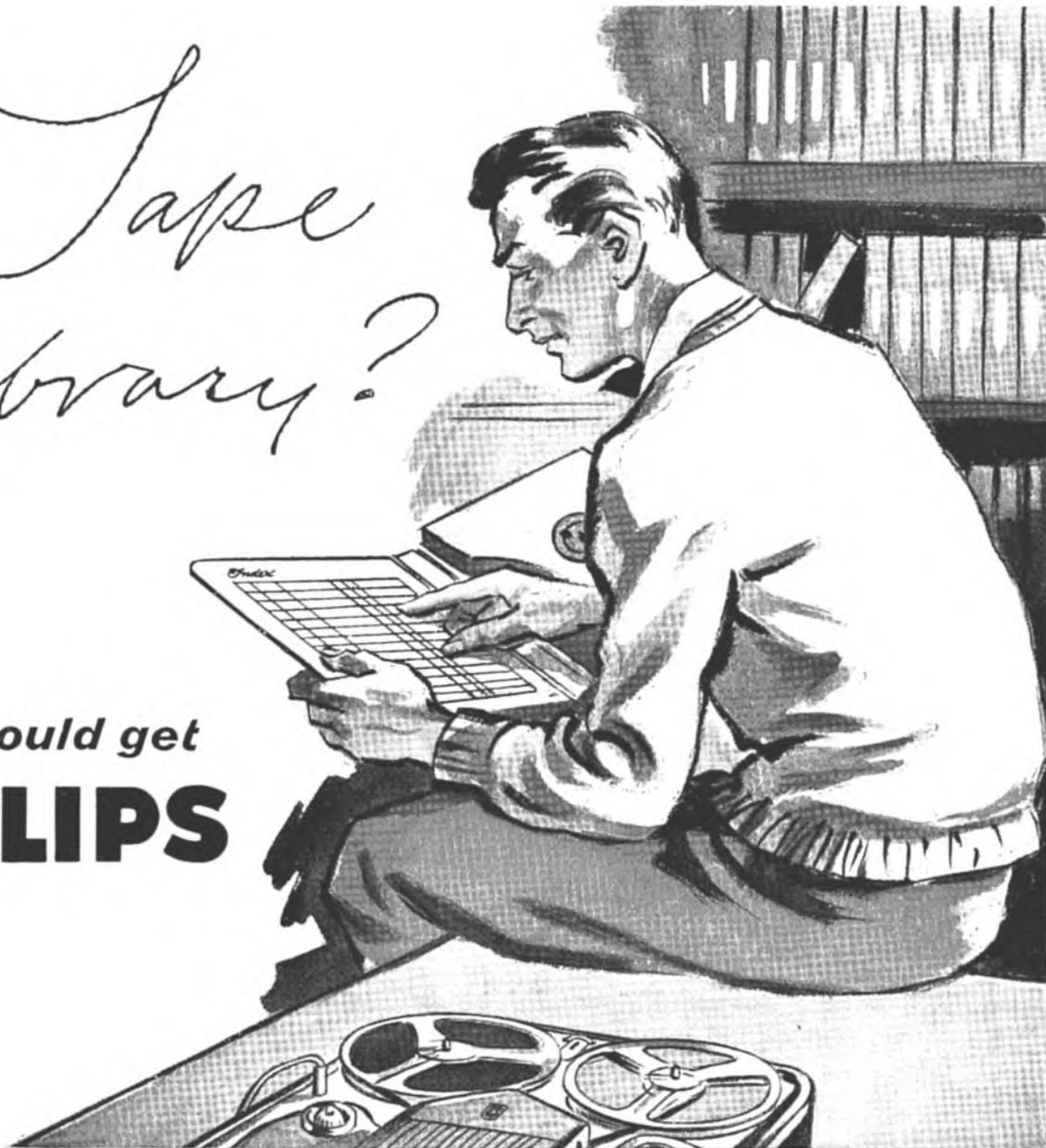
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