The Wireless Constructor

6d

Vol. XVII. DECEMBER, 1933. No 8

SPECIAL DOUBLE NUMBER

John Scott-Taggart's

SUPER SET

The S.T. SUPER

FULL SIZE BLUEPRINT

Free!

Specified for the S.T. SUPER

PRECISION INSTRUMENTS

★ "UNITUNE" GANG CONDENSER (Illustrated above.)

Front trimmer of front section operated by means of a second knob concentric with the Main Control knob.

Two Gang (with cover) '0005 - **17/6**

★ "NUGANG" CONDENSER (Illustrated on left.)

Trimmers to each stage mounted inside the chassis and operated by star wheels.

Mounted in rigid one-piece chassis.

Single Screen (with neat Bakelite escutcheon) '0005 - - **10/6**

Advertisement of Jackson Bros. (London) Ltd., 72, St. Thomas' St., London S.E.1. Telephone: Hop 1837.

CONTENTS

As some of the arrangements and specialties described in this Journal may be the subjects of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

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Of Superlative Interest — Distinctive — Enthralling

A Pageant of Antiquity in PHOTO-PICTURE and STORY

WONDERS OF THE PAST

PARTS 1 and 2 Now Ready 6d. each

Edited by Sir J. A. HAMMERTON

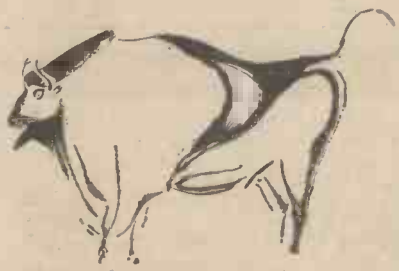
Do you know that this Temple, as big as St. Paul's Cathedral, was hewn from living rock as it stood?

ARCHAEOLOGY is a forbidding word, yet it describes one of the most thrilling and fascinating pursuits of mankind; a pursuit in which every intelligent reader is interested. Delving into the past, exploring ancient civilizations, making the dead cities that flourished thousands of years ago live again in the present is an alluring study, rich in surprises, unequalled in its appeal to the imagination. The inventiveness of the novelist fades into insignificance beside the realities of the days of the vanished centuries which are recalled and illustrated in "WONDERS OF THE PAST."

This new publication is a vivid and sumptuously illustrated survey of the marvels of antiquarian research in all parts of the world—a true wonder tale of unsurpassable variety. The magnificence of the ancient civilizations and the astounding beauty of their cities, palaces, temples, monuments and works of art will come as a revelation to those who follow in its pages, week by week, the unveiling of what the title so aptly describes as "Wonders of the Past."

The work is printed throughout on high-grade paper. It is written by eminent travellers and excavators, and sumptuously illustrated by superb photographs and colour plates of ancient cities, palaces, temples, and monuments; also by fascinating (and accurate) drawings showing them as they must have appeared in the heyday of their glory.

No more wonderful series of illustrations has ever appeared in print. Each part will contain at least one full page colour plate. Part 2 contains two of these superb plates in FULL COLOUR, and the following thrilling articles:



Could you have imagined that the artist who painted this Buffalo lived about 12,000 years ago?

THE MYSTERY OF THE EASTER ISLAND IMAGES
T. A. Joyce

THE GREAT SHRINES OF SICILY
F. N. Pryce, M.A.

A STONE-AGE "POMPEII" IN THE ORKNEYS
Lewis Spence, F.R.A.I.

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P6

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57/6

SPECIFY THE "ATLAS A.C.300" FOR THE S.T. SUPER

The WIRELESS CONSTRUCTOR

The EDITOR'S CHAT

Introducing the S.T. Super—John Scott-Taggart's Latest Triumph of Design

THIS number of THE WIRELESS CONSTRUCTOR represents an important milestone on the road of radio progress, for in it we are presenting to readers a full-size blue print and complete details for making the "S.T. Super"—Mr. John Scott-Taggart's latest and greatest design for home constructors.

The truly remarkable success of the "S.T.300" and the "S.T.400" designs. which were presented to the public through the medium of this journal, set a standard that might appear to be impossible to maintain. They were truly national sets for international reception.

The sweeping successes which they separately achieved under all sorts of conditions is now common knowledge. And progressive readers may have asked themselves: "Is it possible to get results that are even better than those provided by these magnificent designs?" The answer to that question is emphatically provided by the "S.T. Super" described in the following pages.

A Remarkable Set

It is a six-valve superheterodyne of quite extraordinary sensitivity and selectivity. It is easy to build and easy to operate—a truly super set.

It will be remembered that before presenting the "S.T.400" to readers of this journal, Mr. Scott-Taggart took the unprecedented step of testing that wonderful receiver upon readers' own aerials. He piloted his own plane from John o' Groats to Land's End, and ascertained the results achievable in different localities by personal experience on the spot.

It might be thought that no more stringent test could have been devised than this. But the "S.T. Super" has been made to demonstrate its selectivity and sensitivity under conditions even more adverse and difficult.

Stringent Tests

Instead of visiting representative aerials in parts of the country to test the set under the widest possible variety of reception conditions, Mr. Scott-Taggart determined to design and test the "S.T. Super" *under the worst possible conditions that would be met in practice.*

He therefore took a step unprecedented in the history of radio journalism. He handicapped himself by leaving his own laboratories, for six weeks, to carry out all his final experiments and tests within five miles of the high-power twin-wave B.B.C. station at Brookmans Park.

Every reader of THE WIRELESS CONSTRUCTOR knows how interference gets progressively worse as one approaches a powerful transmitting station.

Within five miles of the transmitting aerial there is "a radio fog," through which foreign stations find it impossible to penetrate on the average receiver.

So Mr. Scott-Taggart set himself to solve the greatest problem which confronts the set designer—the problem of local-station interference. And the "S.T. Super" is the outcome of his adventure.

Its selectivity is phenomenal. During a single test, within four and three-quarter miles of the London transmitting aerials, it received no less than seventy-five stations—a stupendous achievement! Imagine what such a set would do in your own home, and the extraordinary variety of super entertainment which it offers you.

It should, moreover, be remembered that Mr. Scott-Taggart has been designing superheterodyne receivers since 1924. And this, his latest receiver, embodies not only his own patented circuit, but special developments such as iron-cored coils and the recently released H.F. screened pentodes for battery-type receivers.

We owe many of the vital master patents of the superheterodyne principle to the designer of the "S.T. Super"—patents of fundamental importance, used in nine-tenths of the superheterodyne receivers in use to-day.

Impressive Proof

In fact, it has been truly said of Mr. Scott-Taggart that "he not only had a finger in the superheterodyne pie, but he provided much of the meat"!

Impressive proof of that assertion will be found in the following pages, wherein the designer tells you of some of the problems which confronted him, and of the triumphant outcome of his efforts.

THE MODERN SUPERHETERODYNE

VITAL MASTER PATENTS DUE TO JOHN SCOTT-TAGGART

The general public knows little of the early outstanding inventions of John Scott-Taggart—many of them ten or more years before their time. The below-mentioned patents which came under the control of the leading concerns in the industry each marked a revolution in radio reception technique. Each is of fundamental importance and one or all are used in nine-tenths of modern superheterodynes. Over fourteen years ago John Scott-Taggart was laying the foundations of the modern receiver.

BRITISH PATENT 153681—AUG. 14, 1919

This is the first patent ever granted for a multiple-grid receiving valve to which different frequencies are led to the different grids. It is used in almost every superheterodyne.

CLAIM 1

Wireless receiving systems employing a vacuum tube containing a cathode, two grids, and an anode, the input circuit being connected across the first grid and cathode, an oscillatory circuit in the anode circuit and said oscillatory circuit coupled to a second input circuit connected across the second grid and cathode, substantially as described.

CLAIM 3

A system as in Claim 1, in which the anode oscillatory circuit is coupled sufficiently tightly to the second input circuit to produce self-oscillation of the vacuum tube, substantially as described.

FROM THE SPECIFICATION:

"If continuous waves are being received the local oscillations may be arranged to form beats with the incoming signals."

BRITISH PATENT 165115—AUG. 18, 1919

This invention is the master patent covering the grid injector system of reception embodied in the "S.T. Super." It also covers practically all modern multiple grid receivers, and the leading radio concerns of Europe operate under it.

CLAIM 3

Radio receiving systems, relays and detectors employing a thermionic valve consisting of a cathode, an anode and two or more control elements or grids, each associated with an input circuit for the purpose of obtaining anode current variations which are the resultant of the individual potentials applied to the grids.

FROM PAGE 4:

"Another method of applying my invention is to apply high-frequency potentials to one grid and another set of potentials to the other grid, the latter set of potentials being preferably of almost equal frequency to the potentials applied to the other grid. The resultant varying anode current may be made to operate a detector or indicator. A form of beat reception is possible by applying locally produced oscillations to one grid, while the received signals are applied to the other grid."

BRITISH PATENT 172376—AUG. 31, 1920

This invention is used in practically every set embodying delayed automatic volume control. It is remarkable for its very early date and its widespread use in the very latest superheterodynes.

1. A receiving signalling system comprising a source of varying current and a circuit shunted by a rectifier which is non-conductive to weak currents but conducts when the currents are above a predetermined amplitude.

3. A receiving signalling system particularly for radio signalling in which a two-electrode valve is shunted across a circuit in which varying potentials are established, a negative potential being applied to the anode of the valve.

6. In wireless receiving apparatus the use of a rectifier, such as a two-electrode valve with a negative potential on its anode in shunt to a circuit applying varying potentials, the current which flows through the rectifier when the varying potentials exceed a predetermined magnitude being used to lessen the effect of the original varying potentials.

FROM PAGE 1:

"Other forms of rectifiers may be employed without departing from the scope of this invention."

LAUNCHED IN THIS ISSUE!

AT LAST!—

ON January 15th, 1931, I wrote these words when introducing the "S.T.300":

There will, of course, come up for consideration other types of sets such as two-valve, four-valve, superhets. But the "S.T.300" is my screen-grid three.

To-day I am fulfilling the programme as regards the superhets. Those who have followed me closely in THE WIRELESS CONSTRUCTOR will have seen how each of my new sets has been a step towards better results.

I have appealed not only to one class but to all classes, and believe that for the number of valves used I have given readers the absolute maximum of performance.

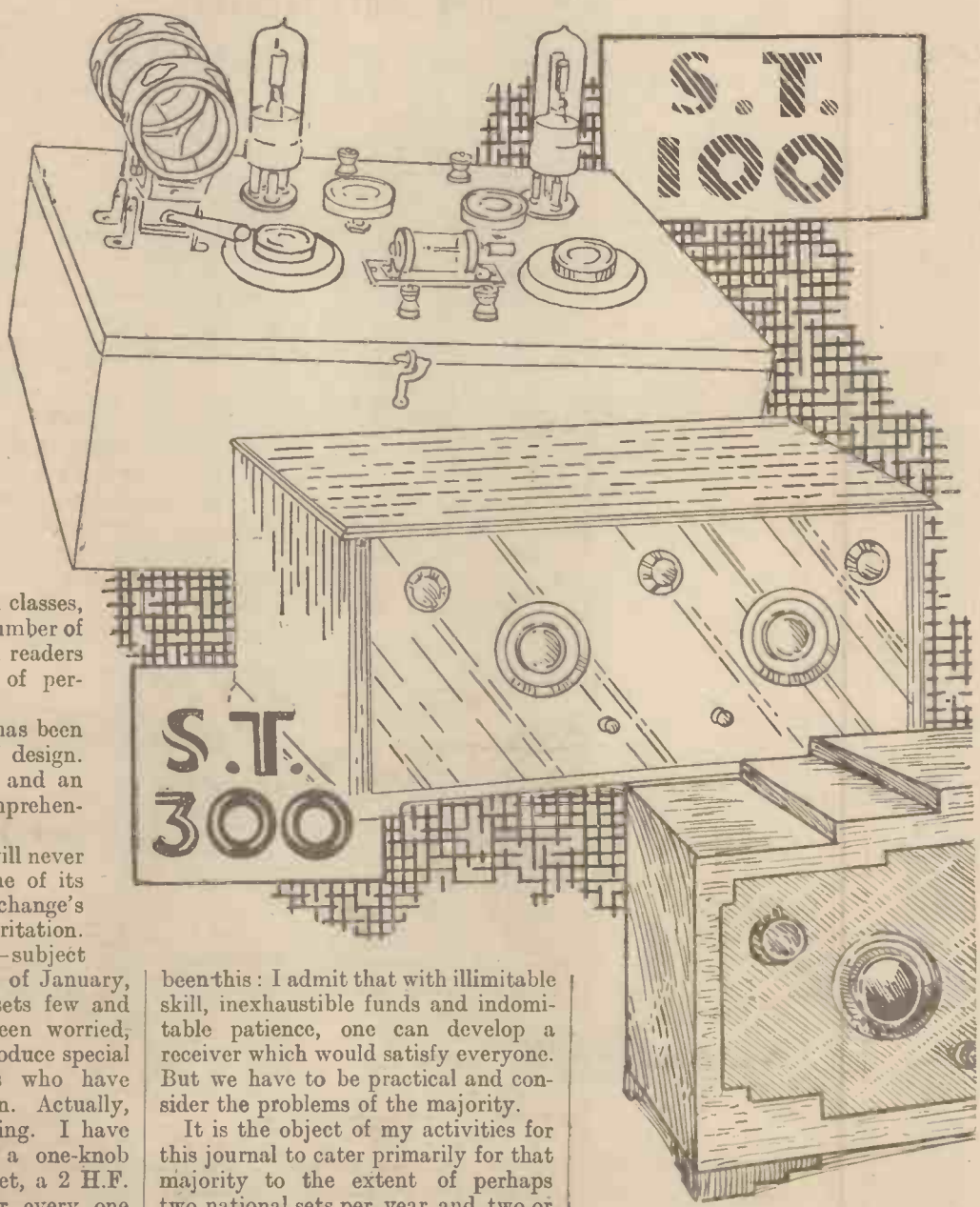
No attempt, however, has been made to claim finality of design. That would be stupidity and an insult to the reader's comprehension.

Radio has never—and will never—stand still. That is one of its delights. But change for change's sake is nothing but an irritation.

Readers will admit that—subject to my reasonable proviso of January, 1931—I have kept my sets few and far between. I have been worried, not to say pestered, to produce special sets for certain readers who have definite ideas of their own. Actually, I welcome this keen urging. I have been asked to produce a one-knob battery set, an Empire set, a 2 H.F. ganged receiver; but for every one of such requests there have been a hundred *orders* to design a superhet.

My attitude to these readers has been this: I admit that with illimitable skill, inexhaustible funds and indomitable patience, one can develop a receiver which would satisfy everyone. But we have to be practical and consider the problems of the majority.

It is the object of my activities for this journal to cater primarily for that majority to the extent of perhaps two national sets per year and two or three other designs of a rather more specialised kind—e.g. radiograms, mains sets, and the like.



This policy, which has so far worked admirably, provides the constructor who follows my work closely in this

The Author says—"IN THIS SUPER I HAVE REACHED

THE S.T. SUPER

By
JOHN SCOTT-TAGGART

journal with a feeling that I will not repudiate a set I have designed within a month of having offered it.

There are, however, five classes of constructors: those who are interested in:

1. Straight sets with few valves.
2. Straight sets without restriction.
3. One-knob receivers.
4. Superhets.
5. Mains sets.

I do not see my way at present to offer a one-knob set except to those who are prepared to make some sacrifice for the sake of simplicity.

The mains public, I regret, is small as regards home construction; price is the governing factor here.

The first two classes are the greatest numerically, and it is only to these that I have appealed with my

"S.T.300," "S.T.400," and "S.T.500."

I am, this autumn, in THE WIRELESS CONSTRUCTOR, placing myself at the disposal of a public which is smaller, but which I believe—so far as one can see at present—is bound to grow if given a lead. It is idle to pretend that at present there are not two sections of the public—those who prefer (or can only afford) straight sets and those who back the superheterodyne.

The straight set has many points of superiority: It is cheap, easy to construct, gives good results, excellent quality, and you can very probably use a great deal of the apparatus you have on hand.

The superheterodyne, however, has also special qualities, some of which appeal and others that do not. It is more expensive, you very probably have to buy new components and valves, and the type has, in the minds of some, a reputation of being uncertain as to results and poor in "quality."

It is, however, universally admitted that the superheterodyne system is very selective. In fact, one often hears the phrase "as selective as a superhet."

In developing the "S.T. Super" I must have tested scores of circuits. I have built up an assortment of designs offered to the home-constructor public and made tests and comparisons. In addition, I have had complete receivers from manufacturers of some of the actual components I have used. But in no case was I satisfied.

This intensive work on superheterodynes has been going on for nearly two years.

My first superhet design for the home-constructor public was in 1924, but if in the last two years I have been "lying low" it is because I have been aiming high.

In the "S.T. Super" I have reached my mark. And so I offer this receiver with a conviction and sincerity which would previously have been impossible.

MY MARK"

JOHN SCOTT-TAGGART, M.C., F.Inst.P., A.M.I.E.E.

HERE IS
VOICI
HIER SEHEN SIE
HE' AQUI!
BOT!
ECCO!

S.T. SUPER

I HAVE, myself, held off the superheterodyne until now—and for several extremely good reasons. In the first place, I think that there are tens of thousands unable to afford a superhet who can, unless living too near the B.B.C., receive a very great measure of satisfaction from a straight set—provided ultra-selective schemes are available—e.g. as in my "S.T.400" and "S.T.500."

Special Developments

The second reason why I have not entered the superhet mêlée is that I have believed that suitable apparatus—components and valves—was not available. **Rather than make a premature entry into a battle where victory was uncertain, I have kept my powder dry.** If you look at the "S.T. Super" in this issue you will see how much it owes not only to my own patented circuit but to special developments such as iron-cored coils, special I.F. coils, and H.F. screened pentodes.

To have offered you a superhet a year ago, six months ago, or even two months ago, would have meant a betrayal of my technical convictions. Of course, if every designer waited for a very high standard before producing a design, there would probably be little progress. I am, however, content to let others offer provisional models. My own will always remain on my laboratory table until such time as they are developed to a pitch where the public can safely be offered a really finished product.

This may sound a trifle arrogant, but it is not meant to be. It is, however, undeniable that the superheterodyne, one of the greatest inventions in radio, has suffered incalculable damage in prestige through premature designs.

Improved Component Position

The fears as to whether a given design will work or not, or whether it will give good quality, have not been groundless. They have been—and can still be—only too true.

What are the troubles that have beset the path of the superhet? Why has it in certain directions acquired a bad name? The reasons are partly technical and partly practical. On the practical side we have had poorly-tested components of inadequate efficiency. Here it is that the constructor must rigidly adhere to the designer's recommendation. The position has improved very greatly, but to-day there are such a variety of superhet components—some good, some indifferent, and some merely unsuitable—that the really conscientious designer has to limit strictly the choice of the constructor.

Technical Considerations

On the technical side there are regular features in every "super," but they may take a variety of forms. There is always an input circuit tuned to the incoming signals; there is an oscillator which generates local oscillations; we have two detector valves, called the first detector and second detector; then there are the intermediate frequency (I.F.) circuits. Finally there is the L.F. and output stages which are often similar to those of a straight set.

The other features, however, may be combined in all sorts of ways, and there has been great scope for invention.

Comprehensive Patents

Practically every system in use to-day is an application of my Patent 153681 of 1919 and my Patent 165115 which cover the application of different varying potentials to different grids in a valve, and the application of locally generated oscillations to an extra grid of a multiple-grid valve; a multiple-grid valve may itself act both as oscillator and detector, as described in my Patent 153681.

These master patents are of very early date and represent the introduction to radio technique of principles which are to be found in nine-tenths of the superheterodynes in use to-day.

But although a mains set can be factory-built and tested, the burden of a battery superheterodyne falls on the constructor himself. The extreme paucity of designs for this type of set is significant. The circuit handbook of the principal coil manufacturers in this country contains no complete circuit for a battery superhet in its latest edition; there is a rather extraordinary dogmatic statement that "the only satisfactory method known to us is that illustrated in Fig. 2, but this is not recommended for single dial control." The figure shows a separate oscillator valve which injects its oscillations into the anode circuit of the first detector.

I agree with their contention

Designed and Tested within

4¾ Miles from the B.B.C.

"For six weeks I left my own laboratory," writes John Scott-Taggart. "I metaphorically chained myself to the greatest problem which faces every designer. I was forced to get good results or throw in the towel and go home."

How brilliantly "S.T." has succeeded is evidenced by his test-report of results at 4¾ miles from the two London transmitters at Brookmans Park. Never in the history of radio journalism has such a report been published under such severe conditions.

"This Will Be Called a Stupendous Achievement"—J. S.-T.

"The 'Local' Has Lost

V1. 1st H.F. STAGE

A COSSOR 220V.S.G. with its long grid voltage base is recommended here. Although the Mullard P.M.12V. is no longer made, constructors who possess this valve will find it a perfectly satisfactory alternative; it was, in fact, used by the designer in some of his tests.

regarding the desirability of a separate oscillator valve, and also regarding the unsuitability of ganging this type of circuit. But the anode injector system itself is not always by any means the most satisfactory arrangement.

I merely give the above statement to show that designing a battery superhet is no light task. It is not surprising to anyone who has experimented much on superheterodynes to hear of dissatisfaction.

Risking Disaster

The question of "quality" on a superhet is a matter of sheer design ability combined with the availability of required components. There is nothing inherently fuzzy or boomy about a superhet as such. Any trouble is due to an improper embodiment of the principles.

There is, however, more opportunity

V2. 1st DETECTOR

OSRAM V.P.21 or the Marconi V.P.21.

for slipshod design work; likewise, if the constructor starts modifying a good design he is certainly steering for disaster. This is an unpopular warning, but I make it nevertheless.

It is my custom when dealing with a new set to tell you about the general problems involved. In a superhet they are legion. This does not make a satisfactory set any harder to build or operate, but it does mean that the designer has more to do and that the constructor must not deviate from the designer's recommendations.

The following are some of the "snags" the superhet designer has to face:

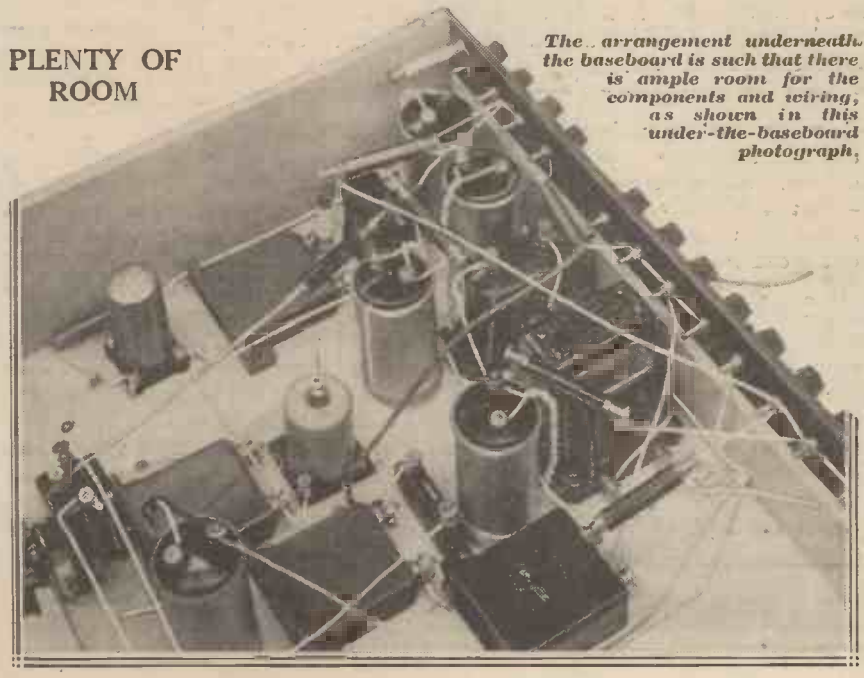
1. Interference from incoming signals (usually high-speed continuous wave Morse) having the same frequency as that of the I.F. circuits.
2. Background noise, oscillator hiss, I.F. mush, etc.
3. All sorts and kinds of peculiar whistles.
4. Interference generally.

V3. OSCILLATOR

A COSSOR 210 DET. was used in the original design. A Mullard P.M.2DX. may be used as an alternative.

5. Inefficient conversion of signals into I.F.
6. Oscillator affecting tuning of input and/or I.F. circuits.
7. Failure of oscillator to oscillate over the whole of both wave ranges without the necessity of altering operating voltages.
8. Wide variations of sensitivity at different points on the dial.
9. Change in frequency of the oscillator, perhaps without warning or apparent cause.
10. Instability of the I.F. stage or stages.
11. Instability of the H.F. stage, if any.
12. Radiation of local oscillations from the aerial, causing interference with other listeners.
13. Overloading of the input, I.F. or detector valves.
14. Variable stray capacities.
15. Trouble due to interaction between the oscillator and the input circuits.
16. Input circuit may oscillate or take charge of the frequency of the local oscillations.
17. Second-channel interference and harmonics.

PLENTY OF ROOM



The arrangement underneath the baseboard is such that there is ample room for the components and wiring, as shown in this under-the-baseboard photograph.

Its Terrors"

These are merely a few of the points and, of course, there are, in addition, all the troubles which have to be avoided in a straight set.

Is it any wonder that all the sets I have tested have failed under one or other of the above heads?

Simplicity of Operation

Let me confess at once that many schemes of my own also failed. My aim, of course, was to produce a set which could be made as cheaply as possible. I have failed. Another aim was to produce a set which could be very simply operated. In this I have succeeded, although I found that a single-knob control was even more impossible for a constructor's design of superhet than in the case of a straight set.

Absolute ganging uniformity was found impossible, and therefore the "S.T. Super" has two tuning dials. But apart from the volume controls, these dials are the only variables.

V4. INTERMEDIATE STAGE

OSRAM V.P.21 or the Marconi V.P.21.

The "S.T.400" owner who has been accustomed to six panel variables all affecting tuning to some extent, will be confronted with only two very simply operated dial knobs. The volume controls do not affect tuning and are almost luxury fitments.

As regards simplicity of operation, I can therefore say that the "S.T. Super" is the simplest of all my "National" sets to tune.

Although I have failed to produce a set which is really cheap, **I believe I have produced a set which in performance will rank higher than any battery superheterodyne, home-constructed or factory-built, in this country.**

This is a serious statement to make and of a kind which only the most stringent and successful tests could persuade me to make.

This "S.T. Super" was designed by me under what I believe to be the worst possible conditions for selectivity. **I designed the set within 4¾ miles of the aerials of Brookmans Park!**

Design Under Difficulties

Every reader must know that interference gets progressively worse as one approaches a Regional station. Within five miles it is a radio fog through which foreign stations find it impossible to penetrate on the average set.

V5. 2nd DETECTOR

The original design uses the MULLARD P.M.2DX. A suitable alternative is the Cossor 210 Det.

For six weeks **I left my own laboratories and went to do all my final experiments near Hatfield within five miles of London Regional. I was *forced* to get good results, or throw in the towel and go home. I metaphorically chained myself to the greatest problem which faces every designer. I determined not to return until I had solved the problem of acute local-station interference.**

Superlative Results

The "S.T. Super" was the outcome of the adventure. And the results? They were these: Mühlacker can be received clear of London Regional, while Barcelona is free on the other side. As regards the National, Frankfurt is clear. My list of stations

V6. POWER OUTPUT

The MULLARD P.M.202 was used by the designer. The Mazda P.220A, the Marconi P.2 or the Osram P.2 are all suitable alternatives.

STANDARD COMPONENTS

Although the circuit is so original, Mr. Scott-Taggart has not used a single "special" component, but all are of standard types.

Designed and Tested in the Shadow of London's Aerials!

is unprecedented in radio journalism, being obtained within five miles of the London station!

This will be called a stupendous achievement. It means that "the local" has lost its terrors. The population within five miles of any of the Regional stations is negligible, but I believe that this "S.T. Super" will become their set.

Margin of Safety

The implications are obvious. If you live more than five miles from the B.B.C., you are protected by a great safety margin. General ether interference can increase many times, and even then conditions will not be as bad as those under which the "S.T. Super" was actually designed.

With other receivers of lesser selectivity, including my own previous sets, you are definitely better off if you live farther from the B.B.C. But now the selectivity is so high that the man in Huddersfield can do as well as the constructor in Leeds. The Airdrie resident is on a level with the man in Glasgow and Edinburgh. Those who live in Hendon, Finchley, Edgware, and North London generally will find this the set they have always needed.

Since the set was designed under conditions probably at least ten times worse than that of most readers, the margin of safety as regards the future is enormous. But even so, there is provision on the receiver for giving progressively greater selectivity!

Applies to all Supers

There may be two comments about this set. One is the price, which is certainly higher than that of less ambitious receivers. The answer to this is that, while I could have designed a cheaper superheterodyne, performance and reliability and ease of reproduction would have suffered.

Had I been prepared to do this, I should have issued such a superhet a year ago. Only when I could issue a design which I felt could victoriously compete with all other battery superhets was I prepared to make the details known to the public.

I expect thousands of these supers to be built, but if only one single model were made by a member of the public I should not want my reputation as a designer to be jeopardised.

A second possible source of comment is that there are few alternative makes of component. This,

(*Please turn to page* 71)

ADVICE ON ACCESSORIES

BATTERIES—H.T.: Ever Ready, Siemens, Ediswan, Lissen, Marconiphone, Drydex, G.E.C., Hellesens, Pertrix, or Block H.T. accumulators.

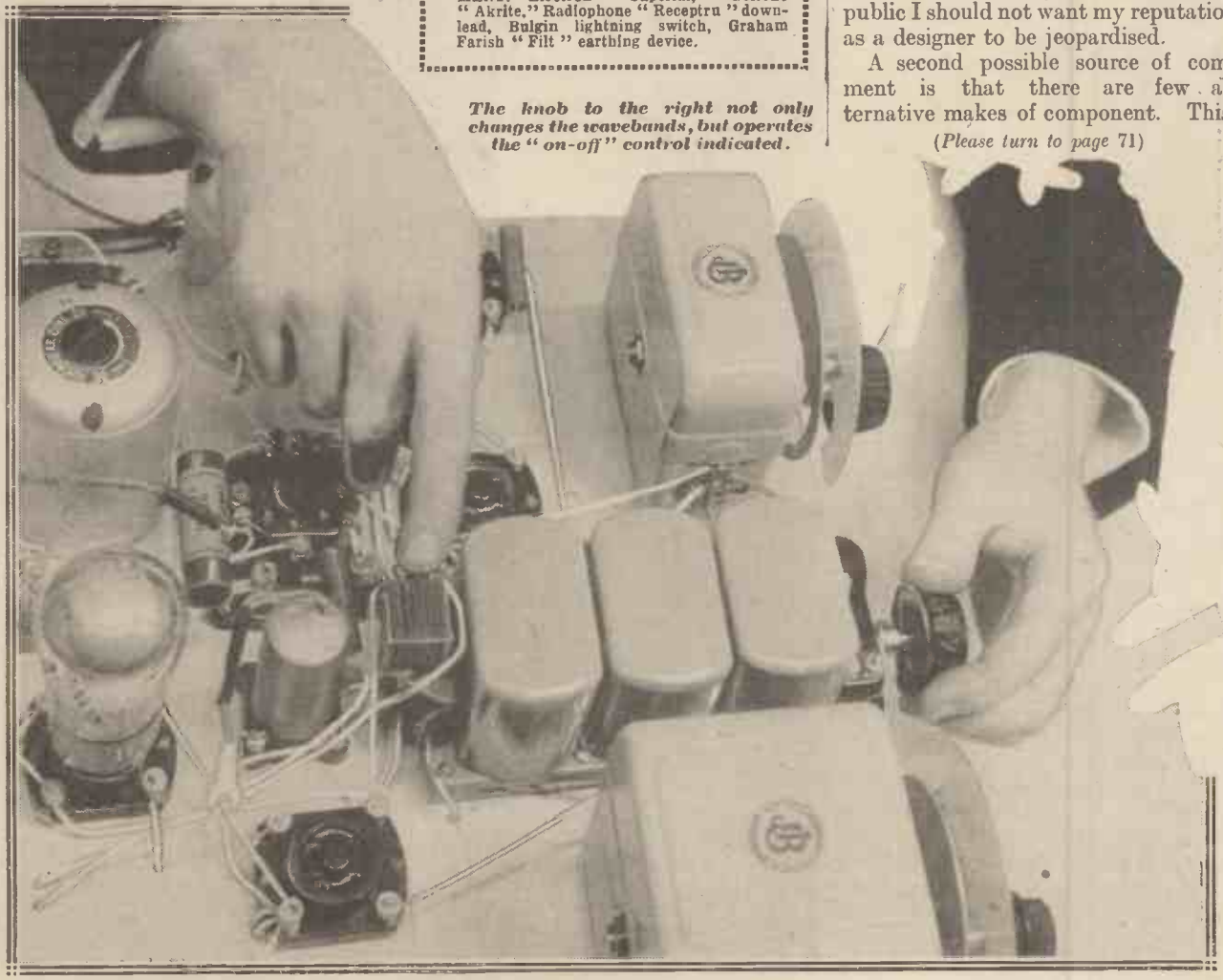
G.B.: Lissen, Pertrix, Siemens, Marconiphone, Ediswan, Ever Ready, Drydex, Hellesens.

L.T.: Block, Oldham, Exide, Lissen, Ediswan, Pertrix.

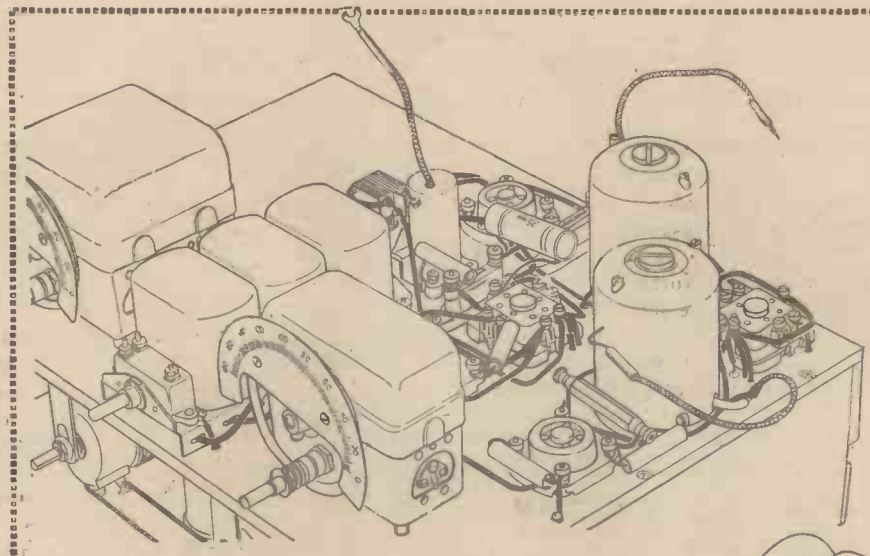
MAINS UNITS.—Both the Atlas A.C.300 and the Ekco A.C.25, have been approved as satisfactory for this receiver.

LOUDSPEAKER.—W.B., Celestion, Rola, Blue Spot, R. & A., Marconiphone, G.E.C., Ferranti, Magnavox, Epoch, H.M.V., Atlas, Ormond, Amplion.

OPTIONAL AERIAL AND EARTH EQUIPMENT.—Electron "Superial," Goltone "Akrite," Radiophone "Receptru" down-lead, Bulgin lightning switch, Graham Farish "Filt" earthing device.



The knob to the right not only changes the wavebands, but operates the "on-off" control indicated.



LAYOUT

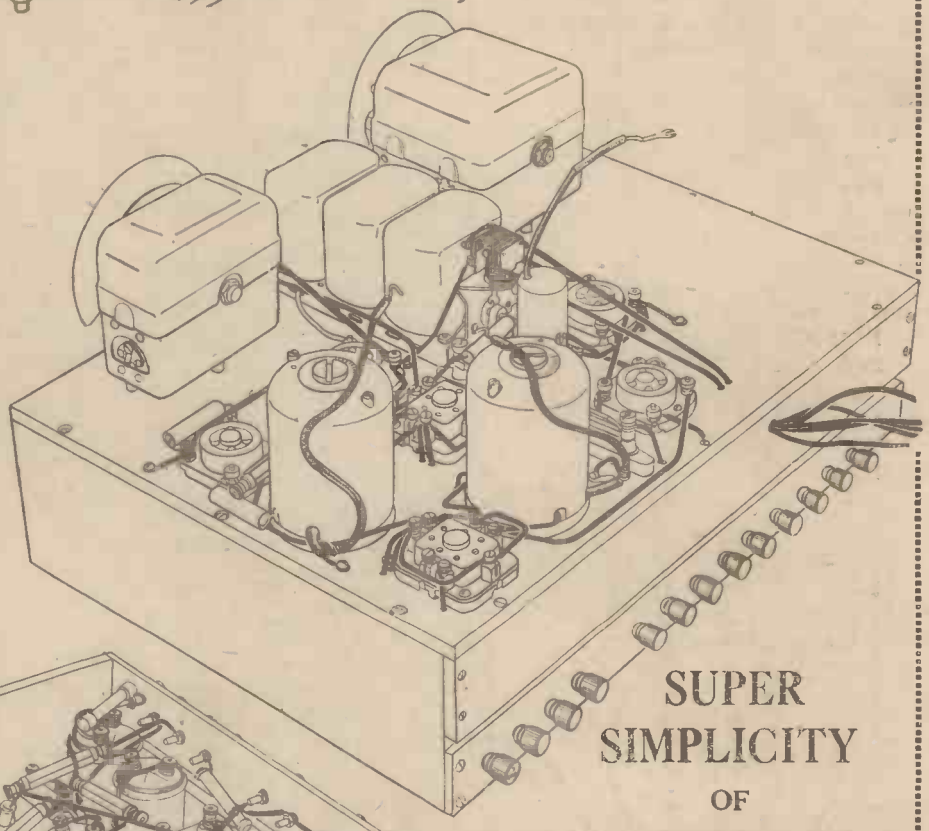
There is no panel, and the raised baseboard system gives the builder very easy access to all the components and wiring.

The full details of the connecting wires shown on this page are on the upper half of the blue print presented to every reader this month.

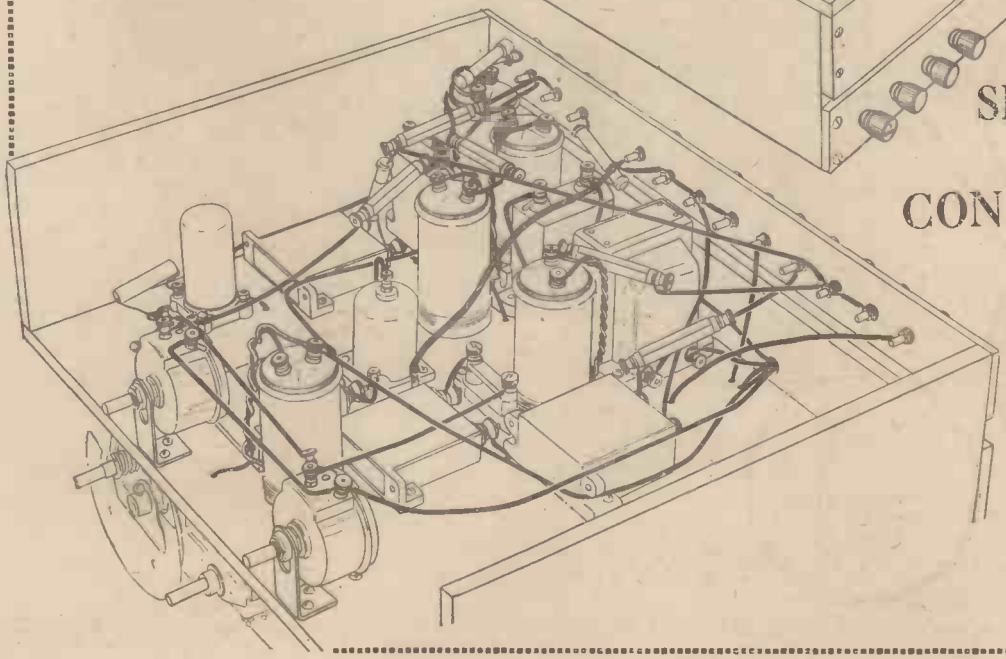
ASSEMBLY

To the right is another view of the above-baseboard wiring. Note how the grid resistance and condensers are attached by their own connecting wires to the valve holder (V5) on the left below the oscillator variable condenser.

From left to right the terminals are: L.S.—, L.S.+, H.T.+6, H.T.+1, L.T.+, L.T.—, H.T.—, E., A., H.T.+5, H.T.+3, H.T.+2, and H.T.+4.



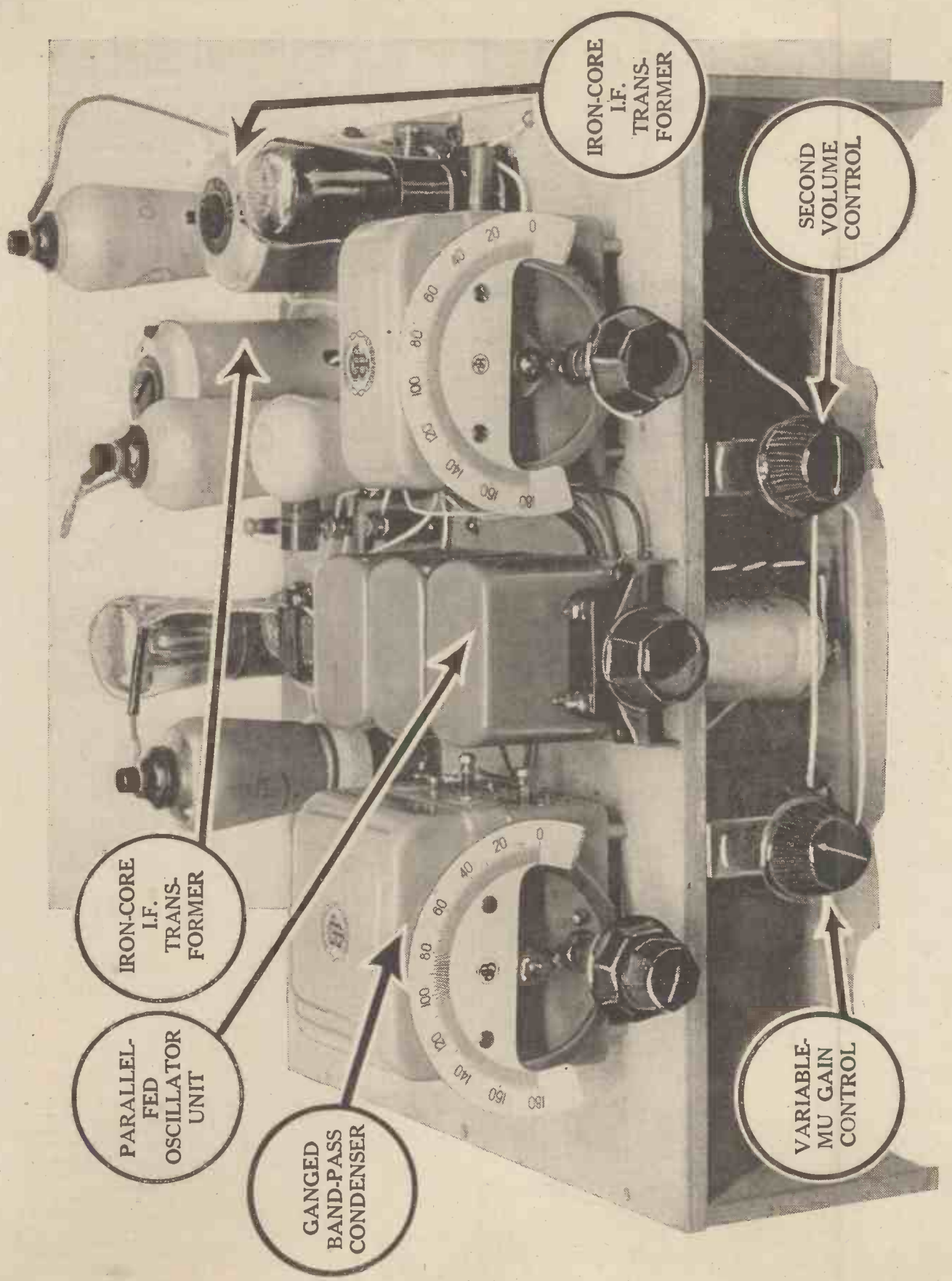
SUPER SIMPLICITY OF CONSTRUCTION



WIRING

Where the wires pass through holes in the baseboard, numbers have been inserted on the blue print to indicate where they emerge on the other side.

Owing to the employment of complete units, the actual external connections required are few in number and easy to make.


IRON-CORE I.F. TRANS-FORMER
SECOND VOLUME CONTROL
IRON-CORE I.F. TRANS-FORMER
PARALLEL-FED OSCILLATOR UNIT
GANGED BAND-PASS CONDENSER
VARIABLE-MU GAIN CONTROL

The S.T. Super Components and Alternatives

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 coil assembly with coloured connecting leads, incorporating battery on/off switch (with terminals)	Colvern G.1, G.2, and G.8 (for S.T. Super)	—
1 ·0005-mfd. two-gang tuning condenser with terminals	J.B. "Unitune" type P.2	—
1 ·0005-mfd. single screened tuning condenser with terminals	J.B. "Nugang" type P.1	—
1 Compensating L.F. transformer	Telsen "Audioformer"	Varley D.P.35, R.I. "Varitone"
2 I.F. band-pass units (iron cored)	Varley B.P.42	—
1 Screened choke	Varley "Nicore" B.P.26	—
1 H.F. choke with screened pigtail	Wearite type H.F.P.A.	—
1 H.F. choke without pigtail	Wearite type H.F.P.	—
2 50,000 ohms log law wire-wound potentiometers	Igranic	—
2 Brackets for mounting potentiometers	British Radiogram type 22	—
2 Seven-pin valve holders	Graham Farish	—
4 Four-pin valve holders	Benjamin "Vibrolders"	W.B., Telsen, Lissen
1 2-mfd. fixed condenser	Lissen	Dubilier, Telsen, T.C.C., Graham Farish, British Radiogram
3 2-mfd. fixed condensers	Dubilier new type 9200	—
1 2-mfd. fixed condenser	T.C.C.	Graham Farish, Telsen, Lissen
3 1-mfd. fixed condensers	Graham Farish	T.C.C., Telsen, Lissen. (Note—double-mounting types)
2 1-mfd. fixed condensers	Dubilier new type 9200	—
1 1-mfd. fixed condenser	Lissen	T.C.C., Graham Farish, Dubilier, Telsen, British Radiogram
1 ·25-mfd. tubular condenser	Graham Farish	Dubilier, T.C.C.
2 ·0005-mfd. tubular condensers	Telsen	Graham Farish, Erie
2 ·0003-mfd. tubular condensers	Telsen	Graham Farish, Igranic, Erie
1 ·0001-mfd. tubular condenser	Telsen	Graham Farish, Igranic, Erie
1 ½-megohm resistance	Graham Farish "Ohmite"	Dubilier, Telsen, Erie, Ready Radio "Thermium"
1 1-megohm resistance	Ferranti synthetic type "S"	Dubilier, Graham Farish
2 50,000-ohm resistors with holders	Ferranti synthetic type "S"	Dubilier, Graham Farish
1 50,000-ohm resistance	Graham Farish "Ohmite" 1½ watt	Telsen, Dubilier, Erie may be used, but Graham Farish have the merit of terminals
2 10,000-ohm resistances	Graham Farish "Ohmite" 1½ watt	
2 5,000-ohm resistances	Graham Farish "Ohmite" 1½ watt	
2 5,000-ohm resistances	Erie 1-watt type	Graham Farish, Dubilier, Telsen
1 10,000-ohm metallised resistor	Dubilier	Telsen, Graham Farish, Erie
13 terminals (marked A, E, H.T.−, H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.+5, H.T.+6, L.T.−, L.T.+, L.S.−, L.S.+)	Belling-Lee	Bulgin, Igranic, Clix
12 Wander plugs (marked G.B.+, G.B.−1, G.B.−2, G.B.−3, G.B.−4, H.T.−, H.T.+1, H.T.+2, H.T.+3, H.T.+4, H.T.+5, H.T.+6)	Clix	Belling-Lee, Eelex
2 Accumulator spades	Clix	Belling-Lee
2 Anode connectors (optional)	Clix	Belling-Lee
1 Metaplex baseboard, 16×12 in. with two side pieces, 12×4 in. and back piece, 16×2½ in. (Metaplex if desired), and terminal strip, 16×1½ in.	Peto Scott	—
Or		
Complete Metaplex chassis with terminal strip	Peto Scott	—
Screened sleeving and Glazite	Lewcos	—
Special "S.T. Super" cabinet	Peto Scott	—
Flex, screws, etc.	Peto Scott	—

The S.T. SUPER ON TEST

REMARKABLE RESULTS

of a single test carried out by

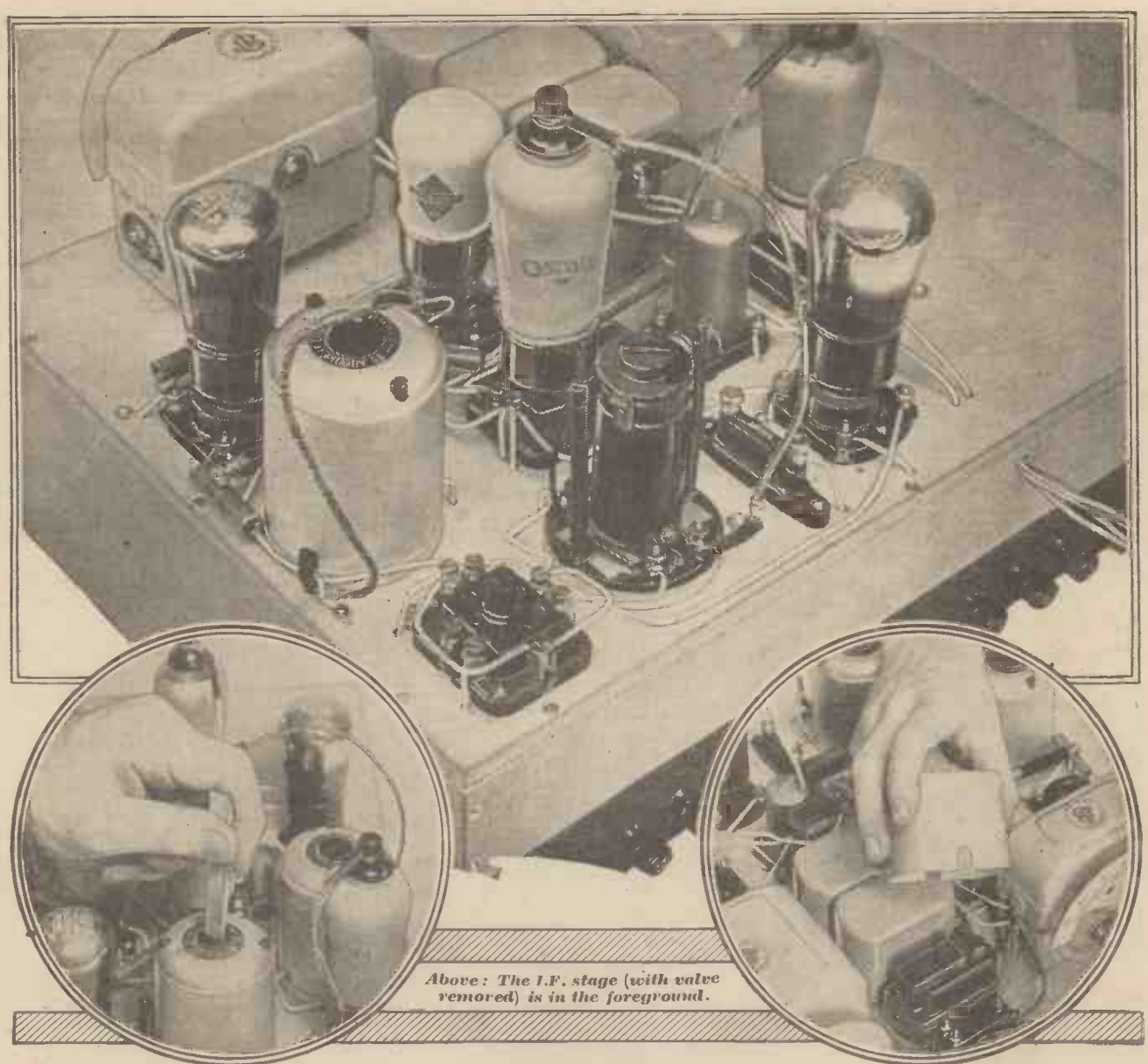
JOHN SCOTT-TAGGART

WITHIN FOUR-AND-THREE-QUARTER MILES OF LONDON'S TWIN AERIALS

Name of Station	Dial Reading	
	Tuning	Oscillator
Newcastle	17·5	9·5
Aberdeen	19	11
Plymouth	21	14
Cork (Irish Free State)	24	17
Fécamp, Radio-Normandie (France)	25	18
Nürnberg (Germany). (*Relays Munich*)	31	24
Belfast (N. Ireland)	32·5	25·5
Trieste (Italy). (*Relays Turin*)	35	28
Gleiwitz (Germany). (*Relays Breslau*)	37·5	30·5
Hörby (Sweden). (*Relays Stockholm*)	39·5	32·5
Frankfurt-a.-M. (Germany)	40·5	33·5
London National and West National	41	34
Bari (Italy). (*Relays Rome*)	45	38·5
Turin (Italy)	47	40·5
Heilsberg (Germany)	48	41·5
Bratislava (Czechoslovakia)	49	42
Copenhagen (Denmark)	50	43
Bournemouth. (*Relay Station*) / Scottish National (Falkirk)	53	46
Hilversum (Holland)	57	49·5
North National (Manchester)	59	52
Bordeaux Lafayette, PTT (France)	60	53
West Regional (Washford Cross)	63·5	56
Genoa (Italy). (*Relays Turin*)	65	57
Göteborg (Sweden). (*Relays Stockholm*)	68·5	61
Breslau (Germany)	70	62
Poste Parisien (France)	71·5	64
Milan (Italy). (*Relays Turin*)	72·5	65
Brussels II Velthem (Belgium). (*In Flemish*)	76	68
Brno (Czechoslovakia)	77·5	70
Strasbourg, PTT (France)	79	71
Barcelona, EAJ 1 (Spain)	81	73
London Regional (Brookmans Park)	84·5	76
Mühlacker (Stuttgart) (Germany)	86·5	78
Hamburg (Germany)	92	83
Scottish Regional (Falkirk)	94·5	85
Lwów (Poland)	96	87
Toulouse (France)	98	88
Leipzig (Germany)	100	90
Bucharest (Romania)	102	92

Name of Station	Dial Reading	
	Tuning	Oscillator
Midland Regional (Daventry)	105	94
Sottens (Radio Suisse Romande) (*Switzerland*)	107	96
Katowice (Poland)	109·5	98
Athlone (Irish Free State)	112	100
Rabat (Morocco)	113	101
Madrid, EAJ 7 (Union Radio)	116	104
Stockholm (Sweden)	122	108
Rome, IRO. (*S.-W. Station, 2RO on 25·4 m.*)	124	110
Beromünster (Schweizerischer Landessender) (Switzerland)	132	117·5
Lyons la Doua, PTT (France)	135	120
Langenberg (Germany)	139	123
North Regional (Manchester)	142	126
Prague (Czechoslovakia)	146	129·5
Florence, 1FI (Italy). (*Relays Turin*)	151	134
Brussels No. 1 Velthem (Belgium)	155	136
Vienna (Bisamberg) (Austria)	158·5	139
Riga (Latvia)	161·5	142
Munich (Germany)	165	145
Palermo (Italy)	168	147
Sundsvall (Sweden). (*Relays Stockholm*)	169	148·5
Budapest No. 1 (Hungary)	173	151
Kaiserslautern (Germany). (*Relays Munich*)	176	154
Oslo (Norway)	48	39
Moscow, Popoff RV 58 (Russia)	52	42
Kalundborg (Denmark). (*Relays Copenhagen*)	56	47
Luxembourg	61	50
Moscow, WZSPS (Trade Union) (Russia)	74	62
Motala (Sweden). (*Relays Stockholm*)	80	67
Warsaw I (Poland)	86	72
Eiffel Tower, FL, Paris	90·5	75·5
Moscow, RV 1 (Old Komintern) (Russia)	95	78
Daventry National	104	84
Berlin (Deutschlandsender) (Germany)	114	91
Radio Paris, CFR	126	97
Huizen (Holland)	148	108

75 Stations at One Sitting!



Above: The I.F. stage (with valve removed) is in the foreground.

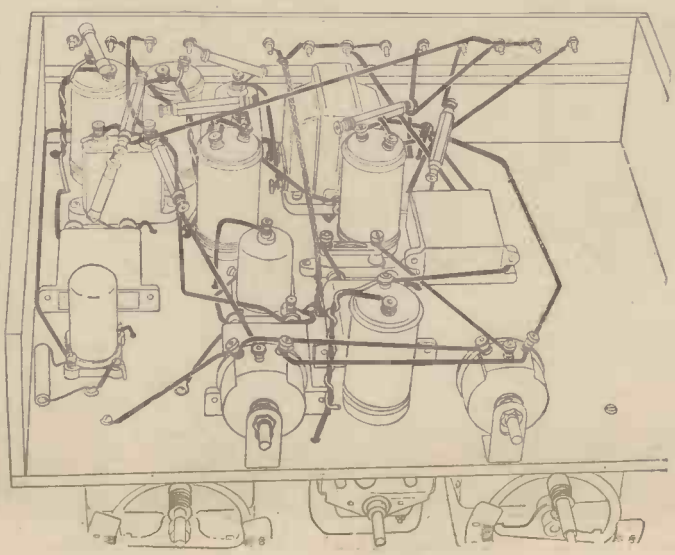
Left circle: Adjusting the I.F. coupling —a coin can be used if preferred.

Right circle: Showing one of the Ferrocart coils with cover removed.

unfortunately, applies to all superheterodyne designs. Apparatus of this kind differs so greatly from maker to maker that to give alternatives would lead to the gravest risks of poor performance. I have used iron-cored coils throughout the set, because there are no reaction adjustments, and I wanted both excellent screening and maximum efficiency.

The apparatus I have used, however, is standard, although the circuit is original. This means that you can use the components on almost any future superhet.

Below: The under-baseboard assembly and wiring.



Just as the "straight set" builder has a collection of components which can be incorporated in all sorts of straight sets, so you can regard the "S.T. Super" components as forming a "pool" for any future experiments. I am extremely doubtful, however, if you will want to dismantle the set for many a long day.

The output of my "Super" is "straight." The output valve is a power valve of the P.M.202 class which, before the introduction of Class B, was the standard valve for those requiring large

"Only Two Very Simply-Operated Dial Knobs"

volume (it was used on the "S.T.400") The output of the "S.T. Super" is excellent, but Class B can be added and still greater output is obtainable. Room on the baseboard is specially provided for such addition, but I favour the building of the set exactly as it is, first.

Those who retain the power valve can greatly economise on H.T. by the use of a Westector Economiser, and I hope to give details of how this may be done. A pentode output valve could be used by those who favour this method.

The present arrangement, however, lends itself to mains-unit operation as well as to H.T. batteries, and I myself am satisfied with the set exactly as it is. Nevertheless, I am willing to describe how other output arrangements may be provided.

The receiver is built on the double-sided system, the main components being on top of the baseboard, while certain fixed condensers, resistances, and the L.F. transformer are underneath. The baseboard is of the Metaplex type, the plywood being coated with metal on *both* sides and round the edges.

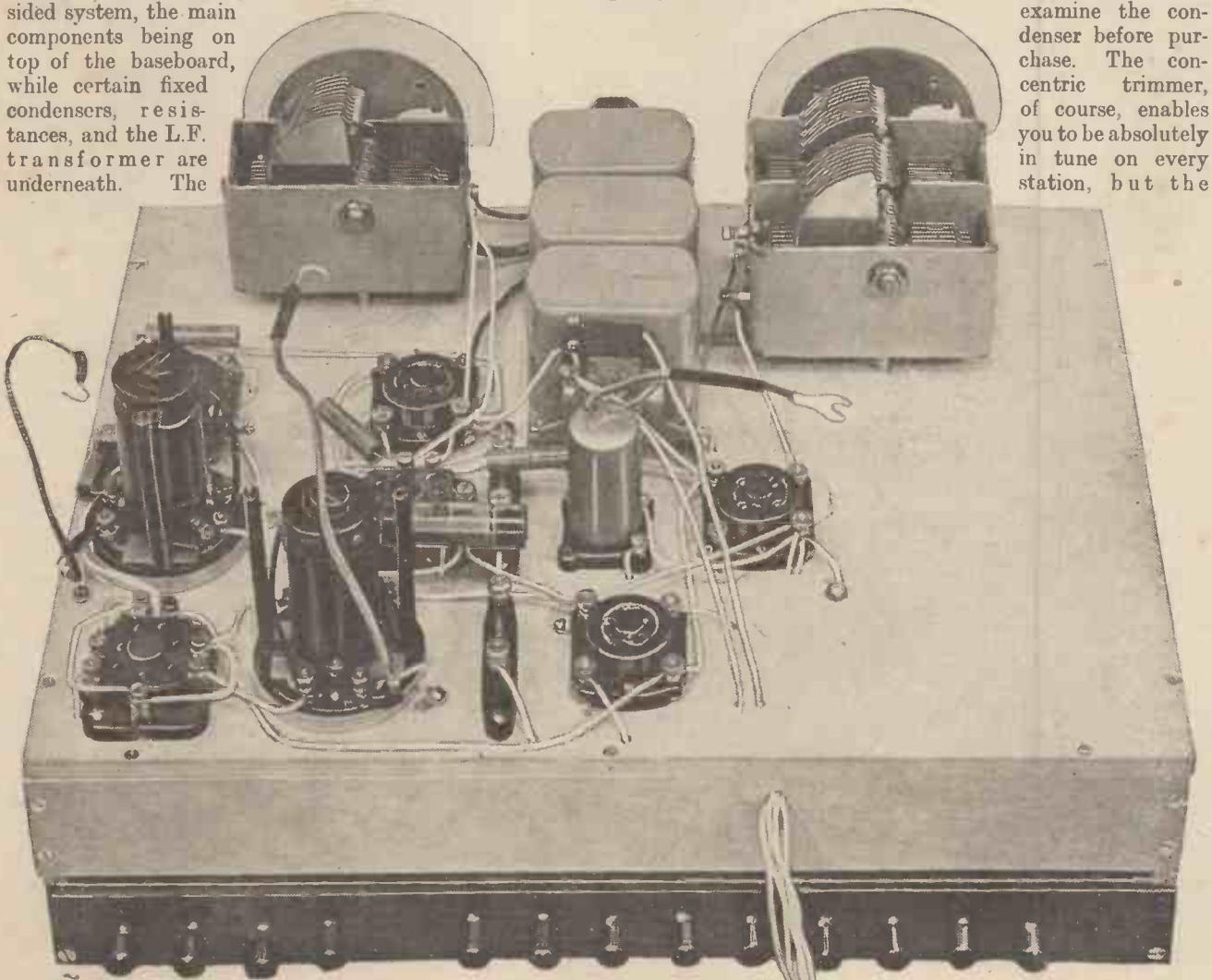
The coating may be metal foil, if you prefer, but the edges need not be metal covered. The end pieces on my set are also Metaplex, and thus become electrically connected to the main baseboard; but I do not consider this actually necessary. Metaplex is very easy to work with, and is no different from plain wood in this respect.

Avoiding Stray Capacity

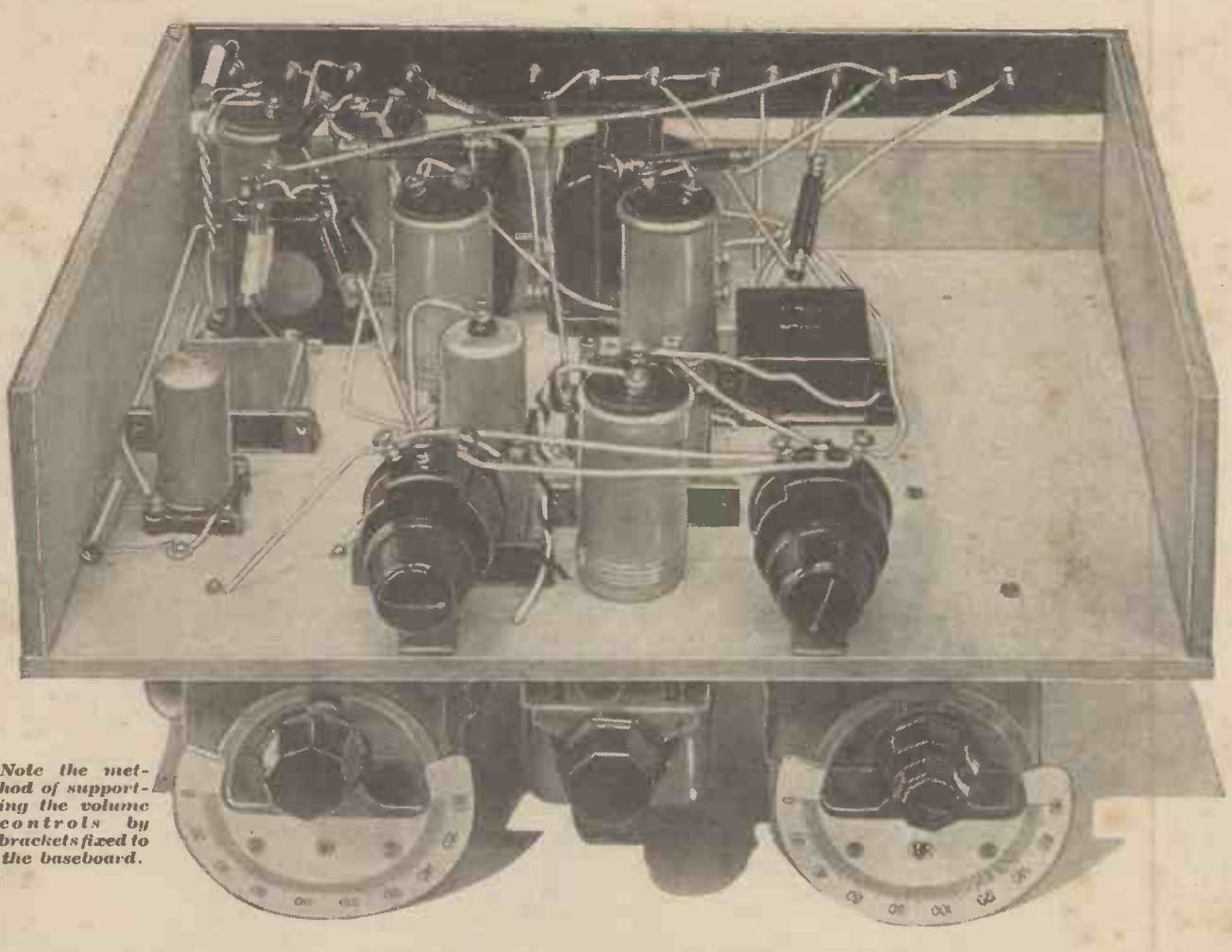
The fact that the baseboard is metallised necessitates careful choice of valve holders, because of the risk of leakage and capacity effects. Vibrolders (by Benjamin) are employed. These are very good in many respects, but not ideal for mounting on metal. The capacity of the grid and anode terminals to earth is excessive, and though I have chosen them for other merits, I ask you to scrape the metal off the Metaplex baseboard where it comes under these terminals; this can be easily done with a penknife, so that a patch on the baseboard is cleared of its metal coating.

The two-gang condenser should be ordered with right-hand terminals. This is important, and the fact that some makes have their terminals on the left prevent their being mentioned as alternatives. The condenser is screwed down to the baseboard by the aid of a template supplied by the makers. See that the trimmer knob on the condenser moves freely without gripping the main knob; unless the trimmer works freely and independently, you will have trouble.

A little oil will usually cure sticking, but I should, if I were the constructor, examine the condenser before purchase. The concentric trimmer, of course, enables you to be absolutely in tune on every station, but the



The upper side of the baseboard carries the main components of the high- and intermediate-frequency circuits.



Note the method of supporting the volume controls by brackets fixed to the baseboard.

adjustment is a refinement and will rarely be used. It prevents all risk of misganging.

Note that the volume controls are of the variable-mu valve type. This is not essential, but it makes for smoother control.

You will see from the blue print that the aerial lead under the set is screened by a metal sheath, and the same applies to the leads to the H.F. pentode used as an I.F. amplifier, and the one used as the first detector. This may look "professional," but it is very simple to slip a bare wire through a length of Lewcos metal-covered tube. The metal sheath is earthed in each case, a bare wire being simply wrapped round the sheath to make connection. The first S.G. valve anode lead is also screened, but this is the pigtail supplied with the Wearite screened choke and the constructor has nothing to do.

Beware of Shorts!

All cans for screening are earthed either by actual contact with the Metaplex or by a terminal. Take great care that all leads from the I.F. coils are insulated and do not short-circuit on the metal cans.

Note that the wires to the new type 9200 Dubilier condensers are twisted. They have an undesirable distance to go and by twisting are made non-inductive. The insulation between them must be perfect (I used Glazite), and they must not short-circuit on to the metal container.

OPERATING THE S.T. SUPER

The following are brief instructions for operating the "S.T. Super." Further details will appear next month.

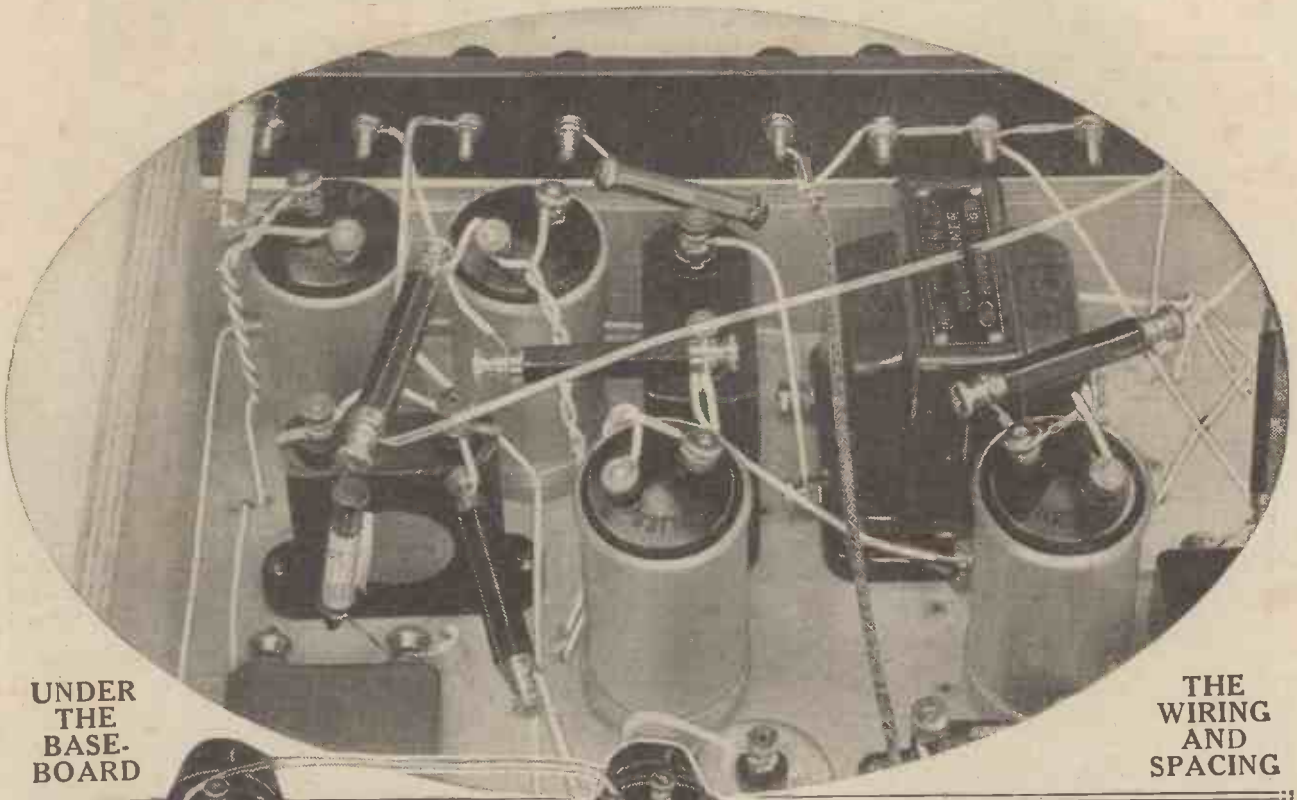
A TRIPLE capacity H.T. battery is advised, as the current consumption *may* reach about 25 milliamperes. A great economy is possible by the aid of a Westector Economiser, but the reader is advised to build the set as it is, first.

The total max. voltage (H.T+6) is 120 volts. The second detector V_5 anode (H.T.+5) and oscillator V_3 anode (H.T.+3) can be 105 volts, or thereabouts. The screen of the I.F. pentode V_4 (H.T.+4) and the screen of the V_1 variable-mu S.G. valve (H.T.+1) are about 75 volts.

The grid bias (G.B.—2) of the first detector pentode V_2 is $-1\frac{1}{2}$ volts (adjustable), while the G.B. — 3 of the oscillator V_3 will usually be also $-1\frac{1}{2}$ volts. The grid bias (G.B. — 4) of the output valve V_6 is $-7\frac{1}{2}$ volts, or as much more as you can apply without introducing distortion. The total grid-bias battery voltage is about $16\frac{1}{2}$.

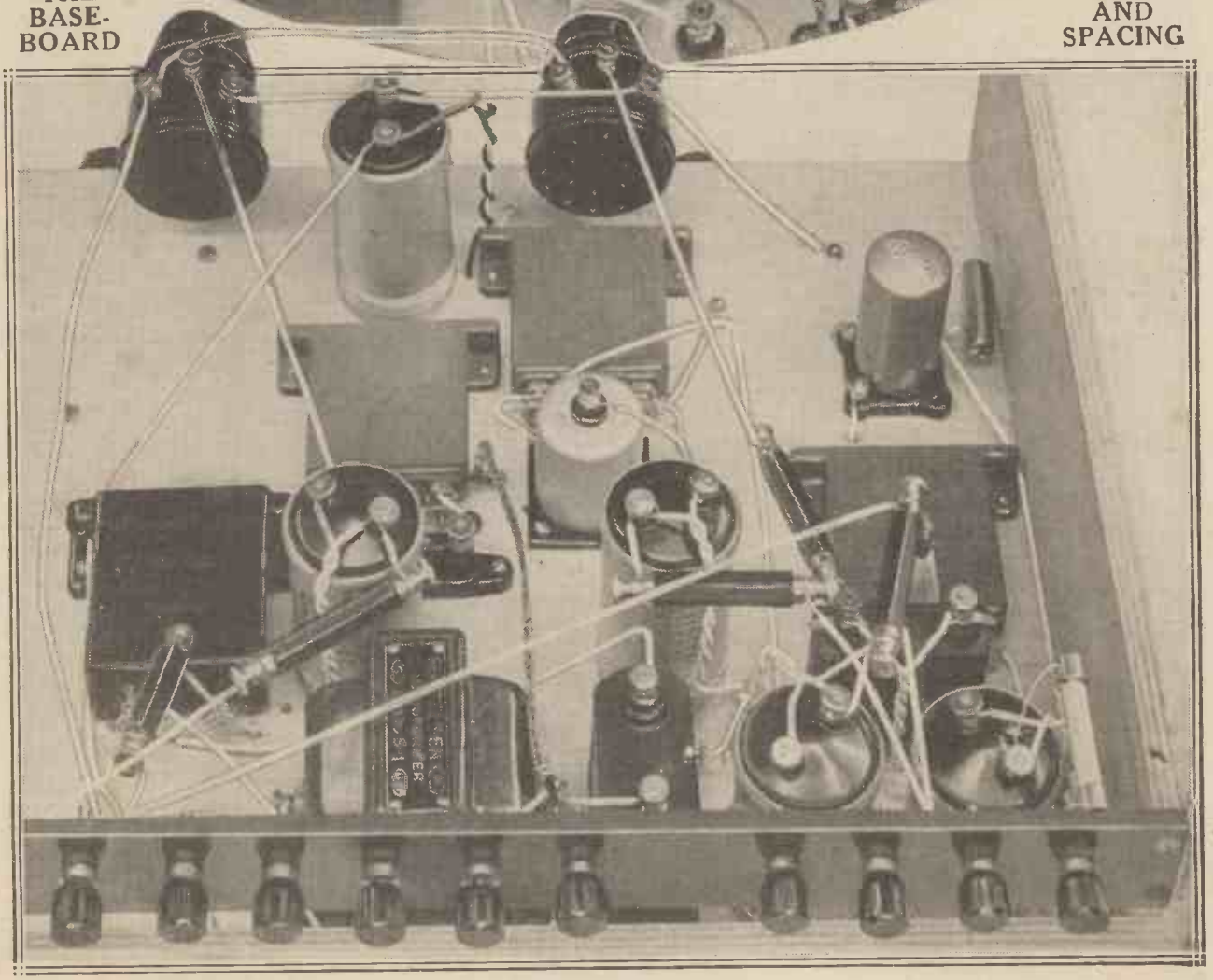
Set both I.F. couplings at Max. (anti-clockwise). Tune in a fairly strong station at the bottom end of the two-gang dial with volume controls at nearly max. (clockwise). Set concentric trimmer (on knob of two-gang condenser) midway. Adjust star wheel trimmer of two-gang condenser (or right-hand side) until maximum signal strength is obtained. In all trimmer adjustments it is a great help

(*Please turn to page* 118)



UNDER THE BASE-BOARD

THE WIRING AND SPACING



A SUPER CIRCUIT for SUPER RESULTS

By John Scott-Taggart

SOME outline of the difficulties which confront the designer of a superhet has been given in my main description of the "S.T. Super."

Some of these may be considered in greater detail here.

The first step to take in designing a superheterodyne receiver is to carry out an initial sifting process. In my set there are actually six tuned circuits, each contributing to produce high selectivity, but only two of these are connected to the aerial.

The initial two tuned circuits are sometimes called the pre-selector circuits, and they tune to the signal frequency, i.e. the incoming signal. The other four tuned circuits are of the I.F. (intermediate frequency) type, and their tuning is fixed and is adjusted to the intermediate frequency which is usually standardised at 110 kilocycles, although the constructor himself can vary this a little by means of the trimmers (i.e. small preset condensers) across the windings.

TONE-CORRECTING L.F. STAGE TO ENSURE PERFECT QUALITY.

★ ★ ★

THERE IS NO RADIATION FROM THE AERIAL.

★ ★ ★

IRON CORES RESULT IN GREATER EFFICIENCY.

★ ★ ★

SEPARATE GRID CONTROL—A VERY VALUABLE REFINEMENT.

Highest Possible Initial Selectivity

The initial selectivity should be as high as conveniently possible, but if elaborate circuits were used here there would be no point in having a superheterodyne! The circuits themselves would provide adequate selectivity. Nevertheless, many of the whistles and interferences experienced on many superhets are due to scamping the initial selectivity which must be definitely good.

On my Super I use a Colvern iron-core band-pass coil assembly in which the coupling between the two coils consists of an inductance common to both circuits. I do not care at all about the band-pass effect, but the arrangement is a loose-coupler of high selectivity. The iron cores result in greater efficiency, and although I am not impressed by the exaggerated claims made for this general class of product, I am not using reaction and therefore am grateful for even a 50 per cent improvement.

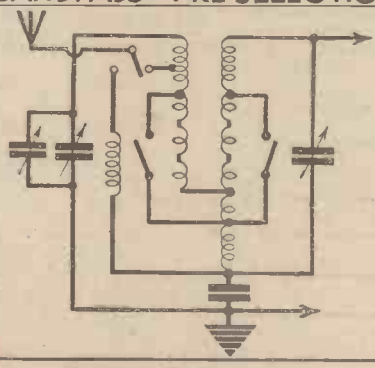
It can safely be said that two tuning controls are the limit in a receiver. Three require three or four times the skill needed for two.

I do not include such controls as reaction, differential coupling, etc., which are in the nature of luxury refinements.

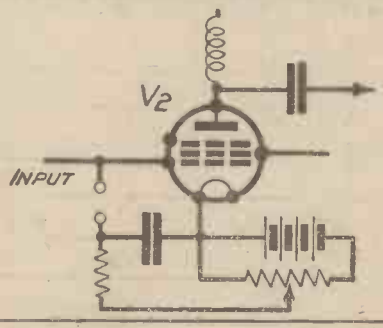
I found that all the merits of two separate tuning condensers for the

FEATURING—

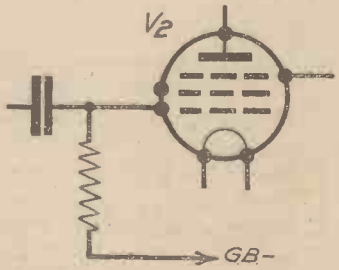
BANDPASS PRE-SELECTION



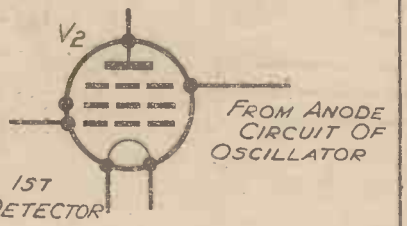
APERIODIC COUPLING WITH VARIABLE-MU H.F. AMPLIFIER



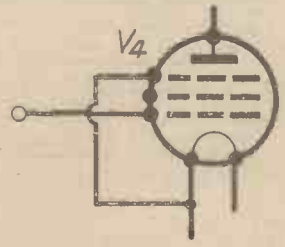
H.F. PENTODE AS ANODE BEND 1ST DETECTOR



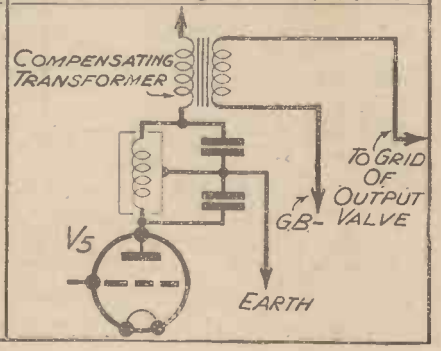
SUPPRESSOR GRID INJECTION

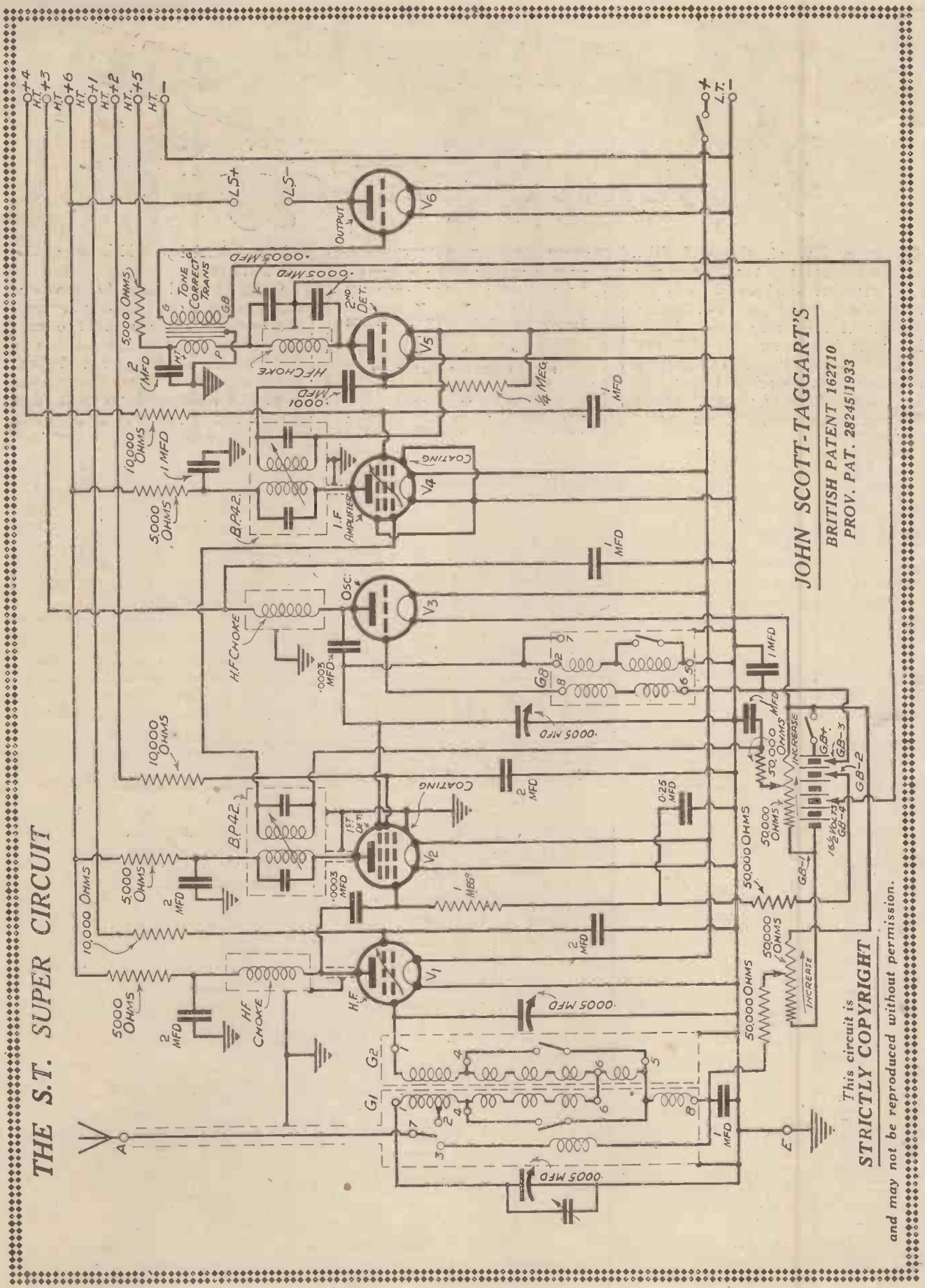


VARIABLE-MU H.F. PENTODE AS INTERMEDIATE H.F. AMPLIFIER

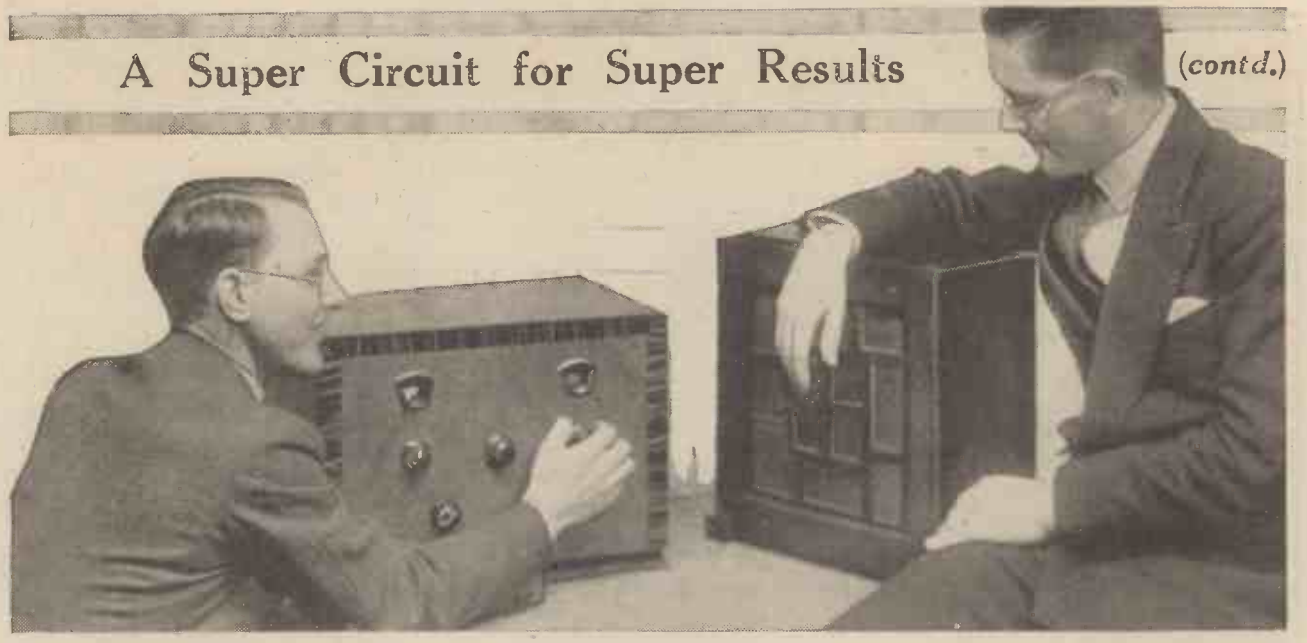


TONE CORRECTING L.F. STAGE




THE S.T. SUPER CIRCUIT
JOHN SCOTT-TAGGART'S
BRITISH PATENT 162710
PROV. PAT. 28245/1933
This circuit is
STRICTLY COPYRIGHT
and may not be reproduced without permission.
H.T.+4
H.T.+3
H.T.+6
H.T.+1
H.T.+2
H.T.+5
H.T.-
L.T.+
L.T.-
V1
V2
V3
V4
V5
V6
OUTPUT
OSC.
2ND DET.
I.F. AMPLIFIER
TONE CORRECT. TRANS
H.F. CHOKE
HF CHOKE
COATING
B.P.42.
5000 OHMS
10,000 OHMS
50,000 OHMS
.0005 MFD
.0003 MFD
.005 MFD
1 MFD
2 MFD
0.25 MFD
1 MEG
½ MEG
INCREASE
GB+
GB-1
GB-2
GB-3
GB-4
G1
G2
A
E

A Super Circuit for Super Results (contd.)



band-pass assembly could be obtained with a two-gang condenser with a concentric trimmer knob. This might be a good occasion to emphasise the fact that this type of condenser may prove in some sets a complete snare and a most irritating delusion. Only by a complicated system of working backwards and forwards of the main dial while the trimmer is advanced, is correct tuning obtained.

In my Super, however, the condenser which tunes the first grid circuit is the controlling one, and the little knob in the centre of the larger one may be adjusted to give maximum strength

"The question of quality on a superhet is a matter of sheer design ability . . . ."

(it takes no more than a couple of seconds usually). It should not be found necessary to touch the concentric trimmer (which tunes the first circuit in the set), but it may be used to give that final touch which brings up the very weak stations.

It will be found that the main tuning knob will not be affected by the "trimming" process.

A great many modern superhets use a detector oscillator as the first valve. The valve oscillates and rectifies.

The complication for the sake of simplicity results in a lower efficiency, and there is a grave risk of interference between the oscillator circuit and the signal frequency circuit. The input circuit may even take charge, and then you are in a fine pickle!

Screened Separation

Incidentally, you will probably be a terrible nuisance to neighbours' wireless sets. The radiation from a superheterodyne is infinitely worse than the spasmodic oscillation of an ignorant or inconsiderate owner of a straight set. In the latter case, the offender suffers as much as his neighbours, and he cannot usually enjoy a programme while his set is oscillating. The superhet user, however, must have a valve oscillating all the time, or he will hear nothing.

The Post Office is becoming alive to the menace, and it is to be hoped that they stop the use of superhets that radiate.

In my Super there are two valves, each with screens between the oscillator and the aerial, and in addition there are two circuits loosely coupled and each is about 110 kilocycles off tune from the oscillator under actual reception conditions. The total result is that there is no radiation from the aerial.

Independent Input Control

I must confess, however, that this immunity from radiation is partly incidental. My preoccupation was to prevent interference between the low-loss input circuits and the oscillator circuits.

I have done this by the use of a stage of high-frequency amplification which has been made aperiodic by the use of an H.F. choke (which, incidentally, is of the screened, iron-core type). The amplification is beneficial, but the isolation merits are very great and there is the special advantage that I am able to use a variable-mu S.G. valve which provides us with an extremely convenient way of altering the strength of oscillations to the first detector.

This is useful partly as a volume control of normal signals, but even necessary when dealing with the signals from a local B.B.C. station.

If no first H.F. stage is employed, the difficulties of controlling the H.F. input without alteration of tuning and with absolute reliability are very considerable. Volume control can also be effected on my Super by altering the second potentiometer, but this serves

". . . . There is nothing inherently fuzzy or boomy about a superhet as such."

additional purposes, and will not cure overloading of the first detector due to a powerful "local."

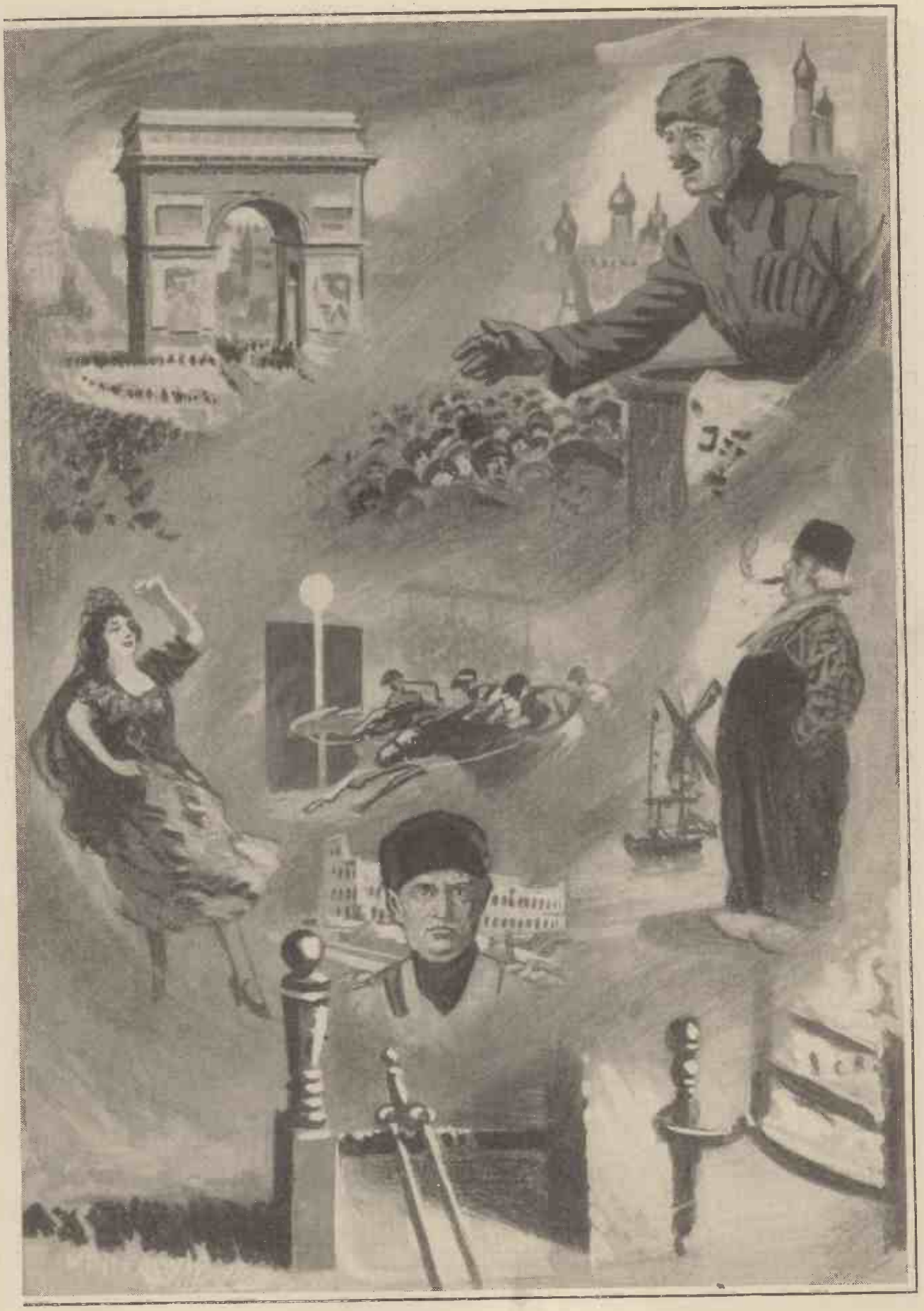
You will notice that I have decided to use a long base-line type of variable-mu S.G. valve as the first valve. This requires (if full control is to be obtained) a grid-bias battery of 16 volts or thereabouts.

This is none too small if the constructor lives two or three miles from a B.B.C. regional station. I tried the small base-line S.G. valve at 4¾ miles from Brookmans Park and was not satisfied that the high input voltage could be properly controlled. Hence my recommendation of the larger base-line valve.

If you already possess a short-base

(*Please turn to page* 118)


SUPER ENTERTAINMENT
WITH YOUR S.T.SUPER



This up-to-date map of Europe shows where all the broadcasting transmitters are situated.

It will be of constant assistance to the "S.T. Super" owner in identifying his "bag" of stations.

Super Selectivity

200 TO 300 METRES

Wavelength (mtres)	Name of Station and Country	Power (kilowatts)
201·3	Jönköping (Sweden) (relays Stockholm)	0·25
203	Kristinehamn (Sweden)	0·25
	Bilbao (Spain)	0·25
204	Gävle (Sweden) (relays Stockholm)	0·2
205·5	Ornskoldsvik (Sweden)	0·2
207	Boras (Sweden)	0·15
209·8	Miskolc (Hungary)	1·25
	Magyarovar (Hungary)	1·25
211·3	Newcastle (Gt. Britain)	1
214·3	Aberdeen (Gt. Britain)	1
216	Radio-Chatalineau (Belgium)	3
	Halmstad (Sweden)	0·2
217	Dublin (Ireland)	1·2
	Königsberg (Germany)	0·5
	Karlstad (Sweden)	0·25
218·5	Salzburg (Austria) (relays Vienna)	0·5
	Plymouth (Gt. Britain)	0·3
219·9	Radio-Beziers (France)	1·5

FROM VIENNA

Othmar Biegler of Vienna is one of Europe's most popular announcers. He pronounces the name of his station as "Rahdeo Veen."

224·4	Cork (Ireland)	1
225·9	Fécamp (Radio Normandie) (France)	10
226	Hudiksval (Sweden)	0·15
227·4	Flensberg (Germany) (relays Hamburg)	0·5
229	Uddevala (Sweden)	0·05
230·6	Umea (Sweden)	0·2
	Trollhättan	0·25
	Malmö (Sweden) (relays Stockholm)	1·25
	Hälsingborg (Sweden)	0·2
232·2	Norrköping (Sweden)	0·25
	Kiel (Germany) (relays Hamburg)	0·25
235	Lodz (Poland) (Experimental)	2
235·5	Christiansand (Norway)	0·5
237·2	Orebro (Sweden) (relays Stockholm)	0·2
	Radio-Nimes (France)	1
	Bordeaux-Sud-Ouest (France)	3
239	Nürnberg (Germany) (relays Munich)	2

Europe offers a magnificent variety of entertainment to the owner of an S.T. Super, so here is a list of all the principal European stations, in order of ascending wavelengths for quick reference. Stations of importance are printed in heavy type.

Wavelength (mtres)	Name of Station and Country	Power (kilowatts)
240·6	Stavanger (Norway)	0·5
242·3	Belfast (N. Ireland)	1
242·7	Liége Experimental (Belgium)	—
244·1	Basle (Switzerland)	0·5
245·9	Turku (Abo) (Finland) (relays Helsinki)	0·6
	Säffle (Sweden) (relays Stockholm)	0·4
	Linz (Austria) (relays Vienna)	0·5
	Kiruna (Sweden) (relays Boden)	0·25
	Eskilstuna (Sweden) (relays Stockholm)	0·2
	Cartagena (Spain)	0·4
	Berne (Switzerland)	0·5
247·7	Trieste (Italy)	10
	Kalmar (relays Stockholm)	0·2
249	Juan-les-Pins (Nice) (France)	0·8
249·6	Varberg (Sweden)	0·3
251·1	Barcelona (Association Nat.) (E A J 15)	1
252	Almeria (Spain) (E A J 18)	1
253·1	Gleiwitz (Germany) (relays Breslau)	5
255·1	Toulouse (P T T) (France)	0·7
257	Hörby (Sweden) (relays Stockholm)	10
259·3	Cassel (Germany) (relays Frankfurt)	0·25
	Trier (Germany)	2
	Frankfurt-am-Main (Germany)	17
261·6	West National (Gt. Britain)	50
	London National (Gt. Britain)	50

AT MUNICH

Munich is pronounced "Munchen," and comes in several degrees above Vienna's reading. This picture shows Ernst Firnholzer, the oldest Bavarian announcer.

Wavelength (mtres)	Name of Station and Country	Power (kilowatts)
263·8	Moravská-Ostrava (Czechoslovakia)	11
265·8	Lille (P T T) (France)	1·3
267·4	Nyiregyháza (Hungary)	6·25
267·6	Radio-Valencia (Spain)	1·5
	Oviedo (Spain)	0·7
269·8	Bari (Italy)	20
	Bremen (Germany) (relays Hamburg)	0·25
271·5	Rennes (France)	1·3
273·7	Turin (Italy)	7
276·5	Heilsberg (Germany) (relays Königsberg)	60
279	Bratislava (Czechoslovakia)	14

"RADIO RIGA"

Situated in Latvia, Riga is about 1,042 miles from London. The name is pronounced "Rega," and this lady, Mme. Stein-Birkmann, makes most of the announcements.

Wavelength (mtres)	Name of Station and Country	Power (kilowatts)
281	Copenhagen (Denmark)	0·75
282·2	Lisbon (Portugal)	2
283	Innsbruck (Austria) (relays Vienna)	0·5
	Stettin (Germany) (relays Berlin)	0·5
	Magdeburg (Germany)	0·5
	Berlin Relay (Germany)	0·5
284·6	Radio-Lyons (France)	0·7
286	Montpellier (France)	0·8
288·5	Scottish National (Falkirk) (Gt. Britain)	50
	Bournemouth (Gt. Britain)	1
291	Viipuri (Viborg) (Finland)	13·2
293	Limoges (P T T) (France)	0·7
	Kosice (Czechoslovakia)	2·5
296·1	Hilversum (Holland)	7*
		20
298·8	Tallinn (Estonia)	11

*Until 5.40 p.m.

400 TO 550 METRES

Wavelength (mtres)	Name of Station and Country	Power (kilowatts)
403	Radio-Suisse Romande (Sottens) (Switzerland)	25
408	Katowice (Poland)	16
413	Athlone (Ireland)	60
415·7	Rabat (Morocco)	6
419	Berlin (Witzleben) (Germany)	1·5
424·3	Moscow-Stalin (Russia)	100
	Madrid (Radio Español) (Spain), 5–7 p.m. (Mon. 5 p.m. to 12 midnight)	—
	Madrid (Union Radio) (E A J 7) (Spain), 7–8.30 p.m. and (except Monday) 10 p.m. to 12 midnight	2
429·7	Belgrade (Yugoslavia)	2·8
431	Parede (Portugal)	1·5
436	Stockholm (Sweden)	55
	Malmberget (relays Boden) (Sweden)	0·25

This accomplished lady has to speak Italian, French, English and German. Her station is Monte Ceneri, Switzerland.

"ROMA-NAPOLI"

The pleasant-voiced lady who announces "Radio-Roma," on 441 metres, is Mme. Maria Luisa Boncompagni. Listen for her "Buona notte a tutte!" ("Good-night, everybody!") which follows the Italian National Hymn and Fascist Anthem, when closing down.

Wavelength (mtres)	Name of Station and Country	Power (kilowatts)
465·8	Lyons (La Doua) (France) (relays P T T)	1·5
473	Langenberg (Germany)	60
480	North Regional (Manchester) (Gt. Britain)	50
488·6	Prague (Czechoslovakia)	120
495·8	Trondheim (Norway)	1·2
501·6	Florence (Italy)	20
509·2	Brussels No. 1 (Belgium)	15
517·2	Vienna (Bisamberg) (Austria)	100
525·3	Riga (Latvia)	15
533	Munich (Germany) (*Temporarily on low power*)	1·5
539·5	Palermo (Italy)	3
542	Sundsvall (Sweden)	10
550·5	Budapest No. 1 (Hungary)	18·5

ABOVE 1,000 METRES

1034·5	Kiev (Russia)	36
1071·4	Tiflis (Russia)	10
1083	Oslo (Norway)	60
1105	Minsk Kolodiatchi (Russia)	35
1132	Monte Ceneri (Switzerland)	15
1153·8	Kalundborg (Denmark) (relays Copenhagen)	30
1191	Luxembourg (*testing*)	200
1200	Reykjavik (Iceland)	21
	Istanbul (Turkey)	5
1239·5	Boden (Sweden)	0·6
1250	Vienna Experimental (Austria)	—
1276·5	Kasbah (Tunis)	0·5
1304	Moscow (Trades Union) (Russia)	100
1348	Motala (Sweden) (relays Stockholm)	30
1380	Novosibirsk (Russia)	100
1411	Warsaw No. 1 (Poland)	120
1445·7	Eiffel Tower (Paris) (France)	13
1481	Moscow (Komintern) (Russia)	500
1538	Ankara (Turkey)	7
1554·4	Daventry National (Gt. Britain)	30
1635	Deutschlandsender (Germany)	60
1725	Radio-Paris (France)	75
1796	Lahti (Finland) (relays Helsinki)	40
1875	Radio-Kootwijk (Holland)	50
	Huizen (Holland)	7
1935	Kaunas (Lithuania)	7

300 TO 400 METRES

301·5	North National (Manchester) (Gt. Britain)	50
304	Bordeaux-Lafayette(PTT)(France)	13
307	Zagreb (Yugoslavia)	0·75
	Radio-Vitus (Paris) (France)	—
	Falun (Sweden)	0·5
309·9	West Regional (Gt. Britain)	50
312	Pietarsaari (Jacobstad) (Finland) (relays Helsinki)	0·25
312·8	Genoa (Italy)	10
	Cracow (Poland)	1·5
315	Marseilles (P T T) (France)	2·5
319	Sofia (Rodno-Radio) (Bulgaria)	1
	Naples (Italy)	1·5
	Dresden (Germany) (relays Leipzig)	0·25
322	Göteborg (Sweden) (relays Stockholm)	10
325	Breslau (Germany)	60
328·2	Poste Parisien (Paris) (France)	60
332·2	Milan (Italy)	50
334·4	Poznan (Poland)	1·9
335	Cadiz (Spain)	5·5
337·2	Brussels No. 2 (Belgium) (Flemish programme)	15
342	Brno (Czechoslovakia)	35
345	Strasbourg (Brumath) (France)	11·5
349·6	Radio-Barcelona (E A J 1) (Spain)	8
249	Leningrad (Russia)	100
352·1	Graz (Austria) (relays Vienna)	7
356	London Regional (Gt. Britain)	50
360·5	Stuttgart (Mühlacker) (Germany) (*Temporarily on low power*)	1·5
363·3	Algiers (N. Africa)	13
364	Bergen (Norway)	1
266·7	Radio L L (Paris) (France)	1·2
368·1	Fredriksstad (Norway) (relays Oslo)	0·7
	Kharkov R V 20 (Russia)	10
	Radio-Galicia (E A J 4) (Spain)	0·2
	Seville (Union Radio) (E A J 5) (Spain)	1·5
	Helsinki (Finland)	10
	Bolzano (Italy)	1
372	Hamburg (Germany)	1·5
376·4	Scottish Regional (Falkirk) (Gt. Britain)	50
381	Lwów (Poland)	16
385	Toulouse (Radio) (France)	8
389·6	Leipzig (Germany)	120
394·7	Bucharest (Roumania)	12
398·9	Midland Regional (Gt Britain)	25
441	Rome (Italy)	50
447·1	Rjukan (relays Oslo) (Norway)	0·15
	Paris (P T T) (Ecole Supérieure) (France)	0·77
	Notodden (Norway)	0·08
	Danzig (Free City) (relays Königsberg)	0·5
	Aalesund (Norway)	0·35
449·8	Odessa R V 13 (Russia)	10
	Radio-Agen (France)	0·5
	Milan (Vigentino) (Italy)	—
	Pori (Björneborg) (Finland) (relays Helsinki)	0·5
	Uppsala (Sweden) (relays Stockholm)	0·15
453·1	Tromsö (Norway)	0·1
	San Sebastian, E A J 8 (Spain). Mon., Wed., Fri., 7.30–9 p.m., other days 10 p.m.–12 m'nt.	0·6
	Salamanca (Spain) (E A J 22)	1
	Porsgrund (Norway) (relays Oslo)	0·7
	Klagenfurt (Austria) (relays Vienna)	0·5
	Bodö (Norway)	0·5
459	Schweizerischer Landessender (Beromünster) (Switzerland)	60

BRUSSELS CALLING

Immediately below the Vienna dial reading you will hear M. Bracony announcing Brussels No. 1. This station always uses the French language, and usually works almost continuously between noon and 10 p.m.

The ROMANCE of the SUPERHETERODYNE

By John Scott-Taggart

An absorbing account of the development of radio's most intriguing circuit. Mr. Scott-Taggart is in a unique position to tell a good deal about the inner history of the superheterodyne, for he numbers amongst his personal friends two of the men to whom we owe its inception.

THE supersonic heterodyne is, in my opinion, the most ingenious invention in radio.

I am not prepared to say it is the most useful—the valve is surely that—but as a clear departure from ordinary practice it fulfils my conception of a real invention.

That amazing genius Fessenden is the one to whom we owe the heterodyne principle. He was one of those Americans who were developing wireless communication in the United States when Marconi was pioneering in England.

A Difference of Opinion

He was prolific with ideas and ranked with De Forest, Stone, and even Edison. His patents are like the grains of sand on the seashore and most of them are as worthless. But here and there is a pearl of great price.

The heterodyne principle is one of these pearls. It is his own queer choice of name, and a surviving monument to his genius.

While Marconi stuck to "spark," Fessenden was (like Poulsen) a believer in continuous waves. We all know that Fessenden was right and Marconi wrong—although for general practical purposes the great Italian left Fessenden standing.

Fessenden used a high-frequency generator, a highly expensive machine, for producing alternating currents of sufficiently high frequency to radiate effectively from an aerial.

Producing a Note

The problem was to cause these currents, when rectified, to produce a note in the receiver similar to that so easily obtained with the Marconi spark system.

The latter sent out the waves in groups. If the groups followed at the rate of 500 per second, one obtained a note of 500, which would be in the form of the dots and dashes of the message.

Fessenden's dots and dashes would just be short and long streams of H.F. alternating current which, when

"FESSENDEN WAS RIGHT"

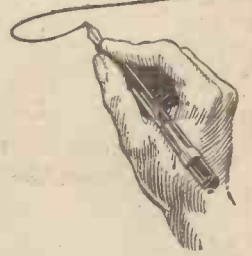
It is to "that amazing genius Fessenden" that we owe the heterodyne principle.

rectified at the receiver, would produce a steady direct current which could operate certain recorders but not work an operator's telephones.

It was therefore necessary to split up the current either on the H.F. side of the receiving apparatus or after rectification. A rapid make-and-break

THE CONTROL ELECTRODE

Lee de Forest, who inserted a grid into the Fleming rectifier, and so gave us the three-electrode valve on which modern radio methods are based.



system was tried, but while a musical note could thus be produced, half the received energy was wasted.

Fessenden thereupon invented scores of methods of reception, and amongst them was the heterodyne, which is an invented name derived from the Greek and implying "different powers." He combined with the incoming H.F. currents (which were simply high frequency A.C.) a local source of A.C. of a frequency differing slightly from that of the incoming frequency.

Two Pioneers

The two currents were made to affect a special telephone receiver which gave forth a musical note which could be varied within the widest limits by adjusting the local frequency.

Fessenden used for a local oscillator an H.F. generator—a highly expensive and cumbersome machine. There was at this time—1907—no very convenient means of generating a high-frequency alternating current, and it was about six years before the thermionic valve oscillator was developed.

Apart from Fessenden, the two men to whom we owe most for the development of the superheterodyne are Hogan and Armstrong. Both of them are personal friends of mine; so I know a good deal about the inner history of the development.

Important Development

John V. L. Hogan is a prominent consulting engineer of New York City—shrewd, entirely able, a patent expert who is always in the thick of a patent conflict. He is also of an inventive turn of mind when he has time. He claims to be the first to take out a patent (donkey's years ago) for ganged condenser tuning. A very much

(Please turn to page 89)

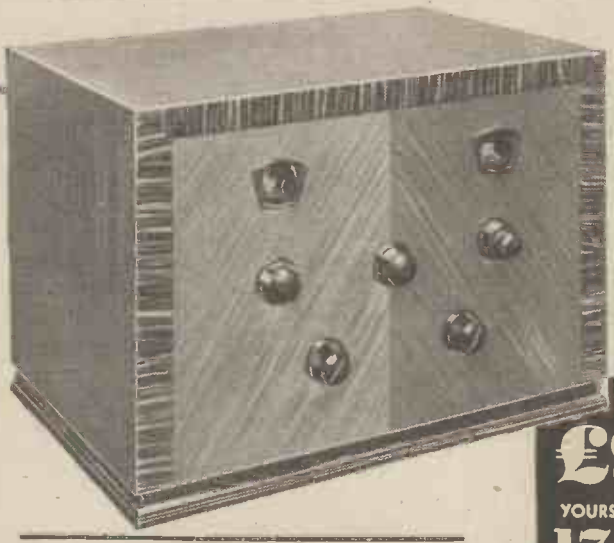
NO TEARS OR FEARS WITH A PILOT AUTHOR KIT

BUILD THE

S.T. SUPER

THE SUPER SUCCESS OF THE SUPER MAN

Exact to Mr. John Scott-Taggart's FIRST specification



KIT "A"

Complete Kit of Components to Mr. John Scott-Taggart's First Specification, and including Peto-Scott Metaplex Chassis and ready drilled terminal strip, complete down to the last screw, together with S.T. Super issue of Wireless Constructor, and Free Full-size Blue Print. Less Valves and Cabinet.

CASH OR C.O.D.

£9-12-6

YOURS FOR **17/6** *Balance in 11 monthly payments of* **17/9**

EXCLUSIVE FEATURES

- Contains parts only as chosen and first specified by Mr. John Scott-Taggart.
- Officially approved, therefore, by an Authority you can trust implicitly.
- Complete down to the last screw.
- The only Kit of Parts that guarantees strict adherence to his first specified components and enables his published set to be duplicated in every way.
- Terminal strip accurately drilled to specification.

EXCLUSIVELY SPECIFIED PETO-SCOTT TABLE CABINET

Beautifully constructed hand-finished walnut cabinet as illustrated with Macassar veneers. Drilled to take S.T. SUPER.

Cash or C.O.D. **19/6** Carriage Paid.

PETO-SCOTT WALNUT CONSOLETTE

Soundly constructed in Walnut as illustrated with front ready drilled to take S.T. Super.

Cash or C.O.D. Carriage Paid. **29/6** or **5**- deposit and **5** monthly payments of **5/6**.

Baffle-Baseboard Assembly, 3 6 extra.

S.T. SUPER FINISHED INSTRUMENTS

Completely assembled from Mr. John Scott-Taggart's first specified parts, and built into exclusively specified PETO-SCOTT Table Model Cabinet. With valves, less batteries. Cash or C.O.D. Carriage Paid. **£16-16-0** *or deposit* **£2-16-0** *and* **11** *monthly paments of* **28/-**.

In Consolette Cabinet as illustrated but complete with valves and Peto-Scott P.M. Moving-Coil Speaker. Less batteries. Cash or C.O.D. Carriage Paid. **£17-17-0**, or **£2-17-0** deposit and **11** monthly payments of **30/-**.

Mr. John Scott-Taggart's FIRST SPECIFIED PARTS appearing on the official Blue Print.

1	COLVERN coil assembly: G1, G2 and G8, with battery on/off switch	1	19	0
1	J.B. 2-gang Unitune type P.2 ·0005-mfd.		17	6
1	J.B. Nugang type P.1 ·0005-mfd.		10	6
1	TELSEN "Audioformer"		11	6
2	VARLEY B.P.42 L.B. band-pass units ..	1	3	0
1	VARLEY Nicore B.P.26 screened choke		4	6
1	WEARITE type H.F.P.A. H.F. choke with screened pigtail		4	0
1	WEARITE type H.F.P. H.F. choke, without pigtail		3	6
2	IGRANIC 50,000-ohms potentiometers ...		10	0
2	GRAHAM FARISH 7-pin valve holders		2	6
4	BENJAMIN 4-pin "Vibrolders"		3	4
1	LISSEN 2-mfd. fixed condenser		3	6
2	DUBILIER new type 9200 2-mfd. fixed		10	6
1	T.C.C. 2-mfd. fixed condenser		3	6
3	GRAHAM FARISH 1-mfd. fixed		6	0
3	DUBILIER new type 9200 1-mfd. fixed		5	0
1	LISSEN 1-mfd. fixed condenser		2	6
1	GRAHAM FARISH ·25-mfd. tubular ...		1	6
2	TELSEN ·0005-mfd. tubular condensers		2	0
2	TELSEN ·0003-mfd. tubular condensers		2	0
1	TELSEN ·0001-mfd. tubular condenser		1	0
1	GRAHAM FARISH "Ohmite" ½-meg		1	6
2	FERRANTI synthetic type "S" 50,000-ohm resistors with holders		3	0
1	FERRANTI synthetic type "S" 1-meg. grid leak with holder		1	6
1	GRAHAM FARISH "Ohmite" 1½-watt 50,000-ohm resistance		1	6
2	GRAHAM FARISH "Ohmite" 1½-watt 10,000-ohm resistances		3	0
2	GRAHAM FARISH "Ohmite" 5,000-ohm resistances, 1½-watt		3	0
2	BRITISH RADIOGRAM brackets, type No. 22		1	0
2	ERIE 1-watt type 5,000-ohm resistances		2	0
1	DUBILIER 10,000-ohm met. resistor ...		1	0
13	BELLING-LEE marked terminals... ...		3	3
5	CLIX marked wander plugs			7½
1	PETO-SCOTT complete Metaplex chassis		3	9
1	PETO-SCOTT terminal strip, ready drilled Screened sleeving and wire, flex, screws ...		2	9½

KIT "A," Cash or C.O.D., Carriage Paid £9 12 6

KIT "B."

As KIT "A" but with 6 specified valves only. Cash or C.O.D. Carriage Paid. **£13-5-0** or **12** monthly payments of **24/3**.

KIT "C.T."

As KIT "A" but with specified valves and Peto-Scott S.T. Super Table Cabinet. Cash or C.O.D. Carriage Pd. **£14-4-6** or **12** monthly payments of **26/-**.

KIT "C.C."

As KIT "A" but with Valves, Peto-Scott S.T. Super Consolette Cabinet (as illustrated), and Peto-Scott Moving Coil Speaker fitted to Baffle-Baseboard assembly. Cash or C.O.D. Carriage **£15-13-0** or **12** monthly payments of **28/9**. *If Speaker not required, deduct 15/- from Cash Price, or 1/3 from each monthly payment.*

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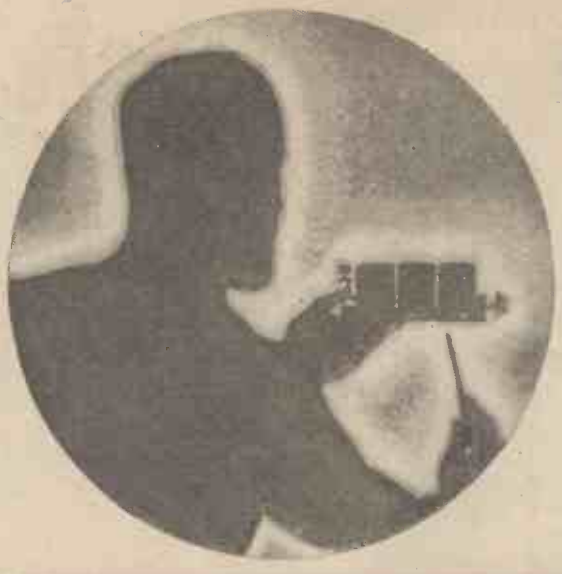
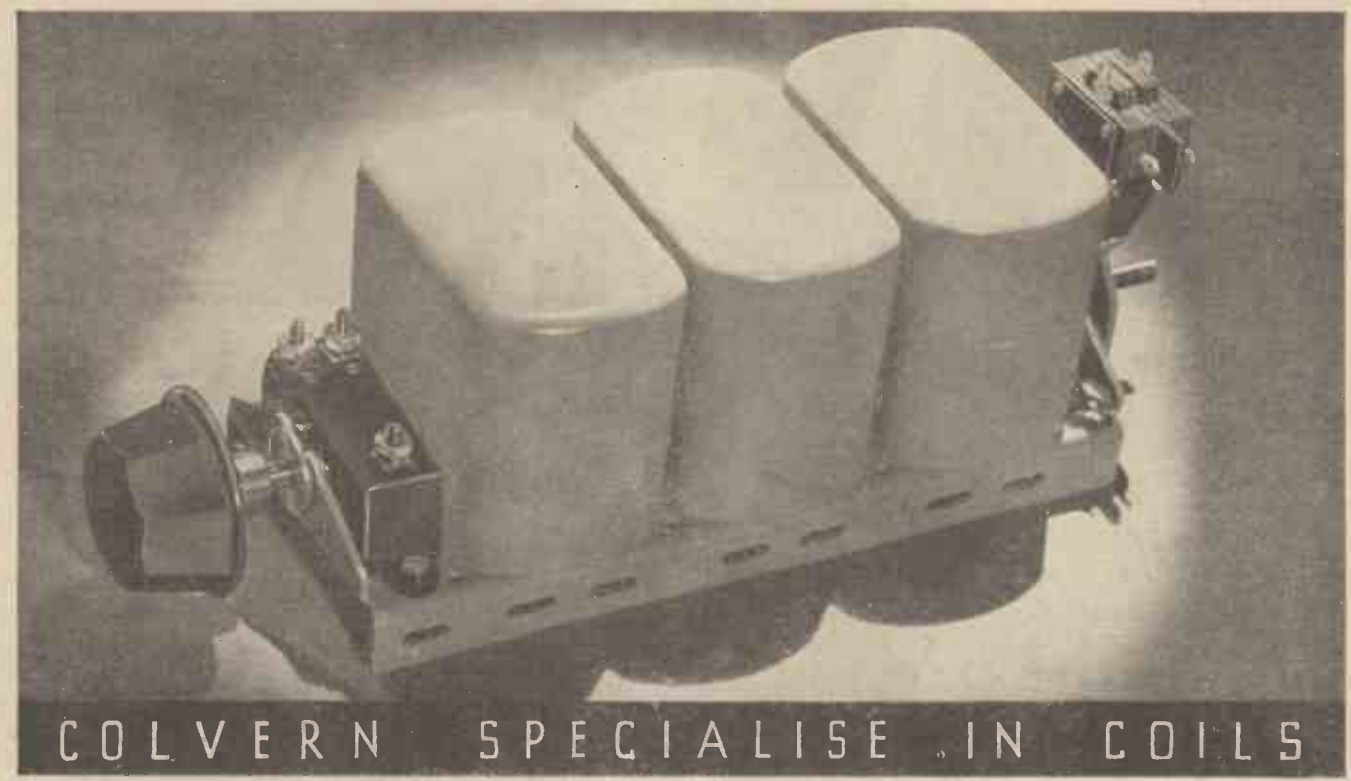


used Ferrocart coils... and he knows the *best!*



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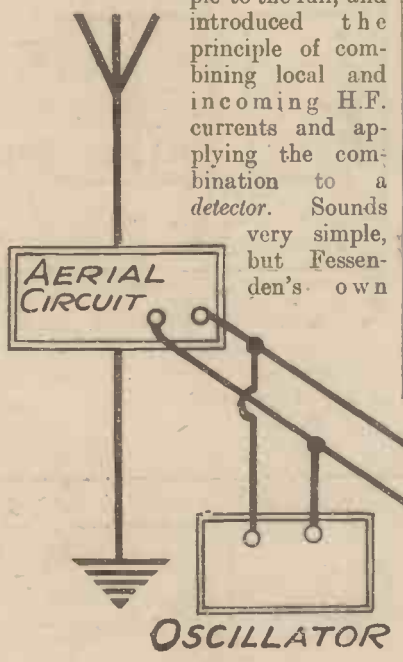
"The Most Ingenious Invention in Radio"

more important development was his method of heterodyne reception.

In 1913 he appears to have appreciated the Fessenden heterodyne principle to the full, and introduced the principle of combining local and incoming H.F. currents and applying the combination to a *detector*. Sounds very simple, but Fessenden's own idea was to apply the currents to a telephone ear-piece in a weird and insensitive manner; he did not use a rectifier, although the telephones presumably responded asymmetrically.



The Hogan arrangement was the starting point of successful heterodyne reception. Just about the same time the three-electrode valve was developed as a cheap and simple generator of oscillations of any frequency desired; to change the frequency one simply altered the value of a tuning condenser. What more delightfully simple than to apply the new valve oscillator to the Hogan arrangement? It worked extremely well and we use the principle in every superheterodyne to-day.

MAJOR ARMSTRONG — an American genius and personal friend of "S.T." Armstrong was among the first to demonstrate the great possibilities of the superheterodyne principle.

When Currents Mix

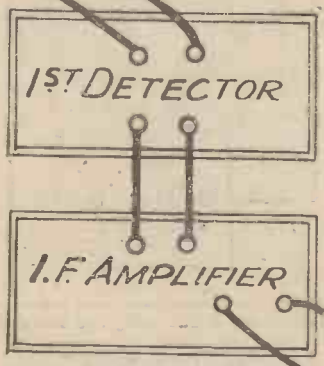
At that early date broadcast telephony was unknown as we know it: Practically all communication was in Morse code. The problem that Hogan solved was the effective conversion of continuous waves into groups which would give a musical note.

The principle of the heterodyne is briefly this: When two sets of alternating currents are fed into a circuit, the resultant current will depend on:

(a) the phase relationship of the currents;

(b) their strength or amplitude.

Suppose the currents have the same strength and the same frequency. If they both flow in the same direction at the same time and change direction at the same moment (i.e. are "in phase"), the resultant current will be A.C. of the same frequency but double the strength. If the currents are of exactly opposing phase, there will be no resultant current at all: when one current is going one way, the other is going in exactly the opposite way and they wipe each other out.



This schematic diagram illustrates the various stages of the superheterodyne from aerial to loud-speaker.

Frequency Differences

If the currents differ in frequency, the resultant current will take a regular but curious form. It will be of an alternating character but will rise to a maximum and fall to zero at regular intervals.

The peaks of maximum strength are called *beats*, and occur when the currents are in step. The zero points occur when the currents completely oppose each other.

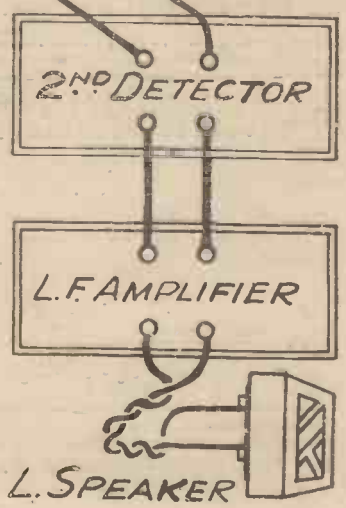
MARCHESE MARCONI — the great Italian who was experimenting in England whilst De Forest, Fessenden and Stone were leading the pioneer work in America.

Explaining "Beat-Notes"

An examination of Fig. 1 and Fig. 2 will assist towards an understanding of the principle of heterodyne reception. Fig. 1 shows a Morse "dash" of incoming continuous waves which produce a high-frequency A.C. in the receiver's tuned circuit.

The second line shows how this A.C. is rectified and produces (third line) a steady direct current; this latter is no use for telephone reception. It has to be split up in some way to produce a note.

Fig. 2 shows, in the first line, the incoming signals, while the second line shows the locally-generated oscillations of slightly different frequency. Beats are produced and these are rectified in the fourth line, while the dotted line



The Romance of the Superheterodyne—*continued*

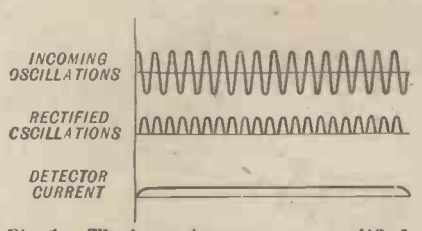


Fig. 1. The incoming waves are rectified, and appear as a direct current output from the detector

shows the H.F. element eliminated; we now simply have a D.C. varying in strength and thus producing a note whose frequency will be equal to that of the humps or beats.

The "beat frequency" used is the difference in frequency between the incoming signal and the local oscillations. If the incoming waves have a wavelength of 300 metres, their frequency equals 300,000,000 divided by 300, which equals 1,000,000.

A Selective System

If we now generate local oscillations having a frequency of 1,001,000, and combine them with the 1,000,000 signals, we will get beats of 1,001,000 minus 1,000,000, which equals 1,000. This will be a musical note, which in the form of dots and dashes will be easy for the operator to read.

Fig. 3 shows a simple heterodyne receiver in which a source of A.C. oscillations forces its current into the receiving circuit, which employs a crystal detector D. Fig. 4 is more complete, a valve oscillator and valve detector being employed.

The condenser C_2 tunes the receiver to the incoming signals, while C_1 tunes the oscillator to a slightly different frequency which is forced into the receiving circuit; the method of feeding the local oscillations into the receiver is by coupling the inductance

PRODUCING THE BEATS

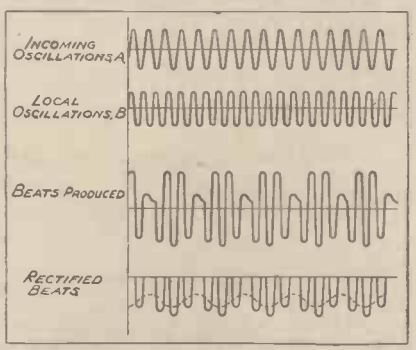


Fig. 2 shows how local oscillations of a different frequency will combine with the incoming oscillations to produce beats, which can be rectified.

L_1 close to L_2. The reaction coil R, of course, is suitably coupled to L_1 so that the valve V_1 oscillates.

The operator can adjust the note of his signals to whatever frequency he likes best. Broadcast listeners can produce a very similar effect. If they make their sets oscillate, beats may be produced with the incoming "carrier wave," and a squeal will be heard; the pitch of this squeal varies as the receiver condenser is altered, because the local oscillations are having their frequency altered.

The heterodyne principle has achieved importance for other reasons than convenience and sensitivity. It is a *selective* system.

Since the beat frequency depends on the *difference* in frequency between local and incoming signals, it follows that if we are receiving a desired station and another station interferes, then the interfering station will produce a different note in the telephone receivers.

Suppose we set our local oscillator to a frequency of 1,001,000. The desired station has, say, a frequency of 1,000,000. The note heard will have a frequency of 1,000. But if a station of frequency 1,006,000 "jams" the other (i.e. causes interference), the note produced by the interfering station will be 1,006,000 minus 1,001,000, which equals 5,000. This note will be higher than that produced by the desired station, and the operator would be able to read the Morse signals of the desired station and ignore the others.

It will be seen that all interfering stations of different frequency will produce different notes. If the note is above between 20,000 and 40,000 (the value varies with different people), the human ear will not hear it. Consequently an interfering station,

(*Please turn to page* 120)

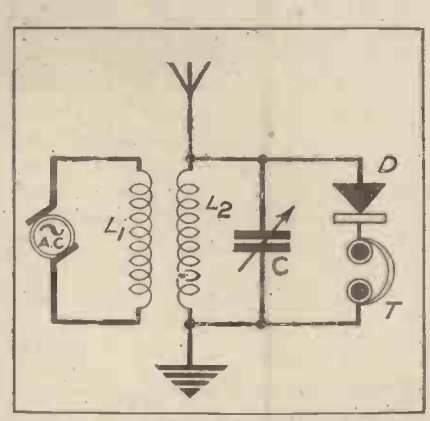


Fig. 3. A crystal detector is used in this simple arrangement, where a local oscillator is coupled to the aerial coil.

USING A VALVE OSCILLATOR AND VALVE DETECTOR

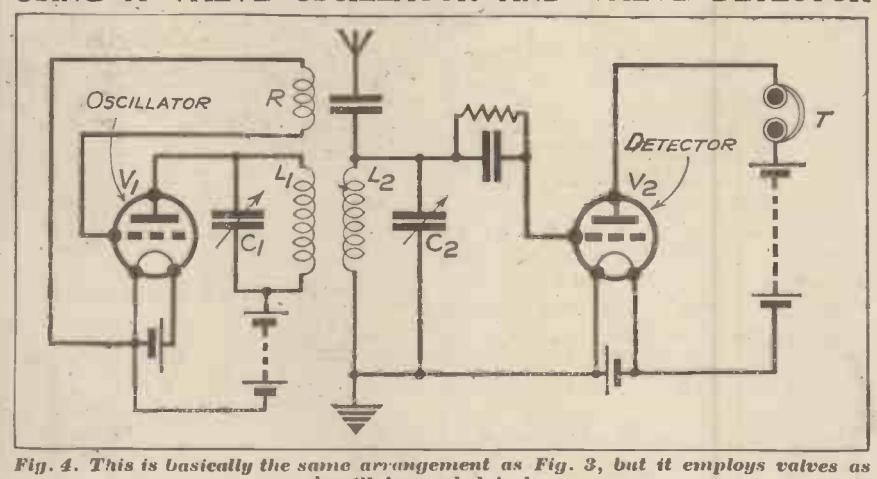


Fig. 4. This is basically the same arrangement as Fig. 3, but it employs valves as oscillator and detector.

VALDEMAR POULSEN, the great Danish inventor to whom Mr. Scott-Taggart refers as a champion of continuous waves.

B.B.C. NEWS

Our Announcers—New Year's Eve—Good-bye to the Radio Circles—Scottish Programmes—The Welsh Problem.

By Our Special Correspondent

Announcing as a Profession

WHEN I met Stuart Hibberd the other day after an interval of several years, I understood at once the reason for my feeling that his announcing and that of his colleagues had improved vastly in recent months. The reason is simply this. Announcing has now become a profession in this country, just as it has been for many years in the United States.

The bad old idea in the B.B.C. was to regard announcers as "repetition" workers, of little account at best. The result of this attitude was monotonous and uninspired commonplace, personality being submerged. Lady Snowden, in her day as Governor, led the revolt and made possible the placing of announcers in the position which they occupy to-day.

No longer are they required to stick slavishly to their manuscripts; no longer are they grossly underpaid; no longer are they anonymous in practice. Mr. Stuart Hibberd's interview with Sir Henry Wood, which he described at the beginning of the "Prom" season, and the Farewell Message from Sir Henry which he gave at the conclusion of the Season, set the seal to the new era of good announcing.

No More Theatre War

I, for one, never had faith in the much-trumpeted hostilities between theatrical interests and the B.B.C. It was obvious from the first that theatrical and music-hall stars had much to gain from prudently arranged broadcasting; whereas equally the listener was bound to benefit from their microphone appearances.

Now all pretence of war has been abandoned except for sporadic publicity purposes. Mr. George Black no longer threatens his regiments of artistes with extinction if they yield to the temptation of the microphone. There is, indeed, the suggestion that the next kind of war which the newspapers may talk about will be based on the angry complaints of the impresarios of the neglect of their favourites.

New Year's Eve on a Sunday

The fact that New Year's Eve falls on a Sunday presents peculiar difficulties to the B.B.C. programme builders. First of all they are faced with the established Sunday policy of the Corporation restricting the scope of their efforts and eliminating all gaiety, as against this there is the natural expectation of the vast majority of listeners to be provided with a really cheery and enjoyable beginning for a New Year.

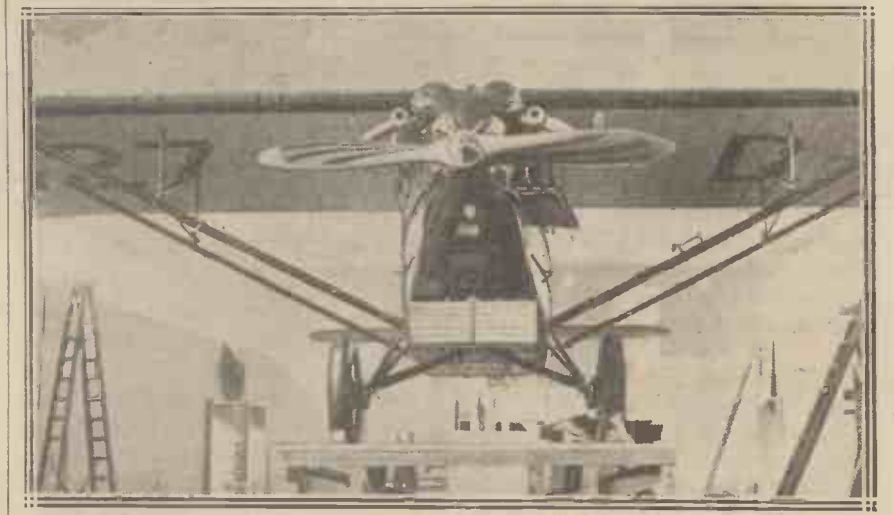
After much scratching of heads the programme builders are understood to have fallen back on a dramatised summary of 1933 as the main feature of the New Year's Eve programme. I am glad we shall not have to bear another "tour round Europe" with the inevitable international complications!

Tragedy of the Radio Circles

The disappearance of the Radio Circles will bring tears and regret, not only to the half-million children subscribers, but also to a multitude of parents and relatives. But it had to be.

The announcing of birthdays became an expanding tyranny which threatened to engulf the whole of the

AEROPLANE RADIO IN THE FATHERLAND



At the great German Radio Exhibition held in Berlin this year, many interesting exhibits were shown. Besides the usual array of broadcast receivers, there were transmitters, army field sets, and, in addition, this radio-equipped 'plane which occupied a very imposing position in the centre of one of the halls.

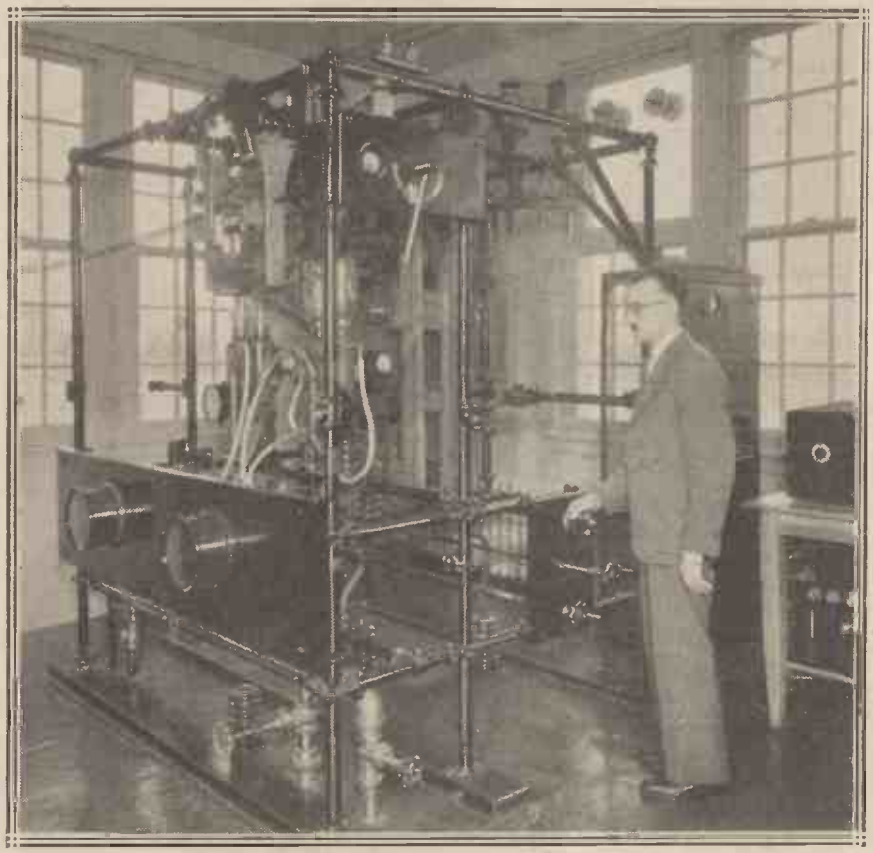
News from Wales and Scotland

Children's Hour. So from January onwards there will be no more birthdays.

I know the B.B.C. are trying to devise other ways to continue the charitable work of the old Radio Circles, and I hope they succeed, because this work, taken as a whole, helped many hospitals up and down the country.

There are rumours that the Children's Hour itself may share the fate of the Radio Circle. I hope these are untrue because the Children's Hour still represents something of personal and intimate contact between the listener and the broadcaster.

THE SHORT-WAVE TRANSMITTER OF W3XL



This huge short-wave transmitter is that at Bound Brook, N.J., perhaps better known to short-wave broadcast listeners as W3XL. This station employs a power of 20 kw., and transmits on a wavelength of 46·69 metres. It comes over exceedingly well in this country in the early hours of the morning.

Scotland Goes Serious

Listeners in Scotland who were accustomed to the programmes of Mr. Cleghorn Thompson's regime are rubbing their eyes (or their ears). Mr. Dinwiddie has struck out boldly and comprehensively to capture the attention of the older and more serious Scot, the churchgoers and the solid citizens. There is more downright uplift, more solid instruction.

On the whole, Mr. Dinwiddie is right; he is doing what was expected of him, and doing it with no qualification. But after a bit he would be well advised to give Mr. Moray MacLaren a little leash just to leaven the mass of seriousness which rightly characterises the main body of the present product.

Will Wales Revolt?

The B.B.C., apparently, has little luck in pacifying Welsh opinion. There was the monthly religious service in Welsh from Daventry National. Then, when Mr. Lloyd George saw Sir John Reith, there was the special programme in Welsh on Saturday nights, also distributed nationally. Then, on top of this, there was the special transmissions to schools, in Welsh, from the North Regional transmitter. Not to mention liberal broadcasting from the Eisteddfod and other features.

And although Mr. Lloyd George may be satisfied, there is no sign that his satisfaction is shared by the Welsh Nationalists who continue to attack the B.B.C. and are ready to secede if they can get anybody else to give them programmes entirely in the Welsh language. There are several difficulties in the way. No other broadcasting concern can afford to provide "all-Welsh" programmes.

Those Collecting Studios

We have not heard lately of the series of collecting studios which the B.B.C. was talking about early last year. I remember there was some bother in Sheffield which a B.B.C. diplomat settled to local satisfaction, by leaving a studio ready for local use as and when either the Regional or the National system wish to collect programme material from Sheffield. At that time I know the B.B.C. considered it possible to extend this idea to cover Nottingham, Wrexham, Bristol, and Inverness.

Since then, however, the Inverness problem has been solved by the decision to put a properly-equipped station somewhere in that neighbourhood next year. Bristol, too, has got its studio, but nothing has been done for Nottingham and Wrexham. And the agitation in these areas is bound to be renewed.

THE LONDON TRANSMITTERS

Clearing up an interesting point regarding this popular twin-wave station.

MANY people have the impression that the London programmes are actually radiated from Broadcasting House. This is probably occasioned by the fact that a pair of impressive looking masts have been erected on the roof.

Although the various studios are located within the building, the actual transmitters—London Regional and National—are situated on the outskirts at Brookmans Park some 16 miles to the north of Broadcasting House. The programmes are conveyed to the transmitters by special telephone lines rented from the Post Office for the purpose.

The masts on the roof of Broadcasting House are used only for low power ultra short-wave tests. F. B.

AS WE FIND THEM

NEW APPARATUS TESTED

Interesting reviews of newly introduced apparatus submitted by radio manufacturers and traders for examination and test in "The Wireless Constructor" laboratories.

Benjamin Valve Holders

THE valve holder is superficially a very simple article, and at first thought the impression is that the design presents few, if any, difficulties. In actual fact, a valve holder is a component requiring a great deal

SUBSTANTIAL CONSTRUCTION

Two of the latest Wearite components—the H.T.12 smoothing choke and a Class B driver transformer.

of experience and ingenuity if it is to give lasting satisfaction to the user.

Probably no firm has had greater experience in the manufacture of this particular component than Benjamin. The value of this wide experience is at once evident on an examination of the latest five- and seven-pin types which the firm has produced.

For example, the spacing of the sockets is dead accurate and the valve pins slide into position smoothly and positively, leaving one with the feeling that each socket is making perfect electrical connection with its respective pin. That this is actually the case has been proved by our laboratory tests.

A practical feature of these valve holders is the provision of reversible terminals to facilitate wiring and also soldering tags in addition to terminals.

We have found Benjamin valve holders to be thoroughly reliable, and we have no hesitation in recommending them.

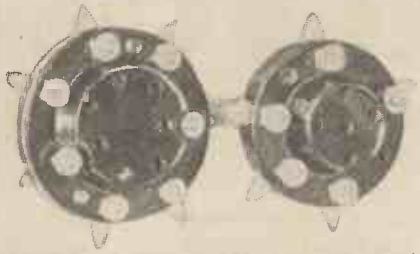
The price of the seven-pin type is 2s., and the five-pin 10d. The makers are The Benjamin Electric, Ltd., Tariff Road, Tottenham, London, N.17.

Watmel Resistances

Messrs. Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, have sent us a sample of their new wire-end "Hy-watt" resistances.

These resistances are wire wound on a ceramic porcelain former, the resistance element being spot welded to the two connecting leads with the object of obviating noise due to corrosion at the joints between the element and the leads. After being coated with Vita enamel the resistances are baked at high temperature. This method of construction results in

TWO GOOD COMPONENTS



These are the new Benjamin valve holders for five- and seven-pin valves. Reversible terminals are provided to facilitate wiring.

a resistance which possesses excellent insulation properties and freedom from moisture absorption.

Values up to 50,000 ohms are available, and the R.M.A. colour-code marking is employed. The sample submitted functioned perfectly, and its measured value agreed very closely with the makers' rating of 10,000 ohms, coming well within the manufacturers' limits of tolerance.

The resistances sell at 1s. each.

Wearite Components

Among the new components from the Wearite factory are an A.V.C. unit, H.T. smoothing chokes, and a Class B driver transformer.

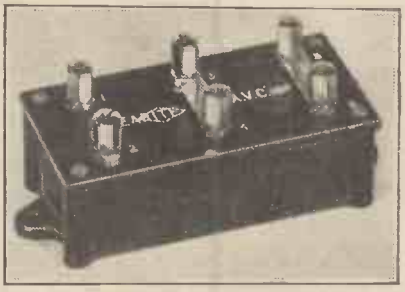
The A.V.C. unit is a particularly compact component, and embodies all the essentials for Automatic Volume Control, including a Westector.

The use of a unit of this type, in which the various parts are ready wired, has much to commend it, and certainly renders the adaptation of an existing set to A.V.C. an easy matter. Moreover, the method is an economical one, because the cost of such a unit is invariably less than that of the individual parts purchased separately.

The Class B driver transformer is a very sound job. Four ratios are provided, viz. 1, 1·5, 2 and 3 : 1, and the primary resistance is 400 ohms. The two halves of the secondary have a D.C. resistance of 150 ohms each (in the case of the higher ratio 100 ohms). Low D.C. resistance is, of course, a very necessary feature of Class B transformers, the existence of an appreciable voltage drop across the secondaries being detrimental to efficiency. The Wearite driver transformer is a high-grade component and adequately fulfils the requirements necessary for high-efficiency working.

In the case of the Wearite smoothing chokes we would mention the H.T.12 model, which has an inductance of 20 henries and will carry 75 milli-amperes.

FOR AUTOMATIC VOLUME CONTROL



This compact unit is specially designed for those who wish to convert their sets to A.V.C. It is a Wearite product.

Practical notes on what stations to look for and how to get the foreigners that are coming over well.

THE listener to the long-wave stations has been having a rather thin time recently. For some obscure reason this waveband has not yet got into its winter stride properly, and although there has been plenty of entertainment it has not been of the superlative quality which one might have expected when remembering the excellent showing of long waves in summer.

* * *

Radio Paris, Luxembourg, and Warsaw have been the pick of the bunch above 1,000 metres. Kalundborg has generally been good, but neither Oslo nor Motala have been up to expectations. There has been an annoying outbreak of heterodyne interference again, and right at the top of the dial Kootwijk, the new Dutchman on 1,875 metres, has been unlucky enough to have a Russian "on his tail."

* * *

Medium waves have been splendid, but what has happened to all the Spaniards of late? Time was when Madrid roared in like a local, night after night, but now there is sometimes quite a difficulty in getting into touch with Spain at all.

The French stations, with Poste Parisien an easy first, have at last removed the impression that broadcasting was never going to catch on properly in France. The quality, strength and reliability are now all that could be desired, and the programme value is far in advance of even last year's efforts.

From the east, the German, Polish, Dutch, and Belgian stations have all been excellent. It is good to hear Katowice in such fine form on 408 metres, immediately under the Athlone setting. Another station which seems to have had a livener is Riga, on 525 metres, and a little above this Sundsvall, the Swede, has been putting up a surprisingly good show on the wavelength just below Budapest's.

* * *

Another interesting feature of recent reception has been the removal of the old reproach about the B.B.C. stations. In the past we often heard the Continent far better than our own stations, but the Western and Scottish Regionals now join with the Northern in providing good alternative entertainment to those with sensitive sets.

The Midland Regional is not so good, but its new home at Droitwich is being prepared by the B.B.C., and when the new Midland takes the air next year we may expect something really first class.

* * *

Before that time we shall have the Daventry National on the air also from Droitwich. The preliminary work for these two stations is well under way, and reports indicate that the quality, like the power, is going to be far ahead of the present standard.

* * *

A special pat on the back must be bestowed upon the Swiss stations. Schweizerischer Landessender (459 metres) is becoming popular in spite of the awful name they have given it (most people still think of it as Beromünster), and Radio Suisse Romande has recently been yodelling away with unusually good effect on 403 metres.

POINTS FOR PURCHASERS

Interesting details from manufacturers about recent trade activities.

Your "AvoMinor"

IF you are one of the many who have been eagerly looking for a new "AvoMinor" combination testing instrument which has not yet materialised, please don't blame the makers.

When they advertised the instrument they thought it would go—but they did not anticipate that it would disappear altogether! But it did, for there was a demand so overwhelming that their shelves were cleared right out, and all the carefully laid plans for production fell short.

The manager of Automatic Coil Winder & Electrical Equipment Co., Ltd. informs us that everything possible is being done to speed up production without detriment to the efficiency and accuracy of the instrument.

What's the Electric Time?

The Edison Swan Electric Co., Ltd., have just completed negotiations whereby they will, in future, be marketing Bulle clocks, of both the all-mains and battery varieties.

Illustrated lists of these are now available, and will be supplied upon request to the nearest Ediswan branch, or head office, 155, Charing Cross Road, W.C.2. A range is now stocked by the main Ediswan branches.

That New Pick-up

"Blue Spot's" seem to have hit another high spot, if the demand for their new 35s. pick-up is anything to go by. It incorporates a wire-wound volume control and rotating head, and full particulars of this and of the other Blue Spot lines can be obtained from the firm at 94/96 Rosoman Street, Rosebery Avenue, E.C.1, on mentioning THE WIRELESS CONSTRUCTOR.

A Hint From R.I.

Constructors who have built sets with the famous and popular R.I. dual-range coil are still regularly demanding "repeats," and, of course, the manufacturers are always willing to oblige; but said constructors should ponder over R.I.'s own statement.

Referring to the good old coil, they say: "Although in its day giving truly remarkable results, it is now superseded by the "Micrion" coil, that now renders the older coils obsolete. By substituting the "Micrion" your old set may be brought right up to date."

Can You Match It?

The accurate matching of loudspeaker to output valve always pays, and "W.B.'s" evidently mean all users should be able to match their "Microlode," for this instrument provides seventeen ratios for matching to any power or pentode valve, and four ratios for Class B or Q.P.P.—all on the one speaker.

Whiteley Electrical Radio Co., Ltd., Dept. C, Radio Works, Mansfield, Notts., will readily answer any inquiries about it from readers of THE WIRELESS CONSTRUCTOR.

SCOTT TAGGART *makes* BLUE SPOT *his*

FIRST CHOICE for S.T.500
(The Star Set of the Year)

AND AGAIN

Recommends BLUE SPOT for his S.T.SUPER

29P.M.
32/6

Scott-Taggart makes no mistake about the quality of the components he selects. If he says "Use Blue Spot Speakers," you may be sure that Blue Spot Speakers will give you the best results.

And apart from *any* recommendations, it is well known that for quality and reliability Blue Spot Speakers stand supreme. Make any test you like—appearance, construction, performance—the result is always the same—Blue Spot definitely superior in every way.

MOVING-COIL SPEAKERS: 29P.M. 32/6 45P.M. 45/- 99P.M. 59/6

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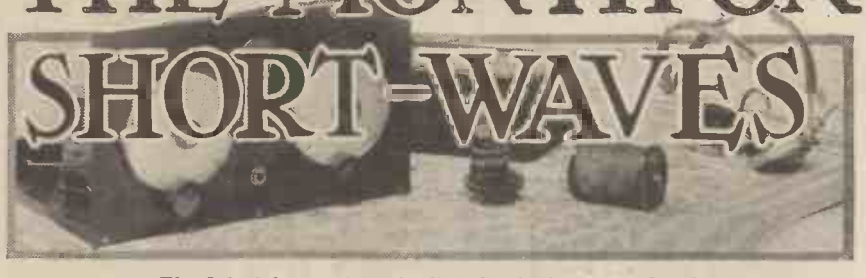
Write your name and address in the margin. Post in open envelope (½d. stamp). Catalogue No. W.C.33.S, giving full particulars of 29P.M. and all other Blue Spot lines by return

THE MONTH ON SHORT-WAVES



The latest happenings in this fascinating waveband.

Now that the long evenings are with us again, many readers who have during the summer neglected their short-wave receivers will be taking them down from their shelves and making attempts to get them shipshape again. Not that I approve of this shelving business, because I don't. But, nevertheless, people will do it.

Artificial Atmospherics

Dust is surely the greatest enemy of all to radio receivers, and particularly to those of the short-wave variety. When it gets between the tuning condenser vanes you obtain the best imitation of tropical atmospherics that I can imagine. After a set has been lying idle for a considerable time I really think that it pays to remove the more vital components and give them a thorough spring-clean.

If you want to try out your set, W 8 X K on 19·72 metres is a good transmission these days. I was receiving him very well on the loudspeaker a couple of nights ago, using quite an ordinary three-valver. His strength has been remarkably consistent of late.

Our old friend W 2 X A D on 19·56 metres, however, is very variable, ranging from a good loudspeaker signal one day to something barely audible a couple of evenings later. When W 2 X A D is coming in well, though, I think it is one of the best stations on the short waves.

Television Tests

At times I have listened to him with the reliability of a good medium-wave European. I remember one occasion when I listened to him for upwards of two hours without the slighest trace of fading of any sort, *and* on the loudspeaker.

By the way, have any of you heard Mr. Baird putting out his television tests on 6·25 metres from the Crystal Palace. At my home station, which is approximately 25 miles north of the Palace, he comes in extraordinarily well.

The tests are being sent out from the South Tower almost every day now, but up to the time of writing no definite data regarding schedules is available. Comparatively low power is being used at first, but later it is hoped to increase this to some 500 watts!

Look to Your Aerial

I was down at Sydenham the other day, and while I was there tried to locate the aerial. It took a lot of finding, but eventually I located it stretched vertically between a couple of wooden brackets just over the edge of the balcony, on the north side of the South Tower. It is quite small, being only about 10 ft. long.

Talking of aerials reminds me that now is the time to see that your "sky-wires" are in order. Many of those "fading signals" can be traced to a swinging lead-in.

So before the winter gales come along, remember the old saying, "forewarned is forearmed."

G. T. K.

"ON THE GRID"

A boon to battery users—Deservedly unpopular—Experts led astray.

My thanks are due to Mr. Swyer, of Bournemouth, for a letter in connection with the interesting accumulator filler to which I made reference in these notes in the October number.

He sends a cutting from a catalogue, on which are given details of this little device, the makers of which I did not know. They are given as Messrs. Stadium Ltd., Stadium House, 75/77, Paul Street, London, E.C.2, and the price of the filler is stated to be 2s. 6d.

Automatic Cut-Off

Known as the "Tapper" Battery Filler, it is good value for money, for apart from the advantages to which I referred, it incorporates another ingenious scheme. This enables it to act also as an automatic level finder.

As I intimated in my previous description, the distilled water is released by touching the end of the outlet pipe against the tops of the plates. To permit water to run out, air has to be allowed to enter the bottle, which it does through a small hole a quarter of an inch or so from the end of the outlet pipe.

The result is that as soon as the water covers the plates to this extent, the air is cut off and the water stops flowing. Actually the device is most useful with car batteries, but, even if only because of its ingenious design, it is of interest to all users of accumulators.

A Friendly Warning

Have you ever had occasion to use enamel or a similar preparation containing amylacetate? If you have, you will know how penetrating the pear-drop odour can be.

I had this strikingly demonstrated the other day when I wished to thicken up some cellulose enamel by allowing evaporation to take place. The tin of enamel, with the lid off, was placed on a window-sill and the window shut right up.

Even so, the smell got inside the room! Several people remarked on it who were quite unaware of the presence of the tin.

So take warning, and be careful when you colour that cabinet or baffle, otherwise you may find yourself hounded out of the house as a general nuisance.

Conductor or Insulator?

Metal treated woodwork is being used very extensively these days for screening purposes. And the similarity of the coating used to the appearance of aluminium paint has led many astray.

The trouble is that the metal particles are insulated by the varnish and similar materials in the paint, which prevent a conducting surface being obtained.

Of course, it is possible that one might come accross a certain grade of metal paint that is somewhat conductive, but this is an unlikely occurrence.

A. S. C.

MARCUS, OVERTON

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THE WORLD'S FINEST RADIO

Introducing a New Era of precise selectivity, super sensitivity under stable control, with perfected fidelity of reproduction.

S.T. SUPER

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	£	s.	d.
1 Colvern Coil assembly with terminals and battery on/off switch, types G.1, G.2, G.8	1	19	0
1 J.B. Unitune Twin Gang Condenser, type P.2, No. 2069, complete with disc drive and escutcheon, ·0005 mfd.		17	6
1 J.B. single-screened Condenser type Nu-gang, No. 2081, ·0005 mfd., complete with disc drive and escutcheon		10	6
1 Varley Compensating L.F. Transformer, D.P.35		11	6
2 Varley Iron-cored I.F. Band-pass Units, No. B.P.42	1	3	0
1 Varley Screened H.F. Choke, No. B.P.2		3	6
1 Wearite Screened H.F. Choke with pigtail, type H.F.P.A.		4	0
1 Wearite Screened H.F. Choke, without pigtail, type H.F.P.		3	6
2 Igranic 50,000 ohms log law wire-wound potentiometers, No. 2235/15		10	0
2 Graham Farish 7-pin Valve holders		2	6
4 W.B. 4-pin Valve holders		2	0
5 Dubilier Fixed Condensers, type 9200, 2 mfd.		17	6
4 T.C.C. Fixed Condensers, double mounting type 50, 1 mfd.		10	0
2 Dubilier Fixed Condensers, type 9200, 1 mfd.		5	0
1 Dubilier Fixed Condenser, tubular type, ·25 mfd.		1	9
2 Dubilier Fixed Condensers, tubular type, ·0005 mfd.		2	0
2 Dubilier Fixed Condensers, tubular type, ·0003 mfd.		2	0
1 Dubilier Fixed Condenser, tubular type, ·0001 mfd.		1	0
12 Erie impregnated Resistances: 4/5,000, 3/10,000, 3/50,000, 1/½ meg. and 1/1 meg.		12	0
13 Belling-Lee indicating terminals		3	3
12 Belling-Lee indicating wander plugs		1	6
1 "ACE" assembled and metal-sprayed chassis, complete with drilled terminal strip		4	0
Connecting wire, flex, screws, etc.		1	0
2 Brackets for potentiometers			6
Blue-print and copy of WIRELESS CONSTRUCTOR		Gratis	
"ACE" S.T. SUPER KIT A	**£9**	**7**	**6**
6 Valves to specification	3	12	6
"ACE" S.T. SUPER KIT B	**£13**	**0**	**0**

ANY COMPONENT SUPPLIED SEPARATELY.

"ACE" S.T. SUPER AND S.T.500 ACCESSORIES

	£	s.	d.
Ever Ready 120-volt Popular Power type H.T. Battery		15	6
Ever Ready 9-volt Grid-Bias Battery		1	0
Ever Ready 16½-volt Grid-Bias Battery		1	9
Block New plateless L.T. Accumulator, 80 amp/hours capacity		11	6
Block New plateless Wet H.T. Accumulator	3	15	0
M.P.R. Eliminator for A.C. Mains	2	10	0
M.P.R. Eliminator for D.C. Mains	1	10	0
W.B. "Microlode" Moving-coil Loudspeaker, type P.M.4A	2	2	0
Blue Spot 99P.M. Moving-coil Loudspeaker	2	19	6
Blue Spot New Model 33 Gramophone Pick-up with volume control	1	15	0
Belling-Lee Unit Gramophone Pick-up with volume control	1	15	0
Garrard No. 30 double spring Gramophone turntable	1	5	0
Garrard No. 202A Gramophone turntable for A.C. Mains	2	10	0
Marconiphone Model 19 Pick-up	1	12	6

"ACE" CABINETS FOR S.T.500 AND S.T. SUPER

	£	s.	d.
Standard Table model		17	6
De Luxe Table model in solid Oak, antique finish	1	15	0
Standard Consolette Model upright or horizontal type	1	10	0
De Luxe Consolette Model in solid Oak, with special antique finish	2	2	0
De Luxe Radiogram Cabinet in solid Oak, antique finish, a very handsome piece of furniture, complete with motor board and accessories, Loudspeaker, Baffle Board, and special Sound Chamber	6	6	0

TRADE SUPPLIED

Donald P. Marcus, Managing Director of Messrs. Marcus, Overton Radio Limited, and originator of the popular "ACE" S.T. 400, S.T.500 and S.T. Super DE LUXE kits, says:

THROW YOUR OLD SET IN THE DUSTBIN

and build yourself a real radio receiver—an S.T.500 or an S.T. Super, which ever suits your pocket. Present-day radio programmes are surprisingly good, it is only your old set that makes them seem poor to you. I back my opinion with this concrete guarantee:

THE "ACE" GUARANTEE

"ACE" QUALITY.—Every "ACE" kit is exact to specification given. No substitutions. Study carefully the "ACE" specifications—every component made by world-famous British Manufacturers and especially selected for performance and efficiency regardless of price.

"ACE" PERFORMANCE.—Every S.T.500 and S.T. SUPER constructed from "ACE" kits will give results equal to those obtained by Mr. John Scott-Taggart himself. The "ACE" De Luxe kits are absolutely unbeatable for wonderful tone, punch and selectivity.

"ACE" SERVICE.—I shall not consider your purchase completed unless your "ACE" receiver gives these results. If you have the slightest cause for complaint when you have built and tried out your "ACE" S.T. SUPER or S.T.500 MY SERVICE DEPARTMENT WILL PUT IT RIGHT FREE, OF CHARGE.

"ACE" DESPATCH.—All orders despatched in rotation by return post from stock. No annoying delays.

DEMONSTRATIONS

The "ACE" S.T.500 and "ACE" S.T. SUPER will be demonstrated at the offices of Messrs. Marcus, Overton Radio Limited, 62, Borough High Street, London Bridge, S.E.1. (One minute from London Bridge Station.)

To MARCUS, OVERTON RADIO LTD.,
62, BOROUGH HIGH STREET,
LONDON BRIDGE, S.E.1.

Please supply immediately: 'Phone: Hop 4431.

"ACE."..... KIT.

For which I enclose £.....

NAME.....

ADDRESS.....

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Block Letters please; insert Kit required.

W.C. Dec., 1933.

S.T.500

"ACE" DE LUXE KIT A	**£5**	**12**	**6**
"ACE" STANDARD KIT A	**£4**	**7**	**6**
4 Valves to specification extra	£2	5	3
"ACE" S.T. 400/500 Conversion Kit			35/-
Or including Class B valve			49/-

This Kit contains all necessary components, including Class B output choke for converting your S.T.400 to the new S.T.500.

"ACE" S.T.300/500 Conversion Kit			47/6
Or including Class B valve			61/6

This Kit contains all necessary components, including Class B transformer and choke for converting your S.T.300 to S.T.500.

For complete constructional details and Blue-print of the S.T.500, and specifications of the "ACE" S.T.500 kits, see "Popular Wireless" for October 21st, 1933. Page 303.

"ACE" DE LUXE KITS for the S.T. SUPER

For those who would like to have absolutely the last word in Battery-operated Radiograms we have prepared the—

"ACE" S.T. SUPER DE LUXE CLASS B RADIOGRAM KIT

This follows the Standard Kit with the following improvements:

(1) J.B. Straight Line Illuminated shadow tuning slow-motion dials, as used in all modern factory-built receivers.
(2) Multitone constant tone control inter-valve transformer.
(3) Additional perfected Class B output stage with Wearite Class B input transformer and output choke.
(4) Combined Radiogram and on/off switch.

Making a DE LUXE 7-valve economical consumption receiver of the most modern type, giving wonderful reproduction on Radio or Records.

KIT A	**£12**	**0**	**0**
KIT B with 7 valves including Class B valve	**£16**	**3**	**3**

For A.C. Mains operation we have the—

"ACE" S.T. SUPER DE LUXE A.C. MAINS KIT

A 6-valve all-mains operated De Luxe receiver of the most modern type with J.B. Straight Line Dials, Multitone constant tone control, intervalve transformer, Westinghouse Hum-free rectification, and Power Pentode output. For radio or records.

KIT A	**£18**	**0**	**0**
KIT B with 6 latest type mains valves	**£22**	**18**	**0**

And for D.C. Mains the—

"ACE" S.T. SUPER DE LUXE D.C. MAINS KIT

Similar to the A.C. Kit but designed for use with mains-operated D.C. Valves.

KIT A	**£15**	**10**	**0**
KIT B with 6 latest type D.C. mains valves	**£20**	**8**	**0**

NOTE—Complete supplementary constructional details are included with each "ACE" DE LUXE Kit.

"ACE" CONSTRUCTED RECEIVERS

Any "ACE" kit can be supplied to order, ready constructed and aerial-tested by expert mechanics, either with or without valves and cabinet. Inclusive charges for this service—5/- per valve for battery sets and 7/6 per valve for mains operated sets.

TRADE SUPPLIED

A PRACTICAL MAN'S CORNER

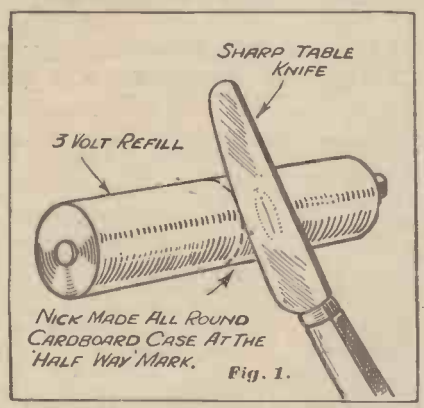
By R. W. HALLOWS, M.A.

Obtaining grid-bias cells from flashlamp batteries and hints for fitting them in your set, a chat about the best type of nuts for component connections, and many other useful hints and tips are included in this month's article by our popular contributor.

For S.G. Grid Bias

One often wants nowadays a single dry cell for grid-biasing purposes. These are made by manufacturers, but such is fate that if you happen to need one urgently it is long odds that every shop you visit will be out of stock for the moment.

CONTAINS TWO CELLS



An ordinary 3-volt flashlamp battery, when cut in half, provides two cells which can readily be used for S.G. biasing purposes.

You can, however, obtain almost anywhere a 3-volt flashlamp refill in a cylindrical cardboard case like that illustrated in Fig. 1. Some of these refills are so made that you can simply push the cells out of the tube, in which case matters are easy. But, in most of them the cells fit so tightly that it is best not to try to remove them in this way. Fig. 1 shows a method that works like a charm.

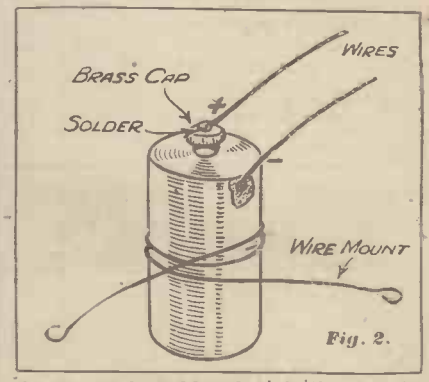
Measure off the half-way mark between the ends of the cardboard tube and make a nick all round with a sharp table knife. Now take the tube in your two hands, exercise a little force and it will break quite cleanly, giving you two cells, each in its own cardboard case.

Connecting and Mounting

It is very convenient to have each of the cells in a cardboard cover, for there is then no bother about insulating the cans. Fig. 2 shows how the connections for a cell are made as well as a handy fixing for baseboard mounting. The fixing is made by wrapping a couple of turns of bare copper wire, No. 20 or No. 22, tightly round the case and forming a loop at either end for the mounting screws.

The leads must be soldered on, one to the can (a little piece of the cardboard tube is cut away for this purpose) and the other to the brass cap at the top of the central carbon rod. Don't forget, by the way, that the zinc can forms the negative pole of a dry cell and the brass-capped carbon rod, the positive.

MAKING CONTACT

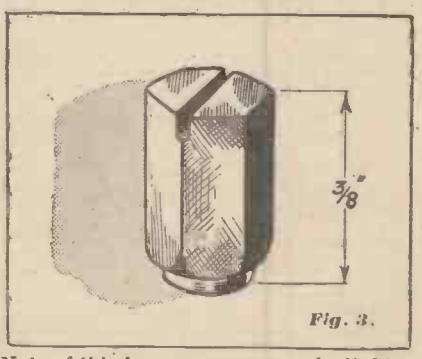


A wire can be soldered on to the case for the negative lead, and another length twisted round the cell to provide a method of fixing to the baseboard.

A Grouse

I have long wondered why some condenser manufacturers, alone among component makers, insist upon providing their larger paper dielectric condensers with capacities from a ¼ mfd. upwards with 5B.A. terminal shanks and miserable little round milled-headed nuts. There is absolutely nothing to be said in favour of the use of odd B.A. sizes. Against

USEFUL NUTS



Nuts of this type are very easy to tighten with a small spanner, and they also have a useful screwdriver slot in the top.

them there is everything to be said—and what is said against them by constructors is of a highly unprintable nature! Supposing that you lose one of those 5B.A. nuts.

You cannot simply go to your small parts box and fish out another, for it is more than likely that your stock contains only 2B.A., 4B.A. and 6B.A. The wireless shop may be able to oblige, but it is quite on the cards that they will have to order you a whole dozen 5B.A. nuts in order to replace the lost *one*.

Difficult to Tighten

Next, those thin milled nuts used on many big condensers are very hard indeed to tighten down properly, especially if the component is in some

Pages 103-122 are missing.

OUR NEWS BULLETIN

—continued from page 122

Possible Modifications

The Union passed resolutions which would be communicated to the Governments concerned to enable the possible necessary modifications to the Lucerne Plan to be effected, and to make the necessary wavelength changes in Europe on January 15th next with the minimum of disturbance to listeners.

A Unique Case

Four people have been arrested at Cologne charged with receiving from a secret short-wave wireless transmitter in a special code the results of horse races abroad before the official results were available.

The accused, who in some cases had wireless receiving sets installed in motor-cars, regularly picked up the secret communications of the racing results near to the office of bookmakers and then immediately went in and backed the winners.

Although the idea of cheating the bookmakers by wireless has been exploited several times in fiction, notably by the late Mr. Edgar Wallace, this is the first time that any big-scale fraud has been attempted in reality.

Christmas Day Broadcast

As we go to press we learn there is every reason to hope that the King will broadcast a message to the nation on Christmas Day. If the broadcast is carried out it will be the second message spoken by the King direct to the nation. Readers will remember that last Christmas Day His Majesty spoke from a small room on the ground floor of Sandringham House in which B.B.C. engineers had installed a special microphone. The King's broadcast last year was the climax to a special Empire programme.

Television Experiments

Under conditions of extraordinary secrecy the Electrical and Musical Industries, Ltd., are at the time of writing engaged in installing a new television equipment in Broadcasting House. New television experiments are due to begin in January.

(Continued on page 124)

OUR NEWS BULLETIN

—continued from page 123

The Electrical and Musical Industries Co. controls H.M.V., Columbia, Regal, Parlophone and Marconiphone.

The new television apparatus to be used in January is reported to be based on a short-wave design produced at H.M.V. laboratories and demonstrated to the B.B.C. in 1932. An official of the company recently said :

"At the moment there is no information which can be given, but it is possible that a statement will be issued in the near future."

Strict Secrecy

The engineers at the B.B.C. who are taking part in these television experiments have been asked to observe the strictest secrecy, and not to discuss any details of their work with "outsiders." Nevertheless, we understand that very important results have been obtained by the research workers in the employ of the Electrical and Musical Industries, Ltd., and that a discovery has been made which it is hoped will solve many television problems.

A Powerful Station

It has now been definitely decided that the great new broadcasting station which is being built at Droitwich is to have a power of 150 kilowatts. It will be five times as strong as the present Daventry 5 X X. If all goes well, the new station will begin broadcasting next Spring.

The Brookmans Park, Western Region, and Moorside Edge stations will cease to radiate a national programme.

Only One Transmitter

Each of the above stations will have only one transmitter and will send out the Regional programme, but with increased power. Two new single programme stations will be erected in the North of Scotland, and in Newcastle, both having high power.

The North Scottish transmitter will serve as many listeners as possible, and especially will it be erected for the benefit of listeners not yet able to get good reception from any other transmitter. The Newcastle station will give a Regional programme to the North-East coast and the Border district.

Who Invented Wireless?

The old, old question : Who invented wireless ? has cropped up again. In a daily newspaper the other day a correspondent stated that a Catholic invented wireless, whereupon another reader wrote and said that presumably by a Catholic was meant Marconi.

The correspondent went on to point out that broadcasting as we know it is wireless telephony, and that without the radio valve this would not be possible on the scale that obtains to-day.

Who invented the valve ? asks this correspondent. Professor J. A. Fleming of London. He put the anode and the filament in it, and Dr. Lee de Forrest, an American, put the grid in it. Marconi made his name many years ago, continued the correspondent, through his experiments in Cornwall, but this was wireless telegraphy and had nothing to do with broadcasting.

As a matter of fact, it is safe to say that no one man is responsible for the invention of wireless. Marconi, Lodge, Fleming, Lee de Forrest, and half a dozen other eminent scientists have all been responsible in a large way for the science of wireless as we know it to-day.

INDEX TO ADVERTISERS

All communications concerning advertising in "Wireless Constructor" must be made to John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4. Telephone : Central 5352.

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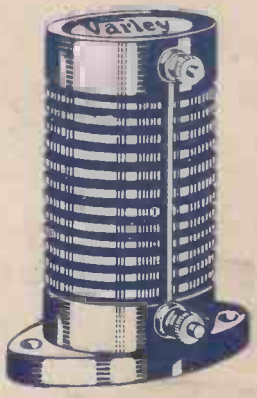
An outstanding result of years of research, by Varley, into powdered metal cores. Combining maximum efficiency with maximum selectivity they are suitable for all superheterodyne circuits.
B.P.42 (Centre tapped) **11/6**

These three up-to-date Varley components have been specified by JOHN SCOTT-TAGGART for the

'S.T.SUPER'

It is wise to match your components and so ensure perfect results.

Write for the complete Varley catalogue



JUNIOR MULTI-CELLULAR H.F. CHOKE

Extremely suitable for use as a reaction type choke and also as a tuned grid coupling choke with air-cored tuning coils.
B.P.2 **3/6**

COMPENSATING L.F. TRANSFORMER

Particularly suitable for automatic tone balance, or A.T.B. The core can be earthed by placing earthing wire under either of the fixing screws.
D.P.35 **11/6**

Varley

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