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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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EDITORIAL COMMENT

The Second-hand Receiver

An Attempt to Meet a Real Need

HOW often do listeners change their sets? Unless they can afford to disregard a considerable capital loss, circumstances dictate that they do not often do so.

This state of affairs exists in wireless to-day because a second-hand wireless set is so difficult to dispose of at a fair price, with the result that owners are inclined to hold on to their sets as long as the sets will hold together, instead of being able to enjoy the advantages, both in performance and appearance, which the more modern sets offer.

Reception conditions and set design had not stabilised sufficiently until two or three years ago to make second-hand sets of marketable value, and later when suitable sets have been available, there has been no recognised medium for offering them for sale.

An Opportunity

The Wireless World hopes to overcome these difficulties and facilitate the disposal of second-hand sets at a price which will enable the owner to purchase a new receiver without feeling that he has been extravagant, whilst the purchaser of his set will, in many cases, become for the first time the owner of an effective receiver at a price he can afford.

We believe it to be essential, if the disposal of second-hand sets is to be effective, that there should be one recognised medium where all such sets should be advertised either "for sale" or "wanted." In this way the fullest opportunity will be presented both to the seller and to the purchaser.

With this object in view we are publishing amongst the advertisement pages in this issue a coupon which entitles any reader to a free advertisement, to enable him to offer for sale his present receiver, the disposal of which will enable him to invest in something more up-to-date.

We ask our readers to make use of these coupons because we are particularly anxious that the scheme should meet with success at the outset. It will, we believe, then grow to serve a most useful purpose to our readers, the general public, and the radio industry.

Television

Basic Details Disclosed

IN this issue we publish statements which have been sent to us by Baird's and by Marconi-E.M.I. with a request that we should give publication to them for the benefit of those who wish to have, in advance, information as to the nature of the television transmissions. It will be remembered that programmes are to be radiated from both these companies' transmitters when they are, in due course, taken over by the B.B.C.

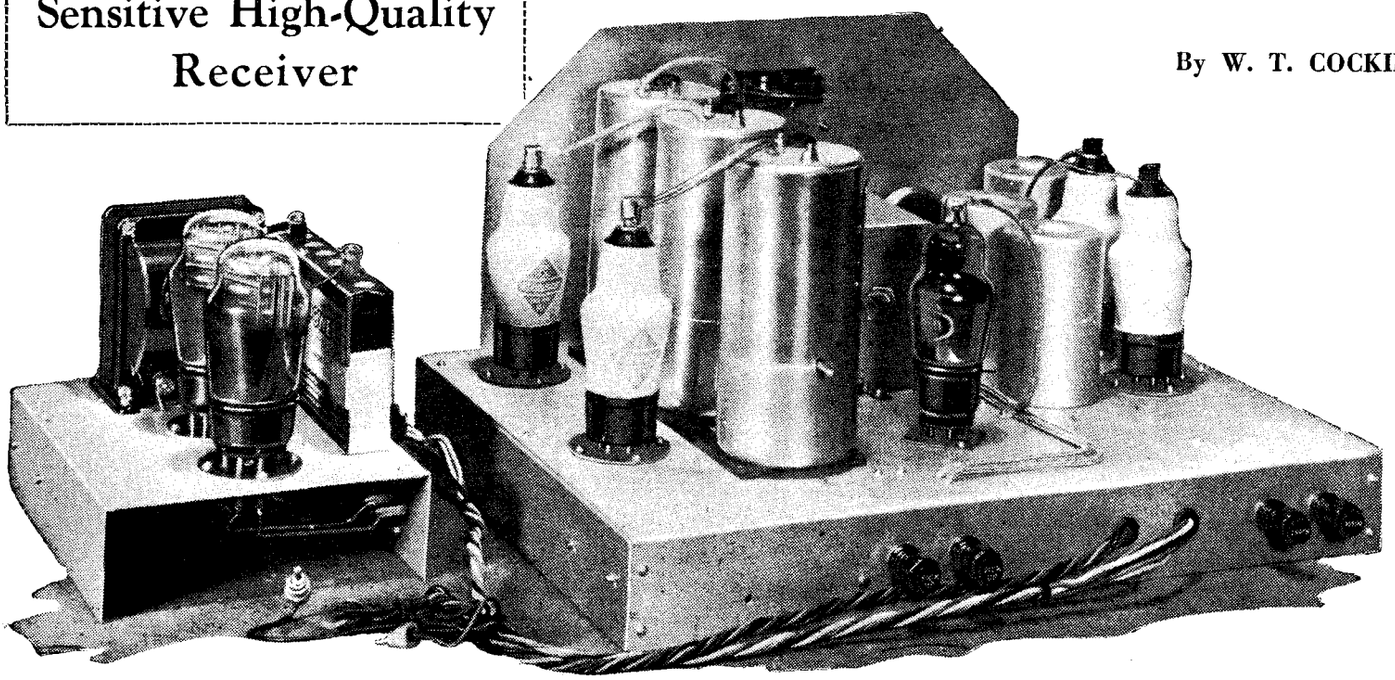
Those who have already studied the subject of television sufficiently will find that this information, although scanty, does give the first essential material on which the design of receivers can be based. It is not, however, the whole story and manufacturers and experimenters will find plenty of scope for individual effort in developing receiving sets.

As time goes on and we approach nearer to the date of the commencement of transmissions, it is to be hoped that fuller technical information will become available.

Constructing and Operating the New Sensitive High-Quality Receiver

The 1936 Battery

By W. T. COCKING



FACTORS which governed the design of this new superheterodyne were discussed fully in last week's issue, and in this article the construction is dealt with. The adjustments necessary for the attainment of the best performance are also described.

THE components of the 1936 Battery Monodial are assembled on an aluminium chassis which can be obtained ready drilled. There are few points of special importance to observe in the assembly, and the parts may be mounted in any order. Wires should, however, be attached to the gang condenser before it is mounted, for when it is in position the soldering tags are obscured by the IF transformers. These transformers are spaced slightly from the chassis by two wooden battens, not to provide insulation but to obtain a firm seating on the chassis. Care should be taken to see that there is a good contact between the chassis and the frame of the gang condenser, and all screening cans.

The wiring must be carefully carried out to ensure that not only are all connections made, and made correctly, but that unwanted couplings are not introduced. With this end in view it is insufficient merely to connect the correct points together, for the wires themselves must be as carefully placed relative to one another as the components. The physical disposition of the wiring shown in the drawings and photographs must, therefore, be carefully followed.

The valve anodes require a supply of some 120 volts, and the screens of the early valves about 80 volts. A single cell in the receiver provides grid bias for the early stages, but the bias for the output stage is derived from a separate battery in that unit. The exact bias used here should be found experimentally; in general, the best quality will be obtained with six volts, but greater economy of HT current can be obtained with a somewhat higher bias.

Ganging with a Test Oscillator

Before the receiver will function correctly, the initial adjustments must be made. These can be divided into three sections: the IF trimming, the medium-wave ganging, and the long-wave ganging. If a calibrated test oscillator be available, set it to 465 kc/s and connect its output between the grid of the second IF transformer and the chassis. Adjust the two trimmers on the third IF transformer (rear can) for maximum response, with the selectivity control set towards high selectivity, that is, with the control nearly fully rotated in an anti-clockwise direction. Then transfer the oscillator output to the first IF valve, connecting it between the grid and the AVC line, and adjust the two trimmers on the second transformer. The trimmers on the first transformer (front can) are similarly adjusted with the oscillator joined between the grid of the heptode and the AVC line. The tuning indicator provides a ready means of determining the optimum setting of each trimmer, for if the oscillator output be adequate there will be a marked change in the reading at resonance, except in the case of one circuit in the last transformer, which must be trimmed by ear. Keeping the oscillator connected to the frequency-changer, check the adjustment of each circuit, and it will usually be found that the optimum settings have changed very slightly.

The oscillator should now be connected to the aerial and earth terminals and set at 1,400 kc/s. Stop the oscillator from working by joining terminal (1) of the oscillator coil directly to the chassis, and set the waverange switch for the medium waveband. Set the oscillator to give a large output (0.1 to 1 volt), and tune in the signal by the main tuning control. Nothing will be heard, of course, for the oscillator is not functioning, but an indication should be found on the tuning meter. Having found the optimum setting, adjust the trimmers on the rear and middle sections of the gang condenser for maximum response. The trimmer on the rear section should be nearly fully unscrewed.

Next remove the short-circuit from the oscillator coil, reduce the output of the test oscillator and adjust the oscillator trimmer (front section of the gang condenser) for maximum response. The setting of this trimmer is very critical. The test oscillator should now be set at 600 kc/s and adjusted for large output. The short-circuit should be applied to the oscillator in the set and the set tuned to 600 kc/s by means of the main tuning

Monodial Super

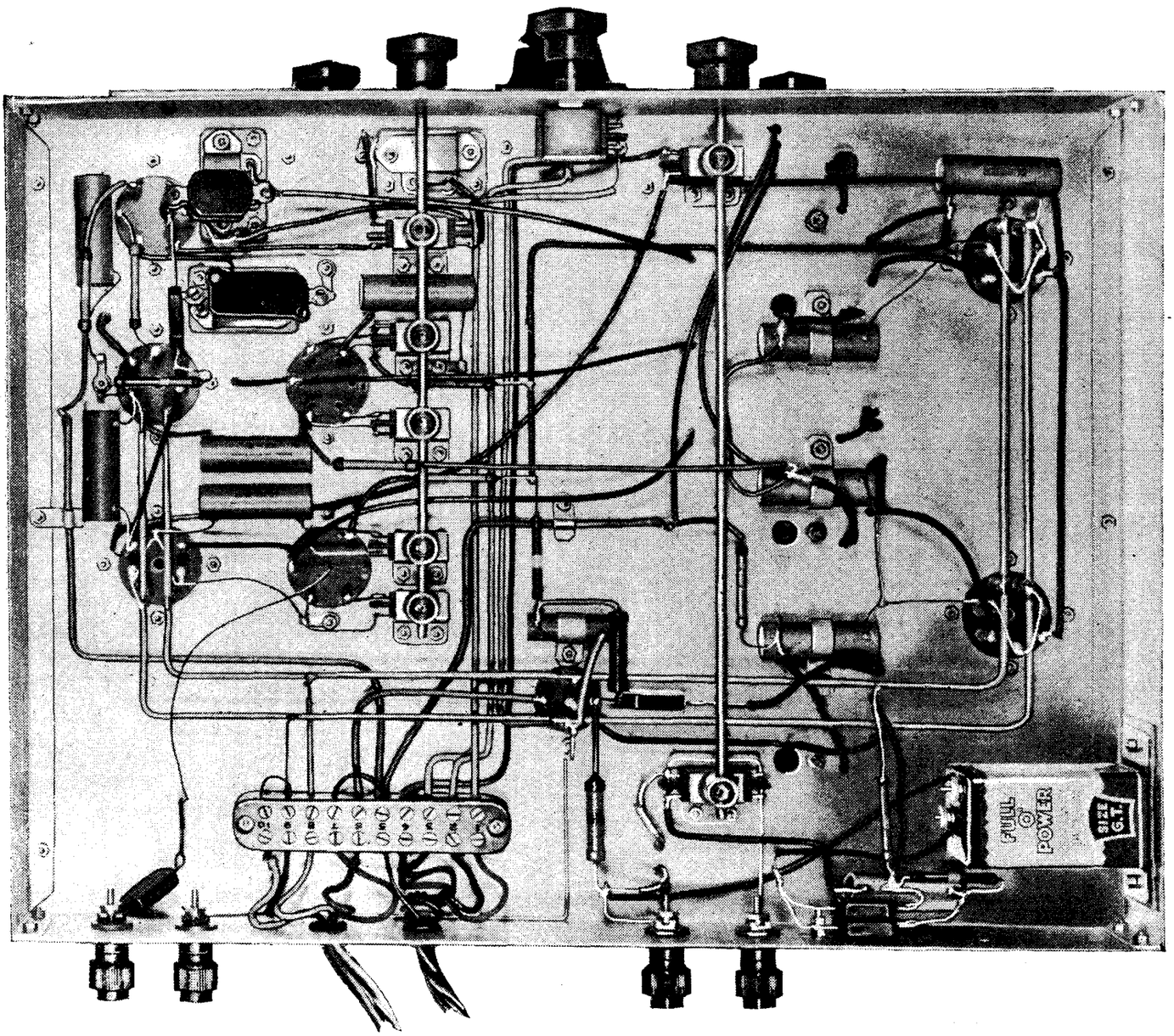
control, using the tuning meter as an indicator. Remove the short-circuit, reduce the oscillator output, and adjust C8 for maximum response. A readjustment of the ganging at 1,400 kc/s should now be made in the manner already described, and the medium-wave ganging is complete.

The procedure on the long-wave band is identical with that on the medium, save that the trimmers on the gang condenser must not be touched. The test frequencies are now 300 kc/s and 160 kc/s, and the oscillator should first be set to the former with large output and terminal (1) of the oscillator coil shorted to the chassis. The signal should be tuned in, the oscillator output reduced, the short removed, and C12 adjusted. At 160 kc/s the same procedure should be adopted, but here C13 is adjusted.

If a test oscillator is not available, the adjustments are somewhat more difficult to carry out, but not unduly so. The procedure, however, is rather different. The first step is to screw each IF trimmer fully home and then to unscrew each one and one-half turns. The circuits are then roughly tuned to 465 kc/s. Set the selectivity control at minimum selectivity, unscrew the trimmer on C3 nearly fully, that on C6 about half-way, and that on C9 about two-thirds. It should now be possible to find some signal and this should be used for the adjustment of the IF circuits. At first adjust each IF trimmer roughly. This will probably lead to a big increase of signal strength, and the selectivity can be increased. Retuning on the main control will probably be needed, and the selectivity should be increased as much as possible while keeping the signal audible. Each IF trimmer can then be accurately adjusted for maximum signal strength, using the tuning meter as an indicator if possible. It should now be possible to receive plenty of stations and only the ganging requires adjustment.

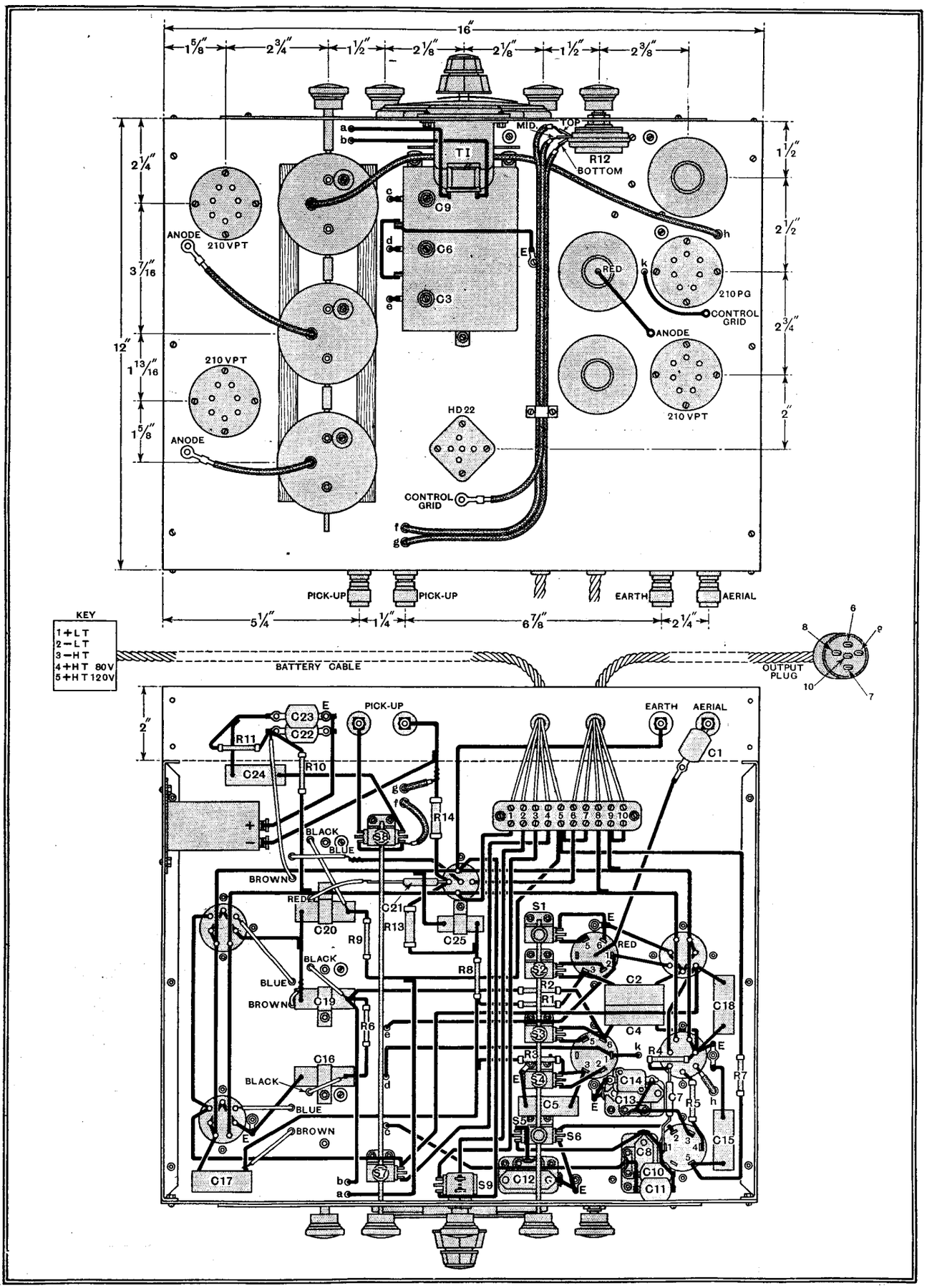
Ganging on a Signal

Find a station on as low a wavelength as possible, and adjust the trimmers on C3 and C6 for maximum response. C3 should be nearly fully unscrewed; if it is not, alter the setting of the tuning control appropriately, and retune the same station by adjusting all three trimmers on the gang condenser. Thus, suppose that no optimum setting can be found for C3, but that results are best with it fully un-



The wiring and chief underbase components are clearly shown in this illustration. Note the single dry-cell for grid bias;

PRACTICAL WIRING DIAGRAM



Full details of the layout of components and the wiring are given in these drawings.

The 1936 Battery Monodial Super—

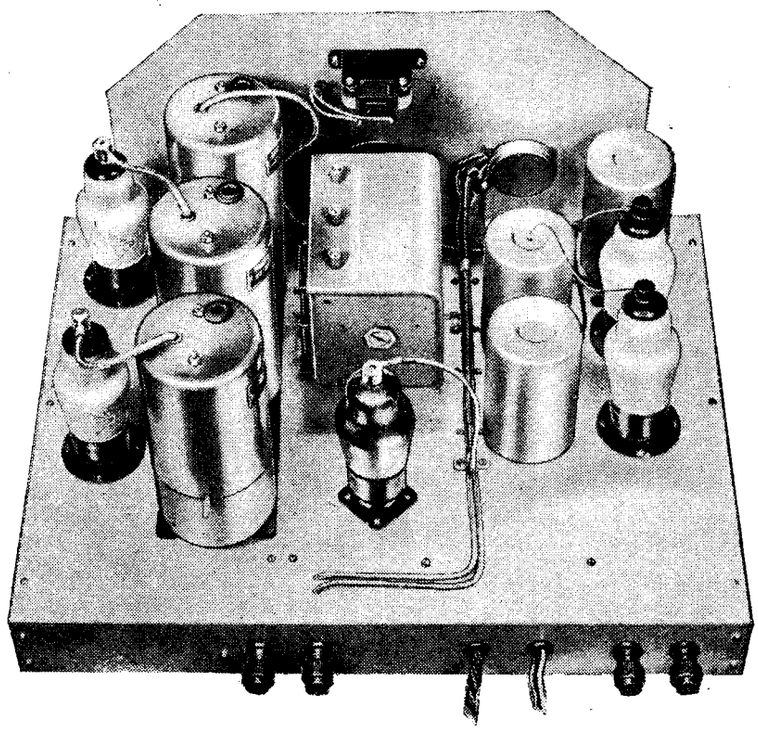
screwed. This means that the capacity across this circuit is too great. Consequently, the tuning control should be set two or three degrees lower and the station retuned by increasing the capacity of all three trimmers.

When satisfied with the adjustment at this point, tune in a station at the other end of the waveband and adjust C8 while rocking the main control backwards and forwards until the optimum combination of settings be found. Some slight readjustment of C3 and C6 at a low wavelength may then be necessary.

The long waveband trimming is next in order. Set C13 at about the middle of its travel, and the tuning control to read 60 degrees. Then tune in Droitwich by adjusting C12. It should then be possible to find a station on a lower wavelength and C12 can be adjusted while rocking the main tuning control backwards and forwards until the optimum combination of settings is found. No adjustment to C13 will usually be needed.

When these initial adjustments have been made, the receiver is ready for operation, and, with certain exceptions, it should be possible to receive any station with little or no interference when the selectivity control is set for high selectivity. The exceptions are those cases where stations are spaced less than the regulation 9 kc/s, and those stations which are immediately adjacent to a powerful local. When the selectivity approaches its maximum it is of a high order, as is attested by the fact that no difficulty has been found in London in receiving the Deutschlandsender without intelligible interference from either Droitwich or Radio Paris. Sideband splash naturally prevents the programme from the German station being musically enjoyable, for both its neighbours are much stronger signals. Speech is readily understandable, however.

The sensitivity on test proved adequate for the reception of the weakest stations with any reasonably efficient outdoor aerial, and ample for all the stronger transmissions with a poor indoor aerial. Such an aerial is not, of course, to be recommended, but where its use is unavoidable the set can be relied upon to give a good account of itself. Second channel interference was found to be very small indeed, while background hiss proved negligible on all but the weakest stations. Under all ordinary conditions of use internally generated whistles should be absent, save at two points at most in the tuning range. Should more whistles be found, it is a sign that either the ganging is inaccurate or that the HF or frequency-changer valve is being over-loaded by the strong signal from a local station. This may occur in a few cases where the aerial is unusually good and where the set is used at a very short distance from a transmitter, and the remedy is to change the value of C1 to 0.0001 mfd., or even slightly smaller.



This view of the receiver shows the chief components on the upper side of the chassis. The frequency-changer and preselector are on the right.

A full-size blue print of the combined wiring diagrams of the receiver and power units is available from the Publishers, Dorset House, Stamford Street, London, S.E.1 Price 1s. 6d. post free.

The Performance

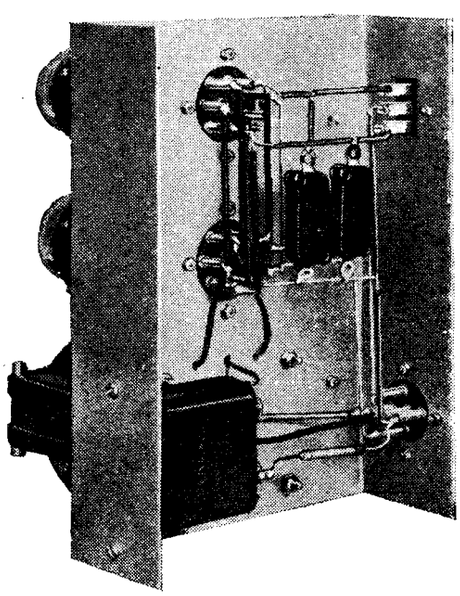
The quality of reproduction reaches a very high standard indeed for a battery-operated receiver. When operated at low selectivity for local reception, very high fidelity indeed is secured, and although it is not as good when the selectivity is increased for distant reception, it is still as high as it is possible to obtain under these conditions. The only point in which the quality may be said to suffer in comparison with a mains set of equally good design is in the power output. Even although the output is abnormally large for a battery set, it is still somewhat below that of a mains receiver, and it can hardly be increased at reasonable cost. The maximum output varies with the HT voltage used, but is of the order of 1.5 watts for really first-class quality. If rather more distortion be permitted, over 2 watts can be obtained, and with a sensitive loud speaker this represents good volume. The distortion at such a volume level, although by no means negligible, scientifically speaking, is far less than that present in the vast majority of battery receivers in use to-day.

The AVC system is designed more to counteract fading than to maintain all

VOLTAGES AND CURRENTS.

Value.	Anode Volts.	Screen Volts.	Grid Volts.	Anode Current.	Screen Current.
				mA.	mA.
HF 210 VPT	90	77.5	−1.6	2.4	1.0
FC 210 PG tet.	95	77.5	−1.6	1.1	2.5
,, osc.	90	—	—	1.85	—
1st IF 210 VPT	95	77.5	−1.6	1.75	0.7
2nd IF 210 VPT	110	77.5	0	4.1	1.25
LF HD 22	85	—	−1.6	1.2	—
Output QP21 (total for two valves)	115	115	−6.2	12.5	3.9

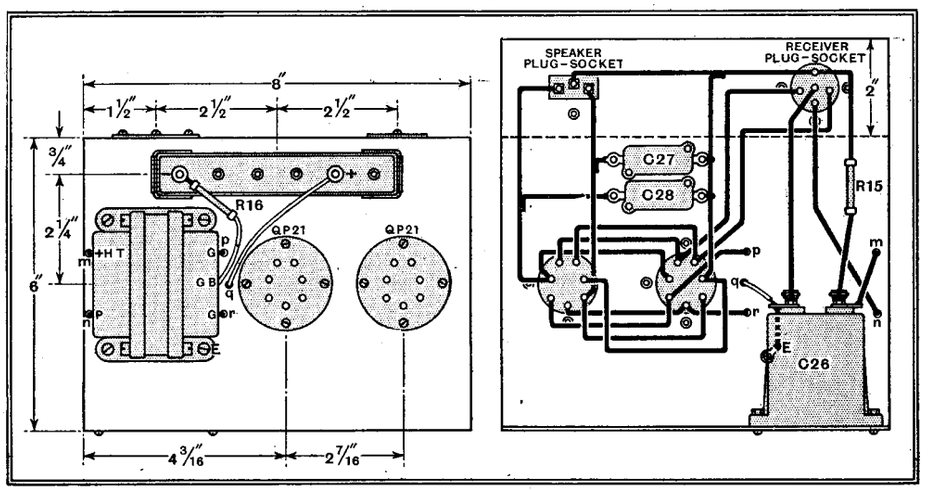
HT battery = 115 volts.



An underside view of the output unit.

1936 Battery Monodial Super—

stations at the same volume, so that no defect need be suspected if it be found that local stations are louder than others. It has been found that with the limitations imposed in practice fading reduction is best achieved with a small delay voltage, whereas a high delay voltage is needed to maintain the distant and local stations at approximate equality of volume. In a sensitive receiver, the reduction of fading is the more important factor.



These drawings give complete details of the construction and wiring of the output unit.

Short-wave Broadcasting

DURING October the International Short-Wave Club is holding a reception contest, in connection with which several of the better-known short-wave stations are radiating special programmes.

Readers of these notes who have had any intention of entering for the contest have already filled in their entry forms and received full particulars from the secretary of the Club. There must be many, however, who have not the time to take it seriously, but will be able to appreciate the large number of extra transmissions that will be on the short-wave ether during the month.

The following are particulars of special transmissions from some of the lesser-known stations, with dates and times: La Paz, CP7, 19.6 metres, on October 5th, 4-5 p.m.; Bombay, VUB, 31.36 metres, on October 9th, 4-4.30 p.m.; Costa Rica, TI-RCC, on 45.81 metres, October 19th, 1-3 a.m.; Mexico City, XECR, 40.65 metres, on October 20th, 11 p.m.-midnight.

Lobito, Angola, CR6AA, 41.8 metres, on October 26th, 7.45-8 p.m.; and Lima, Peru, OAX4G, 48.22 metres, on October 31st, midnight-4.30 a.m.

In addition to these, of course, most of the better-known North and South American stations, as well as Nairobi, Sydney and the Europeans, will also be radiating special test programmes.

The Bright Spot—19-metre Band

In spite of the fact that the fade-out time on the shorter waves is becoming earlier day by day, the 19-metre band still seems to be the brightest spot in the short-wave spectrum. It is a great pity that this band is not used by a more varied collection of stations, although the addition of the Bolivian station CP7 (as listed above) on 19.6 metres makes it more interesting.

The four Americans using the 19-metre band are always exceptionally good, and one imagines that if an Indian and a South African station were to transfer their attentions from 49 or 31 metres, we should have no difficulty at all in logging them regularly.

At the next international convention the whole question of occupancy of short-wave bands is to be brought up. It has even been suggested that short-wave broadcast stations will have to be lined up by something similar to the Lucerne Plan.

"Occupancy checks" on the amateur bands have been made for many months, and have provided much valuable information. Similar checks on the strips of 100-kc, or so on either side of the amateur bands are also being made, so that a claim may be made for the widening of amateur bands if the amount of use made of the adjacent territory appears to be small.

Surely something similar must be done with the short-wave broadcast. There is not one of the official bands which has not a certain amount of commercial interference. Just as certainly there is not a commercial band which does not find several "stray" broadcasting stations within its territories.

If the official broadcast bands can be widened substantially, then there will be no need for this spreading out of stations. Possibly 15-kc. separation would become practical politics. Obviously, however, co-operation between stations is going to be very much more difficult than was the case in Europe where medium-wave broadcasting was concerned.

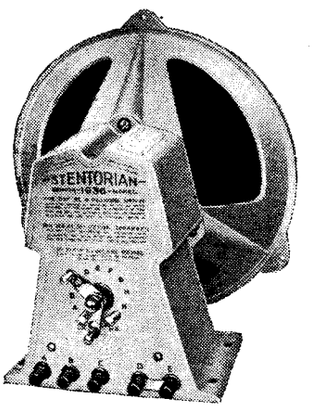
Taking the present arrangement of the 19-metre band as an example of bad planning, we have three stations listed on 15,250 kc.; one on 15,220; one on 15,210; one on 15,200, and then a gap of 70 kc. with no station. The 31-metre band is even worse, with five stations on 9,590, two on 9,580 and three on 9,570

The one thing that saves us from real chaos is the fact that these stations are never heard all at the same time, although they often work in pairs.

MEGACYCLE.

Speaker for the 1936 Battery Monodial Super

A LOUD speaker has been received from the Whiteley Electrical Radio Co., Ltd., of Victoria Street, Mansfield, Notts, for the 1936 Battery Monodial Super. It is fitted with a multi-ratio transformer giving impedances from 3,250 ohms to 70,000 ohms and 1 ohm to 22 ohms, so that it can be matched to any output stage and is particularly convenient for use as an extension speaker. Provision is made for use with either single or push-pull output stages. Two switches on the frame permit the ratios to be changed in a moment. For use with the 1936 Monodial Battery Super, the lower switch should be set at HR and the upper at E.



The W.B. P.M. speaker type 36S.

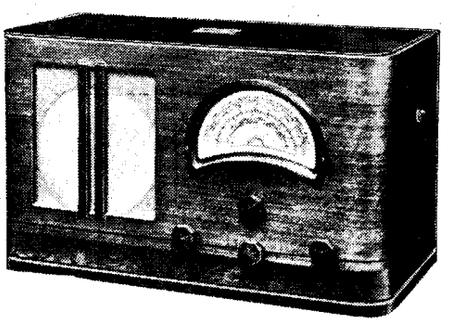
The speaker is well made and can confidently be recommended for use with this set. It is the type 36S and is priced 42s.

H.M.V. Model 360

ALTHOUGH not so sensitive or selective as the superheterodynes in the H.M.V. range, this new receiver will undoubtedly satisfy the demands of the majority of listeners for good reception of the local stations, together with a reasonable selection of foreign programmes. It is of the HF-detector-LF type with a pentode output stage to the moving-coil loud speaker, and is fitted with an input volume control in addition to reaction.

The horizontal cabinet is of high quality, and the loud speaker fret is balanced by a large transclucent tuning scale carrying over 200 station names, and illuminated by a large spot of light traversed by a fine black line.

The set is suitable for 200-250-volt, 50-100-cycle mains, and the price is 9 guineas.



The new H.M.V. Model 360 "Popular 4-valve" receiver.