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Popular Wireless & TELEVISION TIMES

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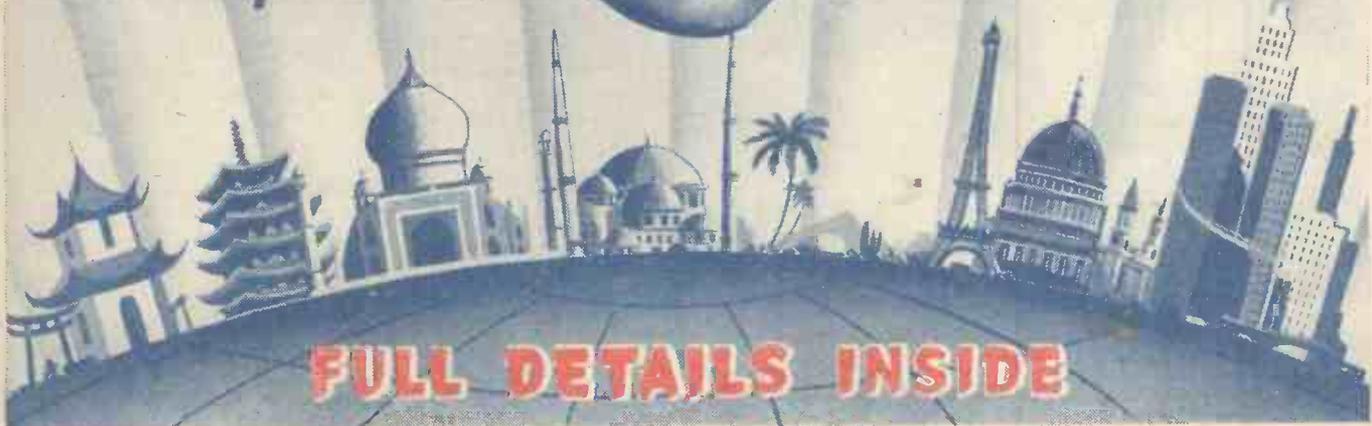
S.T.900

with the Amazing "X" REACTION

**ALL-WAVE
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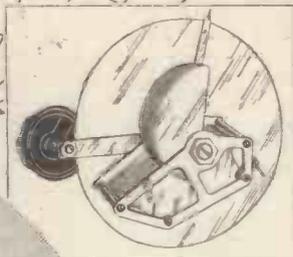
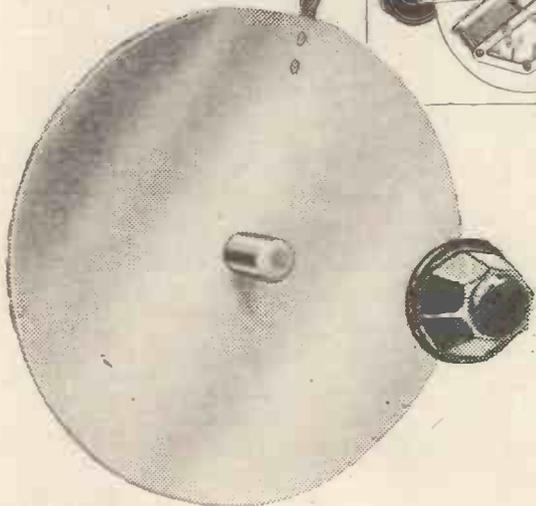
FULL DETAILS INSIDE

S.T. 900

TUNING BY..



It had to be...



ONCE AGAIN Mr. John Scott-Taggart has entrusted the tuning of his latest radio masterpiece to J.B.

The New J.B. Slow-Motion Drive was especially designed for the S.T.900 to Mr. Scott-Taggart's own specification.

If you are to construct a replica and duplicate exactly the performance of this wonderful All-Wave Receiver, you must follow the Author's lead and employ the new J.B. Drive, a typically reliable and robust J.B. Precision Product.

Used with a .0005-mfd. main tuning condenser (see inset illustration) with silent pig-tail, which is matched to the circuit.

The tremendous interest which attends every S.T. design creates an enormous demand for components. Secure your J.B. Drive quickly and avoid disappointment.

J.B. S.T.900 drive complete with Condenser, pointer and knob	6/6
Extra J.B. Knob, as specified, Type 2155	4d.
S.T.900 Drive Only	2/6



Have you seen the New J.B. "Linacore" All-Wave Tuner. Covers 3 Wavebands: 16.5-51, 200-550, 800-2,000 metres. Every device known to modern radio has been developed and incorporated to produce a unit of the simplest form, yet which guarantees the best possible results. A.C. Mains Model Type AW... **55/-**
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RADIO NOTES & NEWS

S.T.900
OLD TIMER
PERSONALIA

STATION NEWS
THE MONEY
RADIO SOFIA

Sir . . . Prize!

WHEN you turn overleaf you are going to get the biggest jolts and jars of your technical career. For in John Scott-Taggart's latest design he brings Relativity right into radio.

In this unique all-wave receiver the switch troubles, my bonny boys, are absolutely abolished. Knowing you can't believe that statement I will solemnly affirm something even more surprising. Not only are all the crackles, creaks and bad contacts due to dirty switches absent for ever, but the dirty switches themselves are abolished.

There's not one single switch of any kind in the S.T.900! Critics may advance 899 violent objections to this, but the 900th fact remains—if you have no switches they can't give trouble. "What can't speak can't lie."

Coils That Nearly Insert Themselves

RESTRAIN your natural inclination to rush into the controversy for another moment while I tell you something else about the S.T.900. I have just made the set's acquaintance and, believe me, boys, it's the silkiest performer since Mme. Pavlova. With effortless efficiency, switchless and hitchless, it covers all the wavelengths from 10 to 2,000. With the right plug-in coils it could, I'm certain, dive lower or fly higher; but what I was most interested in was the utter ease of its wave-changing.

These new coils—right-positioning, automatic-fitting, self-centring—are absolutely different from the old fellows we knew years ago. You can take off your specs., shut your eyes, and turn off the lights, but still there is no difficulty whatever in changing coils and gliding from waveband to waveband.

I won't say more for I want to rush an order through: *One Set of Parts—S.T.900.*

A Narrow Squeak

A SOUTHSEA correspondent, who reminds me that an aeroplane once flew right into a wooden wireless mast there, asks me if there are any known instances of pilots having been able to escape after entering the network of masts that support a transmitting-station's aerial.

Most of the records show that it is easy, and fatal, to become entangled. There was the sad case of the air liner in Belgium which got caught in the Ruyssedele aerials. And the air fatality at Eiffel Tower, though in that instance the pilot was trying to fly through the big aperture in the "mast."

But planes have been known to emerge safely from such perils, and only a year or so ago one pilot flew under the aerial and between the two masts of the Cullercoats station, which was invisible to him because of fog.

Old Timer

IN response to an Old Wireless Sets competition organised in connection with a Dorset radio exhibition several veterans, whose own makers could hardly recognise them, appeared, and spryly flopped their coils.

Some of these old fellows were admittedly

a bit shaky, but in general they were well preserved and in possession of their former faculties.

The winner was a Marconi V2, complete and in working order in every detail. He belonged to Mr. J. Woods, of Puddletown, and the high favour with which Mr. Woods regards him is certainly not diminished by this emergence from retirement to win a £5 voucher.

Several other sets deserved honourable mention; but the perfection of the old V2, and the fact that his birth-certificate was dated 1922, made him a popular winner.

Personalia

COL. A. G. C. DAWNAY, who was formerly Controller of Programmes at Broadcasting House, has now been appointed Director of Public Relations at the War Office. This is a new post, and Col. Dawnay will have the local rank of Major-General.

The broadcasts in English which are being heard from the League of Nations station are given by Mr. Michael Barkway, of the B.B.C.'s Empire News Service.

The Director of the B.B.C. Empire News Service has reached Singapore, and is to continue his round-the-world tour soon.

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

ONE of the most brilliant and eminent radio engineers of this country was born in 1897. His first design was published in the first volume of the first radio magazine twenty-four years ago. 1917: His first valve patent and the beginning of a pioneer series of patents purchased by Marconi's, Edison Swan, Huth Ges, Canadian Marconi, Radio Communication Co., La Radio-technique, Commercial Cable Company, Telefunken. Hazeltine Corporation, etc. Both in this country and America his patents are in the list under which practically every manufacturer is licensed. As wireless officer in Royal Engineers during the war, gained Mention in Dispatches, and later the Military Cross for gallantry under fire. 1919: In charge manufacture of valves for Government at Edison Swan. Introduced the E.S.2 and E.S.4 valves—the first types designed for the public. 1920: Head of Patent Dept., Radio Communication Co. Chief Adviser on patents to Mullard Radio Valve Co. Member of Committee, Radio Society of Great Britain. 1921: Lectured before British Association; published at 23 years of age his famous 440-page book on the valve, "Thermionic Tubes," followed later by a dozen text-books on radio. 1923: Founded "Modern Wireless," "Wireless Constructor," and other radio periodicals. 1924: Chief Adviser on wireless patents to

His Master's Voice. Member sub-committee Engineering Standards Association. Selected with Prof. G. W. O. Howe and S. R. Mullard by Radio Mfrs. Assn. of America to advise on valve matters. Chief Engineer, Elstree Radio Laboratories, which produced the first ganged screened-coil set in this country—the only one at Olympia in 1926. Sets won First Prize International Radio Exhibitions in New York and Rotterdam. 1928: Called to the Bar, after obtaining a very high position in the Bar Final examinations. 1931: Series of articles on Television. 1933: Author of "Manual of Modern Radio" (424 pages) and 1934: "Book of Practical Radio" (384 pages). Nearly a million copies of his books have been sold. He holds the coveted distinction of Fellow of the Institute of Radio Engineers, on the recommendation of Marchese Marconi and three Past-Presidents, and possesses the highest professional status given by the Institution of Electrical Engineers, the Institute of Physics, American Society of Mechanical Engineers and other learned societies. Is a barrister-at-law but practises as a consulting engineer. To the public he is best known for his designs and radio publications; in professional circles he is chiefly noted for his pioneer inventive work on valves and valve circuits, and as a great international legal authority on radio patents.

News Of New Stations

RUMANIA is proposing to build a new twenty-kilowatt at, or near, Jassy, for medium-wave working. There is also a scheme for a Rumanian short-waver, but no site has yet been selected.

Skamlebaek, Denmark, has just (Please turn to Cover iii)



JOHN SCOTT-TAGGART, M.C., M.I.E.E., F.Inst.P., M.Am.I.E.E., Fel.I.R.E., Barrister-at-Law

THE S.T.900 RECEIVER

Introducing High-Geared "X"-Reaction

WORLD-WIDE RANGE ON 6 TO 2,000 METRES

THE GREATEST OF ALL THE S. T. DESIGNS

By JOHN SCOTT-TAGGART

I AM prepared for trouble. If those with advance information of the S.T.900 are any judges at all, there will be gasps from the lips of readers who open this issue and see plug-in coils. Yes, PLUG-IN COILS! In 1937!!

The very word "plug" has a sickening sound—like soil dropped on the coffin of the S.T.900. By using plug-in coils I have given birth to a still-born child; so say those around me. After an unbroken string of successes—a plug-in flop.

By now—even if you have not studied the design—you will have a suspicion that the S.T.900 has plug-in coils. Never has a set been so finely prepared as if for a wedding and with the advance guests so convinced it would be a funeral.

Who are these people who see the set or hear of my plans before you do? A few necessary people in the industry, some other designers, some other writers. (I exclude those readers who hear the set as demonstrators or to whom models are loaned). Some are only telephone voices, some sit in padded chairs, some come and blow cigarette smoke all round the set while it is in a drawing office.

The wisest of them sit on fences and hold tight. They have in the past, where my "numbered" sets have been concerned, fallen off the fence on the wrong side. They are beginning to learn that it is risky to clear their throats or shake their heads. They have lost their balance that way before.

Mutterings behind my back are not on any technical grounds. They fully appreciate the obvious merits of plug-in coils of high efficiency. Their scepticism is merely a frank disbelief that you readers will sacrifice the switch!

The decision to use plug-in coils was no sudden arbitrary act. None of my decisions is. I follow my own ideas on technical points, but on general topics, matters of cabinets, numbers of valves, and so forth, the opinions of others are always invited, and usually they gush out like water from a burst pipe. They

almost need plugging up. Plugs stop leaks. Plugs stop waste, just as plug-in coils do.

Most of these opinions are waste. They cancel out, for one thing. No one knows what the constructor wants. I myself have been all over Britain during the last five



MONTHS OF PLANNING

came before even the technical design of the S.T.900. The deepest thought has been given to embodying the circuit in a design which would work "straight off" with absolute certainty. Every switch means a hitch—sooner or later. The S.T.900 is completely switchless. Other components that have, in my 14 years' experience since S.T.100, given trouble, have been boldly jettisoned without sacrificing the performance. Every component is standard, and no risks as regards deliveries have been taken. I can say with the greatest sense of responsibility that not only does the S.T.900 far excel every earlier set of mine but that everyone is certain to get the superlative performance that this set will give.

John Scott-Taggart

years trying to find out during hundreds of tests of sets in readers' own homes, from Land's End to John o' Groats. A few

things I have learnt—that some constructors like their sets to fit into a coal scuttle, others on the piano with the speaker under the bed, some use window cord as lead-in wires, some like 2-valve sets, others 10 valves. Some want sets to drown their wives; others want them quiet so as not to wake them up.

Wireless papers—I've done it myself—have had thousands of forms filled in by readers saying what sort of set they would like. It has been designed, and those who yelped the loudest have, Pluto-like, given it the sniff-round and then uneasily padded off. Another scheme has been to get most of the leading radio firms together and let them design the ideal set for the constructor. It was like throwing a pound of beef to a pack of hyenas; but let that pass. I think half a dozen sets were built by the public.

Another bright idea has been to get together a Brain Trust—a committee of designers to pool their ideas and launch What the Public Really Wants. The pool was formed, but the receiver sank in it.

The fact of the matter is that it is a waste of time trying to find out what the constructor wants.

He himself does not know. Why should he? The constructor says: "I want all I can get and to pay as little as possible." He is perfectly right. If you buy a dog, you do not bark yourself—except as voluntary exercise perhaps, or if a newspaper canvasser gets past the dog.

When people, then, tell me what you readers want, what you won't stand for, what you'll howl down, I tell them—with as little self-righteousness as possible—that I am paid for thinking independently and designing what I think is a proper solution. It varies from year to year because ether conditions change, because trade conditions alter, because I am learning.

In this field of home construction fourteen years have passed since the flag of S.T.100 was run up; and each year one learns more technically, one observes how manufac-

(Continued overleaf.)

COIL-CHANGING TAKES 5 SECONDS



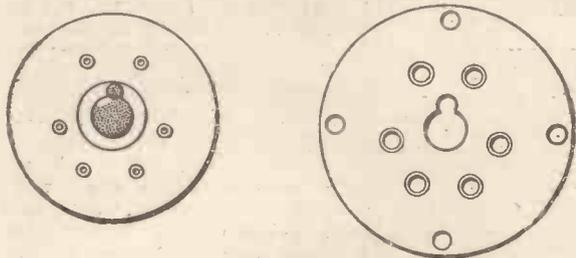
The new self-locating coils used in the S.T.900 are so simple to fit into their holders that this can be done blindfolded with perfect certainty that they can be immediately inserted. Coil-changing takes only a second or two.

(Continued from previous page.)

turers can fail both technically and in delivery of complicated apparatus, switches and so on. One learns what constructors without skill must not be asked to do. One learns how to describe the construction with such precision and such minute detail that any previous constructing experience is unnecessary. Boys of eleven and men of seventy have used my Rapid Guides with success and without any previous experience.

In the S.T.900 I have embodied all this fourteen years' experience from the first arrowhead in the circuit to the last fixing screw in the set. I am going to explain

YOU CAN'T GO WRONG



The base of the coil has an ebonite projecting piece. This is inserted into the centre hole on the coilholder (right), the coil is then rotated slightly until the key slips into position in its slot in the holder. When looking down on the coilholder, the little slot that bulges out from the centre hole should point away from the panel.

every single choice I have made, so that if you have an open mind you can form your own judgment.

When the S.T.900 is being built in its thousands, those who shook their heads will wag their tongues. "He's got away with it again!" There is a very common belief amongst other writers that I exercise a

mysterious magnetic influence over you at this season; that against your better judgment you are mesmerised into ordering kits, sending P.O.'s for components and valves, and otherwise behaving oddly; and that this is not done by kindness (far from it sometimes!) but by word-wizardry—a stringing together of powerful incantations. In a trance-like condition you build the set. Nor do you stop there. You go on doing it year by year. In a period when home construction is losing ground, the number of my sets built is increasing. Last year 13,000 S.T.800's were built. Your friends also fall under the spell. Your own willingness to keep on building my sets is not because you have found they are good sets. That would be far too simple and far too flattering an explanation. It is because repeated hypnotisings have made you highly susceptible. It only needs a few paragraphs of my alleged word-wizardry and you are once more in a trance. That is the theory.

If, therefore, your eyes are beginning to glaze over and your limbs are becoming numb, stop, shake yourself, have a cold bath, go for a walk. I have a great deal to

say about the S.T.900.

With every big set I have designed there has been at least one feature so calculated to upset the digestions of constructors that they could not (it was prophesied) stomach it. In each case the swallowing has been eased by my considered and careful explanations. Actual use of the set has resulted in immediate happy assimilation. So it will be this year.

The readiness to swallow is sometimes put down to the faith of the patient in a competent and experienced doctor. I am grateful for any faith placed in me, but there is no trace of my assuming it. The features of my sets are fully argued out as if to a bunch of sceptical, suspicious, tight-fisted, hard-headed rough-necks, which most of you are. The trusted family physician merely says: "Swallow one of these in water three times a day after meals."

I, at least, explain what it is you have to swallow. This time it is plug-in coils. Last year (S.T.800) it was the short waves—a gold mine which had for years been sold a thousand times over by emotional share-pushers, until the public was sick of the fiddling, finicky sets and prattling talk of overgrown school-boys.

In the S.T.700 it was audio-reaction and the Triple Extractor.

The S.T.600 was an extremely good set. It introduced the Extractor which enabled the set to be worked within 1 mile of a B.B.C. station. Double reaction in an improved form was used. I took a plunge on ganging as a result of listening to readers' wails about one-knob tuning. Lack

of experience on the part of constructors and improper matching of components by manufacturers made me a little sorry for this.

The S.T.500 is a set I prefer to leave out; for once I fell in with a fashion—the Class B vogue. For distant reception (and I admitted it at the time) it was behind the others. For giving great volume it was excellent—but that was no idea of mine. Class B had received such a boost that when they said "It will be a Class B set this year?" I said, "Yea." The S.T.500 was not a provocative set. It was what the public wanted and expected. It was, therefore, the least successful, both as regards numbers built and technical performance. Apparently, the people who build my sets want something their stomach juices can act upon.

The S.T.400 had several features calculated to upset the stomachs of ninety per cent. of constructors of that period. It was a four-valve set—a departure from the magic formulae which for years had declared

300 STATIONS FOR ONLY 55/6d. plus coils.

The S.T.900 without the coils, screws and wire costs 55s. 6d., and you can build it straight off and get the coils as and when you like. To convert the S.T.800 into the S.T.900 costs only 18s. 6d. plus the cost of the extra valve (L210 met. Hivac), which is 3s. 9d. You already have the other valves. Earlier S.T. designs can also be converted cheaply. See how many components you already have. This is the cheapest and best of all the S.T. sets.

that a popular success required three valves. It was smothered in controls and knobs, not to mention presets inside. The coils were open, i.e. unscreened and very simple, a fact which made experts gasp.

The Domination of Fashion

To show I had a very good reason for this removal of the cans then in vogue, I recalled that the Solodyne receiver produced by my laboratories was the first British canned-coil ganged-condenser set, and the first and only one at Olympia in 1925. As the pioneer force behind a type of set that is now commercially very common, I could hardly be accused of being out of date. The coils I chose were, of course, much more efficient than the canned variety, but I was dealing with people dominated by fashion.

Those were the "swallows" of the autumn of 1932. Early in the year was the S.T.300. Here again the chief things the constructor has to swallow were the ridiculously simple and "old-fashioned" coils and the multitude of knobs.

You see, then, that if the idea of plug-in coils is hard to gulp down it is worth considering that all my sets have been unconventional, and that it is the difference that has made for success. I am not seriously worried, but I have to explain why on the

A SALUTE OF 21 MERITS OF S.T.900

- 1** **DOUBLE REACTION:** Produces (as applied to the S.T.900) an increase of sensitivity of as much as 1,000 times. Selectivity is improved enormously. Success of system is especially noticeable on the shorter waves.
- 2** **"X"-REACTION:** An absolutely essential ingredient permitting entirely independent reaction to be applied to the first tuned circuit. Gives the smoothest and most effective reaction ever applied to a popular set.
- 3** **SWITCHES ABOLISHED:** An entirely switchless set. Uncertainty of operation and the inevitable unreliability of complicated (or even simple) switches banished for ever.
- 4** **HIGH-EFFICIENCY PLUG-IN COILS.** Result in larger open-air coils giving much more efficient results, especially on the shorter wavelengths. No dead-end or metal-can losses. Separate reaction for each waveband.
- 5** **NO GANGING.** Ensures accurate tuning for each circuit, resulting in greater sensitivity and selectivity. No skill or special instruments required for ganging which would not remain constant, anyway.
- 6** **STATION-NAME TUNING.** No fiddling or wondering whereabouts you are.
- 7** **HIGH-GEARED REACTION.** Gives very much greater smoothness of reaction and greater selectivity. On the second circuit it reduces the detector "load" and so improves selectivity there for a second reason.
- 8** **LOW COST.** The S.T.900 is the cheapest set of the whole S.T. range, although easily the most efficient. The extra valve is of the cheapest type and the current it takes is utterly negligible.
- 9** **ADJUSTABLE SELECTIVITY.** The selectivity of both circuits is completely adjustable to meet particular circumstances. Future further congestion on any waveband can be handled by the S.T.900. Sets with fixed selectivity start becoming obsolete at once.
- 10** **WORKS OFF MAINS UNITS.** Will work not only off batteries, but also "eliminators." Set is adequately decoupled and designed to give excellent results in such circumstances.
- 21** **DESIGNED BY JOHN SCOTT-TAGGART.** This reason alone will ensure a brilliant success. No one has ever approached the success of this great professional radio engineer, who has lent his talents to help the amateur. Holding the highest professional engineering and physics diplomas obtainable, he has placed his inventive skill, his thoroughness in matters of even the smallest detail, and his fourteen years' experience of the home constructor at the disposal of builders of the S.T.900. Every set since S.T.100 has achieved unparalleled success without one single failure. The reason is that the public have past experience of his designs and have implicit confidence in him. Over 13,000 S.T.800's were built. This number will be far exceeded this year. Start now! Act in Oct!
- 11** **EASILY OPERATED.** Although the number of controls is greater than that of most sets, there are fewer than previous S.T. designs. The operation is vastly simplified by the fact that the extra controls do not affect tuning.
- 12** **HANDSOME APPEARANCE.** This is easily the best-looking set of the S.T. range. The absence of knobs at the top of the panel and the highly plated disc of the main tuning condenser give a very smart appearance.
- 13** **SLOW-MOTION TUNING.** Both aerial balancer and main tuning condenser are of slow-motion type, making them easy to work on the shortest wavelengths while the benefit applies to all wavebands.
- 14** **IDEAL CONVERSION SET.** Owners of the S.T.700 and S.T.800 will find the S.T.900 an extremely cheap set to build, as they already have nearly all the parts. With an insignificant exception, the whole of the parts and valves of the S.T.800 are used except the coil unit.
- 15** **NO DELIVERY DELAYS.** As the coils are so simple and standard no delivery delays should occur. In the past it was usually a complicated coil unit that held up construction. Read manufacturers' unique undertakings.
- 16** **EASILY BUILT.** The Rapid Construction Guide gives every minute detail—even when to have a cup of tea! These Guides have proved enormously popular and have enabled inexperienced constructors (even boys of 11 and men of 70 years) to build sets that work "straight off."
- 17** **IDEAL FOR SHORT WAVES.** The coils, because of their efficiency, are what are used by exacting short-wave experts the world over. The efficient H.F. stage and "X"-reaction inject new life into the short waves. Every one of the five valves does its job perfectly. Metallised panel stops hand capacity.
- 18** **NO WAVELENGTH GAPS.** The S.T.900 is truly all-wave because there are coils which will cover all wavelengths from 9½ to 2,000 metres. Aircraft, police, trawlers, rarely heard broadcasting stations are provided for on the expanding book-case principle.
- 19** **HIGH INDUCTANCE TO CAPACITY RATIO.** A large inductance and small value of tuning condenser results in high efficiency. This is obtainable with overlapping plug-in coil ranges, but not on ordinary coil units.
- 20** **FIVE VALVES.** Five valves in the hands of any competent designer will always give better results than four valves, just as the various S.T. four-valve designs were better than those with three valves. The good big set will always beat the good little set.

S.T.900 such a radical change of attitude has taken place.

The arguments against plug-in coils are :
 (1) They are clearly less convenient than an all-wave switch.
 (2) The idea is old-fashioned.

The first is obvious, and I agree. What is more, the disadvantage is most apparent when you realise that a change to long-wave Droitwich means changing two coils if you have previously been on, say, the Regional. That needs a good deal of swallowing. It stuck in my own throat for five minutes.

"A He-man's Short-wave Outfit"

I think, in fact, that it is this feature that is the only criticism—the change from the medium to the long-wave band. This occurs far more rarely than one imagines on hearing you have to do it! As the medium-wave Nationals are received so excellently on this set, even this change will often not be made at all, except in certain districts. As for other long-wave stations, such as Luxembourg, you will probably be on it for a long stretch of time.

As regards the short waves, the expert knows full well that the way to get results is with these same 6-pin plug-in coils. He knows that switched canned coils are not in the same street as the open plug-in type. In fact, the sales of these coils have been almost exclusively to the short-wave semi-manics who get the other side of the world on one valve. They do it by going "all out" for ultra efficiency. By all that's ironical, it will be this brigade that will cheer me to the echo and admit that I have produced in the S.T.900 a he-man's short-wave outfit. Their chief regret will be that it isn't all done on a breadboard.

There is nothing old-fashioned about these 6-pin coils for short waves. Why?

Because any sensible or experienced person realises that for sheer results there is nothing to touch them.

When you get down to these short wavelengths, efficiency becomes more and more important. On the medium waves and long waves you can make sacrifices for the sake of compactness and ease of operation.

The open unscreened coil went out of fashion because circuits called for screening. Later, multiplicity of coils and contact switching called for small size. The result was the Tom Thumb type of canned coil with its appallingly poor efficiency. Both the small size and the proximity to metal can reduce efficiency greatly, as every coil manufacturer admits.

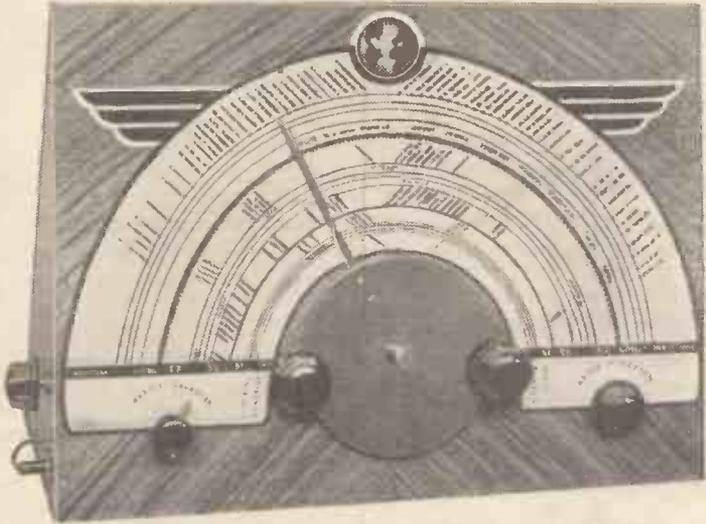
The S.T.900 enables one to abandon this modern coil and go back to the days when coils were coils, not tins. But, of course, this healthy step is only possible on a few circuits. The S.T.900 is one of these. In the S.T.900 you have only two super-efficient tuned circuits in place of several flatly tuned ones. The latter call for small, inefficient canned coils and

extremely complex, inefficient and unreliable switching. Sheer lack of space in the set, fear of interaction, and the craze for simple wave-changing would alone compel this folly.

Not one of these reasons hampers me. There are only two coils, there is plenty of room, and the lay-out and circuit admit no trace of instability although the coils are not canned.

In other words, in this particular circuit there is no need to use small canned coils.
 (Continued overleaf.)

THE S.T.900 AS YOU'LL BUILD IT



On the panel there are four controls, which from left to right are : Aerial Balancer, "X"-Reaction, Main Tuning and Anode Reaction. The knob on the left of the set is the Aerial Coupler, and to the side of it the plug and sockets for selectivity adjustment can be seen. With the plug in the lower socket normal selectivity is obtained; when in the upper socket ultra-selectivity is realised. The "on-off" plug and socket are on the right. The S.T.900 needs no extra cabinet.

(Continued from previous page.)

because the circumstances that drove us to those coils no longer apply. So why keep to inefficiency? Well, the only reply is: for the sake of simple switching.

Designers are prepared to suffer inefficiency, unreliability and a host of other troubles to provide you—or rather Aunt Jemima—with a switch that gives you “All-wave” (probably only three bands in all), whereupon she listens to the fat stock prices from the B.B.C.

I did it myself last year on the S.T.800. The reason is the same. I used four valves and was prepared to lose something in the way of efficiency. On the S.T.900 I refuse

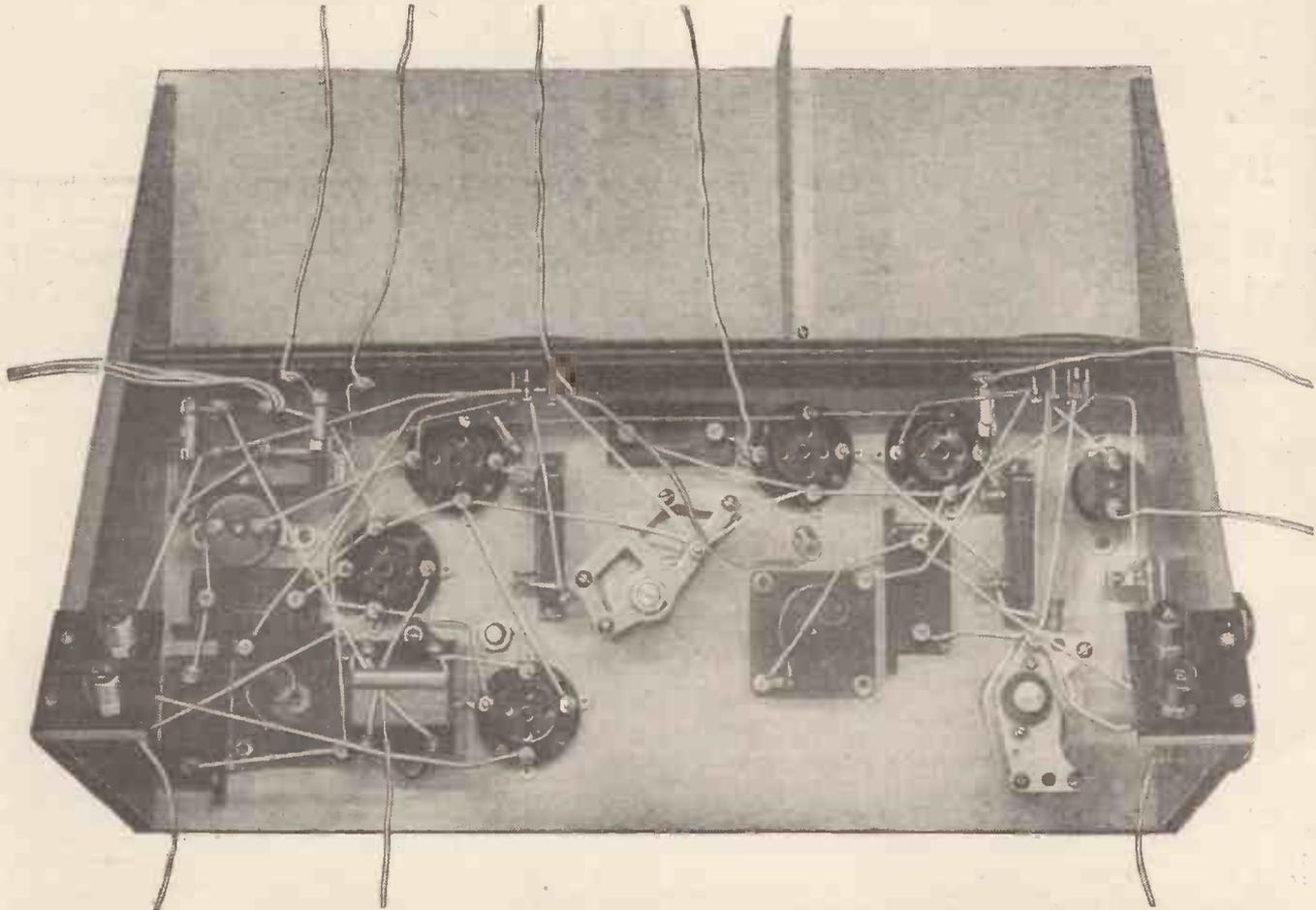
unnecessary, and so the evil is removed. But here is another point. The canned Tom Thumb coil is made even more inefficient by the switching. Even good open-air coils like those of the S.T.400 lose considerable efficiency by the fact that there is a form of “dead-end” effect. This expressive technical term means that when you switch from long-wave to medium you short-circuit the long-wave winding. The shorted long-wave coil remains, however, in the “field” of the used medium-wave inductance. In other words, as wireless signals in the form of radio-frequency currents flow through the medium-wave coil they set up a magnetic field of varying strength. If another coil is placed close you will get

five bands were used it would mean on the S.T.900 having ten coils in one set—a hopeless proposition apart from the difficulties and disadvantages of switching. In a commercial receiver you might easily need twenty canned coils.

By using plug-in coils all dead-end losses are eliminated. The whole of the coil, and nothing but the desired coil is used in every case. The coils are large and efficient, there are no cans to cause losses, there are no dead-end losses and no switching troubles.

In return for all this, you do sacrifice a little much-exaggerated convenience. I would use the plug-in coils if only one-tenth of the actual advantages were obtained. How much more eager am I to cut out, at

THE CHEAPEST YET MOST EFFICIENT SET OF THE “S.T.” RANGE



Although inexpensiveness and efficiency are outstanding features of the S.T.900, it is also amazingly simple to build, and as this photograph of the completed receiver shows, the wiring is entirely straightforward. Components are mounted on the metalised panel, but the two coil holders are on the platform.

to lose anything in efficiency. That's the difference. On every waveband—even without the new aerial reaction scheme of the S.T.900—the efficiency is obviously much higher. The results on short waves are startlingly better.

For anyone to talk of plug-in coils being old-fashioned is vapid nonsense. The modern small canned coil from a scientific point of view is to a good-sized open-air coil what a canned tomato is to a real one. I assure you that if you wind a few yards of bell wire round a 3-in. cardboard tube you will get a vastly better coil than you will find in a shopful of canned coils. Ask the National Physical Laboratory if you wish.

The canned coil is a necessary evil in almost every set. In the S.T.900 it is

appreciable currents in the other coil. This is what happens in a “transformer”; for example, current in the aerial coil produces a current in a tuned-grid circuit.

But in a short-circuited coil (a type used, by the way, in all my previous sets—and everyone else's) the currents set up in the unused part of the coil are not used. They mean loss of efficiency. They harm the main current and reduce it where it is actually wanted. Any metal work, e.g. cans and switching, near an inductance coil will lower its efficiency and reduce the currents in it. So will unused portions of coils.

The only solution would be to have a separate coil for each waveband and then to switch from one coil to the other. If

one fell swoop, all these losses and sources of trouble and inefficiency.

Tests on coil-changing show that ten complete changes of both coils took an average of five seconds for each change. That means that for five or ten seconds of trouble an evening you are given a set whose performance is really superlative, partly because of the circuit and design, and partly because of plug-in open-air coils of respectable size.

I speak only for the S.T.900. I quite agree that for most sets such coils would simply not work. If I have been guilty of using canned coils, remember that I have only done it on one all-wave set (last year's S.T.800) and that on others the loss of

(Continued on next page.)

(Continued from previous page.)

efficiency would not be so marked as when you come down to the short waves.

The absence of canning undoubtedly accounted for some of the success of the S.T.400 in practice. If you agree, then, you will readily admit the merits of the coils for the S.T.900.

How vastly greater the merits of the plug-in open-air coil become as you go down in wavelength where all losses rise rapidly unless countered, may well be imagined.

In the S.T.900 I have the courage to urge you to do the right and the best thing. Without full explanations it might have been a risky step. To those who have handled the set, it seems to be so obviously the right thing to have done that these lengthy explanations seem ridiculously superfluous.

The description "plug-in coil" has an old-fashioned ring about it, because it is associated with sets which would be regarded now as very third-rate. Call plug-in coils "interchangeable inductance units"—which is all they are—and you will find them in all the finest scientific measuring instruments of the day; you will find them in the most modern long-range radio telegraph and telephone stations. And of course, every real short-wave enthusiast knows that they are the only things to use for modern reception. The S.T.900 will, I am sure, add more laurels to this kind of coil.

How far we have sold our souls for compactness, convenience and cheap mass production may be gathered from the remark of a young elegant salesman at a radio exhibition recently. In response to a query of mine he said: "Low-loss? Oh, that! Oh, that went out years ago."

Well, for one section of the public it has come back. You'll find it in the S.T.900.

There is a complete difference between the public who buy a ready-made set and those who are home constructors. The first type can definitely not be bothered to make the slightest changes. The home constructor, however, is essentially one who should be provided with a receiver where his interest and skill (which need only be that of any average intelligent person) can be used. Otherwise sets for the home constructor are merely copies of the commercial article, and quite frequently poor copies at that.

In the earlier days of broadcasting, when sets were expensive, home construction appealed largely to those who wanted to make a set because that was the cheapest way of getting one. That position has now been altered and on a mains receiver, at any rate, it has become quite impossible for I, or any other designer, to produce a design which is as cheap as those ready-

made on the market to-day. Home-constructed designs should, therefore, be of a kind which provides some new feature or system or other merit which is lacking in the commercial article. No one admits more readily than I that the S.T.900 would not appeal to dithery old spinsters and those to whom a radio set is little more than a piece of furniture.

If you or I were given the job of competing with the dithery spinster in operating a commercial set our knowledge and experience would be wasted and we should be unable to get any better results than she could. The obvious thing to do is to build a set which, by the addition of extra controls or by requiring a little extra trouble, will give results which will leave the standard set miles behind.

The average commercial battery receiver is a pretty poor piece of work, and there is very little difficulty in excelling the performance given by such receivers. *The policy of trying to give maximum performance and simultaneously designing down to the lowest intelligence and the most dithery hand simply will not work.* My own set has always been designed to give an extra something which depends upon the constructor's willingness to take a little extra trouble. This policy has produced the most excellent results. Those constructors who have previously rallied to the

PICK YOUR COUNTRY AND TUNE IT IN!



With its "X"-reaction and no-gap waverange, there is not a country on the globe that does not come within the scope of the S.T.900. Never was the term "World-Wide Reception" more truly upheld in either commercial or home-constructor design.

banner of my policy will do so in the case of the S.T.900. The small minority who desire extreme simplicity and convenience have no true interest in the art of radio. They may read wireless journals but their instincts are identical with those of the dithery spinster and, in crying out for an imitation of the commercial type of set, they are branding themselves merely as ordinary members of the public who look upon a wireless set as a musical box. They will find that they can satisfy their needs by buying a commercial receiver instead of trying to build an imitation of one.

I believe that by now the foppish element in home construction has died a natural death. I have no complaint to make against the person who tires of radio construction as a hobby or the man who has no time; these people are perfectly justified but they are certainly not entitled to try to queer the pitch of those genuine

constructors who delight in producing a working model with their own hands and are thrilled at the very much better results they can obtain from it than their next-door neighbour, who may have a considerably more expensive commercial product.

There is not a single one of my big sets from the S.T.100 to the S.T.800 which would make an immediate appeal to the ordinary man-in-the-street. Year after year these sets, as everyone knows, have embodied my theory that special receivers should be designed for the constructor; the correctness of this policy has been borne out by actual results. If I designed a receiver which had one tuning knob it would be a failure. Every constructor with a ha'porth of experience knows that the simpler the set is to operate the more compromises have had to be made. In order to achieve "simplicity," efficiency is thrown away on every side.

In only one receiver out of seven have I risked ganging, and in that case there were undoubtedly many receivers which did not give the results I could get on my own. It warned me once for all that a ganged condenser set, even with a trimmer in front, was too great a risk.

If this is so in the case of medium- and long-wave bands, you can imagine that it becomes very much more difficult as one gets down to the short wavelengths, where slight changes in capacity and inductance will make tremendous differences in tuning.

As every constructor by now knows, you cannot approach the efficiency given by separate tuning condensers, and I need not pursue this subject, but at one time I had most vigorously to defend these sets, though they embodied an obviously correct policy. Within a month of these words appearing, the merits of highly efficient plug-in coils will be so emphatically demonstrated that my lengthy arguments in favour of them will seem to have been

ludicrously unnecessary.

So far I have emphasised that the open-air plug-in coil of high efficiency is better than the midget coils—cribbed, cabined and confined in their metal shrouds. Switching, I have condemned as causing coil losses through unused portions of a coil acting as a millstone hanging round the neck of the active or useful portion of the inductance. But switches are vicious things for quite different reasons. In the first place no one has yet designed anything approaching a perfect switch for radio work.

I read recently in a trade paper that one commercial receiver out of three goes faulty within six months on account of switch trouble, while a very large number are faulty on this account when first connected up. Even in the case of such a straightforward switch as that used on the S.T.400, trouble arose through dirty contacts. This could easily be discovered and could be put

(Please turn to page 205.)

"X" REACTION

A striking feature of the S.T.900 which is largely responsible for placing this set so far ahead of current practice and previous S.T. sets



primitive form in the S.T.400, and then more effectively in the S.T.600. I have now found that it gives amazingly good results on the short wavelengths, and it is therefore introduced in an entirely new way in the S.T.900.

The reaction system of the S.T.900 includes the following features:

1. Double reaction, with a resultant increase in selectivity and sensitivity.
2. The application of reaction by an entirely separate three-electrode valve connected to the first tuned circuit.
3. The use of high-geared reaction, and the operation of the special reaction valve in a particular way.

In a separate article I shall deal with the question of the merits of double reaction. The S.T.400 used double reaction, but I am very doubtful if many constructors ever worked it properly. There was a distributing control which made it impossible to get proper individual adjustments of the two doses of reaction.

In fact, the S.T.400 suffered from the very serious disadvantage that every control affected every other and (what was equally bad) all the controls affected wavelength.

The operation of the S.T.900 is child's play compared with the S.T.400, because the controls do not affect wavelength (otherwise a station-name dial would be impossible)

and each reaction is separately adjustable and has no effect on the other reaction.

In the S.T.600 receiver the aerial reaction was obtained from the screen of the high-frequency amplifying valve. This system was a great improvement on the S.T.400, and from the point of view of selectivity and sensitivity the S.T.600 was better than both the S.T.700 and S.T.800, although these were later sets. I had a great deal of experience with the S.T.600 in different parts of the country, and almost miraculous effects were obtained with the aerial reaction. The S.T.700 did not incorporate aerial reaction because audio reaction was introduced. When a constructor wrote asking me why the S.T.700 did not employ double reaction I replied that there was a limit to the number of special features one could incorporate in a single set and that I was designing receivers, not Christmas-trees. Last year's set, the S.T.800, was a four-valve all-wave set using high-frequency amplification and an all-wave coil unit which was a novel feature in home construction. There was enough here to give any constructor something to think about, and the introduction of aerial reaction would not in my opinion have been practicable with a built-in coil unit of this kind. Switching alone would have stopped such ideas.

Striking Merits On Short Waves

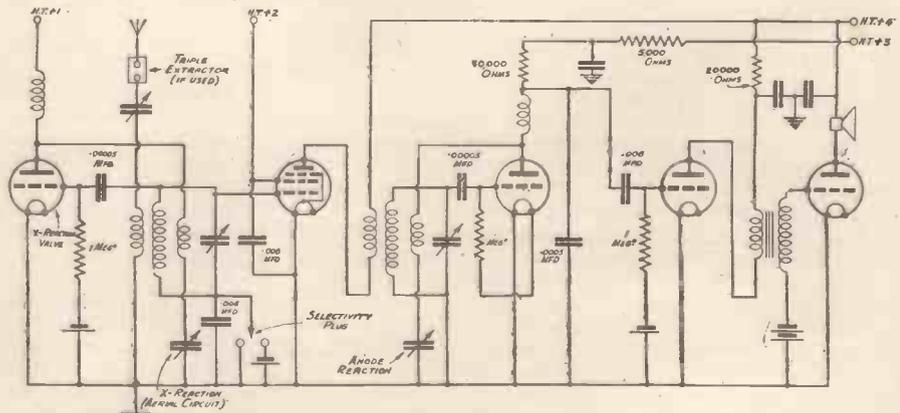
The use of plug-in coils permits the carrying out of an ardent and a long-cherished desire to reintroduce double reaction. Its merits on the short waves are

(Continued on next page.)

THE most striking feature of the S.T.900 is what I have called "X"-Reaction. The extraordinary selectivity and sensitivity of the S.T.900 is due largely to the application to all wavelengths of double-reaction in which the reaction on the first circuit is obtained by means of an entirely independent valve, operated so as to give very smooth, high-geared reaction.

The application of reaction twice over and in this special manner puts the S.T.900 in a class which is quite unique. Last year's set, the S.T.800, although an excellent receiver, is certainly not a patch on the S.T.900 for either selectivity or sensitivity, and owners should most certainly convert. Double reaction is not a newcomer to my sets, since it was employed in a very

THE S.T.900 CIRCUIT SIMPLIFIED



The features of the set are easily picked out on this simplified circuit of the S.T.900. Note the connections to the valve which makes possible the "X"-reaction. Double reaction is used.

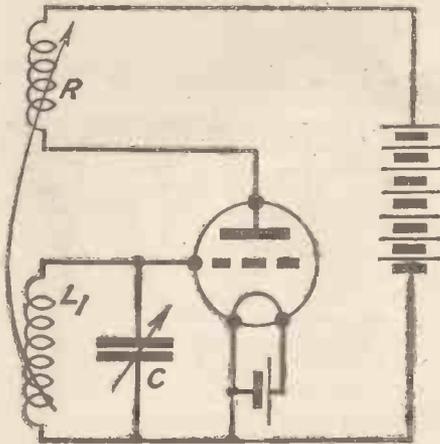


Fig. 1. A simple method of applying reaction to the tuned circuit L_1 - C , the arrow through the coils indicates variable coupling.

(Continued from previous page.)

even more striking than on the more common wavebands, and I am inclined to regard it as an essential feature for really good results.

The use of an external valve for applying the aerial reaction results in several outstanding advantages which have not been obtained on any previous set using double reaction. One merit is that the reaction is always most beautifully smooth and controlled. The second is that the reaction is always certain and entirely independent of the high-frequency pentode which carries out the job of amplifying the incoming high-frequency currents.

In the S.T.600 I made this pentode also provide the aerial reaction by making use of the screen grid, which, of course, is a sort of openwork anode inside the valve. This arrangement as used in the S.T.600 had the following disadvantages:

1. The oscillating potentials on the screen affect to some extent the operation of the valve as a straightforward high-frequency amplifier.
2. The screen current and the amount of reaction obtainable from it are liable to vary considerably with different samples of any make of valves, and so there was some risk of inadequate aerial reaction if the valves were not quite up to standard.
3. The screening (inside the valve) between the two tuned circuits was insufficient, and so reaction on the aerial circuit was not totally independent of reaction on the second tuned circuit.
4. Maximum selectivity was obtained in the S.T.600 when the negative bias on the control grid of the H.F. pentode was greatest. This made aerial reaction impossible.

A Screen-Current Effect

Under these conditions, aerial reaction could not be obtained at all because the screen current was reduced at the same time as the anode current. Consequently, aerial reaction could not be obtained when the bias exceeded a certain small amount. In other words, when you wanted maximum selectivity and applied a good negative bias to the grid of the first valve you automatically stopped the aerial

reaction at a time when you would need it most for selectivity.

This last disadvantage was certainly the greatest because you could only get double reaction when you least wanted it (except perhaps for sensitivity-boosting). When you had a very difficult problem of separating stations, you would naturally increase the negative bias of the first valve; this, unfortunately, cut off the supply of current to the screen grid and so prevented aerial reaction being obtained.

Overcoming a Difficulty

By having an entirely separate valve this trouble is immediately overcome. You can get all the reaction you want with the external triode valve under all possible conditions. When you want maximum selectivity on the second tuned circuit, you apply a considerable negative bias to the grid of the first valve. If reaction to the second circuit is then applied by the ordinary reaction knob, great selectivity will be produced in that circuit. At the

THE TRIPLE EXTRACTOR

This device is connected between the aerial lead and the aerial terminal of the S.T.700, S.T.800 or S.T.900. It enables two medium wave B.B.C. and Droitwich to be cut out or reduced and the S.T.900 will work up to 1 mile of a B.B.C. station if the Triple Extractor is used. It is only for those normally swamped. The S.T.900 needs it less than any previous set. Most constructors will not need it and it should not be built or bought unless found necessary.

Details of the standard model have been published several times. This year's version is much cheaper and easier to build but otherwise is the same, except that Bournemouth and Plymouth readers who are very close to their stations should keep to the standard model as it tunes lower. J.S.T.

same time, great selectivity is obtained on the first tuned circuit by means of the external valve reaction system.

The screen of the H.F. pentode is not used for reaction, and so the valve works in a perfectly normal manner as a radio-frequency amplifier. The screen grid, more-

A SEPARATE REACTION VALVE

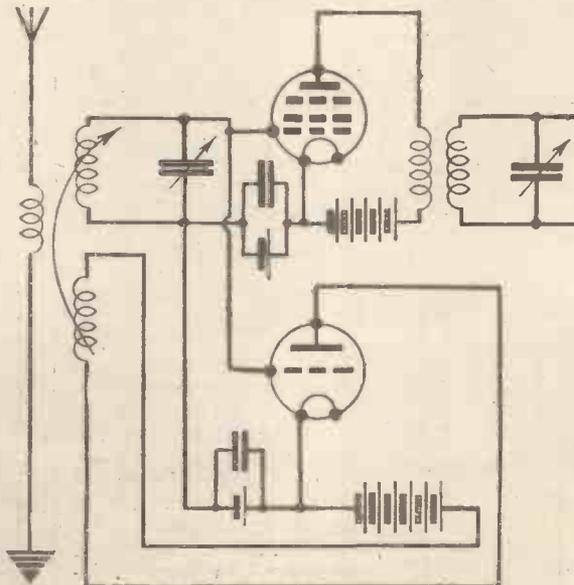


Fig. 3. How reaction can be applied by a separate valve to the grid circuit of an H.F. valve. Note that the pentode is not being used for detection.

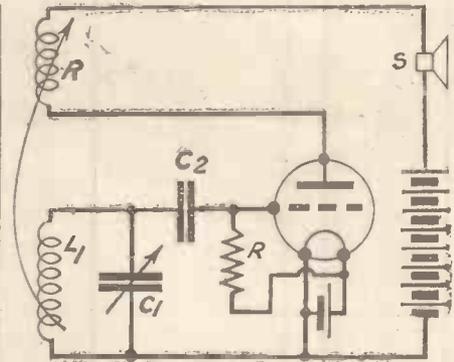


Fig. 2. In this circuit the valve is detecting as well as supplying reaction to the tuned circuit.

over, acts as a screen between the first tuned circuit and the second, and the S.T.900 is remarkable for the absence of any spurious effects between the two circuits. In all previous systems there has been a tendency for an increase in reaction in one circuit to spread over to the other circuit. This makes for some difficulty in operation and also prevents the reaction being built up to the most critical point in both circuits. What used to happen was that if you increased the reaction on the second circuit to a critical point and then brought up the reaction on the aerial circuit the set would go into oscillation. The ideal, of course, is for each circuit to be quite independently provided with reaction. In this way it is possible to make each circuit tune very sharply indeed without affecting the other circuit.

The above criticisms against my own previous circuits may sound odd. But later developments usually throw into the limelight the defects of previous efforts. This does not mean that those methods were not good and a big step forward in themselves. It simply means that defects which were then apparently unavoidable have now been overcome.

Although the "X"-valve (as we may conveniently call it) for providing "X"-reaction contributes so greatly to the success of the S.T.900, it is not in the fundamental chain. You could therefore pull the valve out of its valve holder and the S.T.900 will still act as an all-wave receiver of high efficiency. Even so, it would be a better set than the S.T.800 because of the extra efficiency obtainable through the coils and the absence of switching. The insertion of the "X"-valve in its holder and the use of the "X"-reaction on the first tuned circuit (sometimes called the aerial circuit because it is closely associated with the aerial) will add enormously to the selectivity and sensitivity of the set. Signals which are entirely inaudible even with maximum ordinary reaction and the use of the four valves will come up to full loudspeaker strength as the aerial reaction, i.e. the "X"-reaction, is brought into action.

Proof of Sensitivity

The sensitivity may be proved immediately by disconnecting the ordinary aerial and the use of the most insignificant bits of wire connected to the aerial terminal, or even

(Continued overleaf.)

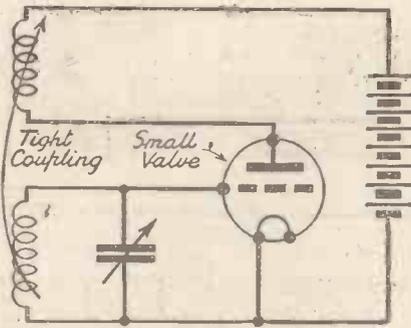


Fig. 4. Illustrating, in conjunction with Fig. 5, how the degree of reaction coupling required varies with the valve.

(Continued from previous page.)

the omission of any wire at all. In the ordinary way this might cut off signals entirely, but as the "X"-reaction is brought into play the set behaves in an entirely new and lively manner and signals ordinarily inaudible are heard to fill the room.

Since the "X"-reaction valve is not part of the main chain, of valves it does not tend in any way to produce instability. The S.T.900 is, in fact, the most stable receiver I have ever come across. The reason is largely because the plug-in coil system cuts out all the interaction which may arise through wires going to neighbouring points on a coil unit and the interaction produced inside the coil unit by wires passing near to each other and going to the switch.

An External Boost

You can regard the "X"-reaction valve as an external boosting device which not only increases signal strength but enables one to cut down the input from the aerial and thereby to reduce the damping of the first tuned circuit, the selectivity of which is very greatly increased by the reaction applied to it by the "X"-reaction valve.

There is no doubt that the best selectivity is obtained when both tuned circuits are almost free of both the aerial and the anode circuit of the H.F. pentode. Naturally, under these conditions the two tuned circuits can oscillate most freely, but signals would normally be very weak indeed. By the application of reaction to each

circuit independently, signal strength is built up to the full while the selectivity remains very high.

Since the "X"-valve is not part of the chain, it need not be a sensitive valve in the ordinary sense of the word; it is only fair to say that many kinds of triode can be plugged in this position, but the choice of the valve has nothing to do with being a good detector or a good high-frequency amplifier or anything of that sort; it is chosen solely for its ability to give extremely good and smooth reaction.

Advantage of Independent Valve

Since the valve has the sole purpose of applying reaction to the first tuned circuit of the set, we can concentrate on making that reaction as perfect as possible. This cannot be done with any ordinary detecting valve which is being made to provide reaction.

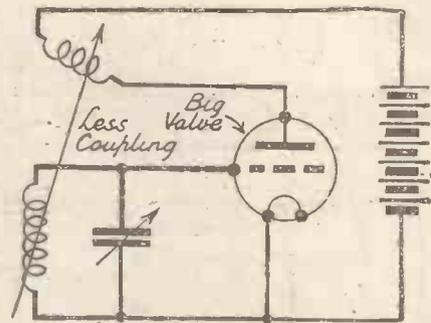


Fig. 5. In this diagram the converse conditions of those depicted in Fig. 4 are shown.

frequency amplification followed ultimately by a loudspeaker.

This idea of using a valve both as a detector and for reaction was remarkably ingenious in 1913. So much so that to this very day it is almost universally used in all straight circuits. It has been used in all my important Press sets, and since two functions are performed by one valve it is a most economical arrangement. Even in this S.T.900 it is still used as a means of introducing reaction on the second tuned circuit.

Concerning Smooth Control

It is quite safe to say that a detector valve is not chosen because of its value as a reaction valve. The conditions for obtaining rectification are not the conditions ideal for obtaining good smooth reaction. Generally speaking, a valve bursts into oscillation long before critical reaction could be obtained. In order to make reaction smoother, a common device is to reduce the high-tension voltage. Whatever else this may do, it at least has the advantage that when you do oscillate

the oscillations are not so powerful, and this gives frequently an illusion that the reaction is much better. A reduction of the anode voltage, however, generally results in a reduction of the signal strength, especially if the valve is coupled to the next by means of a resistance.

When leaky grid rectification is obtained, the valve is in anything but the ideal (Please turn to page 182.)



The amazing demonstrations, given within one mile of the Brookmans Park stations, proved the extraordinary effectiveness of the Triple Extractor. It enabled over 50 stations to be received, with the B.B.C. blazing away across the fields. The demonstrations were given in the joinery workshop of Shadbolt and Nash, illustrated above; where Mr. Scott-Taggart began his work on extractors three years ago.

Fig. 1 shows a simple tuned circuit, L,C, connected across the grid and filament of a triode valve. Reaction may be introduced into this tuned circuit by coupling a coil in the anode circuit to the coil in the grid circuit. An arrow is shown across the two coils to indicate that the coupling between them may be varied; in the old days we actually swung the reaction coil nearer to or away from the other coil, and for the purpose of the following explanations you can imagine that this, or for that matter, any other method of varying reaction is employed; it does not make any difference to the argument.

In Fig. 2 the valve is now being used not only to introduce reaction into the tuned circuit but for detecting, a grid condenser and leak being provided. A loudspeaker or telephone is included in the anode circuit of the valve. In practice, instead of a loudspeaker one would connect the input side of further stages of low-

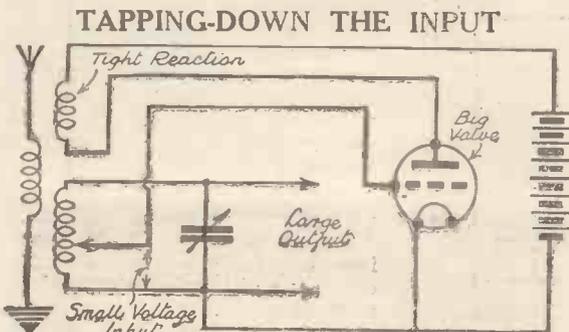


Fig. 6. How the input to a valve used for producing reaction only may be adjusted by means of a coil tapping.

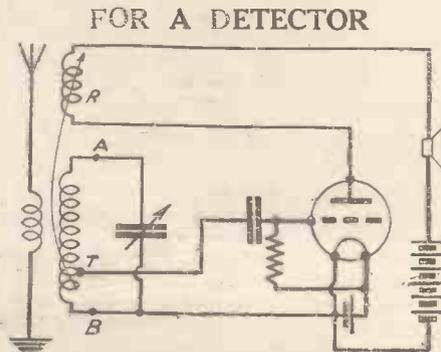


Fig. 7. The tapping scheme of Fig. 6 may be applied to a detector valve in the way shown in this diagram.

The DESIGNER'S
CHOICE

S.T.900



ONE-SHOT

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Self-Locating



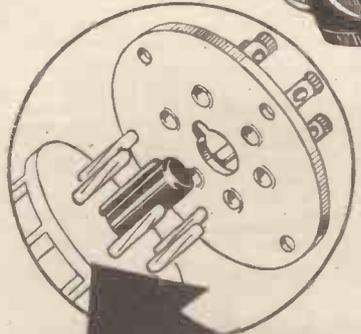
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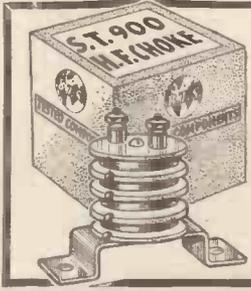
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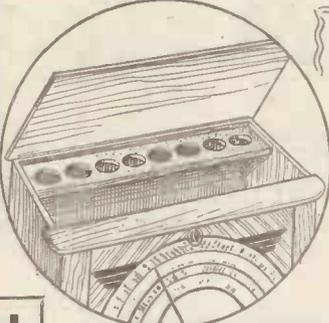
This is indeed a superb example of Peto-Scott craftsmanship, and is undoubtedly the ideal cabinet for Mr. John Scott-Taggart's S.T.900. The illustration conveys but a poor impression of this beautiful piece of furniture. Its modern design and magnificently contrasted walnut veneers together create an atmosphere of luxury that is usually only associated with cabinets selling at double the price. The lift-up lid provides ready access to the interior of the set, thereby facilitating coil changing. Felt-covered rack inside the cabinet provides accommodation for the spare coils. Dimensions: 35½ ins. high, 20½ ins. wide, 12 ins. deep. £3 3s. 0d. (Carr. & Packing 3/6d. extra). Or Deposit 7/6d. and 11 monthly payments of 6/-. Loudspeaker baffle baseboard assembly, with side supports and ready drilled for 8-in. speaker, all to fit into bottom compartment, 3/6d. extra.

2 FINISHED INSTRUMENT

All S.T.900 finished receivers are built by Peto-Scott's expert technicians exactly to Mr. Scott-Taggart's first specification. A full-size celluloid dial places the finishing touch on an extremely attractive receiver. Each component is rigidly tested before assembly, and the assembled receiver is finally tested on actual broadcasting on all wave-bands. The Console Model illustrated is supplied with aerial coupler control extended to operate outside cabinet. Complete with set of first specified valves and 10 B.T.S. One-Shot Inductors covering Long, Medium and 3 Short-Wave bands; also Peto-Scott Type No. 210 P.M. Moving-Coil Speaker housed in Peto-Scott walnut-finished Console Cabinet illustrated, less batteries. CASH PRICE, Carr. Paid, £11 15s. 0d. Or Deposit 27/6 and 11 monthly payments of 22/-.

7/6
DOWN

27/6
DOWN



★ NOTE THIS USEFUL FEATURE OF PETO-SCOTT S.T.900 CONSOLE and CONSOLETTA CABINETS!
Conveniently situated immediately beneath the lift-up lid of the Peto-Scott S.T.900 Console and Consolette cabinets is a shelf for the insertion of 8 spare coils when not in use (see illustration on left). Peto-Scott are first with this advantageous feature, which keeps your S.T.900 coils always ready to hand.

Peto-Scott Noise-Suppressing ALL-WAVE AERIAL

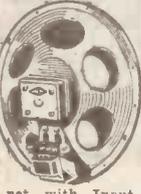
7 The first economical solution to over-coming noise of man-made static. Increases signal strength on all bands. Improves selectivity. Waterproof and Weatherproof. Two transformers. Outfit comprises Duplex lacquered aerials, insulators, waterproof "leak" wire, aerial and set transformers, with instructions for erection. Cash or O.O.D. 17/6, or 8 monthly payments of 2/6.



2/6
DOWN

Peto-Scott Permanent Magnet MOVING-COIL SPEAKERS

8 Type No. 210. After extensive tests carried out in conjunction with an S.T.900 built exactly to Mr. J. Scott-Taggart's specification, we have no hesitation in recommending this speaker as the finest possible value for money, with technical characteristics that set a new standard in high-fidelity reproduction from low-priced speakers. 8" cone diameter, heavy special alloy steel magnet with input transformer tapped for Power, Super Power, and Pentode output. Supplied complete with transformer. CASH PRICE, £1:1:0. List Value 32/6. Or 2/6 deposit and 11 monthly payments of 2/-.



2/6
DOWN



S.T.900 BATTERY VERSION CONSOLETTA MODEL

3 CABINET ONLY

Again Peto-Scott produce just the right Consolette for Mr. John Scott-Taggart's latest success. Constructed throughout of the finest laminated ply, with walnut veneered front and rounded sides. Quarter round cross-banded moulded surround conceals the panel fixing screws. The lift-up lid provides ready access to the interior of the set, thereby facilitating coil changing, and a felt-covered rack inside the cabinet provides accommodation for the spare coils. Supplied complete with battery shelf, speaker baffle, extension spindle and mache-covered speaker opening. Dimensions: 19 ins. wide x 23 ins. high x 13 ins. deep. 39/6d. (Carr. & Packing 2/6d. extra.) Or deposit 5/- and 8 monthly payments of 5/3d.

5/-
DOWN

4 FINISHED INSTRUMENT

Built exactly to Mr. J. Scott-Taggart's specification by Peto-Scott's expert technicians. Supplied with celluloid dial and aerial coupler control extended to operate outside cabinet. Complete with set of first specified valves and 10 B.T.S. One-Shot Inductors covering Long, Medium and 3 Short-Wave bands; also Peto-Scott Type No. 210 P.M. Moving-Coil Speaker, housed in Peto-Scott walnut-finished lift-up lid Consolette cabinet, as illustrated, less batteries. CASH PRICE, Carr. Paid, £10 10s. 0d. Or Deposit 21/- and 11 monthly payments of 19/9d.

21/-
DOWN

S.T.900 BATTERY VERSION TABLE MODEL

5 CABINET ONLY

Modern design Cabinet with fixed lid. Sloping front. The bold cross-banded moulding effectively sets off the handsome panel. Constructed of carefully selected laminated wood, stained and hand French polished, and supplied with extension spindle for the aerial coupler. 18½ ins. wide x 14½ ins. high x 12 ins. deep. 19/6 (Carr. & Packing 2/6 extra.) Or 2/6 down and 5 monthly payments of 4/-.



2/6
DOWN

6 FINISHED INSTRUMENT

Built exactly to Mr. J. Scott-Taggart's specification. Supplied with celluloid dial, and set of first specified valves, 10 B.T.S. One-Shot Inductors in Peto-Scott table cabinet with fixed lid, as illustrated, less batteries. CASH PRICE, Carr. Pd., £8 5s. 0d. or Deposit 16/- and 11 monthly payments of 15/9d.

16/-
DOWN

A.C. MAINS S.T.900

9 KIT "A." Complete Kit as first specified, including S.T.900 Auto-Dial Card, 10 B.T.S. One-Shot Inductors, less valves, cabinet, speaker, Extractor kit. Cash Price, Carr. Pd., £10/18/6, or 21/- down and 11 monthly payments of 20/6.

10 KIT "B." As Kit "A." but with 4 specified valves. Cash Price, Carr. Pd., £13/7/0, or 25/- down and 11 monthly payments of 25/3.

11 KIT "C." As Kit "B." but with specified Peto-Scott A.O. S.T.900 Console cabinet, less speaker. Cash Price, Carr. Pd., £19/13/6, or 30/- down and 11 monthly payments of 30/-.

DEMONSTRATIONS daily at 77, City Road, London, E.C.1 (Glissold 9875); 62, High Holborn, London, W.C.1 (Holborn 3248).

THE OPPOSITE PAGE is an ORDER FORM—FILL IN—TEAR OUT—and POST

1000 S.T.900 KITS IN STOCK!

FREE! Guaranteed Exact to Mr. John Scott-Taggart's First Specification
 WITH EVERY KIT! MR JOHN SCOTT-TAGGART'S FULL-SIZE S.T.900 "AUTO-DIAL" CARD

KIT "A" less Coils, Konectakit, Valves and Cabinet

Cash Price

55/6d. OR **5/-** down

KIT "A" LIST OF PARTS

SPECIAL PILOT AUTHOR KITS FREE OFFER!

Every Complete Pilot Author Kit is accompanied by Mr. John Scott-Taggart's Full-size S.T.900 "Auto-Dial" Card—entirely free and includes a set of matched walnut knobs.

<input type="checkbox"/>	1 J.B. '0005-mfd. main tuning condenser with drive and 1 1/2 in. knob	s. d.	6 6
<input type="checkbox"/>	1 POLAR '0005-mfd. aerial balancer with 1 1/2 in. knob to match anode reaction		5 6
<input type="checkbox"/>	2 B.T.S. 6-pin coil holders, Type "O" (self locating)		2 0
<input type="checkbox"/>	1 GRAHAM-FARISH '0005-mfd. aerial coupler condenser with 1 1/2 in. knob		2 0
<input type="checkbox"/>	1 GRAHAM-FARISH '0005-mfd. aerial reaction condenser with 1 1/2 in. knob to match J. B. Main Tuning knob		2 0
<input type="checkbox"/>	1 GRAHAM-FARISH '0005-mfd. anode reaction condenser with 1 1/2 in. knob		2 0
<input type="checkbox"/>	1 T.M.C. Block condenser Type B1007		4 0
<input type="checkbox"/>	3 LISSEN '006 fixed condensers		3 0
<input type="checkbox"/>	1 LISSEN '0005 fixed condenser		1 0
<input type="checkbox"/>	2 LISSEN '0005 mfd. fixed condensers		1 0
<input type="checkbox"/>	1 T.M.C. '0002-mfd. tubular condenser		1 6
<input type="checkbox"/>	3 DUBILIER 1-meg. 3-watt resistors		1 6
<input type="checkbox"/>	1 DUBILIER 30,000-ohm. 3-watt resistor		6 6
<input type="checkbox"/>	1 DUBILIER 20,000-ohm. 3-watt resistor		6 6
<input type="checkbox"/>	1 DUBILIER 5,000-ohm. 3-watt resistor		6 6
<input type="checkbox"/>	2 B.T.S. All-Wave H.F. Chokes		3 6
<input type="checkbox"/>	1 VARLEY "NICLET" 3-5/11		7 6
<input type="checkbox"/>	5 W.B. 4-pin valve holders with terminals		3 4
<input type="checkbox"/>	4 BELLING & LEE Type "R" terminals		1 2
<input type="checkbox"/>	3 CLIX parallel sockets, type No. 8		3 3
<input type="checkbox"/>	2 CLIX master wander plugs, type No. 5		3 3
<input type="checkbox"/>	1 PETO-SCOTT polished wood panel (Metalex reverse), 16 in. x 12 in. x 3/4 in.		3 9
<input type="checkbox"/>	2 PETO-SCOTT polished side pieces		1 6
<input type="checkbox"/>	2 PETO-SCOTT terminal strips		6 6
<input type="checkbox"/>	1 PETO-SCOTT wood platform, ready drilled, stained and polished		1 0
<input type="checkbox"/>	1 PETO-SCOTT aluminium screen		6 6
<input type="checkbox"/>	1 S.T.900 Copyright Auto-Dial Card	Gratis	

KIT "A" CASH PRICE, Carr. Paid £2.15/6

OPTIONAL EXTRAS

<input type="checkbox"/>	10 BELLING & LEE wander plugs	s. d.	1 8
<input type="checkbox"/>	2 BELLING & LEE accumulator connectors (Type 1031)		1 0

B.T.S. ONE-SHOT INDUCTORS

<input type="checkbox"/>	Type 9/M.W. (190 to 550 metres) per pair	s. d.	5 6
<input type="checkbox"/>	Type 9/L.W. (900 to 2000 metres)		6 6
<input type="checkbox"/>	Type 9/S.2. (15 to 43 metres)		5 0
<input type="checkbox"/>	Type 9/S.3. (24 to 70 metres)		5 0
<input type="checkbox"/>	Type 9/S.1. (9.5 to 27 metres)		5 0

SPECIFIED VALVES

<input type="checkbox"/>	Hivac L210 (met.)	s. d.	3 9
<input type="checkbox"/>	Mazda L2 (met.)		4 9
<input type="checkbox"/>	Hivac VP215 (met.)		9 6
<input type="checkbox"/>	Osram L21		4 9
<input type="checkbox"/>	Hivac PX230		7 6

EXTRACTOR KIT

<input type="checkbox"/>	1 WEARITE Triple Extractor coil unit	s. d.	7 6
<input type="checkbox"/>	3 COLVERN '0005-mfd. pre-sets		5 3
<input type="checkbox"/>	1 PETO-SCOTT Wood baseboard		6 3
<input type="checkbox"/>	Wire, screws and sleeving		3 3
<input type="checkbox"/>	COMPLETE KIT, CASH PRICE		13 6

KONECTAKIT

Two 3/4 x 3/4 hole 20-gauge brass washers, three 3/4 x 3/4 hole 24-gauge brass washers, three 3/4 x 1/2 hole 22-gauge brass washers, thirty 3/4 x No. 4 round-head wood screws, fifteen 3/4 x No. 4 brass round-head wood screws, ten 3/4 x No. 4 brass round-head wood screws, two 3/4 x No. 4 brass O.S. wood screws, two 3/4 x No. 4 N.P. O.S. wood screws, 16-foot 18-gauge T.C. wire, five lengths 1 1/2-in. insulating sleeving, 20-foot 14/36 rubber-covered single flex.

CASH PRICE 2/6d.
 Part Packing and Postage, 6d. extra.

S.T.800 to S.T.900 CONVERSION KIT

COMPLETE KIT OF PARTS necessary for converting the S.T.800 to S.T.900. Comprising Peto-Scott Metalexed and ready drilled panel, Peto-Scott ready drilled platform, Peto-Scott ready drilled screen, 2 B.T.S. Type "O" self-locating coil holders, 1 Graham-Farish '0005 log-mid-line condenser, 2 Lissen '006-mfd., 2 Lissen '00005-mfd., 1 T.M.C. '0002-mfd. tubular, 1 Dubilier 1-meg. 3-watt resistor, 1 B.T.S. All-Wave H.F. Choke, 1 W.B. 4-pin valve holder, 3 Clix sockets, 2 Clix master wander plugs, 16 feet 18-gauge T.C. wire, 5 lengths of sleeving, 24 screws, 8 washers, and 1 Free S.T.900 Copyright Auto-Dial Card.

CASH PRICE 18/6d.
 Carriage Paid

NOTE.—If Coils are required, see detailed list in first column for types and cash prices.
 Extra Valve: Hivac L210, Cash Price 3/9.

18/6
POST PAID

S.T.700-900 CONVERSION KIT

COMPLETE KIT OF PARTS, less coils, for converting S.T.700 to S.T.900 with free S.T.900 Copyright Auto-Dial card. DETAILED LISTS ON APPLICATION. **CASH PRICE, Carr. Paid 26/-**

STRUCTAKIT

EVERY PART GUARANTEED EXACT TO MR. JOHN SCOTT-TAGGART'S FIRST SPECIFICATION. Comprises PETO-SCOTT ready drilled, stained, polished and metalexed walnut veneered panel; 1 PETO-SCOTT Walnut finished ready drilled platform; 2 PETO-SCOTT ready drilled and walnut finished side pieces; 1 PETO-SCOTT aluminium screen; 2 PETO-SCOTT ready drilled terminal strips, all necessary nickel plated and brass screws for fixing.

CASH PRICE 8/- post paid.

8/-
POST FREE

RECOMMENDED SPEAKERS for S.T.900. Model 38S. Further improvement on the famous W.B. Senior 378. Microloids device for matching any receiver. Cash or C.O.D., Carr. Pd., £2/2/0, or 2/6 down and 11 monthly payments of 4/-.

Model 38J. Makes an unmistakable improvement in volume and realism of reproduction. Cash or C.O.D. Carr. Pd., £1/12/6. Or 2/6 down and 11 monthly payments of 3/-.



2/6
DOWN

KIT "A"
 Pilot Author Kit of Components exactly as FIRST specified and used by Mr. J. Scott-Taggart and shown in the detailed list on the left-hand column of this advertisement, with MR. JOHN SCOTT-TAGGART'S S.T.900 AUTO-DIAL CARD, but LESS coils, Konectakit, wander plugs, accumulator connectors, valves, extractor kit, cabinet and speaker. **Cash Price, Carriage Paid, 55/6d. or 5/- down and 11 monthly payments of 5/3d.**

KIT "A2" Exactly as Kit "A" but including Peto-Scott Konectakit and 2 B.T.S. Medium-wave One-Shot Inductors. **CASH PRICE, Carriage Paid £3.3.6 or 6/- down and 11 monthly payments of 6/-.**

6/-
DOWN

KIT "A4" Exactly as Kit "A," but including Peto-Scott Konectakit and 4 B.T.S. One-Shot Inductors covering Medium and Long Waves. **CASH PRICE, Carr. Paid, £3.10.0 or 7/-** down and 11 monthly payments of 6/7.

KIT "A10" Exactly as for Kit "A," but including Peto-Scott Konectakit and 10 B.T.S. One-Shot Inductors covering Long, Medium, and three short-wave bands. **CASH PRICE, Carr. Paid, £4.5.0 or 8/6** down and 11 monthly payments of 8/-.

S.T.900 SPECIFIED VALVES. If set of 5 first specified valves is required with any of the above kits, add £1/10/3 to cash price, or 3/6 to deposit and 2/9 to each of the 11 monthly payments.

KIT "CT" Complete kit of first specified parts, including Konectakit, 10 B.T.S. One-Shot Inductors, Peto-Scott TABLE model cabinet, as illustrated on left-hand page, and 5 first specified valves. **CASH PRICE, Carriage Paid, £6.14.9 or 13/9** down and 11 monthly payments of 12/9.

KIT "CC" Exactly as for Kit "C.T.," but with Peto-Scott CONSOLE TABLE cabinet, as illustrated on left-hand page, instead of the table model. **CASH PRICE, Carr. Paid, £7.14.9 or 16/3** down and 11 monthly payments of 14/7.

KIT "CE" Exactly as for Kit "C.T.," but with Peto-Scott CONSOLE cabinet, as illustrated on left-hand page, instead of table cabinet. **CASH PRICE, Carriage Paid £8.18.3 DOWN** and 11 monthly payments of 16/9.

EXTRACTOR KIT. If extractor kit as detailed in the left-hand column required with any of the above kits add 13/6 to Cash Prices or 1/3 to deposit and 1/3 to each monthly payment.

WANDER PLUGS & ACCUMULATOR CONNECTORS. If required with any of the above kits add 2/8 to Cash Price or to deposit.

HOW to ORDER for PROMPT DELIVERY!

Against each item featured above will be found a blank square. Please place X in the square against the item(s) you require. For articles on the opposite page, simply write in the space provided below the number(s) of the item(s) you require. Complete the coupon, detach this page complete and forward it to us with remittance. No other note or letter is required.

PETO-SCOTT Co. Ltd. 77 (P.W.9), City Road, London, E.C.1. Clissold 9875-6-7
 62 (P.W.9), High Holborn, London, W.C.1. Holborn 3248

Please forward me the items against which I have placed X above, together with the following items from the opposite page (insert numbers) Nos.

against Cash/H.P. I enclose £ Cash/H.P. Deposit.

NAME (in block letters)

ADDRESS (in block letters)

EST 1919
 All P.O.'s should be crossed and made payable to the Peto-Scott Co. Ltd. All currency should be registered.

ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER £1 SENT CARRIAGE AND POST CHARGES PAID

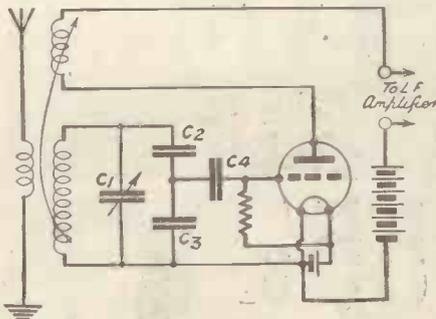


Fig. 8. An alternative method of obtaining a tap on the tuned circuit from which to feed a detector.

(Continued from page 178.)

condition for uniform high-frequency amplification, and the reaction current is, after all, simply the input magnified and passed through a coil, and then fed back. If the process of high-frequency amplification is interfered with by another process such as rectification, which alters the conditions, then clearly you are not going to get proper reaction. During leaky grid rectification the normal grid voltage is around zero, or a little positive. At any rate, it is round about (usually above) the position where a grid current commences to flow. This is by no means the position we should use for high-frequency amplification which would call for a straight, steep portion of the characteristic curve connecting the grid volts and anode current. Also the grid would be biased negatively to avoid any kind of rectification in the grid circuit through the establishment of grid current. As a signal is being received the grid becomes more negative with respect to the filament, and consequently we can anticipate a change in conditions for high-frequency amplification. The constant changing of conditions and the movement of the normal grid voltage to positions on the curved portion of the characteristic curve (and this is easily possible) make reaction a variable thing.

The double process of reaction and

detection means that reaction can never be brought up to a highly critical condition. There is always a chance, for one thing, that the valve will start oscillating, and so we have to keep the reaction sufficiently weak to allow for momentary increases.

Obtaining Perfect Reaction

Nevertheless, a good deal can be done to make a detector valve work quite well for reaction, but in the S.T.900 the perfect reaction is unquestionably obtained by the use of a separate valve operating solely as a producer of reaction on the first tuned circuit of the set. This external valve has extra advantages which have already been outlined, the principal one being that it makes us independent of any bias applied to the grid of the H.F. pentode and enables us also to avoid reaction making a chain between the two tuned circuits, thus permitting a greater amount of reaction on each if desired.

Fig. 3 shows how an external three-electrode valve may be used as the means of

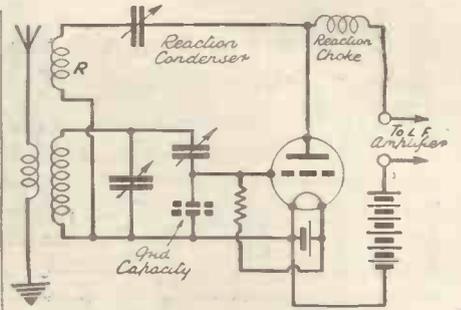


Fig. 9. By using a small grid condenser, a capacity tap may be obtained by making use of the grid-filament capacity of the valve.

reaction is simply a variation of that shown in Fig. 3.

Apart from such matters as the reaction coil itself and the position and size of the reaction condenser, both of which are highly important but are matters of design, the way in which the reacting valve itself is used is of exceptional importance.

The valve should have a straight characteristic, and the input voltages should not be subject to distortion through running into a bend or curvature of the characteristic curve. The input voltages should be small so that even when stronger signals are developed in the tuned circuit by means of reaction, the amplification of the reaction current should take place without distortion.

This at first seems to be an almost impossible ideal, and no doubt it is under the ordinary conditions. It is customary to apply the whole of the input signals across the grid and filament of a valve and then to

feed back from the anode circuit some of the high-frequency energy. The signals in the tuned circuit may be of large amplitude after reaction has been applied, so that a large grid swing is inevitable.

The Use of Taps

When the valve is used not only for producing reaction but as a detector, we are faced with something like a compromise if we improve reaction. We could, for example, tap down, say, half the inductance coil of the main tuned circuit, and this would reduce the voltage swing on the grid. This would result in smoother reaction, but clearly we are going to lose a great deal of signal strength, since only half the electromotive forces developed across the inductance are going to be applied to the detector. Improved reaction may thus give greater selectivity but reduced signal strength. A set of this kind may well be worth while, but in the case of "X"-reaction we do not get any loss of signal strength at all, and we can develop the principle of what one could call high-g geared reaction.

By the term high-g geared I imply that the voltages fed to the grid of the reacting valve are only a fraction of the total voltages developed across the tuned circuit. These small voltages are, however, stepped-up in magnitude by the amplification of the valve and are then fed back into the whole tuned circuit.

(Please turn to page 205.)

A DOUBLE-REACTION CIRCUIT

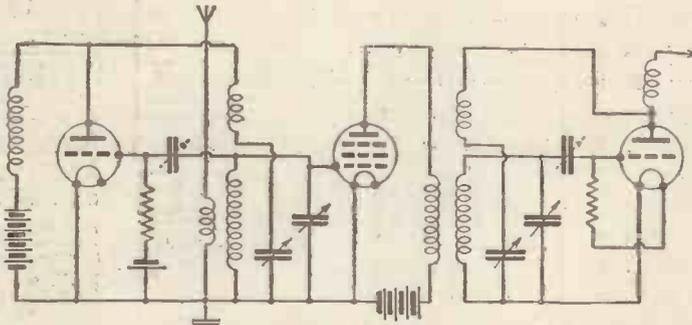


Fig. 10. A combined "X"-reaction and detector-reaction circuit. Small grid condensers are used for both reacting valves.

reducing losses in the first tuned circuit of the receiver. The selectivity of this first tuned circuit is thereby increased and the currents in it are greatly magnified. It will be seen that the tuning condenser is simply connected across the grid and filament of a three-electrode valve which has a reaction coil in its anode circuit. The reaction, of course, is adjustable in one or other of the many available ways. These diagrams are purely theoretical, and

are intended to explain the principle rather than any particular practical arrangement. It will be seen that the reaction has been applied to a circuit which does not feed a detector valve which might alter conditions. It does, in fact, go to the grid and filament of an H.F. pentode. These are the ideal conditions for the use of reaction, and they are the conditions which exist in the S.T.900.

Avoiding Bends

The circuit used in the S.T.900 for "X"-

THE S.T.600 ARRANGEMENT

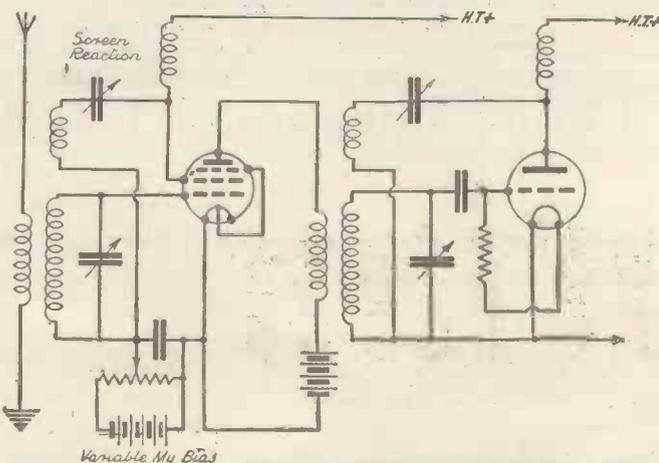


Fig. 11. With this double reaction circuit there are certain unwanted effects when selectivity is varied by altering the grid bias on the pentode valve.

For a Brilliant New Set -
**A BRILLIANT NEW
 SPEAKER!**



Although thousands of listeners will continue for years to enjoy the use of earlier S.T. receivers, there is also a multitude of keen amateurs—always anxious for that little extra performance—who will hail the striking S.T.900 with delight.

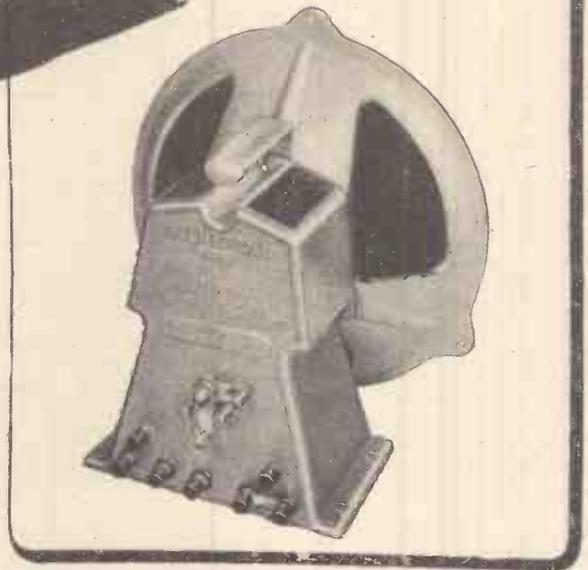
Similarly many thousands of contented Stentorian owners will obtain keen satisfaction from their speakers for a long time to come; but to the enthusiast the improvement offered by the newest models will come as a boon and a godsend.

The new S.T.900—the new Stentorian speaker—each on its own brings better radio than has been commercially available before.

Together, they will reveal to thousands of listeners a brilliant new conception of radio entertainment! Your dealer can demonstrate. Ask him!

PRICES

(Senior 385 as specified for the S.T.900 battery model)	42/-	Junior (38J)	32/6
		EM/S (as specified for S.T.900 A.C. model)	70/-



"Eminently suitable"

HIVAC MANUFACTURERS.

Owing to the increasing following the Hivac PX230 valve has among "quality" enthusiasts, particular care has been taken in designing the W.B. "1938 STENTORIAN" to ensure the provision of accurate matching to its characteristics. The following letter from the High Vacuum Valve Company is particularly interesting in view of Mr. Scott-Taggart's exclusive choice of the Hivac PX230 valve:

Dear Sirs,—We are pleased to inform you that we have found your "1938 STENTORIANS," type 38S and 38J, eminently suitable for use with the Hivac PX230 valve. The matching arrangements are perfectly satisfactory and the Speakers do full justice to the quality of the valve's output. Yours faithfully, HIGH VACUUM VALVE COMPANY.—(Signed) H. Diggle.

Stentorian

PERMANENT MAGNET MOVING COIL SPEAKERS

WHITELEY ELECTRICAL RADIO CO., LTD. (INFORMATION DEPARTMENT) MANSFIELD, NOTTS.

7,000 MILES 10-METRE BROADCASTS ON LOUDSPEAKER

S.T.900 will open your eyes with its terrific performance. Time and again I achieved the impossible—says W.L.S.

"If you build an S.T.900 and can't hear a station, then it's pretty certain that that station's not on the air."

At last it has come! It had to come some day, but it has been left to Mr. John Scott-Taggart to produce it. And by "it" I mean this—a genuine all-wave receiver, the performance of which on short waves suggests a really "hot" short-wave set.

At last the home-constructor can build an all-wave receiver and beat the hardened short-wave fiend on his own ground. Already I can see "18" Club Certificates and DX records of all kinds going to S.T.900 owners this winter.

I took the "900" home with the idea of giving it a very thorough test, lasting over a whole week-end. Unfortunately on the first evening I had lots of other work to do, but I didn't like the idea of having to wait a whole day before testing the S.T.900, and I decided to give it a quick preliminary test of about five minutes on each waveband.

First Station : 10m. Canadian

Having connected up all the batteries and the aerial and speaker, I hastily plugged in the smallest coils, hoping, as the time was about 7 p.m., that I could just catch the 10-metre band before it faded out. Within a few seconds I logged the Canadian VE 2 K X at R9 plus—which means that he nearly shifted the cone of my speaker from its mountings. Within the scheduled five minutes I logged the Americans W 2 C U Z (R5), W 2 N J T (R6), W 1 D Q K (R8), W 8 K Y Y (R8), and W 6 O K Q (R7), the last station being in Los Angeles, over on the other side of the States, 7,000 miles away.

By extending the five minutes to seven minutes, I thought I might possibly manage to log all districts, but luck was not with me. No 9's or 7's were about, but I heard W 5 F O B (Texas) and W 4 C Y U (Florida) and several 3's. All these 10-metre amateurs, of course, were on telephony, and everything was received on the speaker.

The 20-metre band, even so early in the evening, yielded the usual crop of U.S.A. amateurs, all at strengths between R6 and R8. I also logged the Cubans C O 6 O M and C O 2 W Z, and Newfoundland V O 6 L. The very fact that I haven't produced a list of call-signs is a recommendation for the "900"—I simply hadn't the time to put them all down.

The 40-metre band, of course, was congested as usual, but the first thing I noticed was that the "X"-reactor did its stuff uncommonly well and enabled me to clear

several cases of what seemed to be impossible jamming.

The next evening I came back to the real test and started putting the set through its paces on all bands. Remember that I normally use a 10-valve single-signal superhet, with which I couldn't help making subconscious comparisons.

Well, my impressions all along the line were that I wasn't missing anything that might reasonably be expected to be coming in at the time. If you build an S.T.900 and can't hear a station, then it's pretty certain that that station's not on the air.

Band after band I covered—and I much appreciated the great ease with which coil-changes were made—and on each one I heard everything that I had reason to believe was on the air. Europeans like Zeesen, Rome and C T 1 A A lifted the roof

WHAT W.L.S. THINKS

The S.T.900 is here reported on by one of the most critical of short-wave experts. The fame of "W.L.S." is world-wide and his writings on the short waves are deservedly appreciated by those who concentrate on the short wavebands. His reputation for cool, detached commentaries adds greatly to the value of this report on the S.T.900.

off; but there was no difficulty in finding, in between them, the distant Americans and South Americans, which, when tuned-in, proved nearly as strong as the locals.

The strength of W 2 X A D (Schenectady, U.S.A.) on 19 metres was almost incredible. My next-door neighbour popped in to see what all the row was about, but when I whispered "S.T.900" to him and looked secretive, he nodded in an understanding way and reverently crept out. I have a feeling that he'll be getting his own back on me within a week with his own S.T.900!

"A Dial Full of DX"

So interested and thrilled was I with the set's short-wave performance that I hardly bothered to use the medium and long-wave coils, but from a few test stations I was left in no doubt about the set's excellent per-

formance on those bands. For more than an hour I left the second short-wave coils in position, switching round from the 19-metre band to 25, 31 and 40 metres, and reflecting that even the hardened short-wave listener could never have a dull moment with such a dial full of DX as that.

However good the S.T.800 is—and many of you are still getting thrills from it—the S.T.900 is vastly better and will open your eyes with its terrific performance.

Regarding the control of the set—it can be simplicity itself, or, if you want to get even more out of it than you would believe possible, it gives you scope for clever operation. The "X"-reactor gives a most beautifully smooth control of reaction, and also increases selectivity in an even, progressive way. Tune-in a weak station sandwiched between two stronger ones, slowly bring up the "X"-reactor control, and up comes the weak one, out go the others. Time and time again I achieved the impossible by using this control, which will give S.T.900 owners one of the biggest thrills they have ever had out of radio.

Certainty of Calibration

I made a rough calibration of the set on 19 metres, 25 metres and 31 metres, and found that I could come back to any particular station with complete certainty. The variable control for aerial coupling does not have any effect on the settings of the main dial, nor does the "X"-reactor control. As for the reaction control proper, you simply set that at a point that gives the best signal strength, and make your final adjustments on the "X"-reactor.

I should like to have a shot at getting an "18" Club Certificate (that hall-mark of world-wide reception) on this set *within an hour*. I'm sure it would be possible. And readers who have tried to get one *within a week* will know just what sort of testimonial to the S.T.900 that is.

I have no hesitation in saying that it is the first all-wave receiver I have ever handled with which I should feel really happy on all the shortwave bands 10 metres included. And—one last point—the signal-to-noise ratio, all round, was exceptionally good; well in advance of any all-mains all-waver I have met.

In short—**SOME** set, and if you don't build it for yourself you will be missing one of the best things that I have come across for years.

W. L. S.

I do all my electrical repair work—now I've got a **ROTAMETER**

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This PIFCO ROTAMETER De Luxe abolishes old-time hit-or-miss methods of fault-finding; with it, any amateur electrician can swiftly and surely trace electrical faults in radios, vacuum cleaners, irons, clocks, bells, house lighting systems, automobile ignition and lighting circuits, etc. In fact, faults in everything electrical immediately respond to the magic touch of the PIFCO ROTAMETER.

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- | | |
|----------------|----------------------------|
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| 3—0-100 volts. | 8—Resist/valve test. |
| 4—0-400 volts. | 9—Plug-in test for valves. |
| 5—0-10 m/a. | |

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12/6

PIFCO

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"Easily My Best"

—SAYS THE DESIGNER

S.T.900 IN A NUTSHELL—A STRAIGHT-TALK SUMMARY

BEFORE wading painfully through all the detail, read this summary. The only things you really need to look at are the blue print, the list of components and valves and the Rapid Construction Guide. You now have all you want, so do not wait for another week. More detail, more talk, more reports, but nothing really new; every day you wait before deciding to build will delay your final enjoyment of the S.T.900. Act in Oct.

POINT No. 1.—It is a 5-valve set. It is fitted with (may constructors have mercy on my soul) plug-in coils. The arguments in favour of these highly efficient coils are so overwhelming that I stake my reputation on having done the daring but right thing. Read those arguments. Plug-in coils mean five or ten seconds extra trouble per night. The sting has been taken right out of them by B.T.S. in their special new coils which you can literally fit blindfolded. Read about them.

POINT No. 2.—The S.T.900 is utterly switchless. There is not even an on-off switch, but I have fitted a plug and socket which are just as convenient and a thousand times more reliable. An absolutely switchless set!—and I am as delighted as if I had performed a miracle instead of throwing in the dustbin the cause of nearly all the set failures in both constructors' and commercial sets. Switches and potentiometers, as any service man will tell you, are responsible for 90 per cent. of failures. I have, at one bold stroke, cut them from the body of the S.T.900. The circuit does not need them and they are cancers gnawing at the vitals of any set. Even if you are lucky and think you are not troubled, sooner or later your set will fall a victim. Would you rather be born without a useless appendix which can cause all sorts of vague ills and often calls for an operation? Well, the S.T.900 is born without switches.

The benefits of "a flick of a switch" are a delusion and a snare. The highly complicated switches used on modern all-wave sets are pregnant with trouble. On the S.T.900 you have no fears. The coils are very simple, very efficient, easily tested and can be turned out in tens of thousands without delays. Tin-can atrocities are necessities in some kinds of circuit, but not in the S.T.900. They have never been as efficient or as reliable as open-air coils.

POINT No. 3.—Certainty of results on first switching on is my great slogan this year—and reliability ever after. Also a set which will not be ham-strung by manufacturers' delays in deliveries. Every component is standard and easy to turn out in thousands. Alternative where necessary. No monopolies of non-standard components. Quick delivery. I have been more disgusted by delivery delays than any reader. This year the design itself solves

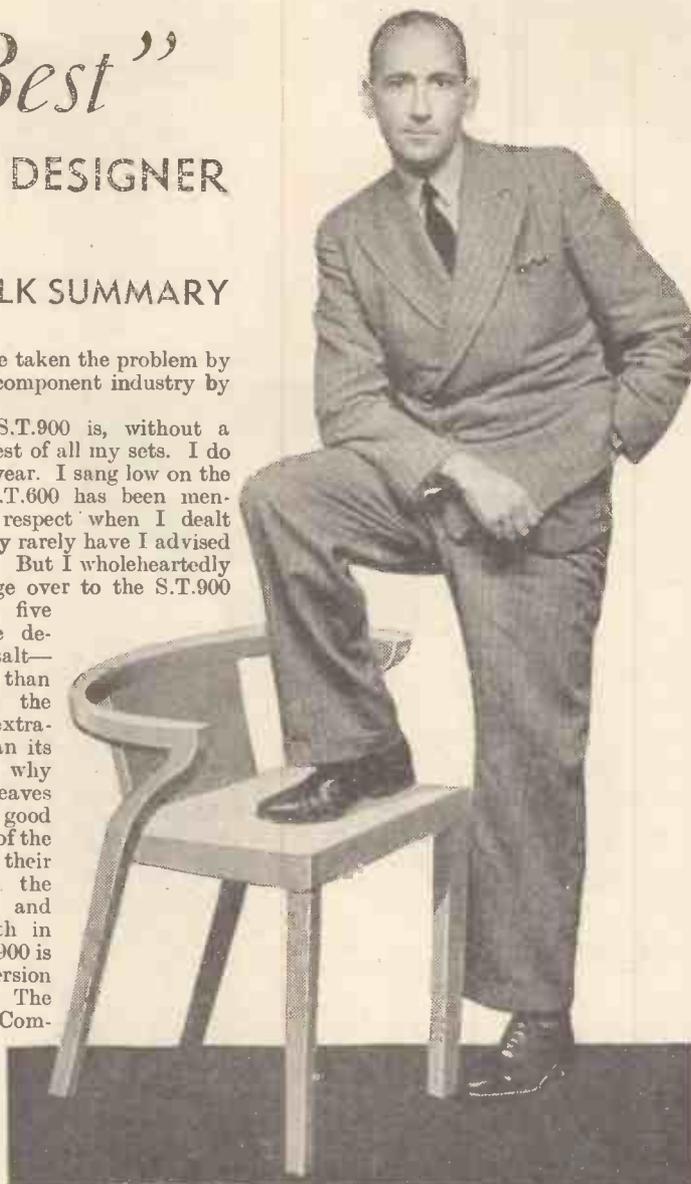
the question. I have taken the problem by the horns and the component industry by the tail.

POINT No. 4.—S.T.900 is, without a doubt, by far the best of all my sets. I do not say that every year. I sang low on the S.T.500, and the S.T.600 has been mentioned with great respect when I dealt with later sets. Only rarely have I advised a reader to convert. But I wholeheartedly recommend a change over to the S.T.900 not just because five valves will—if the designer is worth his salt—always be better than four, but because the receiver is so extraordinarily better than its predecessors. Read why I think the S.T.900 leaves the S.T.800—a very good set—cold. Owners of the S.T.800 can use all their components except the all-wave coil unit and about sixpennyworth in addition. The S.T.900 is wonderful for conversion from the S.T.800. The cost is only 18s. 6d. Component manufacturers may not be pleased, but my duty is not to the industry but to the constructor.

POINT No. 5.—Circuit? Well, the S.T.900 uses "X"-reaction, something really new in a national set. A separate valve is used in a highly efficient manner to apply reaction to the first tuned circuit. That is its sole job and it does it superlatively well. Read about high-gear reaction—how it is done and its great merits. Read how double reaction is used in the S.T.900 for the first time on the short waves with startlingly successful results.

POINT No. 6.—Five valves—isn't that a lot? No, I would use ten if I could do it cheaply and the results were worth it. The cost of the extra valve is only 3s. 9d. A few shillings for, say, forty times—or in some cases four hundred times—the results is ridiculously cheap. Valves are so reliable and last so long that they can be treated as components, and who would cavil at a component that did what my "X"-valve does? Upkeep cost? Negligible. The extra H.T. current is less than what you would notice by changing over the output valve to another sample of the same type.

The only thing the constructor is concerned about is cost and performance and the running costs. Read how I show that numbers of valves were important in the old days but how prejudice no longer has a



valve leg to stand on. Even in earlier days, numbers of valves have often been an attraction rather than the reverse, e.g. Century Supers, Solodyn's, Elstree Sixes, all with about half a dozen valves. The man who hesitates over the S.T.900 because it sounds luxurious and extravagant because of five valves is either a very old hand who does not realise that things have changed or he is ignorant of the absurdly low price of the S.T.900 and the fact that the extra current the "X"-valve takes is negligible.

POINT No. 7.—The S.T. 900 is more than all-wave. It is a flexible set which covers continuously any station from 9½ metres to 2,000 metres. Aircraft, trawlers, police, amateurs, and even television sound on 7 metres, are all there if you'll fit the right coils—a matter of seconds. You can start with a pair of medium-wave coils if you wish. Then add long waves, then one or two short-wave sets of coils. Then longer short-wave coils—the expanding bookcase idea. And always the set is as if designed entirely for the station you want. For example, the coils are designed for that special band and the reaction coil changes for each band automatically. In switched

(Please turn to page 190.)

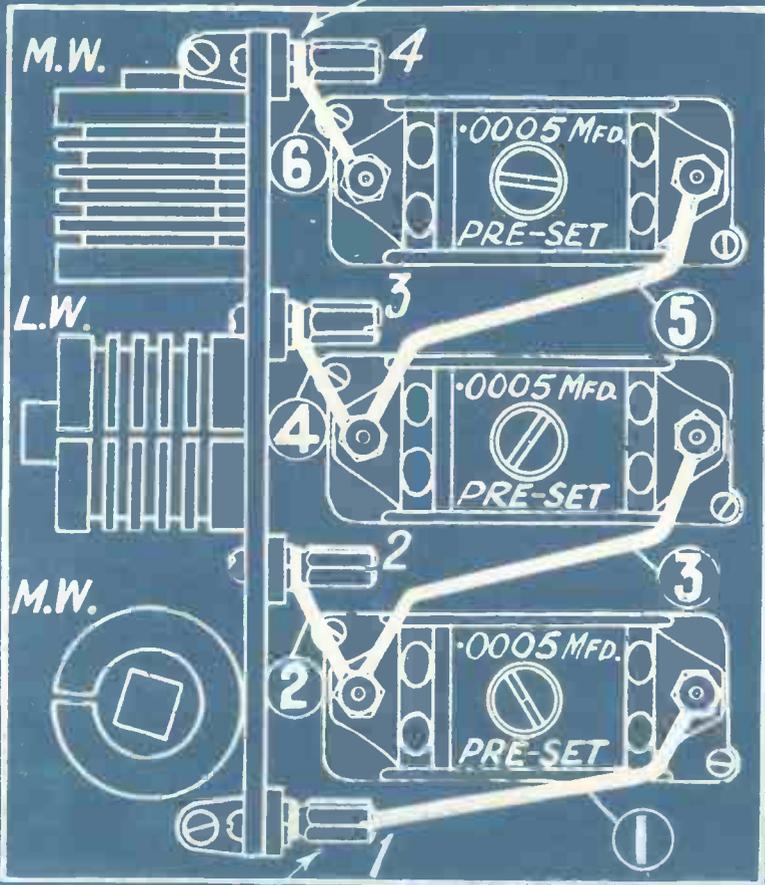
1/4 FULL SIZE BLUEPRINT

S.T.900

DESIGNED BY JOHN SCOTT-TAGGART

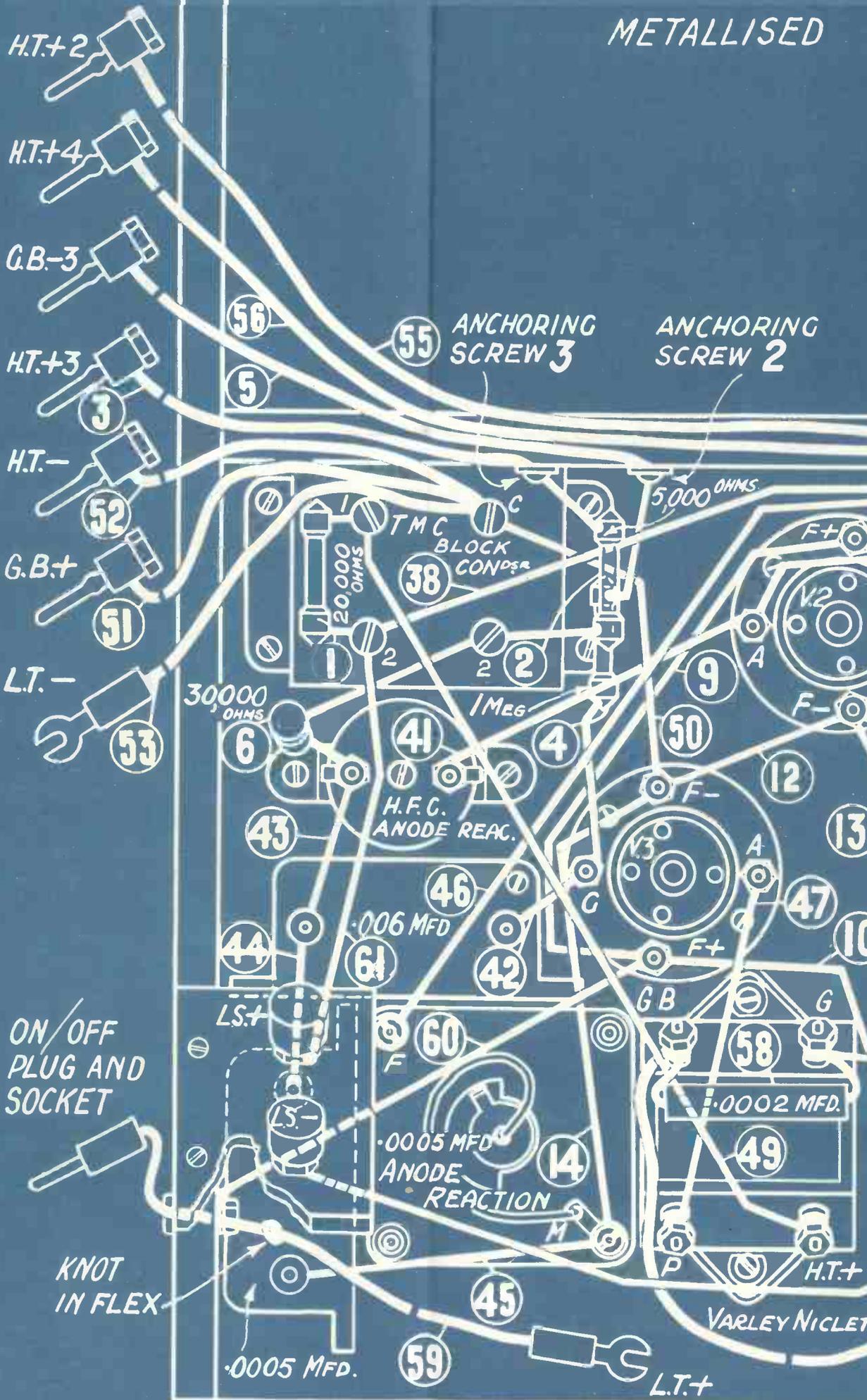
POPULAR WIRELESS, OCTOBER 30TH, 1937

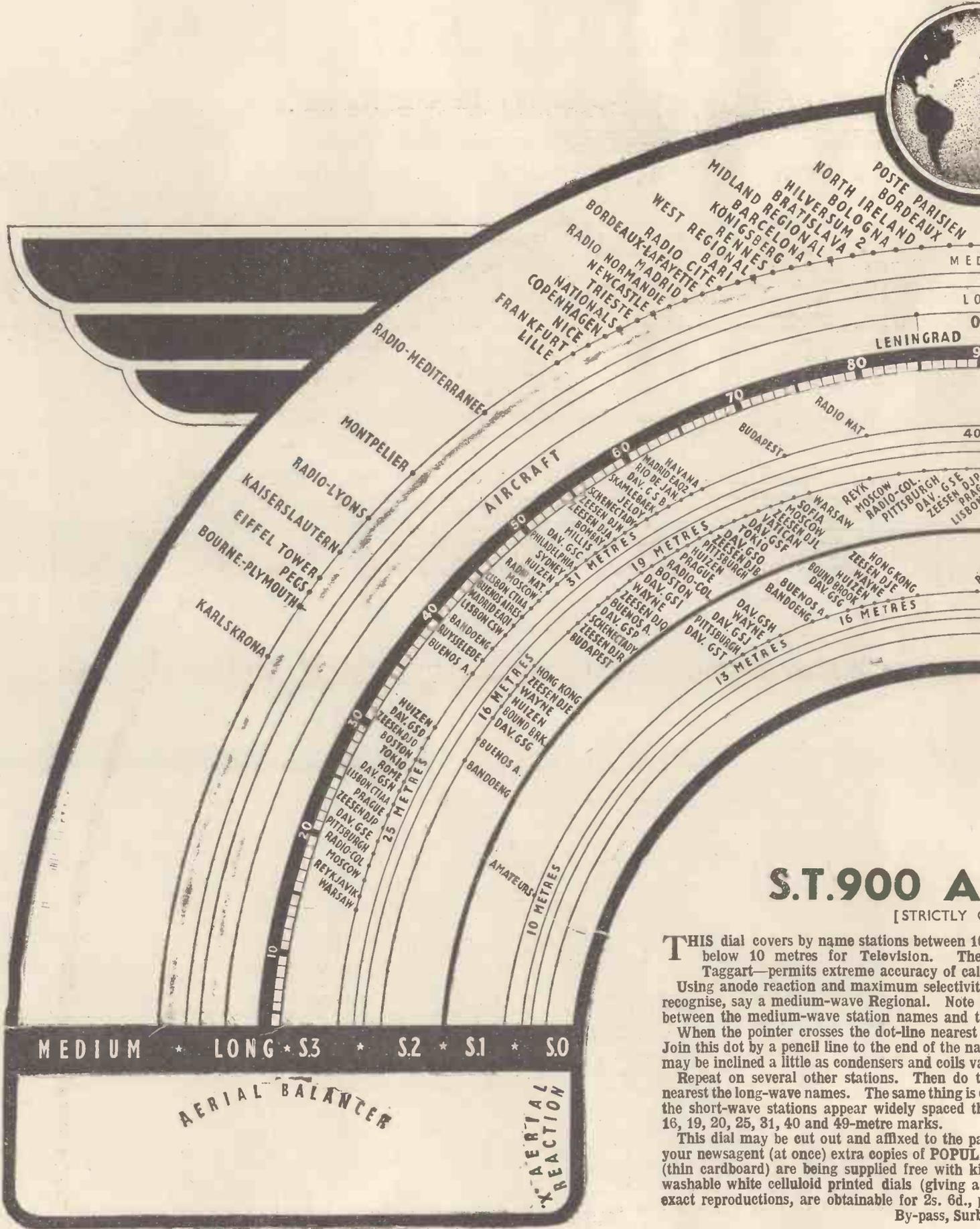
TO AERIAL TERMINAL OF SET



TO AERIAL

TRIPLE EXTRACTOR UNIT

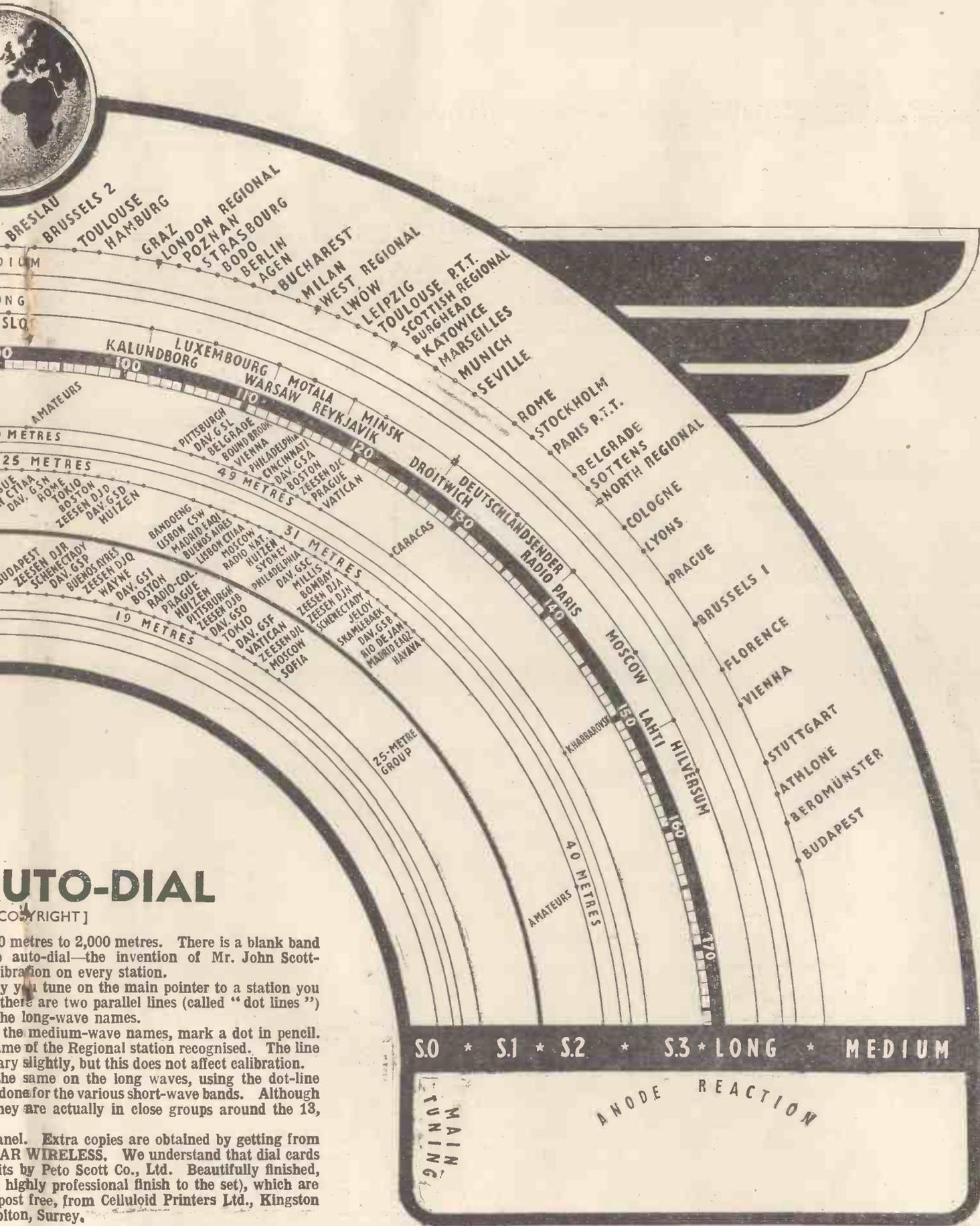




S.T.900 A

[STRICTLY C...]

THIS dial covers by name stations between 10 and 49 metres for Television. The Taggart—permits extreme accuracy of calibration. Using anode reaction and maximum selectivity, you can easily recognise, say a medium-wave Regional. Note the difference between the medium-wave station names and the long-wave names. When the pointer crosses the dot-line nearest the station name, join this dot by a pencil line to the end of the name. Repeat on several other stations. Then do the same thing for the nearest the long-wave names. The same thing is true for the short-wave stations appear widely spaced than the long-wave stations. This dial may be cut out and affixed to the page of your newsagent (at once) extra copies of POPULAR WIRELESS (thin cardboard) are being supplied free with kindly washable white celluloid printed dials (giving a perfect reproduction, are obtainable for 2s. 6d., plus postage). By-pass, Sur...



AUTO-DIAL

[COPYRIGHT]

0 metres to 2,000 metres. There is a blank band of auto-dial—the invention of Mr. John Scott—libration on every station.

When you tune on the main pointer to a station you there are two parallel lines (called "dot lines") the long-wave names.

For the medium-wave names, mark a dot in pencil. The name of the Regional station recognised. The line is slightly, but this does not affect calibration.

The same on the long waves, using the dot-line done for the various short-wave bands. Although they are actually in close groups around the 13, panel. Extra copies are obtained by getting from POPULAR WIRELESS. We understand that dial cards are made by Peto Scott Co., Ltd. Beautifully finished, with a highly professional finish to the set, which are sent post free, from Celluloid Printers Ltd., Kingston upon Thames, Surrey.

S.0 * S.1 * S.2 * S.3 * LONG * MEDIUM

MAIN TUNING

ANODE REACTION

(Continued from page 187.)

sets coils are short-circuited—a messy business from a technical efficiency standpoint, and one reaction coil is used to serve two wavebands, e.g. medium and long wave—an obvious compromise.

So many all-wave sets are medium and long-wave receivers with a dash of short waves thrown in for fun because it's the fashion. So many short-wave sets are finicky, fiddling flops only fit for firewood. Half-crazy fanatics fussing with one or two valves to get some caterwauling from far away will find the five valves of the S.T.900 revolutionising popular ideas of entertainment on short waves. Five valves, mind you; every one pulling its weight and hitting on every cylinder right down to twelve metres. High-frequency amplification that really amplifies—none of your buffer circuits, aperiodic aeriads and other futile shifts. Reaction that is *designed* and

COILS FOR THE S.T.900

DIAL REF.	S.T.900 RANGE	MAKE	TYPE No.
L.W.	800-2,000 metres.	B.T.S. "One-Shot."	9/L.W.
M.W.	170-580 metres.	B.T.S. "One-Shot."	9/M.W.
S.3.	24-70 metres.	B.T.S. "One-Shot."	9/S.3.
S.2.	15-43 metres.	Raymart. B.T.S. "One-Shot."	C.X.6. 9/S.2.
S.1.	9½-27 metres.	Eddystone. Raymart.	6.L.B. O.A.6.
S.O.	6½-8 metres.	B.T.S. "One-Shot."	9/S.1.
		B.T.S. "One-Shot."	9/S.O.

IMPORTANT NOTE:—The above coils and these only should be used in the S.T.900. Coils are undergoing test as alternatives in some of the above ranges, but under no circumstances should constructors obtain them until approval by me is published in an article. Raymart is approved in two ranges so far and Eddystone in one. Certain standard coils of these manufacturers do not match the dial, and non-inclusion is no reflection on their efficiency. J. S.-T.

that works twice-over all the way down the wavebands and all the way over the continents.

POINT No. 8.—But this nutshell has become a coconut. I must leave the subject. In conclusion, do not sneer at the Rapid Guide. Admittedly, it tells you every detail, even when to have a cup of tea. All my successful sets have proved the great time-saving advantages of the Rapid Guide. You are certain of success if you follow it. Not the (apparently) silliest, stupidest instruction is omitted. No intelligence on the part of the constructor is assumed! You can work from the blue print alone, but several S.T.900 sets have been built by expert mechanics, and they find that following the Rapid Guide saves half their time. In one case a mechanic omitted the cup of tea where told. I have always since felt that that receiver is just a little less efficient than the others.

J. S.-T.

COMPONENTS FOR THE S.T.900 BATTERY MODEL

Components	Make Used by Designer	Suitable Alternative Makes
1 0005-mfd. main tuning condenser with drive	J.B. as used in S.T.800. (6/6)	
1 0005-mfd. aerial balancer condenser	Polar as used in S.T.800. (5/6)	
2 6-pin coil holders	B.T.S. (self-locating type). (2/-)	B.T.S. (mention S.T.900).
1 0005-mfd. aerial coupler condenser	GRAHAM-FARISH log-mid-line as used in S.T.800 (2/-)	B.T.S. (mention S.T.900).
1 0005-mfd. "X" aerial reaction condenser	GRAHAM-FARISH log-mid-line as used in S.T.800. (2/-)	B.T.S. (mention S.T.900).
1 0005-mfd. anode reaction condenser	GRAHAM-FARISH log-mid-line as used in S.T.800. (2/-)	B.T.S. (mention S.T.900).
1 Block condenser 2+2+1 mfd.	T.M.C. type B1007. (4/-)	
3 006-mfd. mica fixed condensers	LISSEN. (3/-)	Dubilier type 610. T.C.C. type S
1 0005-mfd. mica fixed condenser	LISSEN. (6d.)	Dubilier type 610. T.C.C. type S
2 00005-mfd. mica fixed condensers	LISSEN. (1/-)	Dubilier type 620. T.C.C. type 34
1 3002-mfd. tubular condenser	T.M.C. (9d.)	
3 1-meg. resistors	DUBILIER ½ watt. (1/6)	Eric 1 watt. Polar-N.S.F. 1 watt
1 33,000-ohm resistor	DUBILIER ½ watt. (6d.)	Eric 1 watt. Polar-N.S.F. 1 watt
1 21,000-ohm resistor	DUBILIER ½ watt. (6d.)	Eric 1 watt. Polar-N.S.F. 1 watt
1 5,000-ohm resistor	DUBILIER ½ watt. (6d.)	Eric 1 watt. Polar-N.S.F. 1 watt
2 All-wave H.F. chokes	B.T.S. as used in S.T.800. (3/6)	
1 L.F. transformer	VARLEY "Niclet" 3.5/1. (7/6)	
5 4-pin baseboard valve holders	W.B. small type. (3/4)	
4 Terminals marked A, E, L.S.—, L.S.+	BELLING & LEE type R. (1/2)	Clix type A Bulgin type TL
3 Parallel sockets	CLIX No. 8. (3d.)	
2 Master wander plugs	CLIX No. 5. (3d.)	
1 Polished wood panel (Metaplex reverse) 16×12×½ in.	PETO-SCOTT. (3/9)	
1 Pair side-pieces	" " (1/6)	
2 Terminal strips 2×1½×½ in.	" " (6d.)	
1 Wood platform 15½×3×¾ in.	" " (1/-)	
1 Aluminium Screen	" " (6d.)	
SCREWS, WIRES, ETC.		
2 ½×½ in.-hole 20-gauge brass washers	" " (1/6)	
3 ½×½ in.-hole 24-gauge brass washers	" " (6d.)	
3 ½×½ in.-hole 22-gauge brass washers	" " (6d.)	
30 ½-in. × No. 4 brass R.H. wood screws	" " (2/6)	
15 ½-in. × No. 4 brass R.H. wood screws	" " (2/6)	
10 ½-in. × No. 4 brass R.H. wood screws	" " (2/6)	
2 ½-in. × No. 4 brass C.S. wood screws	" " (2/6)	
2 ½-in. × No. 4 brass C.S. wood screws	" " (2/6)	
16 feet 18-gauge T.C. wire	" " (2/6)	
5 Lengths 1½-in. insulating sleeving	" " (2/6)	
20 feet 14/36 rubber-covered single flex	" " (2/6)	

URGENT WARNING

No components, valves, celluloid dial or coils not specifically mentioned on this page should be used. Kits using substituted components (even though principal parts are author's choice) are not authorised. There are very important technical reasons (especially on shortest wavelengths) for my choices. J. S.-T.

OPTIONAL

10 Wander plugs marked H.T.—, H.T.+1, H.T.+2, H.T.+3, H.T.+4, G.B.—, G.B.—1, G.B.—2, G.B.—3, G.B.—4	BELLING & LEE (1/8) BELLING & LEE (1/-) J.B. (4d.)	Clix, Bulgin Clix, Bulgin
2 Accumulator Connectors		
1 Extra knob similar to main drive (for aerial-reaction knob)		
1 Extra matching knob for aerial balancer	PETO-SCOTT (4d.)	No Alternative
Celluloid Dial	Celluloid Printers Ltd. (2/6 post free)	

VALVES

V.X Hivac L210 (met.) (3/9) or Mazda L2 (met.) (4/9)	V.1 Hivac V.P.215 (met.) (9/6)	V.2 Mazda L2 (met.) (4/9)	V.3 Marconi/Osram L21 (4/9) or Mazda L2 (4/9)	V.4 Hivac P.X.230 (7/6)
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TRIPLE EXTRACTOR

1 Triple Extractor coil unit	WEARITE (7/6)	FINAL NOTE Build a set identical with mine. You substitute except for the above alternatives, at your own risk. J. S.-T.
3 0005-mfd. pre-set condensers	COLVERN (5/9)	
1 Wood baseboard 4½×4×½ in.	PETO-SCOTT (6d.)	
2 ½-in. × No. 4 R.H. brass wood screws	} (3d.)	
6 ½-in. × No. 4 R.H. brass wood screws		

S.T.900 KITS at the RIGHT PRICES!

• CASH EASY TERMS IMMEDIATE DELIVERY •

New 4-valve BANDSPREAD Battery SHORT-WAVE KIT
List Value £4:9:6 **BARGAIN 42/-**

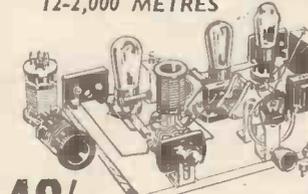


A PERIODIC H.F. reacting detector, resistance and transformer L.F. Stages, Pentode Output. Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Efficient low-loss reaction condenser. Air-spaced bands and SPOT CONDENSER 3 scales calibrated in degrees and tenths.

KIT "1" comprises every part for assembly including 3-6-pin coils, wiring, and assembly instructions, less valves only. Cash or C.O.D. Carr. Pd. 42/-, or 2/6 down and 11 monthly payments of 4/-. **KIT "2"** with 4 British Valves, £3/9/0, or 5/- down and 11 monthly payments of 6/6.

2/6 DOWN

N.T.S. ALL-WAVE 3-12-2,000 METRES



42/-

Build a set that will receive the whole world direct, for a very small outlay. Includes everything for immediate assembly: 1 Slow-motion Dial, 5 6-pin Coils: 12-26, 269/510, and 1,000/2,000 metres; 1 6-pin coil base; 3 4-pin baseboard mounting valve holders; 1 short-wave H.F. choke; 3 variable condensers: '0001, '0002 and '00016-mfd.; 2 terminal mounts; 4 terminals; 2 L.F. transformers; 2 fixed resistances; 3 fixed condensers; 3 component brackets; 1 switch; 1 metal-sprayed baseboard; 1 coil connecting wire; 1 wiring diagram. Cash or C.O.D. Carriage Paid, £2/2/0, or 2/6 down and 11 monthly payments of 4/-. 3 matched valves 10/- extra, or add 1/- to deposit and each monthly payment.

2/6 DOWN

HEADPHONES, New lightweight, super quality, ideal for short-wave work and testing 3'6. Post 6d.

FREE! SHORT-WAVE BOOKLET, describing in detail, with actual photographs, 5 entirely new N.T.S. Bargain Battery and A.C. Short-Wave Kits, together with complete General Bargain Lists—Receivers, Accessories, Components. N.T.S. supply everything Radio (all makes) on the famous New Times Eastway System—Receivers and Accessories. Send us a list of your needs for quotation by return.

PETO-SCOTT S.T.900 PILOT AUTHOR KITS

KIT "A" Cash Price Carriage Paid 55/6
or 5/- down and 11 monthly payments of 5/3. Comprising all components exactly as FIRST specified by Mr. John Scott-Taggart, with S.T.900 auto-dial card, less coils, Konecaktit, wander plugs, accumulator connectors, valves, extractor kit, cabinet and speaker.

KIT "A2" As Kit "A," but with Peto-Scott Konecaktit and 2 B.T.S. medium-wave one-shot Inductors. Cash Price, Carr. Pd., £3/3/6, or 6/- down and 11 monthly payments of 6/-.
KIT "A4" As Kit "A," but with Konecaktit and 4 B.T.S. medium and long-wave one-shot inductors. Cash Price, Carr. Pd. £3/10/0, or 7/- down and 11 monthly payments of 6/7.
KIT "A10" As Kit "A," but with Konecaktit and 10 B.T.S. one-shot inductors, covering long, medium, and 3 short wavebands. Cash Price, Carr. Pd., £4/5/0, or 8/6 down and 11 monthly payments of 8/-.
Any Peto-Scott S.T.900 Pilot Author Kits, Cabinets, or Finished Instruments available for Cash or on Easiest of Easy Terms.
PILOT AUTHOR S.T.800 to S.T.900 CONVERSION KIT: Comprising all necessary parts, but less coils and valve. 18/6 cash. Specified valve 3/9 extra.

NEW TIMES SALES CO.
again offer you kits at bargain prices for this amazing new all-waver, comprising carefully matched, tested and guaranteed parts. All components to specified values and at prices that save you money. N.T.S. KITS come to you absolutely complete and backed by a guarantee of satisfaction—the result of nearly 14 years' continuous service to the constructor. You can, therefore, order from N.T.S. with complete confidence.

EVERY PART GUARANTEED TO SPECIFIED VALUES—MATCHED—PROVED—TESTED

KIT "1" Carriage Paid 45/-
Comprising all parts for S.T.900 battery version, including EXCLUSIVELY SPECIFIED Peto-Scott polished and drilled panel, side pieces, platform, terminal strips and screen. Varley Niclet L.F. transformer, B.T.S. H.F. chokes, J.B. S.T.900 S/M drive and pointer, T.M.C. block condenser, less valves and coils, but including ALL WIRE, FLEX, SOREWS, KNOBS, and FREE full-size station name dial card. Yours for 4/- down and 12 monthly payments of 4/-.
4/- DOWN

THESE ARE THE ITEMS IN KIT "1"

- ANY PART AVAILABLE SEPARATELY ORDERS OVER 10/- SENT CARRIAGE PAID
- 1 Peto-Scott walnut panel, drilled and polished s. d. 3 9
 - 1 Peto-Scott pair of side-pieces and special wood platform, both drilled and polished 2 6
 - 2 Peto-Scott drilled terminal strips 6 6
 - 1 Peto-Scott aluminium screen, ready drilled 1 6
 - 2 Chassis mounting 6-pin coil holders 1 6
 - 1 '0005-mfd. tuning condenser with J.B. S.T.900 slow-motion drive and pointer 5 0
 - 1 Slow-motion '0005-mfd. aerial balancer 4 0
 - 3 '0005-mfd. solid dielectric condensers for coupler, reaction and anode 4 6
 - 1 T.M.C. 2 x 2 x 1-mfd. block condenser 4 0
 - 3 '006-mfd. mica condensers 2 3
 - 1 '0005-mfd. mica condenser 6 6
 - 2 '00005-mfd. mica condensers 1 0
 - 1 '0002-mfd. tubular condenser 6 6
 - 6 1/2 watt resistors of specified values 2 6
 - 2 B.T.S. S.T.800 H.F. chokes 3 6
 - 1 Varley Niclet L.F. transformer 7 6
 - 5 N.T.S. baseboard valve holders with terminals 1 8
 - 4 Terminals marked A, E, LS-, LS+ 1 3
 - 3 Horizontal sockets with nuts 1 3
 - 2 Plain wander plug 2 6
 - 1 Set of matched knobs 2 6
 - Wire, flex and screws, and all screws and washers for fixing panel, side pieces and components 2 6
 - Full-size station name dial card FREE
- KIT "1," CARRIAGE PAID £2 5 0**

N.T.S. S.T.900 6-PIN COILS
Expertly wound exactly to specification, on special low-loss formers with high-grade copper wire. These coils are worthy additions to the already popular range of N.T.S. plug-in type tuners.
MEDIUM WAVE (190-550 metres) per pair ... 4/6
LONG WAVE (900-2,000 metres) per pair ... 5/6
SHORT WAVE, three wave ranges (12-26, 269-510, 9-527 metres) per pair ... 4/-
If complete set of 10 coils required, add 22/- to kit cash prices, or 2/- to deposit and each payment.
5 British matched, guaranteed and tested valves. £1.

EXTRACTOR KIT, comprising first specified parts 13/6; or add 1/8 to deposit and 1/3 to each payment.
If 10 wander plugs and 2 spades required, add 2/8 to cash price or deposit.

- KIT "2"** Comprising all parts as in Kit "1," but including set of 5 matched and guaranteed valves, less coils, cabinet, and speaker. Carriage Paid £3/5/0, or 5/- with order, balance in 12 monthly payments of 5/9.
KIT "3" Comprising all parts as in Kit "1," but including 5 matched valves and Peto-Scott table cabinet, less coils and speaker. Carriage Paid £4/4/6, or 7/9 with order, balance in 12 monthly payments of 7/7.
KIT "4" Comprising all parts as in Kit "1," but including 5 valves and Peto-Scott walnut console cabinet, less coils and speaker. Carriage Paid £5/4/6, or 9/6 with order, balance in 12 monthly payments of 9/4.
KIT "5" Comprising all parts as in Kit "1," but including 5 matched valves and Peto-Scott walnut console cabinet, less speaker and coils. Carriage Paid £6/8/0, or 12/- with order, balance in 12 monthly payments of 11/5.
If the set of 5 valves first specified by Mr. John Scott-Taggart are required with either Kits 2, 3, 4 or 5, add 10/3 to cash prices or 1/- to deposit and 11d. to each monthly payment.

N.T.S. S.T.900 FINISHED INSTRUMENT
Housed in PETO-SCOTT walnut table cabinet with extended aerial coupler, station name dial and 5 valves fitted. Complete with 5 pairs of N.T.S. 6-pin coils covering long, medium and 3 short-wave bands. Aerial tested on all wavebands. Cash Price, £6:6:0 Carriage Paid
Or 10/6 down and 12 monthly payments of 11/3.

W.B. STENTORIAN
IMMEDIATE DELIVERY
YOURS FOR 2/6 DOWN

EASIEST OF EASY TERMS
N.T.S. supply any W.B. 1938 Stentorian cabinet or chassis model on easy terms. SEND FOR COMPLETE LISTS.
MODEL 385 (Illustrated). Further improvement on the famous W.B. Senor 378. New higher flux density and increased sensitivity. Microlobe device for matching any receiver. Cash or C.O.D. Carr. Pd. £2/2/0, or 2/6 down and 11 monthly payments of 4/-.
MODEL 387. Makes an unmistakable improvement in volume and realism of reproduction. Perfectly matches any receiver as principal or extra speaker. Cash or C.O.D. Carriage Paid £1/12/6, or 2/6 down and 11 monthly payments of 3/-.

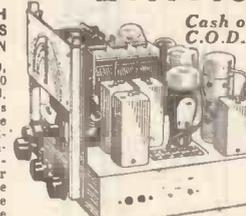


SPECIAL CASH OFFERS!

TRICKLE CHARGER, 2-v. 3 amp. Employing Metal Reflector, 10/-.
P.M. SPEAKER, Goodman's 8 1/2 cone. Transformer specially matched for S.T.900, 15/-.
SHORT-WAVE COILS, plug-in coils. Low-loss material ribbed formers. N.T.S. coils are expertly wound with high-grade copper wire, to ensure accurate distributed self-capacity. 100% efficient. 4-pin: 12-26, 22-47, 41-94, 76-170 metres. List Value, 2/9. Bargain Price, 1/9. 6-pin wavelengths as for 4-pin types. List value, 3/6. Bargain, 2/-.

1938 ALL-WAVE 5-valve A.C. SUPERHET CHASSIS
Amazing Offer! Immediate Delivery!
List Value 8 Gns. **BARGAIN £4:17:6**

COMPLETE WITH 5 VALVES/KNOBS & ESCUTCHEON
Cash or C.O.D.



3 wavebands: 18-50, 200-550, 960-2,000 metres. A.V.O. bandpass on all bands. Input to triode hexode detector oscillator, V.M. H.F. pentode, double-diode-triode 2nd detector triode resistance capacity stage coupled to high-slope output pentode. Output 3 watts. Combined on-off switch and volume control. Separate tone control. 4-position wave-change and gramo-switch. Illuminated rectangular full-vision slow-motion dial, 80-1 and 9-1 reductions, scale engraved station names and wave-lengths. Overall dimensions: 10" high, 11 1/2" wide, 8 1/2" deep. For A.C. mains 200/250 volts, 40/80 cycles.
7/6 down secures; balance 14 monthly payments of 7/11.
ORDER NOW TO AVOID DISAPPOINTMENT.
8" Energised Moving-Coil Speaker for above, 27/6. Add 2/- to deposit and 2/- to each monthly payment.

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56 (P.W.44) Ludgate Hill, London, E.C.4
Please send me Cash/H.P.

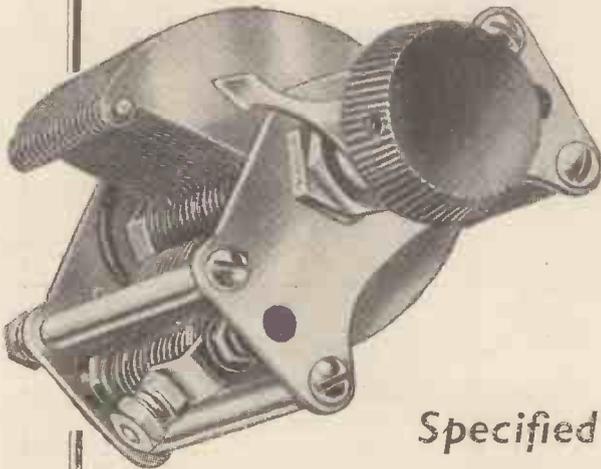
NAME.....
ADDRESS.....
EST. 1924
Please cross P.O.'s and register currency. Overseas orders post. extra.

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Specified for

JOHN SCOTT-TAGGART'S

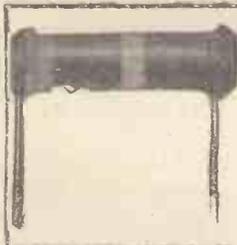
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S.T.900

The POLAR SPECIAL "No. 2"

Made of Aluminium. Ball bearings throughout. Supplied with special knob and pointer (as S.-T. Specification). ONE .0005 required

Price **5/6**



POLAR-N.S.F. RESISTORS

(Specified as alternatives)

Noiseless, constant in use. Supplied with wire ends. Standard colour code.

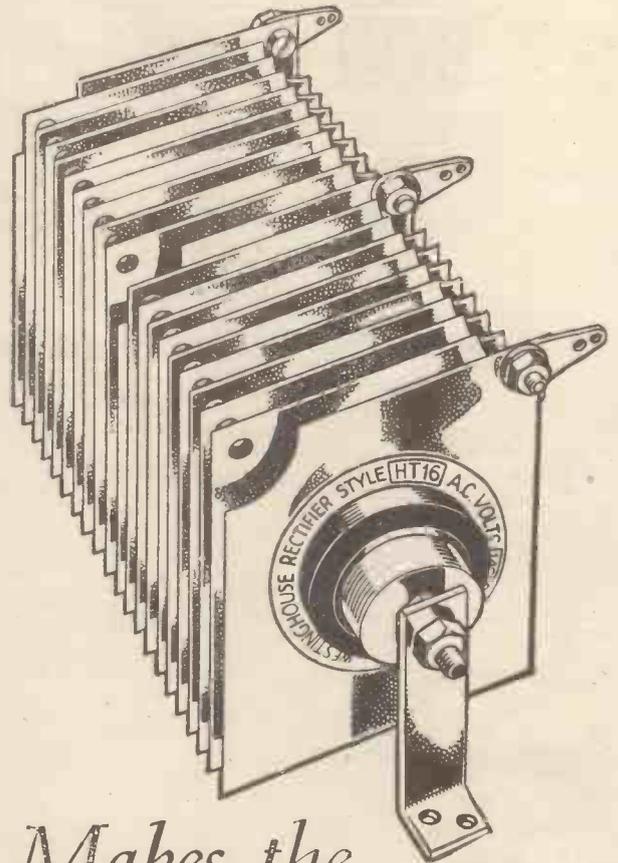
3, 1 watt 1-meg.	} Price	1/-
1, 1 watt 30,000 ohms.		
1, 1 watt 20,000 ohms.		
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Send for fully illustrated Catalogue of Polar & N.S.F. Components.

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A.C. S.T. 900
RELIABLE

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I RECEIVE A THRILL A MINUTE FROM THE S.T.900

300 STATIONS DURING A BRIEF TEST

By Leslie W. Orton

WITHIN a minute of handling the S.T.900 I had pulled in an American station, and ere the hour was out I had received stations from all continents at good loudspeaker strength. Consequently, can you blame me for enthusiastically acclaiming the S.T.900 a pippin?

Last year I had the pleasure of testing the S.T.800, and I was therefore as excited as a school kid awaiting Father Christmas when I knew that the S.T.900 was to be entrusted to me.

What secrets had the designer, Mr. Scott-Taggart, up his sleeve this year? Something good, undoubtedly.

At last the great moment arrived, and as I admired the appearance of the set, noted the features that made for noiseless reception, I fancied I saw a flash of jealousy flit across "Dynamite's" (my pet set) dial! Certainly, few sets can equal the S.T.900 in appearance, fewer still in performance.

Cuba Without An Aerial

And now a remarkable thing happened. I connected up the set hurriedly, switched on, and promptly tuned in W2XAF, Schenectady, and W1XK, Millis. They were followed by W3XAU, Philadelphia, the European fraternity on 31 metres; EAJ43, Canary Islands (boosting General Franco); and a number of Latin-American stations, the best being COCQ, Havana-Cuba.

Not bad going, eh? But I was frankly disappointed. You see, the "punch" I had expected was lacking—surely the great "S.T." hadn't fallen a cropper? A little hunting proved that he hadn't! In my haste I had failed to connect the aerial firmly, and it had slipped off! Next time I was more careful, and the result was a log as impressive as any I have seen.

On the 49-metre band numerous Latin-American stations were heard. I identified YVIRI, Colon; YVIRE, Maracaibo; HJ4ABD, Bogota; HP5B, Panama; and TG2X, Guatemala City. North America provided W3XAL, Bound Brook; W8XAL, Cincinnati; W8XK, Pittsburgh; and CRCX, Toronto.

Between 40 and 49 metres stations teemed in, and I listened to various versions of the Spanish war, a programme of semi-native music from H11X, Trujillo City, and scores of unidentified stations.

Amateurs at 10 a.m.

Next morning I was promptly at the dials by 8 a.m.—breakfast could go "blow" on occasions like this! The first station I tuned-in was an Iraq amateur who inconsiderately closed down before I had caught his call. Next came W5MX at

Corpus Christi, in Texas. W5AS and W6BQR, W4ALL, and numerous other stations provided moderate loudspeaker signals and were coming in until 10 a.m., when—truth will out!—I longed so much for my belated breakfast that I switched off.

In the evenings the band was very much alive. Among the "Yanks" tuned-in were W1JDM, W1CRW, W1BZA, W1JNI, W2IWT, W2ZC, W2LW, W3AEL, W3DR, W3ASG, W3AEL, W3GIZ, W4DLH, W4DX, W4HA, W4OL, W4CYU, W4ALL, W5MXR, W6AM, W8BYS, etc.

More thrilling were the Latin-American, Canadian, and North African stations. I heard VE1FI; VE1CI; CN8AM, French Morocco; CT2AJ, Azores; CE1CA, CE1AR, Chile; HK1EP,



As President of the Anglo-American Radio and Television Society, Mr. Leslie Orton is not only a critical listener, but is also a capable appraiser of scientific values in receiver design.

Colombia; CO7BB, CO2SR and CO6RM, Cuba; PY2ET, Brazil; LU7KG, Argentina; VO6L, Newfoundland, and many others.

Europe provided many British and French stations as well as LY1J, Lithuania, who was broadcasting a programme of records; ES5D, Esthonia; SM6UV, Sweden, etc.

So you can see that thrills are not lacking on 20 metres despite the fact that conditions are far from good at the present time.

Australia on Loudspeaker

During the mornings I pulled in several Australian amateurs, of whom VK2XU was the "star," and VK6ME, Applecross, Perth, provided me with a musical programme on one occasion.

But perhaps a better catch was the Awatea (not "Have a tea"!), which was heard calling on 33 metres. This, in case you don't know it, is a ship which occasionally broadcasts in the Pacific.

It was conducting tests when I heard it, and did not give its call letters.

On 50 metres I heard FIQA, Madagascar, whence a light orchestral concert entertained me.

All the usual broadcasters, such as W2XAF Bound Brook; W2XAD, Schenectady; W1XAL, Boston; W2XE, Wayne (on 13-, 19-, 25-metre bands) came in well, whilst JZK, Tokio, gave me a real surprise by roaring in with an English announcement, followed by the Japanese anthem and close down at 9 o'clock one evening.

10-metre Thrills

Quickly changing coils, I tuned to 10 metres, and was greeted by the American W8EBS, whence a young lady was assuring a fellow-enthusiast that she would let him know if she heard a South African. A slight adjustment, and I found W1COO, G5KJ, and G6GO conducting some experiments of their own.

I don't know whether you have ever operated a set on 10 metres, but thrills are two a penny down there, and among the stations I logged were W8NPF, Delaware, Ohio; W9DS; W1TH and W8KIN, a portable station in Ohio.

Dropping below the amateur band, I discovered W1XKB, Boston, relaying the W8ZBA programme, and W8XKA, Pittsburgh, relaying KDKA.

And I found no hand-capacity. I could tune-in a station and leave it without the slightest drop in volume.

America on Medium Waves

During daylight many European stations provided good loudspeaker strength signals, and at night—well, the dials were as lively as Gorgonzola cheese! Quality, as well as volume, was excellent, and I logged every station of importance upon long and medium waves. Selectivity was sufficient to enable me to part Graz from London Regional—a good test here.

It's comparatively rare to hear a DX-er boast of hearing America on medium waves, but I tuned in several on the S.T.900.

From 10 to 2,000 metres the S.T.900 is consistently excellent in reception. During the short period in which I tested it I pulled in over 300 stations, amateurs and broadcasters!

Join the Army and see the world; build the S.T.900 and hear it, but it must be the S.T.900, for there are sets and sets, but only ONE S.T.900!

EDITORIAL NOTE.—A list of 185 main broadcasting stations received by Mr. Orton appears on page 204.

RAPID CONSTRUCTION GUIDE

THESE SIMPLE STEP-BY-STEP DETAILS SPELL SUCCESS

THIS rapid construction guide is based on the same principles as those in previous years. Experience has shown that not only is the absolute novice assisted, but even the experienced constructor, by being told exactly what to do and when. Actually, you can build the S.T.900 from the blue print alone, but for extra speed and certainty of success you cannot do better than follow the rapid guide in detail. Naturally, the guide is based on the actual components used in my original set.

If you have bought a complete author's kit, including the panel, side-pieces, coil-platform, screen and terminal strips, or if you have bought these items ready prepared, cross out appropriate sections (C), (D), (E), (F), (G).

(A) Collect and examine required components. If you have author's specification kit, check each item to see that it corresponds to my list of parts actually used. Handle J.B. tuning condenser with care, keeping moving vanes closed. Bending of vanes would affect calibration of station names.

(B) Tighten terminal securing nuts (not terminal heads) on components where necessary.

(C) Remove metallising by scraping with pen-knife where indicated in Fig. 5.

Using Fig. 1, mark out on the front (not back) of panel the positions of the holes. With a fine-pointed bradawl prick all the hole positions. Using a 1/16-in. twist drill, start 1/16-in. holes carefully, using light pressure and turning the drill in a reverse direction at first; this is to avoid splitting the veneer. Continue drilling these 1/16-in. holes in the ordinary way. Centre bits are recommended for all the remaining large holes in panel, but twist drills may be used. Drill these holes.

(D) Drill side-pieces as shown in Figs. 3 and 4.

(E) Drill terminal strips as indicated in Fig. 7.

(F) Drill two 1 1/4-in. diameter holes for coil holders in coil platform, and make three holes with bradawl for anchoring screws in positions shown in Fig. 2.

(G) Bend and drill aluminium screen as indicated in Fig. 6.

(H) Fit terminals to terminal strips.

(I) Screw terminal strips to side-pieces, using two 1/4-in. round-head brass screws in each. The terminal strips are screwed at the bottoms of the back edges of the side-pieces (this is not obvious from the blue print which shows the plan view), the terminal strip containing the aerial terminal being fixed to the side-piece with the 1/8-in. hole in it.

(J) Fit aerial balancer to left-hand side-piece in hole indicated in Fig. 3. Also fit two Clix parallel sockets to same side-piece. A 1/8-in. x 1/8-in. hole brass washer must be fitted under each fixing nut of these sockets. Fit a Clix socket to the right-hand side-piece, using washer as with other sockets.

(K) Screw the two coil holders to coil platform, using four 1/4-in. No. 4 round-head brass wood screws for each. The positions of the coil holders are clearly shown on the blue print. At the top of the blue print is a drawing of the two coil holders looking up at the underneath of the platform. Do not get the coil holders wrong way round. The little bulging slot of each coil holder must point away from the panel. Make sure that the sockets of the coil holders are in their correct relative positions. This is where you will probably go wrong. I repeat that the view of the coil holder sockets is from the underneath of the platform. If you imagine it is the top or get the little bulging slot pointing the wrong way it is entirely your own fault. This is absolutely essential. Fit three anchoring screws to coil platform, in positions shown in Fig. 2. Each screw is 1/4-in. No. 4 round-head brass, and a 1/8-in. x 1/8-in. hole brass washer must be used under each screw. Do not screw fully in, as various wires will be connected to them.

(L) Lay the panel face downwards on a cloth-covered table (to avoid scratching veneer). Lay blue print right way round on back of panel. Keep blue print steady with a weight. Lay the following components on the blue print and prick through the panel the fixing holes of these components, the bradawl actually going through the fixing holes in the components themselves: T.M.C. block condenser, valve holders, two B.T.S. H.F. chokes, three Lissen .006-mfd. fixed condensers, one Lissen .0005-mfd. fixed condenser, two Lissen .00005-mfd. fixed condensers, Varley Niclet.

(M) Using the two 1-in. countersunk holes in the panel and which are 6 3/8 in. from bottom of panel, fit coil platform to back of panel, with two 1/2-in. No. 4 court-runk brass wood screws. The panel should project beyond each end of coil platform by 1/2 in. Fit aluminium screen as indicated in Fig. 5 with two 1-in. No. 4 round-head brass wood screws.

(N) Screw the following components on the back of panel, using the sizes of screws indicated (remembering that if you use too long a screw it would project through the panel). T.M.C. block condenser (four 1-in. No. 4 round-head brass screws), valve holders (each is fixed with two 1-in. No. 4

round-head brass screws), two B.T.S. H.F. chokes (each is fixed with two 1-in. No. 4 round-head brass screws), three Lissen .006-mfd. fixed condensers (each is fixed with two 1/2-in. No. 4 round-head brass screws), Lissen .0005-mfd. fixed condenser (two 1/2-in. No. 4 round-head brass screws), two .00005-mfd. Lissen fixed condensers (each is fixed with two 1/2-in. No. 4 round-head brass screws), Varley Niclet (two 1/2-in. No. 4 round-head brass screws).

(O) Fix "X" reaction condenser and anode reaction condenser, having removed knobs in each case. In each case a 1/2 in. x 1/2 in. hole 20-gauge brass washer should be fitted to fixing bush before inserting bush through the panel. Remove knob, pointer, and pointer locking-nut of the aerial-balancing condenser (.0005-mfd. Polar slow-motion air condenser). Remove fixing nut and fit condenser to panel, replacing fixing nut on front of panel. Remove fixing nut from bush of slow-motion driving spindle. Remove fixing nut from the main J.B. tuning condenser, and pass the fixing bush on the condenser through the appropriate hole in the panel, holding the condenser up against the back of the panel. Fit bush of slow-motion driving spindle through its appropriate hole in panel from the front, so that the remaining hole in the metal spacing strip slips over the main bush of the tuning condenser. If this upper hole does not slip over the main bush, it indicates that the distance between the two holes in the wooden panel is not accurate, and you will require to elongate the lower hole in the appropriate direction to rectify matters, e.g. with a round file. Fit the fixing nut to the main bush of the main tuning condenser at the front of the panel. Fit fixing nut to bush of driving spindle at the back of the panel.

THIS COMPLETES THE FIXING OF COMPONENTS.

Now you are going to wire the components. For this you need the blue print and the Hi-Speed series of wiring diagrams to be given next week.

Use the Hi-Speed drawings to help find wire on blue print, and the Hi-Speed instructions (under the drawings) as a guide to the shape, when this is necessary. You also place a tick against wire number below Hi-Speed diagram as each wire is completed. The blue print is always the final authority.

Lay panel face downwards, resting it on two books or cloth-covered blocks of wood; this is to prevent scratching of the veneer, and to prevent pressure on control spindles.

THE HI-SPEED WIRING SERIES (see next week's issue). This series consists of a number of pictures of back of panel showing the connecting wires divided into small groups in their order of wiring. This system makes it possible to find any wire immediately on the blue print. The wires in all my diagrams are numbered strictly in their order of connection, which has been carefully worked out for speed and simplicity of construction. Note the hints under the Hi-Speed diagrams regarding certain of the wires.

The essential wire is S.W.G. 18 tinned copper wire. Over each wire connection is slipped a suitable length of 1 1/2-in. insulating sleeving. It is important to use this wire for all high-frequency circuits for technical reasons in connection with short waves, and therefore it is best to wire the whole set with this wire. Incidentally, the method of wiring is just as easy, if not easier than any other method.

The best procedure for wiring is as follows: Lay a length of sleeving in the position which will ultimately be occupied by the wire itself between the two terminals. Cut the sleeving to the required length. The wire itself requires a little stretching to take out the kinks. This can be done in several ways: you can hold one end in a vice and pull on the other end of the wire. The wire should be pulled

(Please turn to page 196.)

FRONT-OF-PANEL DRILLING DIMENSIONS

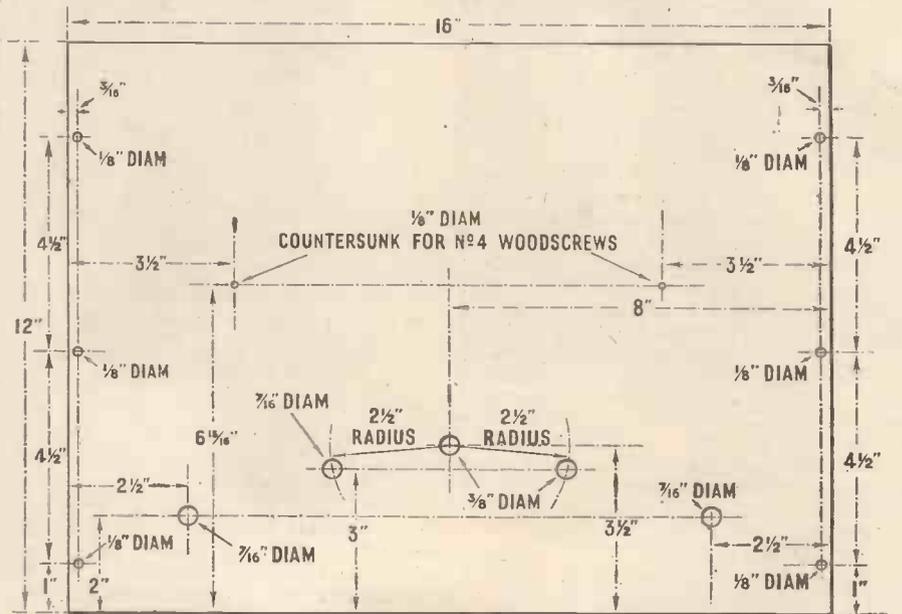


Fig. 1. All the front-of-panel dimensions are given in this diagram.

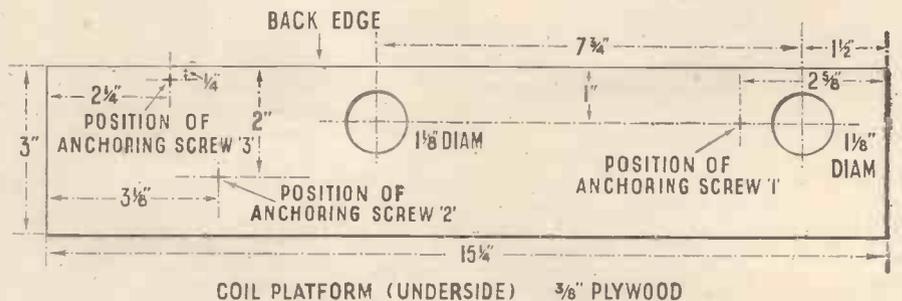


Fig. 2. Here are details of the positions of the coil holder holes and of the anchoring screws.

HIVAC

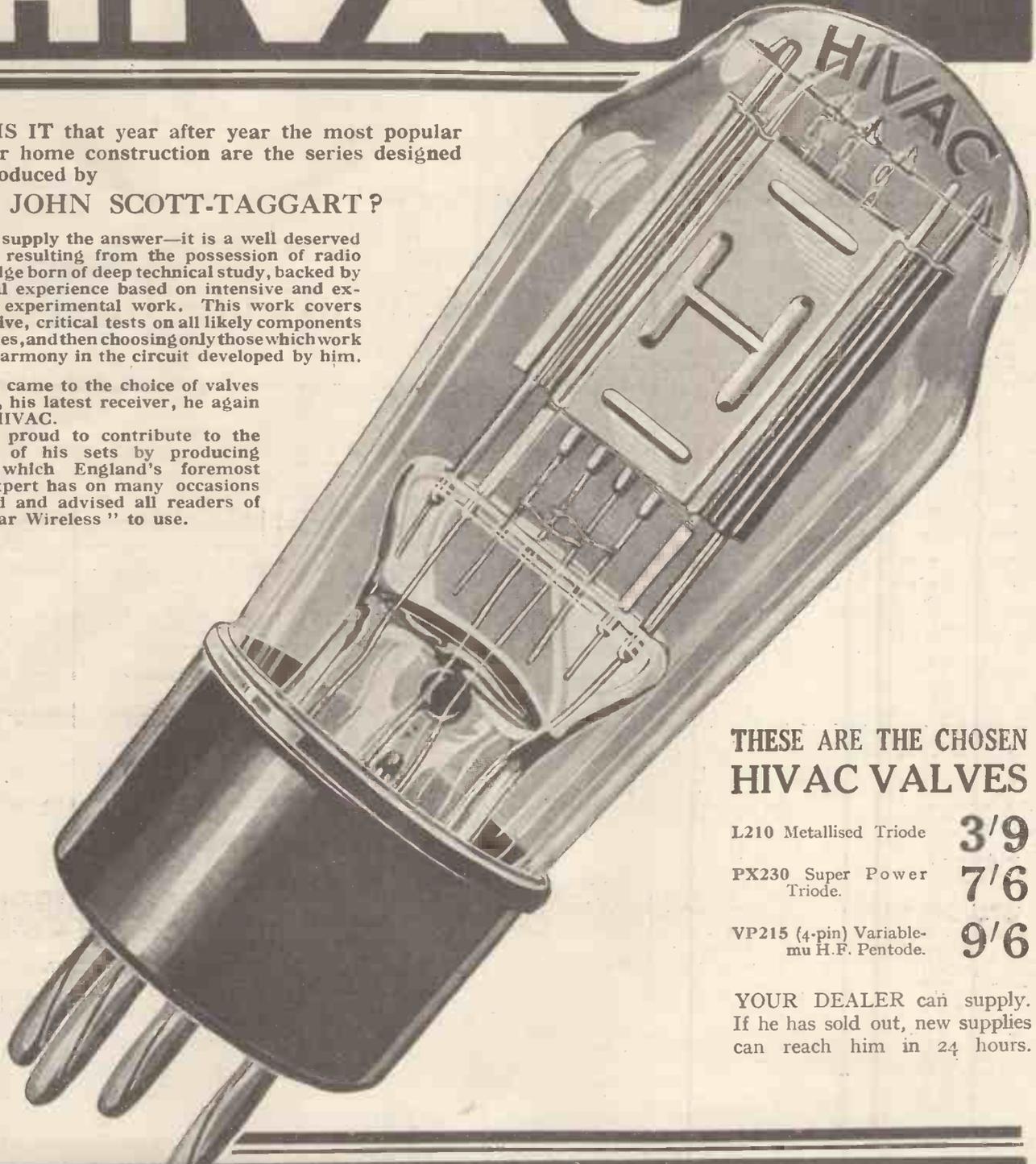
WHY IS IT that year after year the most popular sets for home construction are the series designed and produced by

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We can supply the answer—it is a well deserved success resulting from the possession of radio knowledge born of deep technical study, backed by practical experience based on intensive and extensive experimental work. This work covers exhaustive, critical tests on all likely components and valves, and then choosing only those which work in full harmony in the circuit developed by him.

When it came to the choice of valves for this, his latest receiver, he again chose HIVAC.

We are proud to contribute to the success of his sets by producing valves which England's foremost valve expert has on many occasions specified and advised all readers of "Popular Wireless" to use.



THESE ARE THE CHOSEN HIVAC VALVES

- L210 Metallised Triode **3/9**
- PX230 Super Power Triode. **7/6**
- VP215 (4-pin) Variable-mu H.F. Pentode. **9/6**

YOUR DEALER can supply. If he has sold out, new supplies can reach him in 24 hours.

Specified by SCOTT-TAGGART FOR THE "ST 900" ALL-WAVE RECEIVER

The High Vacuum Valve Co., Ltd., 111-117, Farringdon Road, London, E.C.1.

RAPID CONSTRUCTION GUIDE

(Continued from page 194.)

sufficiently hard till you feel it "gives" a little, after which it will be found that the wire is stiff and straight. The wire may also be stretched straight between two persons each having an end wrapped round pliers or a piece of wood. Cut the wire into approximately three-foot lengths for easy handling. When wiring up two points in the set, slip the correct length of sleeving, as described above, over a three-foot length of the wire. Now cut the wire so that it projects outside the sleeving at each end by $\frac{1}{8}$ in. This method of wiring makes it necessary for the initial length of sleeving to be correct, and the measurement of the sleeving should therefore always be done accurately from the side of one terminal to the side of the other terminal, following the line of the wiring as shown in the illustrations. The $\frac{1}{8}$ in. at each end should be shaped into a round loop. Now have a cup of tea.

(P) USING BLUE PRINT AND HI-SPEED DIAGRAMS (reading notes beneath them) **WIRE UP THE SET UP TO No. (58)**, and then fit side-pieces to panel, using 6 $\frac{1}{2}$ -in. No. 4 round-head brass screws through panel, and 1 $\frac{1}{2}$ -in. No. 4 counter-sunk brass screw through each side-piece into coil platform. Complete wiring by adding wires (59), (60), (61), (62), (63), (64), (65), (67), (68). The lengths of battery leads (3), (5), (18), (51), (52), (53), (54), (55), (56), (57), (59), (63), are suggested under the Hi-Speed diagrams. It is vitally important to get the right wander plugs on the right wires.

In tightening the terminals on condenser block avoid over-tightening, as this will cut the wire; do not finally tighten these or any other terminals till all the wires are on.

The leads going to the grid-bias battery, the H.T. battery, and the accumulator may be 14/36 single rubber-covered flex or Maxamp wire, which latter is stiff wire with insulation which may be slipped back. Leave $\frac{1}{2}$ in. bare at each end of wire. Bend one of the ends $\frac{1}{2}$ in. from the end back on itself and push the loop so formed into the hole in the side of the appropriate Belling and Lee Midget wander plug, having loosened the head of wander plug. Tighten head of wander plug. Fit other end of wire to correct component.

None of the wander plugs is in the actual list of components of the set, because constructors may already have these. The make specified is especially recommended.

Check the whole of the wiring of the set by the method suggested at the end of this guide. Make certain the battery leads are correctly labelled. A mistake is highly likely and may burn out your valves.

(Q) FIT PAPER DIAL AS FOLLOWS: Cut out the dial along the outer edge of the black border. Place the dial in the approximate position it will occupy on the panel. Now accurately position the card as follows: The distance between edge of dial and side of panel should be equal on both sides. At the left side will be found a black band carrying waveband markings. The bottom edge of this band should be exactly $3\frac{1}{2}$ in. up from the bottom of the panel, while the bottom of the black band in the corresponding position on the other side should also be $3\frac{1}{2}$ in. from the bottom of the panel. If dial is of card or celluloid, prepare ordinary plated brass pins (if a pin is of a type that could be bent it can be used) by cutting them diagonally with wire cutters or pincers about $\frac{1}{4}$ in. from their heads. You have now very short and pointed pins. Any other type of very short miniature nails may be used.

Keep the dial card flat on panel, and prick through suitable pin positions with some thin, pointed instrument (I used a drawing pin) for about $\frac{1}{8}$ in. into the wood. Insert a prepared pin into each hole and push home with any hard, flat-tipped instrument (I used the handle of a screwdriver).

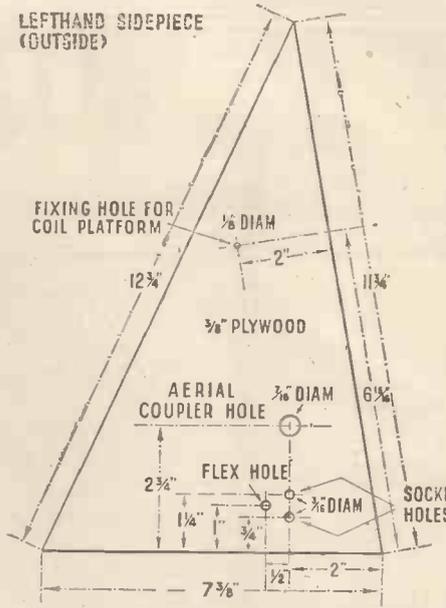
(R) STAND SET IN ITS NORMAL POSITION WITH DIAL FACING YOU. Turn spindles of "X" reaction condenser and anode reaction condenser fully anti-clockwise (fully to left). Fit their knobs with their white spots pointing exactly in a horizontal direction to the left. Tighten up their grub screws.

Turn the spindle of the aerial balancing condenser fully anti-clockwise (fully to the left) so that the vanes are completely open. Screw on pointer to the screwed spindle, so that $\frac{1}{4}$ in. of the spindle is exposed between the pointer and the end of the spindle, seeing that the pointer points exactly horizontally to the left. Fit the lock-nut to the end of the spindle, thus locking the pointer, taking care that the pointer is not moved round from its correct horizontal position pointing to the left as the lock-nut is tightened, the pointer being held to prevent this occurring. Now fit the knob on the plain (as distinguished from the screwed) spindle.

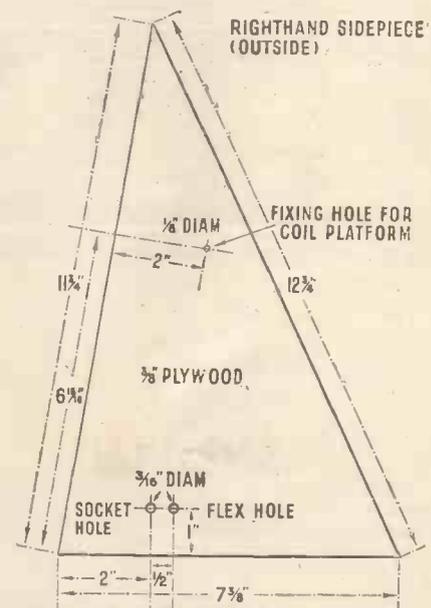
Remove the knob from the driving spindle of the slow-motion drive. Remove spring and sleeve washer from spindle of drive. Turn main spindle

(Please turn to page 198.)

LEFTHAND SIDEPIECE (OUTSIDE)



RIGHTHAND SIDEPIECE (OUTSIDE)



Figs. 3 & 4. These two side-pieces support the S.T. 900 panel and coil platform. The panel is attached to the 11 3/4-in. sides and the side-pieces are of exactly the same overall dimensions.

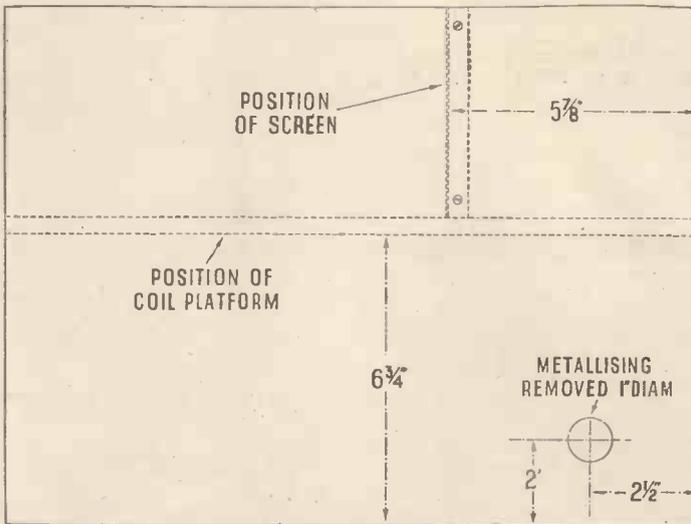


Fig. 5. The whole of the back of the panel is metallised, a small circular portion being removed for a diameter of 1 inch to prevent the aerial-balancer making contact with the metallising.

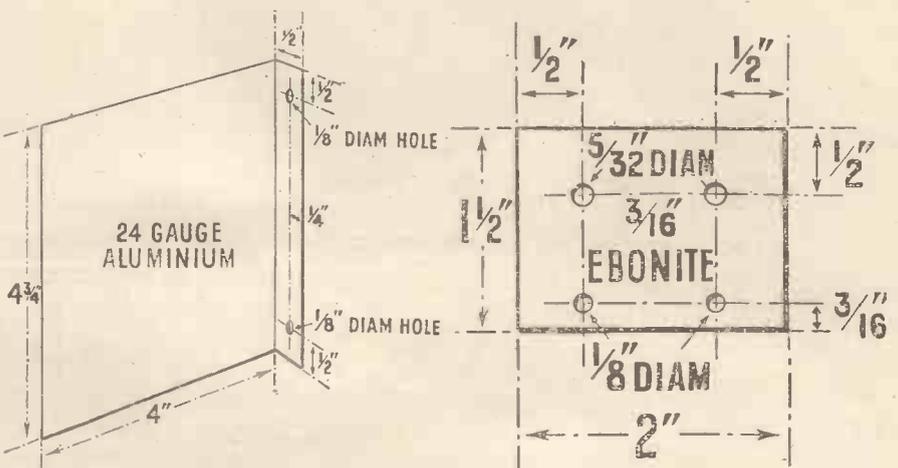


Fig. 6. This screen, which is screwed to the panel, is mounted between the aerial and anode coils in the position shown in Fig. 5.

Fig. 7. There are two terminal strips the dimensions of which are the same, viz. as given above.



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RAPID CONSTRUCTION GUIDE

(Continued from page 196.)

fully anti-clockwise (fully to the left) so the condenser vanes are fully open. Place pointer disc on spindle of condenser with the pointer pointing exactly to the bottom edge of black band carrying waveband markings on the dial, care having been taken that the pointer disc just rests on the flange of the driving spindle. Now tighten the grub screw in boss of pointer-disc. Replace sleeve washer on drive spindle. Place spring over this washer. Place knob on drive spindle, and press down an appropriate amount and tighten grub screw. The correct pressure for the drive for best results may be found by varying the pressure of the knob. Fit knob on aerial coupler, so that when turned fully clockwise, spot on knob points towards front of set.

YOUR SET IS NOW COMPLETE. (See separate articles on installation and operation.) It is desirable to check the wiring before attempting to install.

J. S.-T.

THE S.T.900 WIRING CHECK INSTRUCTIONS

PROVIDED great care is taken, the best way for a constructor to check his wiring is to take each wire in order from the Hi-Speed series (see next week) and then to look at his own set and see whether the wire connects the same points. This has to be done very conscientiously, one wire at a time, making sure that the wire goes to the right side of each component, and where there are two components of a similar kind, such as valve holders, making certain that you have got hold of the right component.

Having found the wire correct on the set, you should then have another glance at the Hi-Speed diagram as a final check.

Each wire thus checked may be ticked off or written down.

It is possible that, although you have all the wires correctly in place, you have added one or more wires unnecessarily.

Next week I publish a skeleton diagram of the set showing the number of wires going to each terminal. Check the number going to the corresponding terminal on your own actual set. You will thus find out which components have an extra connection. This can then be removed. This check, of course, is not really necessary unless your set definitely does not work, or there is a short-circuit.

The checking with the Hi-Speed diagrams, however, is recommended in all cases, before any attempt is made to install the set.

J. S.-T.

INSTALLING THE S.T.900

These instructions are as precise and accurate as those for building the set

BEFORE connecting any batteries to the S.T.900 see that the free end of lead (37), which is for later connection to the anode, i.e. top of H.F. pentode valve, is "in the air." If it touches any metal it may cause a short-circuit when the batteries are first connected. An extra precaution would be to wrap the free end in paper temporarily.

Turn set (without valves) with dial facing you. Place loudspeaker on right of set and preferably not pointing directly towards it. The triple extractor is not connected at this stage, or not connected at all unless swamping is experienced. The two-volt accumulator is placed behind the right-hand end of set. The high-tension battery, which should be of the 120-volt type (the bigger capacity types are always cheaper in the long run), is placed behind the left-hand end of set. The grid-bias battery can be placed between the accumulator and the high-tension battery—the position of these batteries is not very important, but the leads should not be long. Long leads to the accumulator especially may result in a drop of voltage at the valve holders. Suggested lengths are given under the Hi-Speed diagrams.

Connect the aerial lead (after scraping or sand-papering) to terminal A on one of the terminal strips and connect the earth lead (a short earth lead is desirable, if possible)—after similar treatment—to terminal E. The loudspeaker is connected to terminals L.S.+ and L.S.-. There is no special way round in the case of a moving-coil loudspeaker. All connections to wander-plugs should be absolutely perfect. Many troubles, crackles, and often disconnections altogether are due to faulty connections in wander-plugs. I strongly favour testing all leads

by the aid of a voltmeter or a flash-lamp battery and bulb, or other method, as much more trouble than you imagine is caused by faulty contacts in leads.

Join the L.T.+ and L.T.— to the correct terminals on the accumulator. Insert the H.T.— plug in the negative socket of 120-volt H.T. battery. Insert H.T.+1 plug in +84 volts (or near voltage) socket. Insert H.T.+2 in 72-volt socket. Insert H.T.+3 plug in 60-volt socket and H.T.+4 plug in 120-volt socket. The constructor can experiment with tapings H.T.+1 and H.T.+3. If he wishes, and if the H.T. begins to run down he may have to use higher voltages on H.T.+1 and H.T.+3.

The grid-bias plugs are fitted as follows: G.B.+ is inserted in the G.B.+ of the battery, which should be of the 16½-volt type; the G.B.—1 is connected in —1½ volts; the G.B.—2 is inserted in —4 volts; this position can be altered according to the degree of selectivity required; the G.B.—3 is inserted in —3 volts; the G.B.—4 is inserted in —12 volts, the exact position of this being dependent upon the desire for H.T. economy. Actually, the higher voltage you can make this the better from the point of view of H.T. economy, provided distortion is not noticed.

Check all the above connections most carefully, preferably getting someone to read them out slowly to you while you follow the wires. An astonishingly large number of constructors get their leads on to the wrong terminals; this may cause a serious short-circuit, or may affect the efficiency of the set, and the constructor may not know of it for weeks. There is no excuse for this on the S.T.900, as all the plugs and terminals are easily identified, and none of them is duplicated. All terminals should be firmly tightened up. The plugs should also make good contact and should not be smeared with bitumen.

"Switch on" by inserting plug in socket on right-hand side-piece.

A good precaution now is to connect a voltmeter or flash-lamp bulb across the filament terminals on each valve holder in turn, taking care that it is across the filament terminals.

The lamp should light up normally. If a very bright light is obtained, or the bulb is fused, external wiring, and if necessary internal wiring, should be checked. If a voltmeter is used, it should read about two volts. If it reads much more, wiring should be checked.

"Switch off" set by removing right-hand plug. Take out the H.T.— plug from the H.T. battery.

Insert "X" valve (Hivac L 210 1st.) in valve holder nearest aerial coil holder.

Insert H.F. pentode (Hivac VP 215 Met.) in valve holder next to "X" valve. Connect free end of wire (37) which has been "in the air" to top of this valve. Insert detector triode valve (Maxia L2 Met.) in valve holder nearest anode coil holder. Check this carefully as the type of detector valve is important in this set. Insert "first L.F." valve (Osram or Marconi L21, clear or metallised) in valve holder next to triode detector. Insert power valve (Hivac PX 230) into valve holder nearest bottom edge of panel.

Check valves to see that they are in their correct valve holders. Here again constructors quite often get poor results by having valves in their wrong valve holders.

Check once again all battery voltages, including those of the grid-bias plugs. A vast amount of trouble is caused by grid-bias plugs being in their wrong positions, and yet frequently quite good results are obtainable even when these plugs are in their wrong positions, the constructor not realising for that reason that he could get much better results if the plugs were correctly placed.

Put H.T.— plug back into H.T.— socket on H.T. battery.

The aerial lead, it should be noticed, should be kept away from the loudspeaker side of the set, and the H.T. battery, and similarly the leads to the loudspeaker should not trail round the left-hand side of the set. The aerial lead should always be kept away from the earth lead.

Set the pointer of your main tuning condenser to a local Regional station name. Insert a medium-wave coil in each coil holder. Turn the aerial coupler about half-way. Turn anode and "X" reactions fully anti-clockwise (fully to the left). Turn aerial balancer knob so that the pointer points in a direction approximately parallel with the direction of the main pointer. Insert plug in socket on right-hand side-piece, and insert plug in lower socket on left-hand side-piece.

If it is found that the pointer points a little to either side of the name of an identified station, about the centre of the dial, the position of the pointer-disc on the main spindle can be altered by



Here is this year's version of the Triple Extractor. It is no better and no worse than the standard one of last year. It is much cheaper and easier to build. It is only necessary in cases of very severe B.B.C. swamping. Bournemouth and Plymouth readers should use the standard version if they need any at all.

slackening the grub-screw, holding the vanes, and turning the disc one way or the other to a small extent by turning the driver knob. Then tighten grub-screw.

Use of Mains Units. If a mains unit is employed, the H.T.+1 connection is taken to high intermediate tapping on the mains unit; the H.T.+2 connection is taken to the S.G. tapping. The H.T.+3 goes to the medium intermediate socket on the mains unit. H.T.+4 goes to maximum. As many mains units will give 150 volts, the maximum grid bias, G.B.—4 may be increased to 15 volts.

J. S.-T.

THE CONTROLS OF THE S.T.900

EXAMINE the photographs which show the controls. Looking from the front, on the left side-piece of the easi-cabinet, the knob controls the aerial coupler condenser and will be called the "aerial coupler." Below this on the side-piece is a plug which goes into one of two sockets. This is the Selectivity Plug. When in the bottom socket you have normal selectivity; when in the upper socket you have ultra-selectivity (obtained on the second circuit, a negative voltage being applied to the grid of the H.F. pentode valve).

On the right-hand side-piece there is also a plug and socket. This replaces what would be an on-off switch. But as I hold all radio-switches accused, you do not switch on, you plug-in. It is as easy and a thousand times safer, and more reliable.

Now for the front panel. All the controls are at the bottom, thus giving the S.T.900 the most handsome front-view of any of my sets. The knob on the left is that of the aerial circuit tuning condenser which tunes the grid circuit of the H.F. pentode, i.e. the first tuned circuit. This knob is called the aerial balancer. It has a small pointer on it.

The next knob to its right is the aerial reaction control. The next knob turns the main tuning condenser by a slow-motion movement. The knob on the right is the ordinary anode reaction knob.

J. S.-T.

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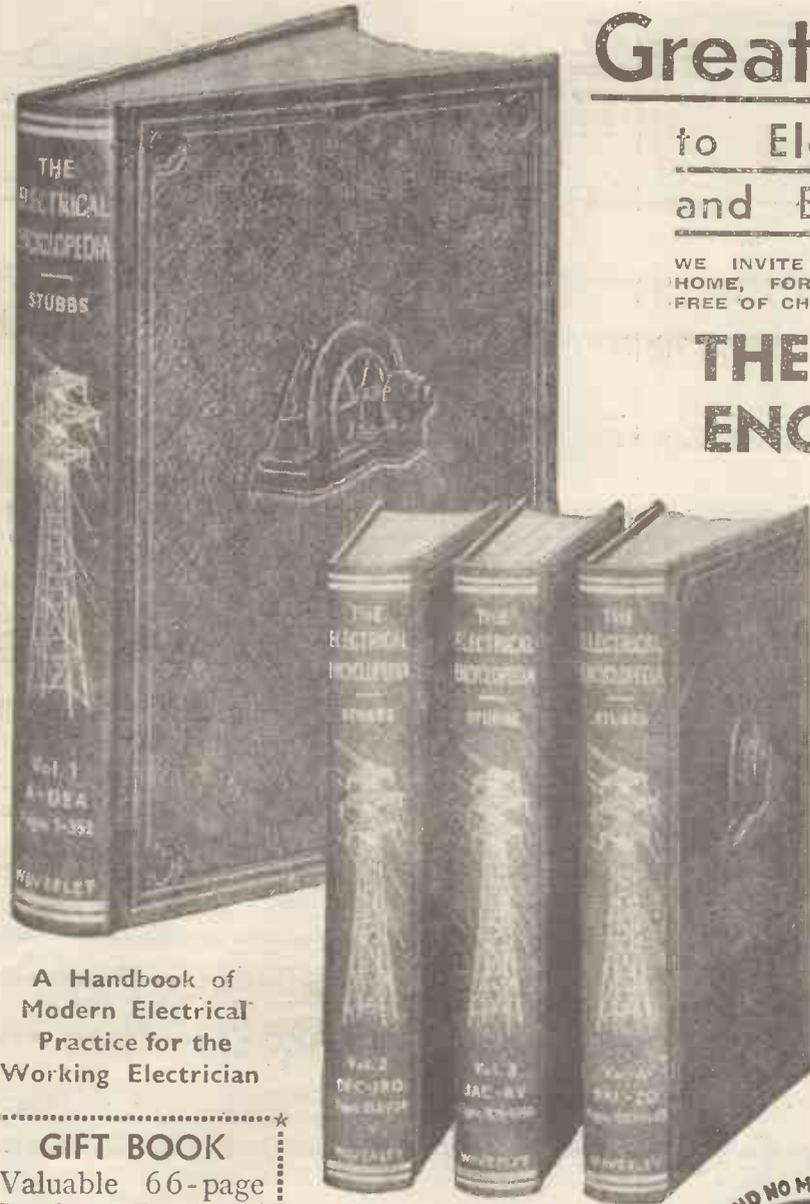
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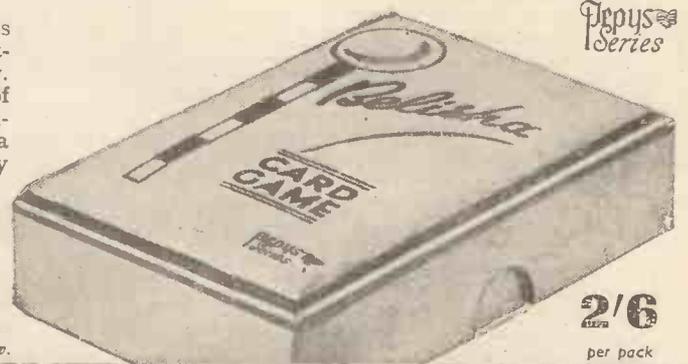
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HOW TO OPERATE THE S.T.900

These instructions will help you to get maximum results. Read them carefully

REMEMBER always that there are two tuned circuits in this set. Each has two adjustments to make it more selective. Intelligent operation depends on linking these adjustments with the correct circuit.

The first circuit is tuned by the aerial balancer. It is fed with radio-frequency currents through the aerial coupler. Its selectivity is thus under control. Also the "X"-aerial reaction knob controls this circuit. It improves selectivity and signal strength. These three knobs are used together.

The second circuit is tuned by the main tuning condenser with its long pointer and dial. The selectivity plug governs the selectivity and signal strength of this circuit. Anode reaction is applied to this circuit, and improves selectivity and signal strength. These three settings are used together.

Aerial Coupler. Normally about a third from the left. Turn left for reducing signal strength or improving selectivity. Turn right for stronger signals (but selectivity is reduced). Tuning is not appreciably affected. Main dial not affected at all, but very slight readjustment on aerial balancer may improve signals after alteration of aerial coupler.

Aerial Balancer. As this tunes the aerial circuit it is a vital control; if not accurately tuned you will not properly receive the desired station. You do not, however, need to know or remember its position. Its pointer will point approximately parallel to (or a little to the left of) the main tuning pointer. Tuning is done after main pointer has been set.

Selectivity Plug. When in upper socket, set is at ultra-selective, but set is not fully sensitive. When plug is in lower socket, signals are loudest but selectivity is only normal.

"X"-Aerial Reaction. Turning to right (clockwise) signal strength and selectivity improved.

Main Tuning Knob. Tunes the second circuit, i.e. the anode circuit. Alteration of reaction should be followed by slight readjustment of this knob.

Calibrating the S.T.900. You should start logging as soon as possible so as to get a few easily recognised stations marked with a dot. As the aerial balancer is not calibrated, "old hands" may find things a little strange at first, but this feeling disappears rapidly as you mark up a few stations. Pick up your locals first and reduce their strength, e.g. by turning aerial coupler to left and selectivity plug in upper socket. Apply reaction so as to get a fine tuning point. The aerial balancer should be tuned to give loudest signals, its pointer being approximately parallel or a little to left of main pointer. Mark a dot in pencil where main pointer crosses the dot-line nearest the outer ring of stations. Join dot by pencil line to end of station name.

If the pointer does not point at the station name you can slightly slacken grub screw which holds condenser drive disc to the condenser spindle. The pointer-disc can then be turned a little to left or right as the case requires; the grub screw is then tightened.

Having marked your local you can always go back to it by setting the main pointer to it and then turning the aerial balancer until the station comes in. (Do not forget to adjust the aerial balancer.) Repeat the process on other easily recognised medium-wave stations. Intermediate stations are easily found by noting the general angle of the junction lines to the station names.

When the set is not in its most selective condition it is possible for the main pointer to be set at a foreign station, and the aerial balancer as it is turned may bring in some other station, due to its not being correctly adjusted. For example, the local station may come in. You rapidly learn to ignore these stations and continue to turn the aerial balancer until the actual station wanted comes in. The final test to make sure you have the wanted station is to move the main pointer to each side of its correct position. Signals should weaken whichever way you move the main pointer. If they do not weaken (unless signals are already very

strong) it means you are on the wrong station, due to an incorrect setting of the aerial balancer.

The simplest way of tuning is to set your main pointer to the station dot, make the set oscillate with reaction. You will no doubt hear a whistle. Then turn the aerial balancer to a point where the whistle suddenly changes note. Loosen reaction, and there is your station. This system, although fool-proof, is only used for logging very weak stations, but the system can be recommended for short waves owing to sharpness of tuning on those bands.

Tuning the Short Waves. 1st Method. The short waves may be received with aerial balancer pointer fully to the left and "X"-aerial

reaction to the left, tuning being accomplished with the main pointer and reaction, the selectivity plug being inserted in lower socket. The set may be made to oscillate with the anode reaction and the main pointer turned to around the middle of a group of short-wave stations. Heterodyne whistles will be heard. Gradually reduce reaction until set stops oscillating and by careful tuning on main pointer and by keeping reaction critical you will pick up a number of stations. This method is most inefficient but easy.

2nd Method. Having received a station you can make it much louder by turning the aerial balancer knob until the signal comes into tune on the balancer. You may find that as it does this the set oscillates. In that case you will have to reduce the anode reaction. This second method is usually only advised when the short-wave signals are strong.

3rd Method. Make the set oscillate by use of plenty of anode reaction (use more than is necessary just to start oscillation). Keep the aerial balancer pointer more or less parallel, but a little to the left of the main pointer. Pick up a station on the main pointer by its heterodyne whistle. Leave go of the main tuning control and turn the aerial balancer either way until the whistle suddenly changes character. This will only occur at one point. You will find that you can get a silent point adjustment on the aerial balancer and that if you tune the balancer to either side the note of the whistle will rise. At the silent point the aerial balancer may be regarded as in tune. Leave it alone. Now go back to the main tuning knob and adjust it while reducing reaction to the normal critical non-oscillating condition. In this process you will hear the whistle appear again and you should not "lose" it by over-rapid alteration of either reaction or main tuning knob. It will be found that the reaction knob will affect tuning somewhat, but if you keep the whistle or the clear station itself within hearing by suitable tuning of the main pointer, this will cause no ill-effect.

4th Method. A final polish for the satisfaction of experts may be given as follows: Tune a trifle below the station on the aerial balancer and get the station at its loudest by trial "swinging" of the main tuning control. Then tune very slightly higher on the aerial balancer, repeating the swinging. Signal should be louder. Keep on with this process till signals are at their loudest. If you over-tune on the aerial balancer signals will begin to fall off in strength. During these tests (which actually take only a second or two) anode reaction should be kept critical.

Note. As usual on straight sets, as you tune higher up the dial more reaction is needed, this applying to all wavebands. Another point useful to note is that an increase of reaction may require tuning down a trifle on the main pointer, and vice versa.

Use of X-Aerial Reaction. After picking up a station apply aerial reaction by turning knob to right, slightly re-tuning aerial balancer. When searching, a little aerial reaction should be constantly left in use. If signal too strong, reduce aerial coupler.

How to Adjust the Triple Extractor. Connect Triple Extractor Unit between aerial lead and aerial terminal of set. Aerial lead goes to terminal 1 on Triple Extractor, while terminal 4 on Triple Extractor is joined by a wire to aerial terminal on set.

(a) At first have all three extractor condenser adjusters turned fully clockwise (to right).

(b) Tune the S.T.900 set to receive your local National medium-wave station, or your relay station if this causes swamping. Signals should be loud but not made unnecessarily so. Reduce aerial coupler and reaction if necessary. Now slowly alter that knob on the Triple Extractor which is nearest terminal 1, until the local National is cut out. On either side of the silent point the National will become louder.

(Please turn to page 203.)

S.T.900

A BRILLIANT ACHIEVEMENT

WE take great pride in being privileged to present John Scott-Taggart's great new set, the S.T.900. Not only because the rising curve of his previous colossal successes makes it certain that once again all records will be broken, but also because it constitutes one of the boldest technical achievements in all-wave radio.

We have all naturally learned to anticipate something that is "different" and BETTER from Britain's leading designer, but in the S.T.900 there is a tearing-off of strait-jacket convention that will surprise most of those who read and stagger all those who build. For only those who build will discover how really good the S.T.900 is.

The use of high-efficiency plug-in coils and the abolition of switching is a surprise, but to me a very pleasant surprise. The more one thinks about it the more one realises how entirely right the designer of the S.T.900 has been in clearing the decks once for all and making a bold stand for efficiency and reliability.

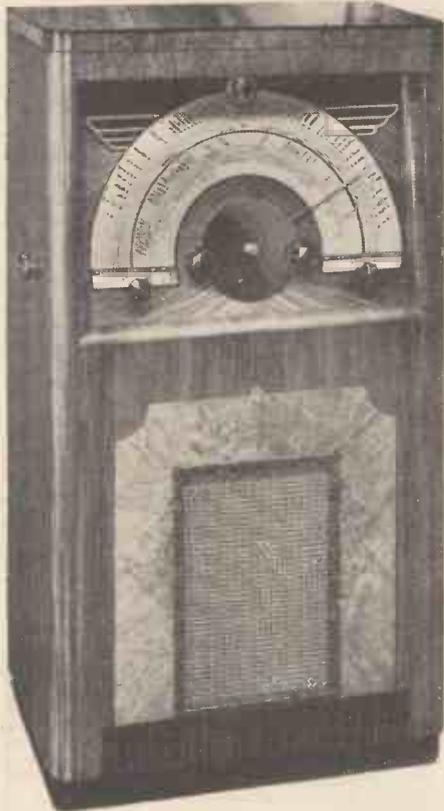
This great engineer set himself the task of producing for home constructors an easy-to-build, snag-free receiver of maximum efficiency on all broadcasting wavebands. It is an original product of his own keenly analytical and inventive mind, which has always remained untrammelled by the ruts, grooves and conventions of standard practices. Time and again he has ruthlessly trodden popular fashions underfoot, and the constructing public have followed him to their lasting benefit. They will do so again.

The magnificent performance which the S.T.900 provides and its fundamental simplicity and certainty of results completely justify Mr. Scott-Taggart's individualistic methods of design. He has been proved uncannily right year after year. He is right once more—with a set that is easily his best.

The Editor.

THE A.C. S.T.900

Preliminary notes on the all-mains version of this extraordinarily efficient all-wave design



The A.C. S.T.900 in its handsome console cabinet

THE annual set on which I concentrate my greatest efforts has been produced for years in an all-mains version for readers who have A.C. in their homes. The publication of these "versions" has become almost a matter of course, but this year the situation is different. The nature of the S.T.900 is rather special. In the first place it works on all bands without a gap—from 6½ metres to 2,000 metres, or 20,000 metres for that matter, if you use the right coils. It will receive telephony or continuous waves at will. In the case of C.W. the "X"-reaction is used for strength-

ening and selecting, while the anode reaction is increased to produce oscillations which are made to beat with the C.W. signals. It would thus make an excellent set either for ship installation, a Polar expedition, or a fireside broadcast receiver.

Startlingly Successful Results

The flexibility of the S.T.900 is going to make a very great appeal. It is essentially a set for those who have the interest and elementary skill to work a few knobs to get far better results. The reserves of selectivity are great and completely under control. The quality of reproduction is very good and the background noise so prevalent in superhets is missing. The station-name dial is a practical feature of extreme value to those who want foreign stations on all bands. There is nothing like it on any commercial set made, and there is certainly no home constructor's set which features anything resembling it.

My spot-on dial enables the user to put a pencil or ink dot on the appropriate dot line, this dot being then joined to the station name by a pencil or pen line. Absolute accuracy of calibration is thus certain, and you can always go back to the station desired.

These are features of the battery set, but when they are applied to the A.C. version you get a set which outwardly is a domestic receiver but is actually a scientific instrument which, in the hands of anyone with the willingness to adjust a few knobs, will give startlingly successful results.

Naturally, I am not competing with the flivver A.C. sets of commercial type. They are cheaper than the constructor can build. The S.T.900 gives him features he cannot get otherwise. The tonal quality is truly

superb. I have used a high-price speaker, and the circuit is one which makes the S.T.900 a set which cannot be excelled for domestic reception of the more powerful stations. But coupled with this superb quality of reproduction you have the world-touring abilities of the battery S.T.900, but in an enhanced degree, as a mains valve will always give better results than a battery type.

So good is the S.T.900 in this version that this year I have built it into a very handsome console cabinet which stands on the floor. There is a lid which lifts to provide access to the coils, and extra coils are accommodated in a rack just behind the coils in use, and within the cabinet. This cabinet is also available for the battery version of the S.T.900 and may be strongly recommended. When used for the A.C. set it is free from reverberations which are so common when lighter-built cabinets are used.

A Magnificent Output

The operation of the A.C. S.T.900 is the same as that of the battery S.T.900 except that I provide a volume control on the left side of the cabinet and a tone control on the right. The first is to control the magnificent output (3½ watts), while the tone control is a refinement appreciated by many.

Altogether, I can assure readers that this year the A.C. set is as far ahead of my previous popular A.C. sets as the battery S.T.900 is ahead of my battery receivers. It will prove an investment you will never regret.

J. S.-T.
[Owing to space considerations, technical and construction details of the A.C. S.T.900 will appear in succeeding issues.—EDITOR.]

COMPONENTS FOR THE A.C. S.T.900

COMPONENT	MAKE USED BY DESIGNER	COMPONENT	MAKE USED BY DESIGNER
1 0005-mfd. main tuning condenser with drive	J.B. (as S.T.800).	1 100,000-ohm resistor	Dubilier ½-watt
1 0005-mfd. aerial balancer condenser	Polar slow-motion (as S.T.800)	1 10,000-ohm volume control potentiometer	Colvern S.T.5/C
1 0005-mfd. aerial coupler condenser	Graham-Farish log-mid-line (as S.T.800)	2 H.F. chokes	B.T.S. (as S.T.800)
1 0005-mfd. "X"-reaction condenser	Graham-Farish log-mid-line (as S.T.800)	1 L.F. transformer	Varley Niclet 3-5/1
1 0003-mfd. differential anode reaction condenser	Graham-Farish solid dielectric	3 7-pin baseboard-mounting valve holders	W.B.
1 00075-mfd. tone control condenser	Polar "Compax"	1 5-pin baseboard-mounting valve holder	W.B., small type]
2 4-mfd. fixed condensers	Dubilier, type L.S.A.	2 5-pin coil holders	B.T.S., type O.
1 05-mfd. tubular fixed condenser	Dubilier, type 4002/S.	1 Mains Transformer	Ferranti S.M. 3-4
1 2-mfd. fixed condenser	Dubilier, type B.B.	1 Metal rectifier	Westinghouse H.T.16
6 1-mfd. fixed condensers	T.C.C., type 50	1 Energised Loudspeaker	W.B., type E.M.S., 1,500 ohms field (as for S.T.800)
3 1-mfd. tubular fixed condensers	T.C.C., type 341	1 L.F. choke	Varley, type D.P.10
1 006-mfd. mica fixed condenser	Lissen	1 Aluminium screen	Peto-Scott
1 0005-mfd. mica fixed condenser	Lissen	1 Twin fuse holder	Bulgin, type F.19
2 00005-mfd. mica fixed condensers	Lissen	1 Toggle on/off switch	Bulgin type, S.80
1 0003-mfd. tubular fixed condenser	T.M.C., type T.5	1 Twin electrolytic condenser bracket with terminal	Peto-Scott
2 8-mfd. electrolytic condensers	T.C.C., type 802	3 Extension spindles	Peto-Scott
1 50-mfd. electrolytic condenser 12-volt working	T.C.C., type F.W.	25 feet 18-gauge T.C. wire	Peto-Scott
2 1-meg. resistors	Polar N.S.F., 1-watt	6 Lengths 1½-mm. insulating sleeving	Peto-Scott
2 50,000-ohm resistors	Polar N.S.F., 1-watt	1 Piece screened flex 1 ft. long	Peto-Scott
3 20,000-ohm resistors	Polar N.S.F., 1-watt	Screws, flex, etc.	Peto-Scott
1 15,000-ohm resistor	Polar N.S.F., 1-watt	1 Polished panel (Metaplex reverse) 16 in. × 12 in. × ¼ in.	Peto-Scott
2 10,000-ohm resistors	Polar N.S.F., 1-watt	2 Side pieces	Peto-Scott
1 500-ohm resistor	Polar N.S.F., 1-watt	1 Coil platform	Peto-Scott
1 100-ohm resistor	Polar N.S.F., 1-watt	2 Terminal strips, 2 in. × 1½ in. × ¼ in.	Peto-Scott
1 100-ohm resistor	Polar N.S.F., 1-watt	4 Terminals marked A., E., L.S. +, L.S. -	Belling & Lee, type R.
		1 Console cabinet	Peto-Scott

V "X"	VI	V2	V3
Marconi/Osram	Marconi/Osram	Marconi/Osram	Mazda
M.L. 4.	V.M.P. 4 C. (met.)	M.S.P. 4 (met.)	A.C.2/Pen.

HOW TO OPERATE THE S.T.900

(Continued from page 201.)

(c) Tune S.T.900 to receive your other medium-wave local—the Regional. Signals should be loud but not be allowed to overload set. Reduce reaction and aerial coupler if necessary. Now slowly adjust preset on the Triple Extractor nearest to terminal 4 until Regional disappears.

(d) Switch S.T.900 to long waveband and tune-in Droitwich in the ordinary way, not permitting it to overload the set. Reduce volume if necessary. Now slowly adjust middle preset on Extractor until Droitwich disappears.

S.T.900

THE POWER SUPPLY

Batteries: H.T. 120 v.—Drydex, G.E.C., Aerialite, Milnes H.T. Unit, Lissen, Fuller.

G.B. 16.5 v.—Drydex, Lissen.

L.T. 2 v.—Exide, Lissen, Fuller.

Mains Units: Ekco, Atlas.

SUITABLE LOUDSPEAKERS

W.B., Rola, Blue Spot, Amplion, Wharfedale (No significance attaches to the order of makes.) J. S.-T.

(e) You can now slightly readjust any of the three presets to allow just as much B.B.C. signal to get through to main set as you wish. Remember which station each Triple Extractor preset controls.

(f) Never let the Triple Extractor presets be "just anywhere." They may be extracting the very station you are looking for. Midland Regional listeners may set both outside presets to Midland Regional. When not needed, it is best to take the whole Triple Extractor out of circuit. Its extreme usefulness will, however, be appreciated in all districts suffering from B.B.C. swamping.

J. S.-T.

SHORT-WAVE STATION IDENTIFICATION

By F. A. BEANE

BEFORE resuming our imaginary etheric tour of identification, let us revert for a while to the New World and Canada. This great Dominion has never really established herself as a reliable programme provider, nor has she commanded the limelight of the short-wave sphere for any length of time. Numerous low-powered stations have made their debut, but few have radiated a really consistent transmission into Europe such as are provided by the neighbouring United States. Occasionally C J R X (25.6 m.), C R C X (49.26 m.), V E 9 H X (48.92 m.), C F C X (49.96 m.), V E 9 D N (49.96 m.) or C F R X (49.42 m.) have put in a brief appearance and been well heard, but eventually they are either overshadowed by their more powerful and consistent neighbours or engulfed by the QRM. However, at the time of writing a newcomer has sprung into the limelight and is causing some great interest; it is C J C B of Sydney, Nova Scotia, operating on 49.92 m., 6,010 kc. Its programmes are similar to those of the U.S.A.—in fact, some actually originate in Boston, and the call is given as either "Your station is C J C B in Sydney, Nova Scotia," or "This is C J C B, Sydney, Nova Scotia," each quarter of an hour.

Nearing Home

Continuing our tour we find our route less pacific; in fact, very tumultuous since we must

pass through the Iberian Peninsula, now shattered by political warfare. It is not only physical, however, but also waged etherically by both sides. The Government supporters commandeered and organised local amateur and other radio stations for the fight against the insurgents, while the latter did likewise. In time, the Government supporters radiated such a variety of news bulletins that it was found necessary to close down all stations excepting those actually under the direct control of the Government, thus the official voice of the Republic is now available only through E A Q and E A R of Madrid, both aptly self-styled "La Voz de Espana." The latter operates on 31.65 m., and may be heard from 18.45 and 22.45 with an English news bulletin during which various personalities are sometimes introduced to the microphone. In Spanish the call is given as "Aqui, La Voz de Espana, E A R, Madrid, Espana," and two chimes are used. E A Q on 30.43 m. is so familiar to all that further introduction is unnecessary. Next week I hope to give you more hints on identifying the various short wave stations.

THERE WILL BE MORE ABOUT THE S.T.900 NEXT WEEK

ORDER YOUR COPY NOW PRICE 3d. AS USUAL

S.T.900

'DESIGNER' KITS

All components exactly as specified by Mr. Scott-Taggart. Carefully packed in strong cartons, and sent post free.

Note. Complete kit or any part supplied separately for Cash or C.O.D. We pay postage or C.O.D. charges on orders of 10/- or over. Dispatched by return.

KIT 'A'

with screws, wire, etc., and 4 coils covering medium and long wave bands, without valves. Cash £3/10/0, or

7/-

WITH ORDER and 11 monthly payments of 7/10.

KIT 'B'

with screws, wire, etc., and 10 coils covering medium, long, and 3 short-wave bands, without valves. Cash £4/5/0, or

8/-

WITH ORDER and 11 monthly payments of 7/10.

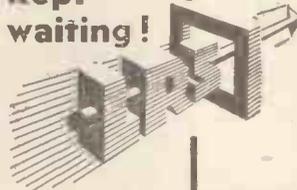
KIT 'C'

As KIT "B," but inclusive of all valves. Cash £5/15/3, or

10/-

WITH ORDER and 11 monthly payments of 10/7.

Don't be kept waiting!



DELIVERY AT ONCE—

FROM STOCK As usual, L.R.S. customers will get their S.T.900 kits first, without any annoying delays. L.R.S. has supplied all "P.W." kits quickly and on lowest terms continuously since 1925.

Go for the line with this 'L.R.S.' Sign!

EVERY offer carrying this symbol is:
 (1) Fully Guaranteed.
 (2) Sent Carriage Paid.
 (3) Available for Immediate Delivery.
 (4) On the Best and Lowest Terms.

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GARRARD A.C.6 Radiogram UNIT

Comprising silent running, enclosed induction motor for A.C. 100/250 volts, 50/60 cycles. Unit plate with pick-up, needle cups, etc. 5/6 with order and 11 monthly payments of 7/-. Cash price £3/15/0.

GARRARD A.C.6 MOTOR ONLY

Similar to above, but with fully automatic start and stop, and without pick-up, needle cups, etc. Complete with 12in. turntable. 4/- with order and 10 monthly payments of 4/3. Cash price 4/6.

Genuine McCARTHY Chassis and complete Receivers always in stock. Cash or Easy Terms.



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A model of unusually high performance. Ideal as principal or extension speaker for any set. Other W.B. Models similar terms. 2/6 with order and 11 monthly payments of 4/- Cash price 42/-.



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Thirteen testing instruments in one. Measures current, voltage and resistance with ease and accuracy. In handy case with leads, clips and testing prods. A most valuable fault tracer. 5/- with order and 10 monthly payments of 4/6. Cash price 45/-.

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DIPLOMA S.T.900

Kit of first specified components packed in an attractive SEALED CARTON containing a SIGNED and NUMBERED WARRANTY which fully GUARANTEES EVERY COMPONENT to stand up to its work or to be replaced FREE OF CHARGE

IMMEDIATE DELIVERY—ORDER TO-DAY!

1 J.B. S.T.900 main tuning condenser with drive	s. d.
1 Polar S.T.900 aerial balancer condenser	6 6
2 B.T.S. 6-pin coil-holders (self-locking)	2 0
5 Graham-Farrish .0005-mfd. Litos condensers with flanged nuts	6 0
1 T.M.C. block condenser, type BI007	4 0
3 Lisen .006-mfd. mica fixed condensers	3 0
1 Lisen .0005-mfd. mica fixed condenser	3 6
2 Lisen .0005-mfd. mica fixed condensers	1 0
1 T.M.C. .0002-mfd. mica fixed condenser	9 9
6 Dubilier 1-watt resistors (3) 1-meg and (1) each -30,000, 20,000 and 5,000	3 0
2 B.T.S. all-wave H.P. chokes	3 6
1 Varley Niclet 5-5/1 L.F. transformer	3 4
5 W.B. small type baseboard valve holders	1 2
2 Belling-Lee type R terminals—A, E, LS—, LS+	3 3
2 Ollx No. 8 parallel sockets	3 3
2 Ollx No. 5 master wander plugs	3 3
1 Peto-Scott polished wood panel (Metaplex reverse) 15" X 12" X 1/2"	3 9
1 Pair Peto-Scott polished side pieces	1 6
2 Peto-Scott terminal strips, 2" X 1 1/2" X 3/16"	1 6
1 Peto-Scott wood platform, 15 1/2" X 3 1/2" X 3/8", ready drilled, stained and polished	1 0
1 Peto-Scott aluminium screen, ready drilled	6 6

KIT "A," CASH OR C.O.D. CARRIAGE PAID £2 15 6

B.T.S. ONE-SHOT INDUCTORS

Type 9/MW (190 to 550 metres) per pair	5 8
Type 9/LW (300 to 2,000 metres) per pair	9 6
Type 9/S2 (15 to 43 metres) per pair	5 0
Type 9/S3 (24 to 70 metres) per pair	5 0
Type 9/S1 (9.5 to 27 metres) per pair	5 0

KONECTAKIT, comprising two 3" X 3/4"-hole 20-gauge brass washers, three 3" X 3/4"-hole 22-gauge brass washers, thirty 3" X No. 4 brass R.H. wood screws, fifteen 3" X No. 4 brass R.H. wood screws, ten 3" X No. 4 brass R.H. wood screws, two 3" X No. 4 brass C.S. wood screws, two 3" X No. 4 brass C.S. wood screws, 16 feet 18-gauge T.C. wire, 5 lengths 1/2"-mm. insulating sleeving, 20 feet 14/36 rubber-covered single flex. Cash price, 2/6.

- DIPLOMA KIT "A."** Complete Kit of first specified parts, less coils, Konectakit, wander plugs, spade terminals, valves, Extractor Kit, cabinet and speaker, £27/15/6.
- DIPLOMA KIT "A2."** Exactly as Kit "A," but including Peto-Scott Konectakit and 2 B.T.S. medium-wave one-shot inductors. Cash price, carriage paid, £33/3/6.
- DIPLOMA KIT "A4."** Exactly as Kit "A," but including Peto-Scott Konectakit and 4 B.T.S. one-shot inductors covering medium and long waves. Cash Price, Carriage Paid, £32/10/0.
- DIPLOMA KIT "A10."** Exactly as for Kit "A," but including Peto-Scott Konectakit and 10 B.T.S. one-shot inductors covering long, medium and 3 short-wave bands. Cash Price, Carriage Paid, £45/5/0.
- DIPLOMA KIT "CT."** As Kit "A," but including valves, 10 Peto-Scott one-shot inductors and Peto-Scott table model cabinet. Cash or C.O.D. Carriage Paid, £28/14/9.
- DIPLOMA KIT "CO."** As Kit "CT," but with Peto-Scott console instead of table model cabinet, with speaker baffle and battery shelf, less speaker. Cash or C.O.D. Carriage Paid, £27/14/9.
- DIPLOMA KIT "CE."** As Kit "CT," but with Peto-Scott Console instead of table model cabinet, with speaker baffle, less speaker. Cash or C.O.D. Carriage Paid, £28/12/3.

Walter plugs and accumulator connectors, if required with any of the above kits, add 2/8 to cash price.

TRIPLE EXTRACTOR KIT

- 1 Wearlite triple extractor coil unit, 3 Colvena .0005-mfd. pre-set condensers, 1 Peto-Scott wood baseboard, 4 1/2" X 4 1/2" X 1/2", with 2 No. 4 R.H. 3" brass wood screws and 6 No. 4 R.H. 3" brass wood screws wire and sleeving.
- DIPLOMA EXTRACTOR KIT** ... 13/6

If Extractor Kit required with any of the above Kits, add 13/6 to cash price.

RECOMMENDED EXTRAS FOR THE ABOVE KIT

1 Hivac L210 (Met.)	3 9
1 Hivac VP215 (Met.) 4-pin	9 6
1 Mazda L2 (Met.)	4 9
1 Osram L21	4 9
1 Hivac PX230	7 6
DIPLOMA VALVE KIT AS ABOVE	110 3
Hivac Valve Kit	2 0
1 W.B. Stentorian 388 chassis	2 0
Peto-Scott Table Cabinet	19 6
Part carriage and packing extra 2/6.	
Peto-Scott Console Cabinet, with speaker	119 6
Part carriage and packing extra 2/6.	
Peto-Scott Console Cabinet,	3 3 0
Part carriage and packing extra 3/6.	

OASH WITH ORDER OR C.O.D. CARRIAGE PAID FREE. Part kits supplied carriage free on £1 orders. FREE—there is NO CHARGE for our unique guarantee! Assure yourself of DIPLOMA protection—buy DIPLOMA kits only!

INTERNATIONAL RADIO BUREAU, 260 DEANSGATE, MANCHESTER

THE S.T.900 RECEIVER

(Continued from page 175.)

right in a moment because the switches were very simple and visible. I used two separate switches, each of which was pushed in or pulled out according to the wavebands to be used. There is not the slightest doubt that the remarkable freedom from failure in this set and of the S.T.300 was largely due to the fact that the coils were of very simple design, and that the switches were equally simple and get-at-able.

The more complicated the coil units, the greater has been the percentage of failures due to what is generally described as faulty coils. In a complicated coil system the fault may lie in the coils themselves, but this must be very rare. It is far more likely that the fault is one of a wrong connection inside the can somewhere or a faulty switch. These switches even on a comparatively simple two-coil unit are highly complicated. On the S.T.800, for example, there are 16 connections to switch points.

The making of connections to these complicated coil units is a difficult business. As a minimum of 10,000 coil units are required on each of my big sets, and as these are all required almost at once, you can imagine the conditions of hustle in which the coil units on my receivers have to be made. This hustle is hardly the right atmosphere in which to produce a very complicated coil unit with dozens of wires being soldered to dozens of different points frequently difficult to get at, and all looking very much the same.

Apart from errors in connection, you also have the risk of soldering troubles. Here the effects are very insidious. The wire may break off at the point where it is soldered, or the wire itself weakened by the soldering process may break off even though the soldering is strong. A much more obscure fault is the "dry joint." This may occur when the soldering iron is not hot enough or the parts to be soldered are not clean enough. The joints may look perfectly good, but actually although there is a mechanical join the electrical one is bad. Very frequently these dry joints do not show up as a defect when an ordinary test is made because the sudden application of a testing current may cause the joint to become conducting; after a short time the joint once more becomes bad. Dry joints and faulty contacts on the switches are particularly troublesome when dealing with high-

frequency currents. A switch which may give perfectly good results for switching on the filament current from the accumulator may be totally unsuitable for high-frequency switching, which is what we are usually concerned with in a coil unit complete with switch.

Short-Wave Considerations

But the trouble goes farther than that, for as the wavelength decreases, so all bad contacts or even slightly imperfect contacts introduce very high resistances which may cut off signals or reduce their strength. Components which work quite well on broadcast wavelengths on the medium and long bands may behave quite differently when you come down to 20 metres. Variable condensers tend to become noisy in action, and all joints soldered or otherwise may be a source of trouble which is often not suspected.

Where a circuit is designed exclusively for short wavelengths, much greater care is usually taken to look out for these troubles, and switches are always avoided like the plague if possible. In all-wave sets there is a grave risk that the technique which is successful on medium and long waves will break down when you come to the short wavelengths.

I have definitely come to the conclusion that all coil units with switches embodied are to be avoided if 100 per cent. certainty of success is aimed at and if constant reliability over a period is required.

The plug-in coil is the end of all these troubles. There are no switch contacts, there are no opportunities for incorrect wiring, dry joints are obviated, and the

(Continued on next page.)

185 BROADCASTERS HEARD ON THE LOUDSPEAKER By LESLIE W. ORTON

Kaunas	Poste Parisien	F I O A, Madagascar
Hilversum	Bordeaux	C E C X, Montreal
Lahti	N. Ireland Regional	D J C, Zeelen
Moscow	Hilversum	H J 4 A B F, Medellin
Paris	Bratislava	W 8 X A L, Cincinnati
Deutschlandsender	M. Regional	S B G, Stockholm
Droitwich	Barcelona	Y V I R E, Maracaibo
Motala	Koenigsberg	C R C X, Bowmanville
Warsaw	W. of Eng. Regional	H 4 A B E, Medellin
Luxembourg	Bari	W 3 X A L, Bound Brook
Moscow	Radio Cité	Y U A, Belgrade
Kalundborg	Bordeaux	C O C D, Havana
Oslo	Salamanca	W 8 X K, Pittsburgh
Leningrad	Naples	Y V 5 R B, Caracas
Budapest	Moravska-Ostrava	H 11 X, Trujillo City
Beromünster	Radio Normandie	A J 8, San Sebastian
Athlon	Newcastle	P S U I, Barcelona
Palermo	Nyregyháza	C O 9 J O, Camaguey
Stuttgart	Hörby	Z M B I, Awateh (?)
Grenoble	Turin	C O B Z, Havana
Madona	Nationals	E A R, Madrid
Rabat	Kosice	O Z F, Skamlebaek
Florence	Copenhagen	W 2 X A F, Schenectady
Brussels	Frankfurt	L K J I, Jelöy
Prague	Prague	D J N, Zeelen
Lyons	Lille	D J A, Zeelen
Cologne	Gleiwitz	W 1 X K, Millis
North Regional	Cork	K Z R M, Manila
Stockholm	Nürnberg	W 3 X A U, Philadelphia
Rome	Radio Méditerranée	V K 6 M E, Perth
Madrid	Aberdeen	H B L, Geneva
Munich	Klangenfurt	H J I A B P, Cartagena
Katowice	Swedish Relays	C T I A A, Lisbon
Scottish Regional	L'île de France	L R X, Buenos Aires
Toulouse	Eiffel Tower	C O C Q, Havana
Leipzig	Bournemouth	E A R 43, Canary Isles
Welsh Regional	W G Y, Schenectady	C S W, Lisbon
Milan	W P G, Atlantic City	C O C X, Havana
Strasbourg	W B Z, Boston	H P 5 A, Panama
London Regional	W T I C, Hartford	S B G, Stockholm
Graz	L R 3, Buenos Aires	J Z K, Tokio
Ljmgos	W O A I, San Antonio	W 2 X E, Wayne
Hambourg	W H A M, Rochester	W 2 X A D, Schenectady
Toulouse	W I O D, Miami	W 2 X G B, Hicksville
Algiers	W N A C, Boston	P L E, Bandoeng
Göteborg	Y V 5 R C, Caracas	W 8 X K A, Pittsburgh
Breslau	Y V 1 R B, Maracaibo	W 1 X K, Boston
	T G 2 X, Guatemala City	H V J, Vatican

THE S.T.900 RECEIVER

(Continued from previous page.)

whole wiring is vastly simplified. Also the layout can be designed for efficiency and not for convenience.

I am not suggesting that it is impossible for a six-pin coil to be made incorrectly, but the chances are extremely remote. With three simple windings without tapping points, it is almost impossible to imagine an error occurring. As for faulty contacts, the position is entirely different from that of a switch. The pins are split in a helical manner, the contact is over a large area, and it is always a rubbing contact which is automatically self-cleaning; as the coil is inserted in its holder, perfect contact on each pin is automatically attained. Incidentally, you can see that contact is being made.

Even if it were possible to get a perfect workman making perfect joints on to the contacts of a perfect switch, the system is to be condemned on technical circuit grounds. In practice it is not possible to make dozens of contacts in a complicated canned coil system without some of the wires approaching each other or contacts being near to each other.

J. S. T.

"X"-REACTION

(Continued from page 182.)

Bigger and better valves might be regarded as highly desirable for reaction, if used externally for that purpose solely. (The valve used for reacting detectors is chosen from a different standpoint since the quality of reaction is regarded as a secondary matter, detection and sensitivity being all important.)

The trouble about using bigger and better valves for reaction is that, as ordinarily used with the whole voltage across the tuned circuit applied to the grid, a better valve will result merely in a reduction by the operator of the amount of the high-frequency currents fed back into the tuned circuit. In other words, if you use a better valve, you will set your reaction to a lower value, and you are very much where you were before. (See Figs. 4 and 5.)

The great improvement in modern valves can, however, be taken advantage of if we reduce the voltage applied to the grid and increase the high-frequency feed-back. This can be done by tapping down on the input inductance coil and tightening a coupling between the reaction coil and the main inductance of the circuit. A bigger reaction condenser will also usually be used. Under these conditions, the high-frequency voltages applied to the grid of the valve will be reduced and maximum reaction is obtainable.

The merits of this plan were suggested to me by Captain H. J. Round some years ago when he was chief of the Research Department of the Marconi Company. I have worked up the broad idea and am applying it in a highly practical form in the S.T.900.

Fig. 6 shows a valve used exclusively for reaction effects, a tapping being taken down

the inductance and an efficient valve being used. Fig. 7 shows a detector reaction circuit with the tapping taken down the inductance; although this is not the ideal arrangement, since the valve acts as a detector, the tapping-down gives a high-gear form of reaction and an improvement is at once noticed in operation.

Instead of tapping down the inductance we can connect two small fixed condensers across the tuned circuit, and take the connection to the grid condenser from a point between these two fixed condensers. Whatever the frequency of the signals may be, the relative tapping point will be the same. Naturally, the capacities would be small so as not to interfere with the main tuning condenser. (See Fig. 8.)

We now come to a very simple way of my own of getting a very similar effect to tapping between two condensers across the

tuned circuit. This is accomplished by using a small grid condenser instead of the quite usual .0001 mfd. In fact, the grid condenser used to be almost always .0003 mfd, until my sets changed the fashion in 1932. The grid condenser may be regarded as being in series with the grid capacity. You may regard, for example, the grid and filament of the valve as forming a small condenser in series with the normal but smaller-than-usual fixed grid condenser. The grid is connected at the middle point between these two capacities. In Fig. 9 I have shown the arrangement, a dotted line showing the equivalent capacitance of the grid. By making the grid condenser small, we are doing what is equivalent to tapping down on the tuned circuit.

Incidentally, when a detector valve is used, this reduction of the grid condenser not

(Continued overleaf.)



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This number of last year's set by John Scott-Taggart were built up to Sept. 14.

STOP PRESS

S.T.900 RECEIVES TELEVISION!

Just as this issue of "Popular Wireless" goes to Press I am able to announce that the S.T.900, in addition to its 10-2,000-metre coverage, will, with the appropriate coils, receive excellently the television sound programme on just over 7 metres. This achievement makes the S.T.900 a set of extraordinary utility. The coils are B.T.S. type 9/S.O. (2s. 9d. each). The excellence of the S.T.900 for television sound reception would have been mentioned in the main articles but these coils have only just been approved. J. S.-T.

"W.L.S." WRITES: "Since testing the set on the ordinary short-wave bands, I have had an opportunity of trying it out with the "television" coils, which bring the television sound within the range of wavelengths and really make the '900' an all-wave receiver *par excellence*. **THE SOUND TRANSMISSIONS ARE RECEIVED AT EXTREMELY GOOD STRENGTH, AND THEIR HIGH QUALITY IS ALSO TREATED WITH JUSTICE.**" W. L. S.

NEXT WEEK: 12 Hi-Speed wiring diagrams, each showing very clearly the wires added a few at a time.

"X"-REACTION

(Continued from previous page.)

only improves reaction, but it also reduces damping on the tuned circuit, thus improving selectivity. A further advantage is that it improves top note response, thus balancing any tapering off of high notes due to the application of efficient reaction.

My plan in reducing the grid condenser for giving smooth high-g geared reaction suffers from only one real disadvantage. As the circuit remains exactly the same, the great technical benefits are not obvious

to the casual inspector of the circuit! Spectacular results are obtained by an arrangement which might easily be overlooked.

A complete "X"-reaction system followed by an ordinary detector reaction arrangement is shown in Fig. 10. In both cases high-g geared reaction is achieved by using a small grid condenser.

In Fig. 11 I reproduce the double-reaction system, as used in the S.T.600. In this case the reaction comes from the screen circuit. When you want maximum selectivity you will use double reaction. You will also want to put a negative bias on the

grid of the H.F. pentode. This, unfortunately, cuts down the screen-grid current, and you will find you cannot get enough reaction to apply to the aerial circuit. Although the S.T.600 double reaction worked very well, the "X"-reaction of the S.T.900 enables double reaction to be obtained under all conditions. Under conditions of high selectivity, full aerial reaction is always obtained, as an entirely separate valve is used for the purpose.

DOUBLE REACTION ON ALL WAVELENGTHS FROM 10 METRES UP.

The Secret of S.T.900's Brilliant Performance.

Although "X"-reaction in a high-g geared circuit arrangement is the novel feature of the S.T.900, yet the basic idea of applying reaction to both tuned circuits at the same time is the fundamental reason for the extraordinary sensitivity and selectivity of the S.T.900. My older friends know what double reaction does, but for the benefit of those who have joined during the last three years some explanation is essential.

You all know the enormous benefits that are obtained from the application of reaction to a tuned circuit. Signals become very much stronger and the selectivity is vastly increased. This selectivity is obtained by the fact that reaction only increases the strength of the desired signal while leaving the interfering station very much as it was before. If, then, we reduce the input signals to the circuit until the interference cannot be heard, the application of reaction will bring up the desired signal without bringing back the interference. This is the way that all reaction circuits are, or should be, used.

Since the merits of reaction are so obvious on a single circuit, it must be obvious that to do it on the other tuned circuits will also give remarkable results. In other words, you cannot have too much of a good thing where reaction is concerned. The only possible disadvantage is that selectivity becomes so high as to start trimming off some of the high notes of the desired signal. Compensation for this can be applied unobtrusively in other parts of the circuit, and this, of course, is done in the case of the S.T.900.

Overcoming Aerial Effects

Other straight sets use reaction on one circuit and leave the first tuned circuit of the set to its own devices. A virtue is even made out of necessity, and the very flat tuning is treated as a merit. You might as well give an invalid a piece of coal to swallow, explaining that it saves him the bother of having to chew. Actually the aerial circuit is the one which most needs reaction. The first tuned circuit of the set (conveniently called the aerial circuit, since it is fed from the aerial) has the aerial losses to bear as well as its own. By reducing the value of the aerial coupler condenser we can reduce the bad effect of the aerial losses, but at the same time we shall reduce the amount of energy fed into the circuit from the aerial. From a selectivity point of view the best results will be obtained with the aerial completely disconnected, but, unfortunately, there might well be no signals for the selectivity to work on!

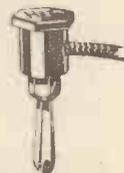
(Continued on next page.)

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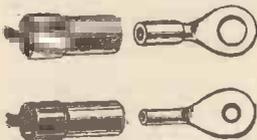
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REG. WIGFIELD,
Edlington, Doncaster.

"X"-REACTION

(Continued from previous page.)

The old rule is that the stronger you make the signals the worse the losses imposed on the tuned circuit and the flatter the tuning. In other words, a deliberate weakening of the signal strength will improve the selectivity of the circuit. This vicious rule is reversed if reaction is used, because an increase of reaction improves signal strength and results in better selectivity. Looked at in another way, you can reduce the aerial coupler till the circuit is highly selective and then bring the signal strength up again by applying reaction.

Wonderful Daylight Feats

Where, however, your aerial is small, or you desire maximum sensitivity because of the weakness of a signal, or because you are far distant from the station, you can use more aerial coupler and aerial reaction. The set becomes extremely sensitive, and wonderful feats in daylight or with miniature aerials are possible. Signals which cannot be heard at all on ordinary circuits using single reaction will fill a room when aerial reaction also is applied.

As you know, yourself, reaction has a miraculous effect in livening up things and turning weak signals into strong ones. Double reaction does it all over again, this time on the aerial circuit, and signals which you never dreamt were there will flood the house.

The S.T.600 gave astonishing results, but it suffered from the disadvantage that you could not get aerial reaction when the set was arranged to be most selective. This disadvantage and the introduction of other features entirely new resulted in double reaction being dropped from the S.T.700 and S.T.800. In the S.T.900, however, it comes back in a vastly more efficient form at the cost of an extra valve, a matter of a few shillings, and at virtually no increased upkeep costs, since the valve takes very little current. And its merits on the short waves are almost unbelievable until you have tried it.

In the old days valves were highly expensive and most unreliable. They took a great deal of filament current (equivalent to about seven modern valves), and, quite rightly, constructors felt they were extravagant. That is no doubt why they took so kindly to the S.T.100, which had only two valves.

In every respect the situation has changed. In the S.T.900 the valve is a simple triode, extremely cheap, and reliable, and, like all modern valves, will as likely as not outlive the circuit. The tenth of an ampere filament current is going to make no noticeable difference, while the high-tension current is so small that even if you use H.T. batteries the fractional increase may be ignored. The very slight increase in high-tension current is less than what you might experience merely by changing the output valve for a different sample by the same firm of the same type. In fact, three out of five of the S.T.900's valves are insignificant from the battery point of view. Nearly all the current on such a set is taken by the output valve. The S.T.900 will work excellently, taking only a total of 12 milliamps.

J. S.-T.

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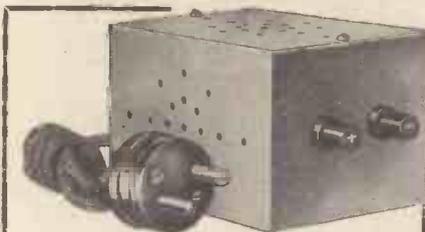
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THE DIAL REVOLVES

By Leslie W. Orton

AMERICAN gangsters are looking with keen interest, and much apprehension, at the latest plans of the U.S. police to make it hot for them.

Previously, if a gangster were chased by a "cop" on a motor-cycle it was only necessary to put him "on the spot" to silence his siren.

The police are now experimenting with transmitters aboard these two-wheeled terrors of the road, so that a quiet little "smash and grab" may readily land the light-fingered gentry in a veritable hornets' nest quicker than saying "Jack Robinson."

It all sounds very thrilling, but two things puzzle me. How will the transmitter hold together when the cycle is "all out," and how will the policeman be heard above the din of the engines?

Tibet on 10 Metres

Seldom has the DX-er the chance of so much excitement as provided by the 10-metre amateur band at the present time. With every post news of some outstanding reception reaches me, but I think we should award the medal to a Dorset enthusiast who reports hearing A C 4 U U, a Tibetan amateur. I wonder how many of you can beat that? Nevertheless, we are having fun in our own little way, and I expect you all preen yourselves when you think of your log! And I don't blame you. Never was a DX-er prouder than I when I pulled in Z S 6 A W the other day.

Incidentally, if you, my noble DX-ers, do not number among the lucky one who have heard W 6's, now is the time to buckle to and make mincemeat of your opponents' logs!

Recent catches of mine include W 1 R A, W 2 U A, W 2 S W K, W 2 K H R, W 2 I E I, W 4 D P E, W 5 S O B, W 6 L M, W 6 L Y, W 8 I W, W 8 K Y Y and W 9 D I. On 9-494 metres the broadcasters are coming in well, but are as difficult to identify as eating a herring, and that's no mean feat! With much listening and many muttered exclamations I've verified W 8 X K A (Pittsburgh), W 3 X E Y (Baltimore), and W 2 X D V (Wayne).

United Broadcasters

"Broadcasters of the world unite!" would appear to be the motto of the 31-metre stations. Zeesen, Schenectady, Daventry and Philadelphia are all audible—frequently at once. Nevertheless, despite the little difficulties that beset the DX-er, some really amazing reception is possible these nights—and days also, for that matter.

The Americans have gone baseball "mad" and are consequently little entertainment. K Z R M (Manila) may occasionally be heard just behind W 1 X K (Millis), whilst the Spanish Morocco National station E A 9 A H has had them all beaten for volume on about 20 metres.

Martinique Heard

Listening to a French station the other night around 9 p.m. my ears were galvanised into action by the call F M 8 L C. Hurriedly consulting my call-book, I discovered that the station was in Martinique. Burning with excitement, I swung the dials hither and thither, pulling in V E 1 F I, V E 2 F C, H K 1 E P (Colombia), P Y 2 S X (Brazil), C T 2 A I (Azores), C N 8 A M, C N 8 S A (French Morocco), E S 5 D (Esthonia), L Y 1 I (Lithuania), and an alarming batch of Britishers—but no more "FM's." Just my luck!

By the way, the 20-metre G's are beginning to annoy me much as G-men annoy racketeers—they are far, far too plentiful!

"Yanks" have again been active, but one has to search around midnight to pull in anything spectacular. My log includes W 1 B Z A, W 2 Z C, W 3 A F L, W 4 C Y U, W 4 D L H, W 8 B Y S, etc. Not so good.

DX on 40 Metres

I bet that heading made you blink! Probably you are wondering whether I am quali-

fyng for Coney Hatch! Familiarity breeds contempt, and I for one have imagined that anything nearer than America was tame DX, but I've changed my mind. You see, I've been reforming a boy—and I've converted him to DX so effectively that a conversation with him is like a code book read backwards!

To show the possibilities of a receiver I tuned to the 40-metre band with the idea of letting him do some searching upon an easy part of the band. I immediately tumbled upon a merry gang of enthusiasts conducting modulation tests in Birmingham. Chuckling at the "wise guys," I followed up by tuning-in G 2 U S, G 2 S F, G M 6 D U, G 5 J O, G 8 Q J, and scores more—and that poor misguided boy is still awaiting a chance of trying out the set himself!

Incidentally, DX on this band is considerable, though not particularly spectacular, and I've logged O N 4 A Z and O N 4 D C (Belgium), F 8 P T and F 8 F R (France), and have had a cheery time with the boys on that band. So "dar-de-dar"!

AN AMAZING BOOK

I DON'T suppose that there are many readers of POPULAR WIRELESS who take such things as astrology and palmistry very seriously. They will be too twentieth-century minded. Nevertheless, they would hardly be human if they did not want to believe that "there might be something in it," even although they were not prepared to accept traditional mysticism at its face value, because, after all, everyone's future is full of fascinating possibilities.

The desire to lift aside the veil and peer ahead is strongly present in all of us. But can we do that? Shall we ever be able to do that? The palmist says: "Come into my parlour and let me do it for you by interpreting the wrinkles on your hand." The astrologer goes farther afield and looks at the stars for you, though I will wager that not many astrologers appreciate how really far away are the stars!

But most, if not all "soothsayers," base their arts on ancient ideas that have been handed down from pre-scientific days. One might almost say from pre-historic ages. Modern surgery and medicine have displaced "witch doctors," and now "fortune telling" has been tackled scientifically by Mr. G. V. Dowding (Editor of "P.W.") in his "True Prediction—Your Character and Your Future Prospects Scientifically Revealed." (Published by The Millway Publishing Company, High Holborn House, London, W.C.1, price 2s. 10d. post free.) And I believe it is the very first time that modern science has been recruited for this purpose.

It is an extremely interesting book. One part of it tells you how, through the agency of certain physical characteristics, you can with great precision read your own character and those of your friends, how by other means you can peep into the future and how you will be affected by coming events.

The other part, and in my view the more important one, is a fascinating and logical explanation of the new system.

I've tried it on myself and several of my friends, and it does seem to be amazingly successful. One, a hard-headed business man, said: "It is absolutely true of my life so far."

So if you want to know what you are and why, and what may happen to you, then you should certainly secure a copy of Mr. Dowding's new book.

H. A. R. BAXTER.

AMATEUR-BAND NEWS

By W. L. S.

PERHAPS it's rather late to mention it now, but one or two readers have asked for news about the "G.W." stations heard on the air. "G.W." is the new prefix for stations in Wales; they noted the allocation of "G.M." to Scotland, and didn't see why they should remain common G's, so every Welsh amateur now has the privilege of sending an extra dot and two dashes every time he sends his call-sign. Northern Ireland, of course, has been "G.I." for years.

Ever heard of "W.A.Z."? It means "Worked All Zones," and it is the particular baby of the publishers of "Radio," an American amateur radio journal. The world has been divided up into 40 zones—rather in the manner of our own "18 Club," and the only amateurs in the world to have worked all 40 and produced verification are ON4AU, the famous Belgian station, and our own G2ZQ at Blackheath, London. There are several thirty-niners, including two more Britishers (G6VP and G6WY) and several Americans, but Belgium and England share the honours at the top of the list.

We hear a lot of talk about 5-metre work on this side, but apart from some of the excellent exploits on Snowdon and around North Wales and the Peak District, we don't hear of any record-breaking achievements. On the other side of the "Pond" they are more favourably placed, and they have real mountains to play with. A recent series of tests was carried out on top of Mount Washington, 6,300 feet high, and the power plant consisted of a 300-watt petrol-driven generator. Stations at distances up to 190 miles were worked. Other 5-metre DX news from the States includes the reception of Argentina in the U.S. 6th district. Cases of two-way working across the Continent and from Texas up to the northern States have become so regular that they are not even reported nowadays.

Ten metres continues to break all records. It's not been quite so consistent during the past fortnight or so, but when the band has been alive, signals of enormous strength have been coming over from the States. The new arrangement which confines phone to frequencies between 28,500 and 30,000 kc. has made a vast improvement in the conditions for two-way phone work, as most of our own stations work between 28,000 and 28,500 kc. This has rather tended to cram all the C.W. stations into an already congested part of the band, but as it seems to be the accepted order of things that 10 metres should become a phone band, nobody minds much.

It certainly is a fact that there is ten times as much phone activity as C.W. on the band at present—just one good reason why every keen short-wave listener should have a good receiver for 10-metre work.

W. L. S.

RADIO NOTES AND NEWS

(Continued from page 169.)

brought into service a new short-wave transmitter, employing six kilowatts.

Where The Money Goes

EVERY person in the U.S.A. spends about £10 a year on indoor entertainment of one kind or another, and the great majority of that money finds its way into the ticket-offices of the talkies. The only big rival is radio, all other entertainments tailing off into positions of no consequence.

In Great Britain it has recently been computed that radio comes first, several

million pounds more being spent on this annually than on the cinema. The theatres are a far-off third, though it is not so many years ago that their position as first seemed unassailable.

Sofia Takes a Bow

INTO the pool of high-power radio stations of Europe, Sofia has now landed with a splash. The new station was officially inaugurated on October 3rd, and with its 100 kilowatts and excellent position it promises to be the star station of south-eastern Europe.

Not only is the power very greatly in advance of that of neighbouring stations, but the "get-away" also is superior. The site is over 2,500 feet above sea-level, and the aerial is more than 600 feet high, so it is well placed to plaster a programme over a wide stretch of country.

NO DELIVERY DELAYS

There is no sign of any delay in component deliveries this year. Every manufacturer, we understand, is in full production. Peto-Scott Co., Ltd., write declaring they will have 1,000 S.T.900 Kits "A" actually in stock as you read this, so that immediate orders should receive immediate delivery. They also give an undertaking that in the event of delivery of any order for Kit "A" being delayed more than 14 days after the date of receipt of order they will, if requested by the purchaser, refund the moneys paid in respect of goods not then delivered."



6 BIG DANCE HITS EVERY WEEK FOR 4d.

Henry Hall's Popular Selection

EVERYONE who has bought sheet music knows that the cost of a single number is quite a considerable item. Now you can buy the words and music of six of the most "catchy" successes of the day at a price less than you would normally have to pay for one.

Think of it! The cream of up-to-date successes, and hits from the best musical films for a few pence! Yet this is what POPULAR MUSIC AND FILM SONG WEEKLY offers you every Thursday for 4d. No. 1 of this grand new publication is out this week, and contains the six tunes that its Editor, famous Henry Hall, has selected as the hits of the week. Here they are:

BROKEN-HEARTED CLOWN

I NEED YOU

THROUGH THE COURTESY OF LOVE

I SAW A SHIP A-SAILING

LITTLE OLD LADY OF POVERTY STREET

FIFTY MILLION ROBINS CAN'T BE WRONG

All readers will agree that this is really wonderful value for the money. Each week, Henry Hall, who has had such wide experience in the choice of dance and film song hits, will present his selection of the tunes that will appeal most to lovers of popular music.

POPULAR MUSIC AND FILM SONG WEEKLY is printed full music size on good quality paper. There will be a rush for No. 1 so make sure of your copy early.

Owing to pressure on our space this week several of our regular features have been unavoidably held out. These will all appear as usual next week.

INSTRUCTION

MAKE YOUR HOBBY your career, or increase its interest tenfold. Britain's Best College, approved by the Institute Radio Engineering and leading Radio firms, provides complete training in Radio Engineering by post or day classes. Full details from "P.O.W.", London Radio College, Grove Park Road, London, W.4. (Chiswick 3244.)

MISCELLANEOUS ADVERTISEMENTS.

SOUTHERN RADIO'S Wireless Bargains—all guaranteed and sent post paid.

CELESTION Soundex Permanent Magnet Speakers, 10/-; Telsen Speaker units, 2/6; Telsen (1937) iron cored coils, W349, midget size, 3/6; W478 (twin ganged), 9/-; W477 (triple ganged), 14/6; W476 (triple ganged superhet), 14/6; I.E. transformer coils, W482, 47/-; Telsen dual range coils, 2/9, with aerial series condenser incorporated; W76, 3/9; Telsen A.C./D.C. multimeters, 5-range (tests anything radio or electrical), 8/6.

HEADPHONES, 4,000 ohms, 3/-; Ace (P.O.) microphones, ready for use with any receiver, 3/6. GARRARD Record Changers, A.C. 200-250 volts, changes eight 10-inch or 12-inch records, 6/-; Garrard A.C. motors with pick-up, 42/-.

A FULL Range of Valves for all American Receivers, 6/- each; bargain parcels of radio components, including coils, chokes, condensers, circuits, etc., etc., to the value of 21/-, 5/- per parcel.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1; and 46, Lisle St., W.C.

All mail orders to Southern Radio, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). Phone: Euston 3775.

HEADPHONES. Brown, Ericsson, G.E.C., B.T.H., Standard Telephones, Nesper, Western Electric, Sterling, etc. 2,000 ohms, 2/6; 4,000, 5/-. Postage 6d. SPECIAL. Ericsson 4,000 ohms, as new, 7/6. Telefunken lightweight, adjustable, 7/6.

CRYSTAL SETS. Burne-Jones, complete, guaranteed, 5/6. Ditto, double circuit, 8/-. Sensitive permanent detectors, 1/6. Crystal detectors, complete, 1/-. Crystals, with silver cat's-whisker, 6d. Postage 13d. Post Radio, 2, Copenhagen Street, London, N.1.

CONVERSION KITS for operating D.C. Receivers from A.C. mains. Improved type, 120-watt output at £2/10/0. Send for our comprehensive list of Speakers, Resistances, and other components, WARD, 46, Farringdon Street, London, E.C.4; Tele.: HOLborn 9703.

S.T.800 Kits exact to specification with Specified Valves, £5/17/6.

S.T.900 Kits now ready. Radio Goods, Lowest Prices, Part Exchanges. Servwell Wireless Supplies, 64, Prestbury Road, London, E.7.

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S.T.900 "FIFTY-FIFTY" KIT. Fully Guaranteed Saves You £1. Write to-day for free lists. P.R. Co., Terminus Road, Brighton.

"COSMO" Battery Charges, 2-v., 8/6; 6-v., 14/6; 12 v., 21/-; steel-cased, complete, 200-250-v. A.C. FREE TRIAL, 7 days. Send now! Brighton Radio Service, 34, Middle Street, Brighton.

S.T.800 Radio-Gram, Home-built, used. Eliminator-Charger, Accumulators, P.M. Speaker, 67. Phone Willesden 1540.

RADIO TURNED RADIOGRAM. Electric motors, 25/-; Pick-ups, 9/6. Heads, 4/3. Pedestal Anexagrams, £5/5/0. Tablegrams, £4/1/0. Portables A.C. mains, £3/10/0. Battery, £2/10/0. Automatic record changers, 66. Acoustic Gramophones. Portables, pedestals, Spring Motors, turntables, tonearms, sound boxes, horns, cabinets, fittings, springs, wheels, musical instruments. Cheapest. Unifige assortment. List Free. Gilt alarm clocks, 8/6. Approval.—"Regentpop," 120, Old Street, London, E.C.1. Telephone, CLE 5770. Est. 34 years.

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GRAMOPHONE MOTORS. A special line of British Electric Gramophone Motors complete with general purpose pick-up and motor-board (16 in. x 13 in.). A.C. only, for quick disposal. Limited quantity. Excellent opportunity to convert your table receiver into radiogram for small outlay. Nearly 50 per cent. reduction on list price. Delivery by return on receipt of order. Price £1/19/6.—"Agencies," 25, Great North Way, Hendon, N.W.4.

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