The Wireless World

THE PRACTICAL RADIO JOURNAL
24th Year of Publication

No. 805. FRIDAY, FEBRUARY 1ST, 1935. VOL. XXXVI. No. 5.

Proprietors: ILIFFE & SONS LTD.

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Editorial,
Advertising and Publishing Offices:
DORSET HOUSE, STAMFORD STREET,
LONDON, S.E.1.

Telephone: Hop. 3333 (50 lines).
Telegrams: "Ethaworld, Watloo, London."

COVENTRY: Hertford Street.
Telegrams: "Autocar, Coventry." Telephone: 5210 Coventry.

BIRMINGHAM:
Guildhall Buildings, Navigation Street, 2.
Telegrams: "Autopress, Birmingham." Telephone: 2971 Midland (4 lines).

MANCHESTER: 260, Deansgate, 3.
Telegrams: "Iliffe, Manchester." Telephone: Blackfriars 4412 (4 lines).

GLASGOW: 26B, Renfield Street, C.2.
Telegrams: "Iliffe, Glasgow." Telephone: Central 4857.

PUBLISHED WEEKLY. ENTERED AS SECOND CLASS MATTER AT NEW YORK, N.Y.

Subscription Rates:
Home, £1 1s. 8d.; Canada, £1 1s. 8d.; other countries, £1 3s. 10d. per annum.

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No Change in Broadcast Receivers

THE imminence of the publication of the Television Committee's report to the Postmaster-General has produced a crop of rumours and speculations as to the effect which television is going to have on our broadcasting organisation, and it has even been suggested that existing receivers for broadcasting and new models which manufacturers are working on at present will be rendered obsolete.

Such statements and suggestions are startling and may, in consequence, in some quarters be regarded as good journalism, but there is little foundation in fact for such ideas and unfortunately they have a disturbing effect upon those who, through ignorance, accept them.

It is, perhaps, just as well to consider the position briefly and marshal some of the facts which serve to repudiate any idea that a revolutionary change in our broadcast receiving arrangements is upon us.

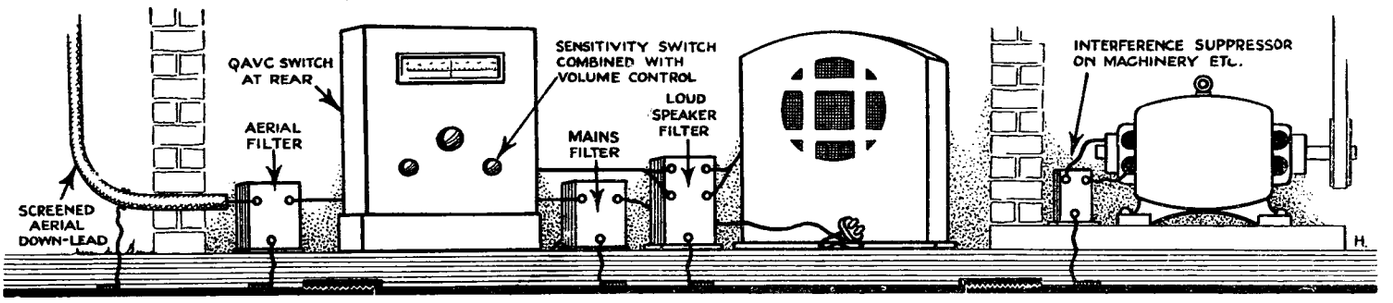
First of all, the recommendations of the report, however promptly they may be acted upon, will certainly take some months for the B.B.C. to carry out. Then the B.B.C. has to get started with the transmissions and the public must acquire apparatus for their reception. The present order of broadcasting on the long and medium wavebands is far too firmly established to allow of any change to be brought about as a result of the development of television in its initial stages. The change which television might ultimately bring would be the transfer of *local* broadcasting to the very short wavelengths, but common sense decides that this would come only after television had been accepted as an essential part of the broadcasting service by the majority of the European countries, and, even then, international agreement would have to be reached first. It is hardly necessary to point out that such agreements are not easily consented to, and probably long deliberation and a succession of international conferences would precede the adoption of any such scheme.

Again, there is such a thing as the responsibility of the Post Office and the B.B.C. towards both the listener and the manufacturer, and it is quite absurd to imagine that any step would be taken which would leave the public and the manufacturer with sets rendered obsolete by reason of such drastic changes.

There are good technical reasons for supposing that ultimately sound for the television programmes may be broadcast on channels adjacent to the television transmission itself as pointed out in an article in last week's issue, but this is looking a long way ahead, and even then this would not affect the present broadcasting service.

Suggestions have been made that short-wave convertors may be employed for television, to precede the existing receivers as an attachment. As far as television is concerned, this idea can at once be dismissed as technically unsound because for high-definition television present-day receivers are quite unsuitable in design. They would not pass anything approaching the frequency band required for the purpose.

There seems little doubt, therefore, that the present types of broadcast receivers will still be required for an unchanged system of broadcast sound reception, and the television set will be a separate entity marketed as an entirely independent instrument and designed for transmissions on independent wavelengths.



NOISE SUPPRESSORS

Effective and Ineffective Methods Described

ALL kinds of devices, ranging from truly automatic and highly developed "Quiet" AVC systems to the simplest form of mains disturbance filter or "sensitivity limiting switch" are loosely described as noise suppressors. This article will help to clear up many popular misconceptions on the subject.

By M. G. SCROGGIE, B.Sc., A.M.I.E.E.

PEOPLE who go to Olympia, or any other place where numerous wireless sets are to be seen, for the purpose of selecting a receiver, presumably proceed something like this: They first find out what general type they require, or can pay for, and realise that they have to choose from among (say) forty models of that type. They then commence an eliminating process based on the points for and against each model. That is the idea, at any rate.

In order to spare their prospective customers undue brain fag, the vendors of the said models often draw up their "selling points" into lists, which, naturally, are made as overwhelming as possible.

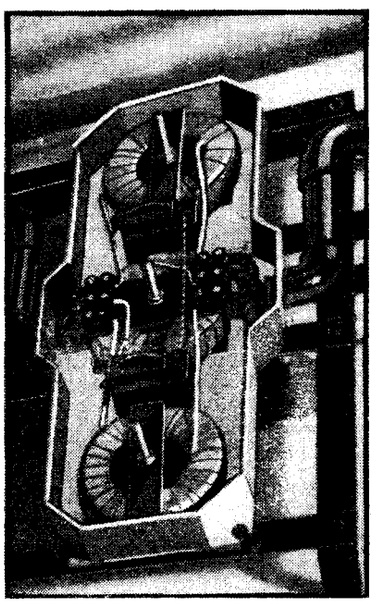
One of the star points this season is "Noise Suppression." The term suggests an obvious advantage, for the association of undesirable noise is one of the chief stumbling-blocks in the way of those who remain to be numbered as licensees.

What sort of noise is there to be suppressed? What methods are available for suppressing it? And how much of it do they suppress?

It will be granted that it is a disadvantage to be deaf. One is thankful for good hearing. But if it were in our power to gain still better hearing, our thankfulness for it would probably be short-lived. A normal pair of ears brings in sounds from a sufficient range to make life quite uncomfortable in some situations as it is; and the advantages of super-sensitive hearing would be neutralised by the multifarious noises which it would make intolerable.

Much the same applies to radio. Modern valves and circuits have increased the range and sensitiveness of receivers, but there are electrical noises in great variety which may turn this into a doubtful advantage. These noises, according to their sources, fall into three classes.

The first is often given the unpleasant and rather inaccurate title of "man-made static." Most electrical machinery and appliances—tramcars, transmission lines, refrigerators, cleaners, signs, motor car ignition systems, etc., etc.—cause electrical noises that can be heard with a radio receiver. Most of them can be more or less effectively silenced at the source by an appropriate system of condensers and/or chokes. The difficulty lies in persuading the owners of the interfering equipment, who usually are not inconvenienced thereby, to go to trouble and expense for someone else's benefit. Still, this class of noise may perhaps be classed as avoidable.



Electrical disturbances are likely to prejudice the accuracy of laboratory work: as a guard against mains interference, banks of Belling-Lee Suppressors have been installed in the power supply circuits in the H.M.V. research department. One of the choke units is shown with its cover removed.

The major operations of Nature, however, are less subject to control. "Atmospherics" have worried radio people for the last thirty years, and they are still with us. They are caused chiefly by lightning, and their intensity depends on whether the nearest flash of lightning is taking place immediately over the aerial or a few thousand miles away. One can count on thunderstorms somewhere in the world at all times, and a single flash puts out far more power than all the broadcasting stations in the world combined; so a sensitive receiver is never entirely free from atmospheric noises.

Even if everything from without is excluded, the receiver itself makes its own noise. Often this is due to faulty working or poor design, but the best receiver is noisy if it is sufficiently sensitive. Valve hiss is a limiting factor.

Thus the valves cause hiss; atmospheries have been likened to the delivery of coals into the cellar; and the "man-made" noises are as varied as the human activities to which they are due.

The condensers, chokes, etc., suitable for abating the last-named nuisance, form one well-known class of noise suppressor. With them may be included such things as screened aerial down-leads for moving the collector away from the source of interference.

The last few Radio Exhibitions have included a prominent demonstration by the Post Office of how nearly all interfering appliances may be silenced with great success. There would be little trouble due to noises under this heading if only existing knowledge on methods of suppression were fully applied. In one sense this is the true noise suppression, for there is nothing lost to the receiver. But—we have no power over the other two sorts of noise.

Noise Suppressors—

Nobody has presumed to fit filters to a thundercloud.

Turning from prevention to the inferior doctrine of cure, we have the types of noise suppressor that apply to the receiver. In judging these one has to consider not only whether they dispose of the chaff satisfactorily, but also how much of the grain is lost with it.

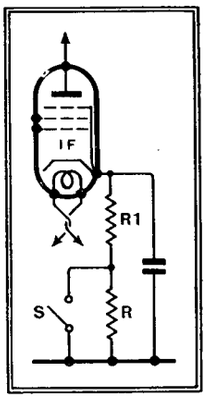


Fig. 1. When the noise-suppressor switch (S) is opened it inserts resistance R, which increases the bias on the valve and reduces its sensitivity. The resistor R1 is to provide the usual initial bias.

Extravagant claims are sometimes made for devices to be connected between the aerial and the receiver. While one would not go so far as to say that none of these has any value at all, it remains to be proved that anything can be done in this way which does not cut down good and bad alike, or nearly alike. A filter in the mains connection, and a screened mains transformer, however, are sometimes quite useful in keeping out "man-made" noise, particularly when the source of the disturbance is beyond one's jurisdiction.

Suppression—At a Price

Devices claimed to "purify" reception are not confined to the input end of the receiver; there are others for attaching to the loud speaker. This sort generally consists of a fixed condenser in a sealed box, sold at a profitable figure. The more irritating and obvious noise-sounds are high in pitch, and are reduced by the condensers at the expense of the corresponding frequencies in speech and music. Some people like "mellow" tone and write testimonials to the makers of such appliances. But the method is not for those who want natural reproduction.

One of the "noise suppressors" that figure on receiver specifications consists of nothing more than an extra resistor (R in Fig. 1), connected in the cathode circuit of the variable-mu valve or valves, and provided with a switch (S) to short-circuit it. When it is un-shorted the sensitivity of the receiver is thereby cut down with regard to noises and everything else alike. Although this sounds rather futile, the arrangement is not a mere pretext for publicity; in most sets provided with AVC there is an abominable row when one is tuning from station to station, and if the sensitivity can be temporarily reduced it is a comfort.

One might think that the same thing could be done more simply by turning down the volume control, without any need for an extra gadget; but this is not so. To see why, refer to Fig. 2. This is a typical curve showing the relation between output available for the loud speaker (milliwatts) and the signal strength at the aerial (microvolts) necessary to produce it. "Signal" includes what is received from desired or undesired radio stations, and from the first two forms of noise interference.

A perfect AVC system would give the same output all the time, irrespective of the signal strength. Actually, of course, the weak signals are not enough to produce full output; and it is only above a certain signal strength that it is advantageous for the AVC to be brought into action to minimise any further rise in volume. These two conditions are shown by the two parts of the graph: the steeply rising part which applies when the delay effect prevents the AVC from being effective, and the flatter part corresponding to AVC action. The more effective the AVC the flatter it is.

Now programmes that are worth listening to are generally strong enough to come well beyond the "knee," on to the flat part. Unless the conditions are such as to make satisfactory reception impossible, the noise is weaker in comparison. But while tuning between the stations, when the AVC action is temporarily suspended, the receiver becomes fully sensitive and the noises may sound nearly as loud as the programmes. This produces the distressing effect that noise suppressors are designed to alleviate.

If the ordinary volume control, which affects the *output*, were turned down as suggested, everything, programmes and noise alike, would be reduced, as shown by line A. The balance between the two would be unaffected. But the sensitivity reducing device, instead of shifting the curve bodily downwards, shifts it to the right: line B for example. Obviously the weak signals (which we are assuming to include everything that is undesirable) are severely curtailed; but thanks to AVC there is very little reduction in those programmes that are still able to reach past the "knee" of the curve.

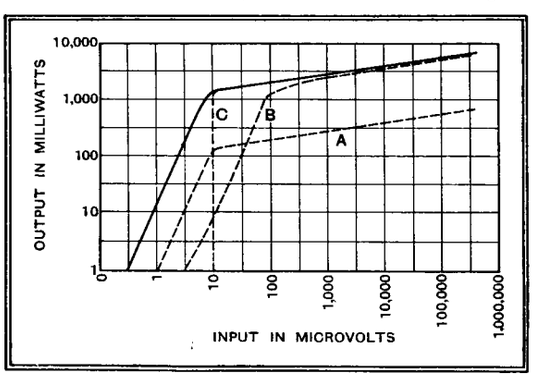
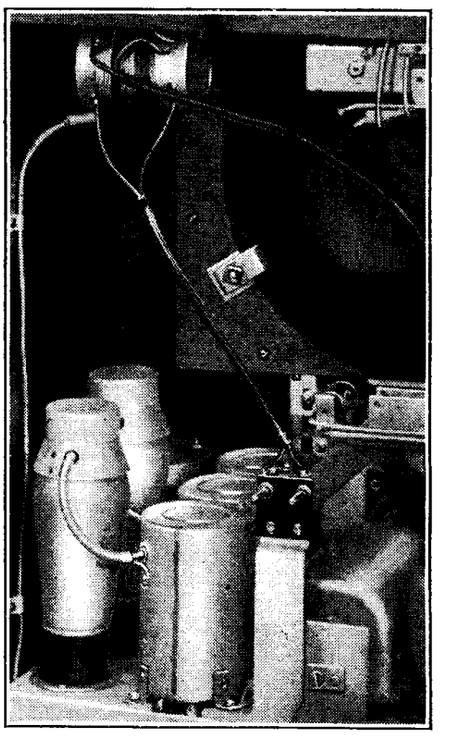


Fig. 2.—The full line is a normal curve, showing the relation between input and output of a receiver. The effect of ordinary volume control is shown at A; of the noise-suppression switch at B; and of QAVC at C.

So we have the rather curious result that although this type of noise suppressor desensitises the amplifier towards everything that it handles—noise and programmes alike—it appears to cut down noise far more than programmes.

One of the chief objects of AVC is to counteract fading. Suppose the desired programme has a strength of 100 microvolts. Then (referring to the example illustrated in Fig. 2) with the noise suppressor out of use it is possible for it to fade down to 10 microvolts without noticeable drop in volume; but when the suppressor is in, the fading is just as bad as if there were no AVC—which is in fact exactly the situation.



Built-in mains filter (top left-hand corner) in a Philips set.

If one were perfectly free to map out an ideal shape it would be a vertical line: C in Fig. 2. The AVC portion remains unmolested, but the portion corresponding to noise and to weak and almost worthless signals is completely removed, giving a perfect silence between the tuning points of the more powerful stations. This ideal is more or less closely approached by the various systems of Quiet AVC. Not many receivers embody any of these, because they add to the cost or complication, or are otherwise open to criticism. There is a remarkable amount of scope for difference in method, leading to subtle differences of behaviour; and it is on these that the pleasure of using the set largely depends.

For instance, it might well be argued that the correct system would give the result indicated by Fig. 3. No station having a strength of less than, say, 100 microvolts would be heard, but, once tuned in, it could fade down to the lower limit of the AVC (10 microvolts in this example) without being cut off. Some-

Noise Suppressors—

thing approaching this action is actually accomplished in some systems.

Again, the designer may arrange that the "Q" is worked from an exceedingly selective tuned circuit, so that the station is cut in only when it is exactly tuned. This makes it impossible for even the careless listener to mistune it, and avoids "side-band shriek." There are still other refinements. And on the contrary there are all sorts of possible defects, such as distortion, fluttering, and reduction in AVC efficiency. So QAVC is a considerable test of a designer's skill.

Any system of interstation noise suppression may take the outward form of a mere switch, giving the alternatives of "On" and "Off"; or it may allow the listener to control—within limits—the level below which signals are weakened or cut off. Obviously the latter permits one to make the best of whatever conditions happen to prevail at the time; the noise level is seldom constant.

At the risk of being guilty of repetition it is perhaps worth emphasising that the last two methods—desensitising switch and QAVC—do nothing to reduce the noise *when one is actually listening*. If the noise is comparable in strength with the desired programme there is no true remedy other than tackling the noise before it reaches the receiver at all.

Summarising: the only way to suppress noise without losing something else is to silence each noise-producing source, or to remove the aerial from the zone of interference. When the receiver is so sensitive as to pick up an unpleasant amount of noise that cannot be stopped at the source there is a choice of several methods of noise suppression. Those that act by affecting the tone impair the quality of all programmes when in use, and they are not very effective as suppressors; aerial filters usually reduce sensitivity generally, and actually increase the proportion of noise generated in the set itself, but mains filters can be very useful.

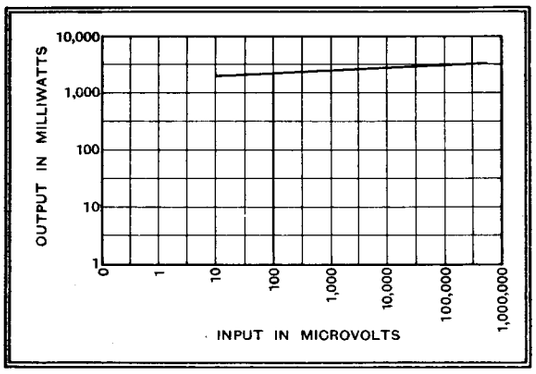
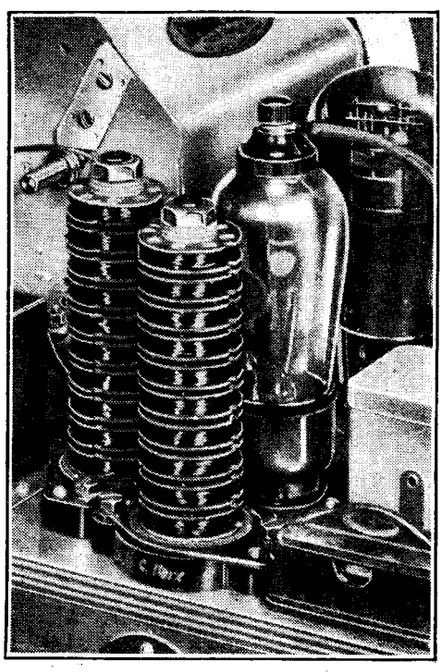


Fig. 3.—Ideal QAVC characteristic curve showing overlap to preserve AVC action intact.

AVC systems provided with a switch or control to insert extra bias for the pre-detector valves are effective in reducing noise, and leave the strongest programmes practically unaffected, but restrict the AVC action on programmes of moderate strength.

True QAVC, if skilfully designed and carried out, progressively eliminates noise and weak stations without affecting the better programmes.



Heavy-duty HF chokes in the "Wireless World" DC Superhet.

DISTANT RECEPTION NOTES

A GOOD many reports of freak reception are reaching me at the present time. Most of them are concerned with the reception of some station or other with a highly selective receiving set when tuned to quite a different wavelength. Those who experience such happenings are not a little puzzled that a set, whose tuning may be described as of knife-edge sharpness, can misbehave itself in this uncanny way. Their mystification is increased when they find, as sometimes they do, that their own superheterodynes insist upon bringing in two stations at once, or one is a background to another, and that far less selective straight sets belonging to friends do neither of these things.

In genuine cases of the Droitwich or Luxembourg effect both straight sets and superheterodynes are equally at a disadvantage since the double reception that then occurs is due to natural causes and no kind of receiving equipment can prevent it. But there is also what may be termed a superheterodyne effect, which accounts for numerous kinds of freak reception.

Many superheterodynes are distinctly unselective in the tuned stages preceding the first detector, particularly those which have no signal-frequency amplifier. In numerous different ways either the locally generated oscillations or the carrier wave of another station may beat with the carrier of an unwanted transmission so as to produce oscillations either exactly on the intermediate frequency or very close to it. When this occurs the unwanted station is more or less strongly heard according to the closeness of the beat frequency to that of the intermediate stages. The big increases in output power which are taking place will make it necessary for designers in future to pay special attention to the selectivity of the pre-detector stages in superheterodynes.

A considerable amount of heterodyne interference is observable at the present time on the medium waveband. Few stations of importance are continuously affected: but at the same time there is hardly an evening now when some transmissions that are normally good are not found to be accompanied by unwelcome whistles. A good many of these heterodynes are due to Russian stations, some of which have rather hazy ideas about wavelength keeping. Others are undoubtedly caused by harmonics of stations of longer wavelength.

Amongst the important stations that have been heterodyned on occasion are Stuttgart, Leipzig, Breslau, Königsberg and Nürnberg. Königsberg has been the worst sufferer, for this station is comparatively seldom to be received clear of interference. A new wavelength plan is urgently needed, though, judging from the results of the Lucerne Conference, any attempt to devise a scheme acceptable to all countries concerned would seem to be an almost hopeless task. We must resign ourselves to the fact that whatever the sensitiveness or the selectivity of a receiving set the reception of every important European station on any evening is not possible, and apparently never can be. But when all is said and done each evening provides us with a large number of genuine alternative programmes from which to make our selection.

The best of the long-wave stations at the time of writing are Huizen, Radio-Paris, Warsaw, Luxembourg, Kalundborg and Oslo. Zeesen, however, is apt to be none too strongly received at times, and Luxembourg is prone to heterodyne interference.

Of the meduim-wave stations the group at the top of the band continues to be well received. This includes Budapest, Beromünster, Stuttgart, Vienna, Florence, Brussels No. 1 and Prague, though Florence is subject to certain variations. The most dependable stations on lower wavelengths are Stockholm, Rome, Munich, Berlin, Hamburg, Brussels No. 2, the Poste Parisien, Hilversum, Bordeaux and Frankfurt. It should be noted that Radio Toulouse is now permitted to use greatly increased power, and that this station is usually well received.

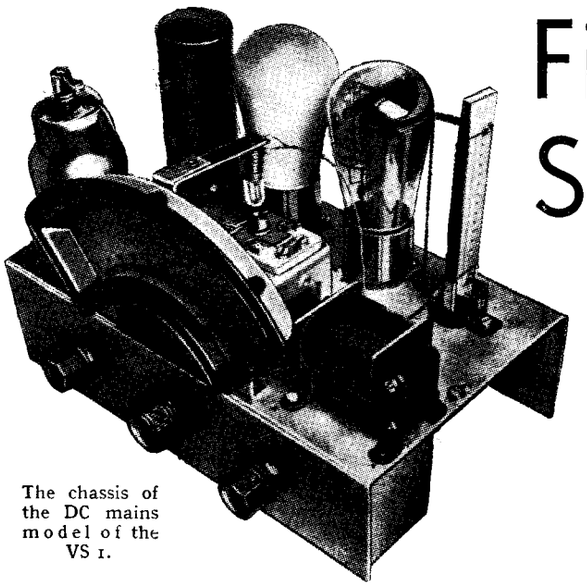
D. EXER.

NEW LAMPEX RECEIVERS

A Table Model Superheterodyne and Radio-gramophone

DESIGNED for operation from AC mains, the Lampex Superhet Four is fitted in a walnut cabinet with birdseye maple inlays. The frequency changer is coupled to the double-diode-triode second detector through an IF filter operating at 473 kc/s, and a high-slope pentode is used in the output stage. Tungsram valves are used, and the price of the table model is 10 gns. This set is now available, and a radio-gramophone version at 19 gns. will be released shortly.

The makers are Lampex Radio & Electric Co., Phantom House, Brewery Road, London, N.7.



The chassis of the DC mains model of the VS 1.

First Continental Single-Span Receiver

THE "VOLKS-SUPER"

By H. J. WILHELMY (Munich)

THE Single-Span system of tuning has now firmly established itself as a practical method of obtaining single control tuning without involving either ganging or waveband switching. In this article is given a description of a new German Single-Span receiver. It is a three-valve mains set for broadcast reception, and one of the chief aims in design has been to reduce the cost to the utmost.

THE first German superheterodyne in which tuning was carried out by a single circuit only embodied double-frequency-changing. It employed a first intermediate frequency of 2,200 kc/s and a second of 100 kc/s, and was tuned over the range of 150 to 1,500 kc/s by a single small condenser of approximately 120 mmfds. This set is said to have given an entirely satisfactory performance, in spite of the inherent difficulties discussed in *The Wireless World*,[1] and it was produced commercially. This set appeared as early as August, 1933, but is no longer produced to-day, because of the large number of valves used and its consequently high price, compared with standard superheterodynes of equivalent performance.

The first superheterodyne of practical value to include the principle of tuning by means of a single circuit was the "Single Span" developed and published by *The Wireless World*. It works without ganging and waveband-switching, and has a selectivity and sensitivity quite adequate for distant reception. This set, however, is not very suitable for the Continental, or, at least, the German market. It demands one or two valves more than an ordinary superheterodyne of the same performance, and the writer believes that its selectivity is not so high as is usually expected of a set having so many valves. In Germany, for instance, the largest superheterodynes normally sold this year are equipped with four valves only, and they have the very difficult task of receiving and selecting almost every station worth hearing, including the short waves, from 20 to 60 metres. A Single-Span cannot do this with four valves, and it was because of this, therefore, that the writer did not attempt the design of a large Single-Span receiver.

It was the extreme economy of Single-Span tuning that caused the development of the first German and Continental Single-Span receiver. The chief advantages of the new system are "no ganging" and "no waveband-switching"; these advantages lead to an extremely simple and inexpensive set, and, in the case of the German "Volks-Super 1," this was the decisive point. The omission of an accurately manufactured two- or three-

[1] *The Wireless World*, July 27th, 1934.

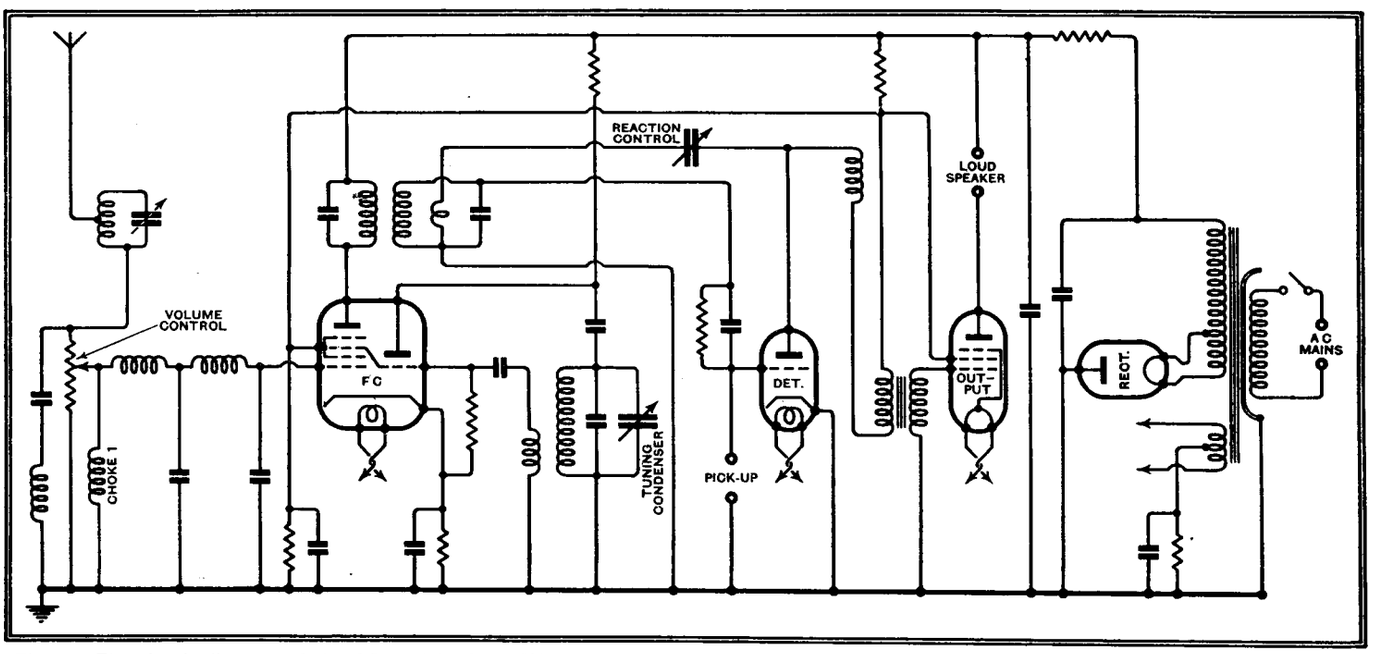
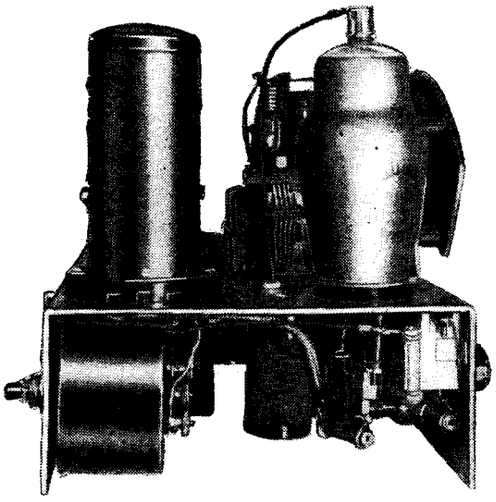


Fig. 1.—The circuit diagram of the AC model of the VS 1 shows that a pair of coupled coils is employed in the IF circuits and reaction is applied from the detector. Two wavetraps are included in the aerial circuit—one tuned to the local station and the other to the intermediate frequency.

First Continental Single-Span Receiver—

gang condenser, of two exactly matched coil assemblies and many trimmers means a radical reduction in the cost of such a receiver. Thus, on this principle, it was possible to construct the cheapest superheterodyne available up to the present day, and it seems that this new class of superheterodynes is destined to replace the small straight set and the cheap superheterodyne of to-day. Thus, extreme economy is an outstanding feature of Single-Span tuning, and the writer believes that, hitherto, this great advantage of the new system has not been sufficiently emphasised.

The smallest type of superheterodyne available to-day makes use of three valves: the first of these is the frequency-changer, preceded by a single tuned aerial circuit; it is followed by an IF band-pass filter directly connected to the second detector valve, and fitted with reaction; the third valve is the output valve. When Single-Span is applied to this type of receiver the total selectivity depends upon the two circuits of the IF filter, as there is no signal-frequency tuned circuit. Unexpectedly this simple device could be brought to a very satisfactory adjacent-channel selectivity, making possible interference-free reception of all European high-power stations. This result was unexpected, because of the very wide bandwidth of a circuit tuned to a frequency as high as 1,600 kc/s, but it could be attained by the use of modern low-loss components and of critical reaction. The sensitivity of such a receiver is sufficient for the daylight reception of some four or five stations, even with an indoor aerial, and in the evening it even has to be greatly reduced by a volume control operating upon the input to the frequency-changer in order to eliminate the weak stations which cannot be satisfactorily selected from their strong neighbours. The reception of our high-power stations, however, is entirely satisfactorily and exceptionally free from disturbance.



The IF coil assembly is mounted to the left of the triode-hexode frequency-changer and the oscillator coil is underneath the chassis.

The Aerial Circuit

The input voltage is taken from the slider of a potentiometer connected across a wavetrap tuned permanently to the local station. Between the slider and the input grid of the frequency-changer there is inserted a filter device similar to that of *The Wireless World* Single-Span receiver. Some modifications were made to this, and an IF wavetrap was inserted to prevent whistle-production due to harmonics of strong broadcast stations. In addition an HF choke Ch1 was included to prevent low-frequency currents from entering the receiver, and this is sometimes of great importance in preventing AC hum from being introduced by the aerial. A very efficient valve was employed as a frequency-changer, in spite of the desire to make the receiver as cheap as possible, because the very small difference between the oscillator and intermediate frequencies when receiving a signal as low as 150 kc/s made it impossible to attain satisfactory results with simple tetrode or pentode frequency-changers. The valve employed, therefore, is a triode-hexode, which is capable of fulfilling its important task without any difficulty. The oscillator and IF circuits are of standard design, the band-pass coils being coupled by their mutual inductance, and not capacitively, as in *The Wireless World* Single-Span receiver.

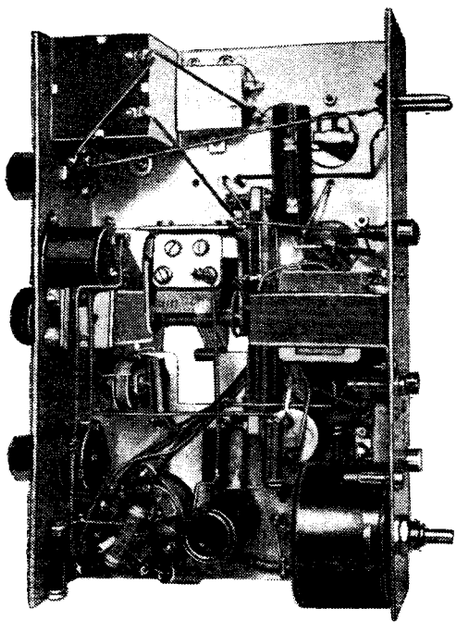
The buffer valve is dropped, of course, as extremely critical reaction is possible by the grid leak second detector itself. The output valve is a small pentode of 0.8 watts undistorted output, and it is coupled to the second detector by a transformer, in order to attain a satisfactory high degree of LF amplification. Good bass response is secured by the electrolytic by-pass condenser of 20 mfds. across the cathode resistance.

The Mains Equipment

The rectifier is fed from the AC mains by a simple transformer and thermionic rectifier, smoothing being accomplished by a resistance of 1,500 ohms joined by two condensers of 8 mfds. There are only two different DC voltages taken from the mains unit: a high voltage of 190 volts, approximately, feeding the anode circuits of the frequency-changer and output valves, and a low voltage of 72 volts for the screens of the frequency-changer and of the output valve, and for the second detector triode. In this manner the receiver was designed as economically as possible throughout, in order to retain the inherent economy of single-span tuning.

"VS 1" is a midget: it is built on a chassis of 250 by 150 by 65 mm. These small dimensions, however, are not attained by crowding the components, as is the case with some American midgets, but by the exceedingly low number of components and by the small size of the components themselves. Of chief interest is the IF filter, for it has been fitted with iron-cored coils, in spite of the objections which might be raised against their use at the comparatively high IF of a Single-Span receiver. Indeed, the iron cores were not provided to get a better performance than with air-cored coils, but to save space and cost. The iron-cored coils used are of very small size, and, in addition, may be enclosed within a very narrow screen (40 mm. diam.); the correct frequency of the IF circuits is not adjusted by variable condensers, but by a variable air-gap in the cores. Thus, it is possible to provide fixed mica-condensers instead of variable air-dielectric condensers, this meaning another very important saving. The coils are litz-wound, of course, and there is no noticeable difference in performance between these coils and very good air-core types. The oscillator coil, however, is a simple cylindrical air-cored coil, as it is unnecessary to screen it or to match its inductance accurately. Reaction is controlled by a small trimmer accessible from the rear of the receiver—the possibilty of varying selectivity being thus dropped, as it is not essential for this extremely simple edition of a "Single-Span."

In spite of its very economical design, high quality was maintained from every point of view. Thus, the first Continental "Single-Span" is not merely an extremely cheap midget, as it might seem at first sight, but a soundly designed receiver of an entirely new class. "VS 1" is a set designed for home-constructors only, but we may expect that sets of this or similar circuits will soon be produced by the radio industry. Thus, the new "Single-Span" principle developed by *The Wireless World* seems to have found a wide area for its successful expansion, and, as we must anticipate that considerable further progress will be made in the future this area is likely to increase still more.



An underbase view of the DC receiver—the oscillator coil can be seen on the right behind the valveholder.

Current Topics

EVENTS OF THE WEEK IN BRIEF REVIEW

Wireless for the Deaf Fund?

A WIRELESS for the Deaf Fund has been suggested by a correspondent of the *Times*. "There could be no greater joy," he writes, "for a deaf person than to hear—sometimes, even if imperfectly. Many deaf people could hear broadcast programmes if they had suitable receivers with suitable telephones."

Date of Birth

THE French Postmaster-General has been asked in the House of Deputies why applicants for radio licences must state "the place and date of birth"—an obligation not waived even in the case of the ladies. The official reply explains that the particulars are needed to facilitate identification.

A disgruntled licensee last week insisted on adding the size of his gloves.

Ultra-short Waves Save Human Contacts

"TO enable students to hear a lecture without being subjected to my presence" was one of the reasons put forward by Dean E. J. Kilduff, of New York University School of Commerce, last week, when he delivered a talk by ultra-short waves from an easy chair in his apartment three blocks away from the lecture room. The tests employed two-way radio so that the students could ask questions and secure immediate responses.

Who will be the first clergyman to adopt similar methods by broadcasting from the vicarage to the church next door?

What Language Was That?

A STORY is going the rounds of Europe concerning the recent programme addressed by Budapest to Holland. In a praiseworthy attempt to make the proceedings intelligible to Dutch listeners, the announcer interspersed the remarks at the microphone with brief phrases in Dutch. A few days later a eulogistic letter was received from Amsterdam in which the writer enquired: "What was the foreign language that we heard between announcements in your own tongue?"

Down on the Farm

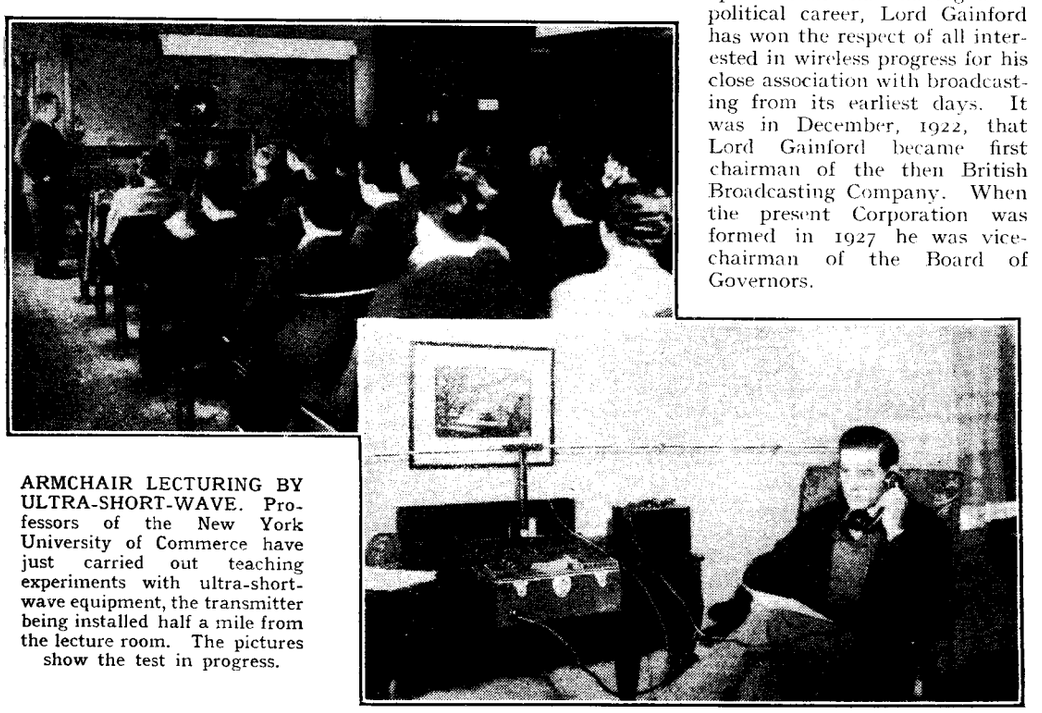
THE Riga broadcasting station now begins the day with a gramophone record of farm noises. A cock crow starts the concert, followed by the lowing of cows, a dog barking, and the grunting of the pigs.

Radio in Agriculture

M. KATAEVICH, of the Moscow Institute of Cereals, is reported to be carrying out experiments to determine whether short waves can be used as an artificial manure. A twelve-acre farm at Dnieprostrol is being used for the tests.

Music *v.* Talks

DANISH listeners are up in arms at a proposal of the Broadcasting Board, the director of which is Mr. Emil Holm, that late musical programmes should be abandoned in order to provide additional funds for educational programmes. At a meeting of representative clubs a plea has been put forward for a listeners' plebiscite. It is suggested that licence cards should carry a detachable slip on which the listener could vote for or against late musical programmes.



ARMCHAIR LECTURING BY ULTRA-SHORT-WAVE. Professors of the New York University of Commerce have just carried out teaching experiments with ultra-short-wave equipment, the transmitter being installed half a mile from the lecture room. The pictures show the test in progress.

New Finnish Station

FINLAND is to have a new 20-kilowatt broadcasting station at Sortavala, in the Eastern Provinces. The wavelength will be 400.5 metres, being shared with Marseilles PTT.

New German Sets

MUTUAL contracts bind the German radio industry not to introduce new types of receivers between January 31st and July 31st of this year. In the past a number of firms have produced the so-called "between season" types for the Leipzig Spring Fair, but this year owing to the special contracts, the firms have been compelled to place any new types on the market before the end of January. Several new sets have appeared, including an entirely new one-circuit two-valve set by Telefunken, replacing the one produced for the Radio Exhibition last August. The "Tefag" firm, according to our Berlin correspondent, makes use of a reflex circuit in a standard three-valve receiver.

The R.S.G.B. Lounge

ESPECIALLY for the benefit of members visiting headquarters at 53, Victoria Street, London, S.W.1, the Radio Society of Great Britain has just opened a lounge where amateurs can meet and discuss mutual problems. Showcases of short-wave apparatus are being installed.

English Talks from Poland

MR. THAD ORDON'S English talks from Warsaw are being given at 9.45 p.m. on the first and third Thursdays of each month.

Lord Gainford, elected President of the Radio Manufacturers' Association for 1935.

Lord Gainford

NO more fitting choice could have been made by the Radio Manufacturers' Association when, at the eighth annual general meeting in London last week, they elected Lord Gainford as their president. Quite apart from his distinguished political career, Lord Gainford has won the respect of all interested in wireless progress for his close association with broadcasting from its earliest days. It was in December, 1922, that Lord Gainford became first chairman of the then British Broadcasting Company. When the present Corporation was formed in 1927 he was vice-chairman of the Board of Governors.

Pips in Egypt

FOLLOWING the example of the B.B.C., the Egyptian State Broadcasting organisation now transmits a six-dot Observatory time signal at 4.30 p.m. and 11 p.m., the hour and half-hour being indicated by the last of the six dots.

National Radio Engineers' Association

A MEETING of the new Association is to be held on Wednesday, February 6th, at 8.15 p.m., at King George's Hall, Y.M.C.A. Buildings, Caroline Street, Tottenham Court Road, London, W.C. Copies of the agenda can be obtained on application to Mr. J. N. de Gruchy, 48, High Street, London, N.2.

High-Quality Technique

Developing Distortionless Receiving Equipment

By W. T. COCKING

THE design of a receiver, as distinct from a low-frequency amplifier, for the highest quality of reproduction is a matter which is greatly complicated by questions of selectivity and interference. The essential requirements are discussed in this article, and it is shown that, except in local reception, some restriction of the high-frequency response is necessary.

IT is now nearly a year since *The Wireless World* Push-Pull Quality Amplifier[1] was described—an amplifier which can truly be said to be perfect so far as sound reproduction is concerned. For outputs up to 4 watts the amplitude distortion is negligible, over the whole range of audible frequencies the departure from even amplification is so small that it cannot be detected by ear, and the hum level is below audibility. As originally described, the amplifier was most readily available for gramophone reproduction, but it is equally suitable for use on broadcasting, and several articles have appeared dealing with this aspect, while the modifications necessary to a particular set—the Single-Span Receiver—were given in full.[2]

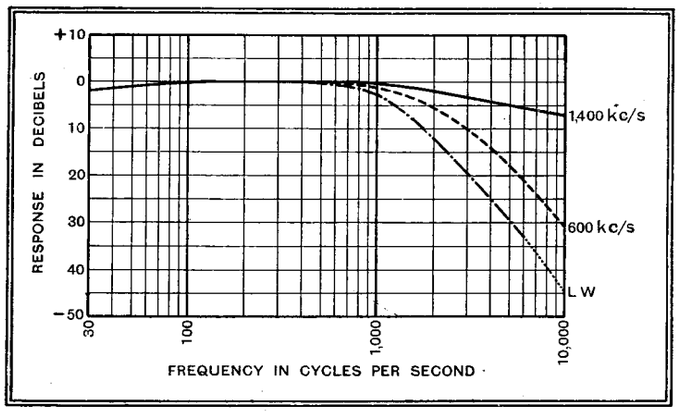


Fig. 1.—The fidelity curves of an experimental receiver embodying variable condenser tuning show how greatly the quality of reproduction varies over the tuning range.

That the discriminating listener can appreciate high-quality apparatus is thoroughly proved by the reception accorded to this amplifier and by the steady and insistent demand for a receiver worthy of being coupled with it. As regards freedom from distortion, the modified Single-Span Receiver meets all requirements, and can hardly be improved upon, but the frequency response is rather too good for present-day broadcasting conditions. Moreover, many people feel that the superheterodyne principle is only justified in a long-distance receiver. It was decided, therefore, that a three-stage receiver feeding the amplifier would give a performance meeting the requirements of most users of the amplifier, but it was realised that a conventional design would not be satisfactory from the point of view of quality.

Since the amplifier is practically perfect, we need only consider here the receiver which is to feed it, and for a close approach to perfection in quality we require a minimum of amplitude distortion and an overall frequency response flat within very few decibels between 30 c/s and 10,000 c/s. It is quite possible to attain this, but, paradoxical as it may seem, experience shows that the full frequency response may actually be undesirable on account of interference. Broadcasting stations are, in general, spaced by 9 kc/s, which means that if the overall frequency response of the receiver extends as high as 9,000 c/s an audible note of this frequency will be imposed on the desired programme. Nothing can be done in the receiver, save to use directional aerials, to eliminate such a whistle without also affecting the quality of reproduction by restricting the upper register.

If two adjacent stations are of equal field strength at the receiver the heterodyne note between them will be reproduced at the same strength as a 9,000 c/s note in the desired programme with a modulation depth of 50 per cent. Such deep modulation rarely occurs in practice for notes of high frequency, so that the whistle will actually be louder than similar frequencies in the wanted transmission. It is easy to see, therefore, that reproduction up to 9,000 c/s cannot be tolerated under these conditions, which apply to the general case of distant reception.

Heterodyne Interference

Now if the field strength of the wanted station is greater than that of its neighbour the strength of the whistle is reduced, and if the disparity in field strength be great enough it will fall below the level of audibility and no longer trouble us. The exact degree of disparity naturally depends upon the volume level, and increases with volume, but is probably about 60 db., or a field strength ratio of 1,000-1. Only under such conditions can the full range of musical frequencies be reproduced without any interference.

In local reception during daylight such a ratio is often naturally present and no difficulty is attached to the attainment of the highest quality. At night, however, the field strength of distant transmissions greatly increases, with the result that at such a short distance as ten miles from a local station the 9 kc/s whistle may become audible, although it is never very loud.

If these facts be borne in mind it is easy to see that the frequency response of the receiver must be variable within certain limits. It should extend to 10,000 c/s or beyond to enable the highest standard of quality to be obtained under suitable conditions, but one should be able to limit it to about 8,000 c/s at will to avoid inter-

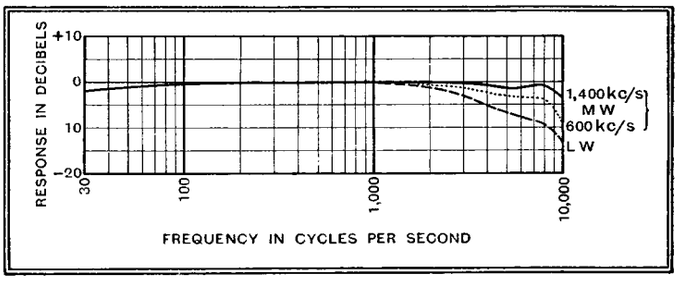


Fig. 2.—When permeability tuning is employed the fidelity becomes much less variable; on the medium waveband the changes are so small that it is difficult to detect them aurally.

[1] *The Wireless World*, May 11th and 18th, 1934.
[2] *The Wireless World*, June 22nd, 1934.