

Recording on Steel Tape

EQUIPMENT FOR REPRODUCING DICTATION AND TELEPHONE CONVERSATIONS

A METHOD of magnetic recording was introduced by Poulsen in 1900, and was used in conjunction with his arc system of radio-telegraphy. It was known as a "Telegraphone." Telegraph signals transmitted at high hand speed were recorded at the receiving station on a steel wire, i.e., circular cross section, driven at a higher velocity when recording than during reproduction. Thus the signals could be transcribed at a convenient speed for the operator. In the same year Poulsen obtained a U.S. Patent No. 661,619 for steel tape as a recording carrier or medium.

Although Poulsen proved the possibilities of magnetic recording, the development of a practical "quality" system had to await the coming of thermionic valve amplifiers. Research into the metallurgical problems of the special steel tape required was commenced by a German engineer, Dr. Stille, in 1924; this, together with his work on the mechanical and electro-magnetic questions involved in this system, was of great importance. The Blattnerphone, which was first employed by the B.B.C. some years ago, was largely based on research and patents due to Dr. Stille, although certain improvements were made by B.B.C. engineers in collaboration with the British Blattnerphone Co. In 1933 Marconi's Wireless Telegraph Company designed a machine in which certain defects in the original model were overcome, and this instrument, known as the Marconi-Stille recorder, is used to-day by the B.B.C. and other organisations.

The process of magnetic recording depends basically upon two properties of steel, namely, remanence (i.e., the

length of steel to be magnetised, to a great extent independently. In its simplest form magnetic recording can be carried out by pulling a length of steel wire or tape at constant velocity through a recording head which will vary the distribution of remanent flux along the length of the wire. Reproduction can be obtained by passing the magnetised tape at the same velocity through a reproducing head which is sensitive to the tape's flux changes.

It is essential that any previous variations in the flux distribution in the tape should be removed before recording. This is usually done by drawing it through a "wiping" or "wash-out" head which magnetises it to saturation. To obtain optimum results it is also necessary to bring the magnetic condition of the tape at the instant of magnetisation to such a point on the hysteresis (B-H) curve that the remanent magnetisation corresponds to the waveform of the current through the winding. This is performed by a biasing or polarising current. The wiping, recording and reproducing heads usually have different types of coils and pole-pieces, but are otherwise identical. The steel tape may be magnetised longitudinally, or transversely, through its thickness or through its width, or in any combination of these directions.

It is well known that the B.B.C. has been recording programmes on steel tape for many years past, and the actual equipment has been exhibited at Radiolympia. A combined recording and reproducing instrument of this type for use in offices can now be obtained, and is described in this article. Various refinements have been added, the most important being provision for direct connection to the G.P.O. telephone circuit for recording conversations without the intervention of a microphone or of the G.P.O. telephone earpiece.

and, thirdly, the recording impressed upon the sound-carrier can be easily obliterated, thus leaving the tape free for further recordings.

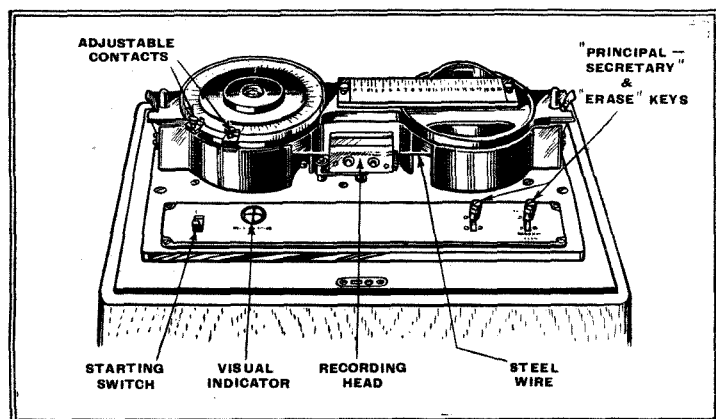
A steel wire magnetic recorder suitable for use in offices has now made its appearance under the name of Textophone. It is housed in a cabinet of similar size to an average radiogram, and provides an uninterrupted recording of 20 minutes' duration. The sound input can be either from microphone or by direct connection to the telephone circuit, for which the G.P.O. has granted permission.

Two pairs of coils are arranged in the recording-head. Each individual coil is provided with a guide slot for the core pressing against the steel wire under spring pressure. The pair of coils first influencing the wire are fed with DC, which erases any previous recording. The second pair are also fed with DC for magnetic biasing purposes, but there is a superimposed alternating current representing the sounds to be recorded. For reproduction the wire moves in the same direction as when recording. A single ear-piece and also a pair of headphones are provided.

The steel wire is stored on interchangeable drums, and is run to and fro through the recording and reproducing mechanism by an electric motor. The speed of the moving wire as it passes from one coil to the other is approximately 5 feet per second, this speed being kept as constant as possible by using a synchronous driving motor.

Valve amplification is, of course, used, and the various switching operations are remotely controlled by push-buttons and telephone-type relays. Thus the master Textophone unit can be situated anywhere in a building, with small control panels at each operating position. Circular scales with markings in minutes are fitted which show the time available for a recording. About 2 minutes before the end of a spool of wire is reached a strong buzzer signal is heard in the headphones.

Two features of the Textophone of outstanding interest are that a second recording on the wire automatically obliterates a previous one, irrespective of whether the erase key is operated or not, and that



amount of magnetic flux remaining in a path, which has been magnetised, after the impressed magneto-motive force has been removed) and coercivity. This latter property permits adjacent elements in a

The distinguishing characteristics of magnetic recording are, first, that immediate play-back is possible as no processing is required; secondly, it is unaffected by external vibrations or mechanical shocks;

The necessary controls, together with the reels of steel tape, are mounted on the top of the cabinet. One of the greatest advantages over older systems is that at no time is it necessary to "change the record" even for removing a previous message.

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each time the stop key is pressed the tape runs back a little before finally stopping. The object of this latter arrangement is to permit the last few words of the previous message to be repeated when a new one is started. The overall frequency response of the instrument is said to be 100 to 8,000 c/s.

The purchase price of a complete Textophone equipment with one spare spool of wire is £198 10s. net, but rental or graduated payments are permissible. It is obtainable from E. Shipton and Co., Ltd., of 24, Broadway, London, S.W.1.

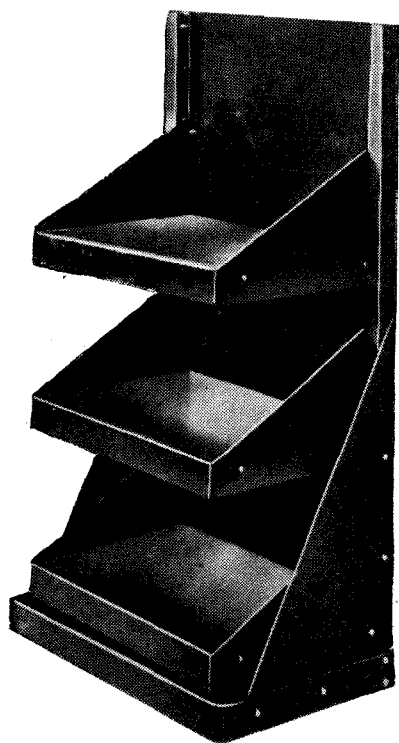
D. W. A.

Premier Transmitting Racks

THE rack-form construction of amateur transmitters and modulating equipment combines the advantages of attractiveness and flexibility, for by assembling the various stages on separate chassis any one part can be replaced by a different circuit without disturbing the remainder of the equipment or detracting from its frontal appearance.

The racks, designed by the Premier Radio Co., Jubilee Works, 167, Lower Clapton Road, London, E.5, are fitted with panels 19in. wide, which is the standard size now employed in racks of this kind.

Our illustration shows a three-tier rack measuring 39in. high and 19½in. wide overall. Each chassis is 17½in. wide and 12in. deep (back to front), and has 2in. side-pieces. There are three panels measuring 19in. x 10½in., and a smaller one 3½in. wide at the top for meters.



Three-tier transmitting rack made by Premier.

Finished in black crackle enamel, this rack cost £2 14s. complete, but the parts can be purchased separately if desired. The main framework costs £1 2s. 6d., chassis with brackets 5s. 6d. each, and 19in. x 10½in. panels 4s. 6d. each. The price of the small meter panel is 1s. 6d. Thus it costs no more to buy the parts separately and as required than it would to purchase a complete rack.

In Forthcoming Issues**MAGNETIC TELEVISION RECEIVER.**

Full details for home construction.

SHORT-WAVE ADJUSTMENTS.

Trimming the SW circuits of an all-wave superhet.

POWER SUPPLY UNIT.

For generating HT for a portable transmitter; a vibratory converter, operated from a 6-volt accumulator, is employed.

For those who require a larger rack there is a six-tier one which measures 67in. high. Complete, it costs £4 10s. The framework only costs £1 10s., and it accommodates the same chassis and panels as the 39in. size. There are available also panels 7in. wide which fit both racks, and these cost 3s. each.

HENRY FARRAD'S SOLUTION

(See page 604)

AS the explanation of the previous trouble, based on the assumption that the IF of the set is about 470 kc/s, is correct, it may be assumed that the IF is as stated. The information in the present letter also leads to this conclusion, because Milan is on 814 kc/s, and London Regional on 877. The second harmonic of London Regional is, of course, 1,754 kc/s, and for this to come in on the second channel when tuned to Milan the IF must be half the difference

$$\text{i.e., } \frac{1754 - 814}{2}, \text{ or } 470.$$

Now Brussels No. 2 is on 932 kc/s: half this is 466. Radio-Lyons is 1393: one-third of this is 464. The other stations affected give figures in the same neighbourhood. The whistles are therefore probably due to harmonics of the IF. Harmonics are inevitably produced by the rectification of the IF by the diodes, and unless proper precautions are taken these are liable to be picked up by the aerial or circuits near the input, beating audibly with any station tuned in which is nearly equal in frequency. This is especially liable when, as in this case, there is no audio stage and consequently a considerable IF voltage at the diodes, and a radio stage to amplify any harmonic leakage. Even when the frequency of the station being received differs from an IF harmonic frequency by more than an audible amount, the actual IF is altered by a slight mistuning, and the whistle is heard, as Mr. Keen noticed.

The usual precautions to avoid this trouble are careful screening of the diode circuits and a filter between them and the pentode section of the valve. If one of the condensers in this filter became open-circuited, or the screening unearthed, harmonics would almost certainly cause trouble, so Mr. Keen is advised to examine this part of the set.

PROBLEM CORNER No. 25**A Correction.**

IT is feared that the task of would-be solvers of Henry Farrad's problem last week was made more difficult by an error in the circuit diagram of Philip Cowe's receiver. The short-circuiting switch for the long-wave reaction coil should be joined directly across the coil and not to earth; in the position shown it would impose a partial short-circuit across the HT supply. In order that reaction may be effective on long waves, this switch must, of course, work in opposite sense to the others.

News from the Clubs**General Experimental Wireless Club**

Headquarters: Barnard Castle School, Barnard Castle, Co. Durham.

Hon. Sec.: Mr. D. Knox, Barnard Castle School, Barnard Castle, Co. Durham.

This club, which is additional to those given in the directory of clubs published in our April 6th issue, has now been in existence for five months, and the members are desirous of getting into touch with other organisations.

Ashton-under-Lyne and District**Amateur Radio Society**

Headquarters: Commercial Hotel, 86, Old Street, Ashton-under-Lyne, Lancs.

Meetings: Alternate Wednesdays.

Hon. Sec.: Mr. K. Gooding, 7, Broadbent Avenue, Ashton-under-Lyne, Lancs.

A new club room has been obtained, and it is hoped to install gear shortly, and to apply for a transmitting licence.

Dollis Hill Radio Communication**Society**

Headquarters: Braintcroft School, Warren Road, London, N.W.2.

Meetings: Wednesdays at 9 p.m.

Hon. Sec.: Mr. E. Eldridge, 79, Osgate Gardens, Cricklewood, London, N.W.2.

Ordinary meetings have been cancelled until September.

Romford and District Amateur Radio**Society**

Headquarters: Y.M.C.A., Red Triangle Club, North Street, Romford, Essex.

Hon. Sec.: Mr. R. C. E. Beardow, 3, Geneva Gardens, Chadwell Heath, Essex.

On May 14th a joint field day organised by the Southend Society was held. On June 11th a second field day organised by the Romford Society took place, at which there were 39 entries contained in 12 cars and one bicycle.

The Society's transmitter, G4KF, has been licensed for portable operation. At a recent meeting a representative of Peto-Scott demonstrated a "Trophy" receiver.

Southend and District Radio and**Scientific Society**

Headquarters: Strand Chambers, High Street, Southend-on-Sea, Essex.

Meetings: Alternate Fridays at 8.15 p.m.

Hon. Sec.: Mr. J. M. S. Watson, 23, Eastwood Boulevard, Westcliff-on-Sea, Essex.

The following programme of field days has been arranged for the summer months:—

July 3rd.—56 Mc/s Field Day.

August 21st.—1.7 Mc/s DF Field Day.

September 24th and 25th.—All night 1.7 Mc/s DF Test.

October 23rd.—1.7 Mc/s DF Field Day.

British Sound Recording Association

Headquarters: 44, Valley Road, Shortlands, Kent.

Hon. Sec.: Mr. F. J. Chinn, 14, Tirlmont Road, South Croydon, Surrey.

On June 9th a members' equipment evening was held at the London meeting room off the Strand. For this meeting each visitor contributed an item of equipment which he described and demonstrated. Mr. D. Davidson brought along a recording and play-back amplifier, and also a moving coil microphone. Mr. L. Widger, research engineer of the National Institute for the Blind and St. Dunstons, provided two portable reproducers, one electric and the other an acoustic model with stethoscope earpieces, for playing the 24 r.p.m. "talking books for the blind." A ribbon microphone was demonstrated by Mr. C. Appleby, while Mr. D. Aldous provided a special Presto recording of an American sponsored programme. Mr. D. Roe contributed a ribbon-condenser microphone, some novel tracking mechanisms being shown by Mr. J. Hale.

Eastbourne and District Radio Society

Headquarters: The Science Room, Cavendish Senior School, Eastbourne, Sussex.

Hon. Sec.: Mr. T. G. R. Dowsett, 48, Grove Road, Eastbourne, Sussex.

At the last meeting Mr. A. Achurch gave a lecture entitled "Television Transmission and Reception." He dealt with the subject in a very thorough manner, commencing with a very detailed account of the work of the pioneers.

Edgware Short Wave Society

Headquarters: Constitutional Club, Edgware, Middlesex.

Meetings: Wednesdays at 8 p.m.

Hon. Sec.: Mr. F. Bell, 118, Colin Crescent, Hendon, London, N.W.9.

Arrangements are well in hand for the society's five-metre field day to be held on July 2nd. There are ten entries. The transmitter, which will be in charge of G2QYP, will radiate each hour for five minutes. The station is also working in the RSGB field day on July 9th.

Among future activities will be a lecture by a Voigt representative, a discussion on practice and theory and a discussion on five-metre field day apparatus.

Watford and District Radio and**Television Society**

Headquarters: Carlton Tea Rooms, 77, Queens Road, Watford, Herts.

Hon. Sec.: Mr. P. G. Spencer, 11, Nightingale Road, Bushey, Herts.

A successful junk sale was held on May 18th.