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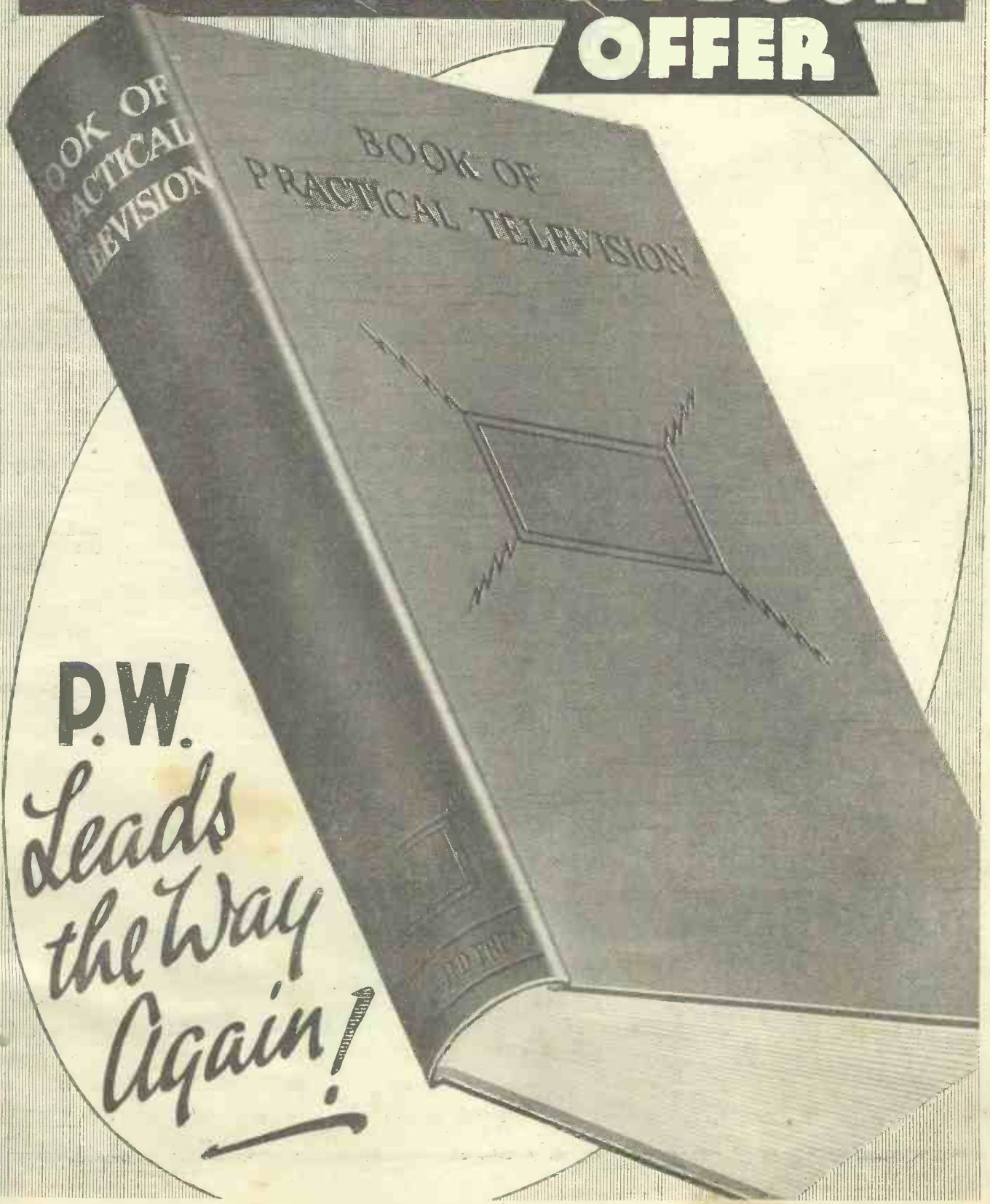

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The BOOK OF PRACTICAL TELEVISION as a work on modern television has no predecessor. The "high definition" service and technique of the new television have been moulded into practical forms during only the few months preceding the writing of the volume. It would have been humanly impossible for any one man to have gathered together all the material for the complete but popular television survey that lies between the two covers of this book. It was only possible with the aid of a carefully selected team of experts. Any practised technical journalist would be able to compile a passable handbook on, say, electricity, for there is a wealth of appropriate textbooks from which he could draw his information. But to make the BOOK OF PRACTICAL TELEVISION the complete guide that it is, no such easy procedure was possible. A great proportion of the material had to be derived from first-hand experience, but this has enabled the Editor to obtain a considerable amount of valuable information regarding the practical aspects of the science. For instance, the chapters describing the theory and operation of cathode-ray tubes and time bases not only deal with the most modern developments, but also give details of their relative performances.

It will be noticed that the BOOK OF PRACTICAL TELEVISION is a carefully welded amalgamation of the contributions of the individual experts and is not a disjointed series of articles. Its preparation was largely more in the nature of a collaboration, and many of the contributors actually gathered together on frequent occasions to discuss the work, even going so far as to carry out practical investigations and attend demonstrations together.

There is a vast amount of information which is absolutely original in the BOOK OF PRACTICAL TELEVISION and which has never been disclosed previously in any journal or book. It even includes the full constructional details of a complete outfit suitable for the reception of the forthcoming B.B.C. television programmes, and this instrument is the very first home-constructor set for the new high-definition television in the whole world.

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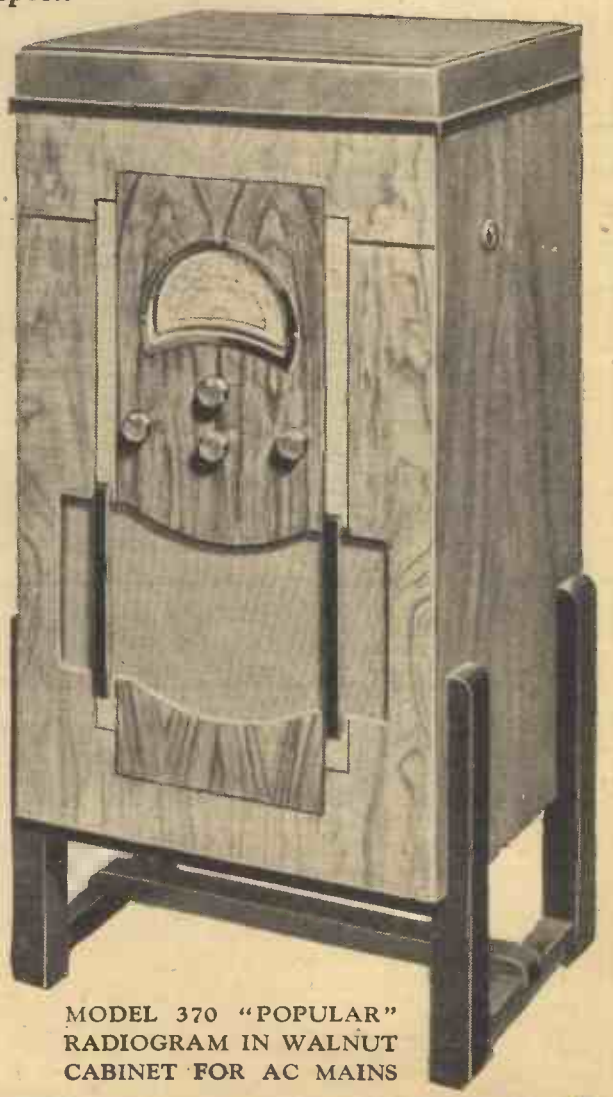

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STATION CRASHES
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RADIO NOTES & NEWS

NOT APPROVED
"ALLY PALLY"
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The S.T.700

METHODICAL readers who do me the honour of reading these Notes before perusing the other pages of "P.W." are hereby excused this week. I make this graceful gesture partly in honour of a great occasion, partly from native politeness, but chiefly because I know that nothing on earth will hold back your dyed-in-the-wool radio man from a new "S.T." design!

So turn to the next page forthwith, and get blissfully acquainted with S.T.700.

Tallis Uplift.

AND now I can tell you of a little incident that occurred in the Tallis House lift the other day. There was I, suspended 'twixt heaven and earth, with only one other occupant in the lift—Mr. Scott-Taggart. On the floor between us was a big parcel, evidently a wireless set.

Now, as you know, the reticence of Mr. Scott-Taggart about his new designs is proverbial. Might as well hope to get the sphinx to tell you its secrets. However, swaying heavenwards, I thought I would try, so I cocked an eye at the mysterious parcel and ventured to murmur, interrogatively, "*Seven hundred?*"

But knowing my infinite capacity for spilling the beans, he vouchsafed no reply. His Mona Lisa smile, however, clinched the matter, and ever since I've been itching to get my fingers on the S.T.700.

Well I've seen it, I've heard it, and Mr. S.-T. has conquered. His dial is the most glorious, most fascinating, most satisfying thing I've seen since Marconi tapped a coherer. I am referring, of course, to the *set's* dial. And performance?—amazing, stupefying, terrific—here, boy, fetch my dictionary. . . .

The Race for the Radio Lead.

GERMANY, as you will remember, is the runner-up in the race for Europe's radio licence supremacy, in which Britain has always held the lead.

A year ago the October 1st figures for Britain were 6,473,990. This year, on the corresponding day, Britain's total had risen to 7,224,123.

Now Berlin announces that the German total for October 1st, 1935, is 6,651,924. This is a very respectable figure indeed, and you will see from the above that Britain now has less than a twelvemonth's lead.

Television Progress.

THE roseate hues of early television are beginning to steal across the skies of many lands. In the U.S.A. the Radio Corporation is planning to build a test station near Philadelphia in the spring. In Hungary a Watch-Television Committee has been appointed to report on progress abroad, with a view to grabbing the most promising method for a Hungarian service.

Austria has actually taken the plunge, and an experimental station has been erected in the Technological Industrial Museum, Vienna. It is a two-thousand-pounder (cash, not weight), and one of the interesting points about it is that it is erected on the site where Austria's first experimental station was born.

Wind Up.

THE recent gale which swept the countries of Western Europe played Ancient Henry with wireless aerial masts in this country and abroad. Germany appears to have been the worst sufferer, for two of those famous wooden masts of hers Humpty-Dumptied themselves during the gale.

The Langenberg mast, which was two hundred feet high, came down with a resounding crack. But the real Big Bang was at Cologne, where only six months or so ago they put up a snorter, which, before the gale, was 531 ft. high. About 530 ft. of this altitude has now been lost!

Point of View.

THE B.B.C. has announced that Dr. Adrian Boult and the B.B.C. Symphony Orchestra will undertake a Continental tour next April. They will visit Paris on April 21st, Zurich on the 22nd, Vienna on the 24th, and Budapest on the 25th.

From the melodic highbrow's point of view this is a musical event of the first importance, and old Wagnerians will be going around solemnly congratulating one another, and talking of a Continental triumph for British music.

Grosser souls will regard it merely as an export of so much wood, wind, and brass; and will say with airy nonchalance—if they mention it at all—that Adrian Boult and His Boys are going to do the Continental!

"All Ferrie Well."

DON'T blame me for the phrase "All Ferrie well." It is due to G. M. A., of Hunstanton, who uses it when demanding that I give particulars of the Ferrie Plan for French Regionals, to which I referred not long ago.

So here goes. The five stations in action are Lille, Paris-Villebon, Lyons, Strasbourg, and Toulouse. The respective wavelengths (with power in parentheses) are 247·3 (60); 431·7 (120); 463 (100); 349·2 (100); and 388·6 (120).

Nice, 253·2 m. (60 kw.) and Marseilles, 400·5 m. (90 kw.) are due for testing, with Rennes, 288·6 m. (120 kw.) to follow them immediately.

Finally there will be Bordeaux, 278·6 m. (120 kw.); Limoges, 328·6 m. (120 kw.); and the new Radio Paris, 1,648 m. (150 kw.).

That is the essence of the plan. And now you see that the tribute I paid to the late General Ferrie was well deserved.

(*Continued on page* 236.)

THE S.T.700 RECEIVER

Designed by

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

EDITOR'S NOTE: This issue of POPULAR WIRELESS is an exceptional one in two ways. In the first place, it is necessary to tell new readers that most of our usual much-appreciated features are held over this week to accommodate the very full account of the S.T.700. Secondly, this number gives complete details of Mr. Scott-Taggart's principal National set for the forthcoming year.

Readers are fortunate in having at their disposal the designs of one who occupies an unrivalled position in the world of radio. This year he celebrates the twenty-first anniversary of the date of his first published design—having designed a set for the first number of the first radio magazine. Since then many famous sets have come from his laboratories, including the extraordinarily successful series beginning with the S.T.100.

This journal—of which, incidentally, Mr. Scott-Taggart was Chief Technical Adviser in its first year—is proud to-day to present what we believe will be his greatest success. Mr. Scott-Taggart derives his prestige and authority amongst constructors largely because he enjoys an almost unique position in professional circles. No one of his especial standing and attainments is to-day a regular contributor to the technical-press. He is famous as a pioneer of the valve era and his patents have acquired world importance.

He is a qualified barrister-at-law, and has been granted by the Institution of Electrical Engineers, the Institute of Physics, and other learned societies the highest professional status it is in their power to confer. Last year, on the recommendation of the Marchese Marconi and three Past-Presidents, the rare and coveted distinction of Fellow of the Institute of Radio Engineers was awarded to him for his pioneer inventions and professional eminence.

THE trumpets have sounded, the drums are still beating, and the vast publicity machinery of the largest publishing concern in the world is at work to get you to read what I have to say.

I am a little intimidated. I am a professional engineer, and have nothing to do with the methods whereby my writings are "put over"—I believe that is the expression—to the public.

But all this does put me on my mettle. As I shudder past those S.T.700 posters on the railway stations, decorated with my portrait—that unpleasant one—as I see huge stacks of POPULAR WIRELESS on the bookstalls and shop counters rapidly dwindling into the hands and then the homes of countless enthusiasts, I feel a very definite responsibility towards the 300,000 who will be reading these words.

The Peak of the Season.

This issue and this big annual set have apparently become the peak of the radio season. The circulation of the S.T.300 number was 155,000; of S.T.400, 217,000; of S.T.500, 242,000; of S.T.600, 284,000; and 300,000 is probably the size of my audience-to-day. Each year I feel I have in some way to do better; to design a better set in its particular field; to invent some new and valuable feature; to devise improved methods of construction; and finally to develop my instructions so that almost a child in arms can build my "star set" of the season with certainty of results.

I am told that each of these "numbered" sets has almost monopolised the attention of the public during its season. I have been accused of "cornering" the home-constructor public, and those of ill-will try to attribute it to some mesmeric skill of words! Such an explanation is more flattering to their vanity than any admission that I design, test and demonstrate a good set conscientiously, and then describe it so that a complete novice can build it with certainty.

I am told that I enjoy to an unusual extent the confidence of the constructing public. **Perhaps it is because I never forget Dean Inge's saying: "Nothing fails like success."** No truer words were ever spoken. Failure tends to follow success almost as night follows day. You people who are reading this are as fickle as the people of Athens. **If I let you down, you would pitchfork me into outer darkness, just as you have abandoned other designers, who in their day were lifted up on high** for having designed for you sets that brought you happiness.

Believe me, it is a hard life—not just to design a successful set, but to go on doing it. Sometimes, while the sales are rocketing, I almost hope for a failure next time, so that I can sit back for a little while. But the mood soon passes. I visualise that day at the end of the following October when something really first-rate is expected of me in the way of a national set. And after months of research and striving to develop new and better methods, there comes at last a success that rewards all one's efforts and redoubles all one's determination to build up an outstanding receiver.

It is no secret that my autumn star set is the principal one of the six I design each year—the one by which I stand or fall. It is my National Set, so to speak. The others, though often very popular, are planned to have a more specialised appeal. The public knows this, and, if you are a new reader, **it is only fair to say that if you do not like the S.T.700 you will have to wait twelve months before you will have an opportunity of disliking another big set of mine.** But, of course, there are other designers, good designers—dozens of them.

A Plain Statement.

This is very much like saying "Take it or leave it." Well, perhaps it is. But the old-time fashion of fingering and pawing designs for weeks is now out of date. Constructors used to dilly and dally, not through any fault of their own, but because they knew that the wireless journal which had just announced some epoch-making design would, within a month, splash some colour on an old circuit and unveil it before the goggling eyes of a star-set-struck public.

This worked for a while, but when I returned to the limelight of the printed page with the S.T.300, I saw that the public were rightly becoming blasé. They persisted in waiting and seeing. The technical Press were treating them like crying babies, dangling in turn a dozen glittering designs per annum. The wireless constructor became like a petulant invalid, pushing away the tempting dishes or playing with his food. Sets were not *constructed*.

Frankly—perhaps rudely, certainly sincerely—I declared flatly, as I do to-day: **"This is my idea of the best set you can**

by a CRAFTSMAN

build for this coming year. If you don't like it, I'm sorry, but I am not going to go on designing sets to tempt your appetite. You know where you are with my sets. You must make up your mind now. You will not be disappointed."

"Two Years' Minimum Life."

The policy worked. It has worked better each year. **Each of my big sets is given a two years' minimum life, during which I bring out nothing to compete with it.** That spells security. It is true that some readers play about with the idea of building my star set, but delay while they wonder whether something better will be brought out by someone cleverer. After a few months, desperately needing a new set, they feel mine is not quite fresh enough, and, being told I shall be doing nothing in that line for one, or even two, years, grab at any old published design and live to regret it.

But that section is fast disappearing. I obviously do not expect every reader to start on my new set immediately.

All my receivers are designed to be still new a year or more after publication. In a year's time from now the present S.T.700 will be as fresh as paint—more than ready to tackle any situation in the ether congestion. Last year's set, the S.T.600, is not ousted by the 700. True, the 700 has new, important features, but I should hesitate a long time before deliberately asking a successful 600 user to scrap his set; I would advise him to use one of the main S.T.700 features, the new Triple Extractor, and I intend to tell him how to do this.

But for four years I have been staunchly faithful to my policy. There are tens of thousands even of S.T.400 users to-day who—not knowing the great strides taken—are still delighted with their sets. Their smug satisfaction sometimes irritates, but it is a wonderful testimonial for my sets to acquire the reputation of being "good for years"—really good.

Have you studied the advertisements of the constructor-kit people? After the S.T.600 was published they devoted page after page to announce their kits. Then new sets were published, and for a week, or perhaps two weeks, the S.T.600 would drop to second place in the advertisements. But with persistent elasticity the S.T.600 would bound back to the head of the advertisement page as the best and most consistent "seller." Only a week or two ago this star set of last year was still the most popular receiver, still figured at the head of an advertisement. Even people who knew that the S.T.700 was on its way were still determined to get the set they had heard at a friend's house, or been urgently recommended to buy.

Having built the S.T.700, you will find in a year's time that you have an absolutely up-to-date receiver—the kind your more dilatory friends are just determining to build. How much better it is to start reaping the delight obtainable from this set within, say, a week of reading these words.

Don't be Tied.

The ordinary set begins to die from the day it is built. It starts at once to toboggan down the slippery slope of obsolescence which ends in the dust-bin. And if you have chosen such a set you are tied to it with strangling ropes, and every month will find you shooting helplessly down the precipitous slope, until you are finally pitched into such a mess of interference that you cut your losses and start again—probably to start at the top of a new slippery slope.

The reason is that the ordinary set is designed to meet present ether conditions. Even if it did that with supreme competence the set would still begin to lose ground the first month, the first week, nay, the very first day it was used. Within twenty-four hours some new station with ten times—in some cases it has been fifty times—its former power bellows down your aerial and your brand new set,

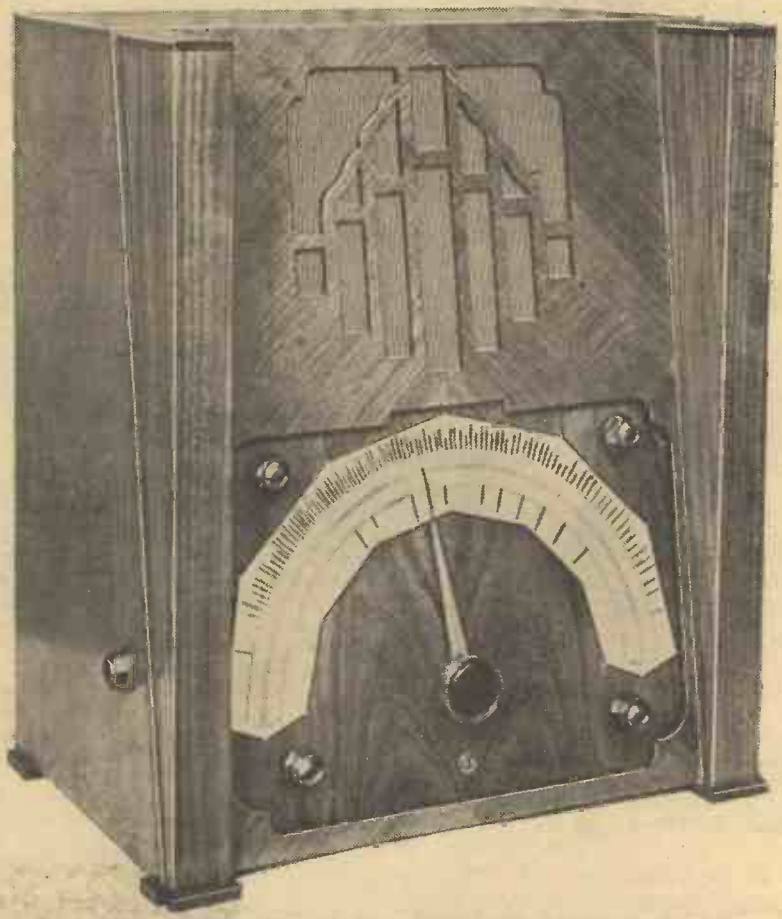
If you want a first-rate example, look at Droitwich! How do you think pre-Droitwich sets were faring within twenty-four hours of that monstrous voice breathing over what was Eden? Yet responsible designers were telling us that we had seen the worst, that the ether conditions would improve rather than deteriorate! *Why, the catarrhal breathing of an Oxford professor on the Droitwich carrier-wave is louder than Daventry playing the massed bands of the Brigade of Guards.*

In a huge area of Britain on an ordinary set, Radio Paris and Luxembourg are drowned by the sipping of a glass of barley water on our long-wave National.

Ether Conditions Getting Worse.

Believe me now, as you value your ethereal security, if you did not believe me last year or the year before, things are getting worse daily. As I said once before, you may be in the frying-pan now, but you will soon be in the fire. This thought may prod you into action; but don't blame me for the prodding—it's just the lust for power which marks our ether dictators.

A DE-LUXE S.T.700 CONSOLETTE



The S.T.700 in one of the cabinets which have been suggested for it by Peto-Scott. This is not essential to the operation of the receiver, but forms a most imposing "home."

I have been ridiculed—and even vilified—as a pessimist, a bogy man, terrifying innocent readers with hair-raising threats of dire consequences, so that they will build my "unnecessarily complicated" sets to give unnecessary selectivity. Well, we have seen what we have seen, and we are going to hear what we are going to hear—that is, if anything is hearable on ordinary sets.

Future Swamping by B.B.C.

The next big move in this country will assuredly be an increase in power of the Regionals. Already Cologne has twice the power of North Regional, its neighbour. Scottish Regional has feeble ether neighbours, but who knows what is brewing? London Regional at present reclines complacently between two harmless friends, but who—even in Central London—forgets the mauling it got from stuttering Stuttgart?

Who knows what Mussolini will do to Bari—and then look out for Scottish National. The other medium-wave Nationals are sandwiched between Turin, with only 7 kilowatts, and Kosice's 2·6 kilowatts.

North Regional excepted, we are fortunate in our ether bedfellows, but should they shoot up to 200 kilowatts *we* shall be shot out of bed. The B.B.C. will retaliate by repeating their Droitwich "act."

It is the duty of the B.B.C. always to see that their meat and mustard, in the thick sandwich of kilocycles, can be tasted. But the mustard will be laid on so strong that you who are interested in foreign station reception are going to be callously and nonchalantly made to gasp and choke.

The B.B.C.'s job is to be heard. If it drowns the conversation of the foreign gentry, that's *their* look-out. It is up to us to provide an antidote to the B.B.C. if we want to draw on the wealth of continental entertainment. If musical Britain attends the Salzburg Musical Festival we cannot afford to miss Austria's contribution to radio. If the finest singers in the world go to Milan we are not going to be cheated out of the delight of hearing them. If we prefer to hear Tyrolese merrymaking from Munich instead of the Foundations of Music, who shall say us nay? And if, finally, B.B.C. entertainment officials have to go on their pathetic junketings to Budapest to bring us second-hand romance, why should we not go higher up the dial and pick it up ourselves?

The Three Bugbears.

It is no good saying "Hands off our foreign stations" to the B.B.C. They have never minded throwing millions of sets out of date by working on new wavelengths or powers. You have to look after "Number One" yourself, and I venture to suggest that the best way is to build Number 700.

Provision is therein made against anything the B.B.C. may do. One of the biggest features of this set is the Triple Extractor—described under a separate heading—which is in the form of a small box, which, when connected in the aerial lead, will cut out any two powerful stations on the medium waves and one on the long waves. There are no prizes for guessing that the medium wave stations will be a local Regional (or relay) and a local National, while Droitwich will be the defeated enemy on the long waves.

I have called these the Three Bugbears of Radio. Each can be annihilated by one of the three Extractor circuits—a bugbear apiece. Each of the three knobs is a ring

in the nose of its prisoner bugbear. With the beast in your power you can either pare its claws or have it stuffed.

Read what demonstratees said about the Extractor device I developed for the S.T.600 last year. And then realise what can be done with this year's version, when you are told that each **S.T.700 Extractor circuit is by actual measurement 25 times as effective as the older form**—itself a miracle of efficiency. Moreover, each circuit keeps out its own B.B.C. station for always, and at all points of the dial. There is no need for switching or for altering any adjustment, even when you go over to the long waves. The adjustment can be made on all three Extractors blindfold within half a minute. You can then put this magic box—a quackish but apt description of an extremely effective technical apparatus—on your window sill and forget about it.

The "Magic Box."

I have given—and will continue to give—demonstrations at Shadbolt and Nash's joinery shop at North Mimms, exactly one mile from the Brookmans Park stations. **The Triple Extractor will cut out Droitwich and the two locals (blazing away with huge power, within sight and almost within a stone's throw), so that the demonstratee cannot even find them on the dial! Cut out the Triple Extractor and, of course, Bedlam breaks through again. Put in the "Magic Box" and in broad daylight you can receive Fécamp with London National working at full blast. Read the reports of readers like yourself who heard 52 stations at 1 mile from Brookmans Park, with both stations working!**

You do not need this uncanny selectivity. In practice you arrange to "let through" enough of these stations to give a good tamable signal; silence or Bedlam—or anything in between—is at your discretion.

Of course, very few people live as close as one mile, but here is an interesting compliment to the S.T.600: **When I returned to North Mimms after six months I found nearly everyone had built the S.T.600 with its Extractor!** There are more Extractor sets to the acre there than anywhere in Britain!

People with expensive mains superhets have scrapped them. People with crystal sets—no good getting anything better when you were swamped, they said!—became Extractor-conscious. Nine out of ten do not know what an Extractor is, but they know that "by turning that there knob foreigners come in grand!" I am stopped in the country lanes by grateful natives. Go to North Mimms yourself and they'll tell you all about it, and point out the joinery shop where I did my tests and now give my demonstrations.

And you will benefit by that experience of mine—shutting myself up there off and on for weeks until I had solved the problem of combating the swamping effect of the "locals"—"local" with a vengeance at one short mile.

Tremendous Selectivity Reserves.

What selectivity reserves you will have with the S.T.700! **In Central London, with the Triple Extractor, Brookmans Park would have to raise its power from 50 kw. to thousands of kilowatts before it could produce the interference experienced to-day in Central London on an average set.**

As regards foreign stations interfering with each other, the S.T.700 takes care of that, with plenty of selectivity to spare—and the signals are free from the annoying whistles so common on all but the most complicated commercial mains superheterodynes. The S.T.700 gives you extraordinary sensitivity, life-like quality and variable selectivity, which enable you to cope with the various degrees of selectivity called for by different stations.

The sensitivity and reaching-out powers are truly remarkable. **You need that dial of mine with its hundred and twelve stations.** The Triple Extractor, if necessary, owing to your home district, actually puts up the equivalent sensitivity often a hundred times, because conventional schemes have to rely on insensitivity to get selectivity.

SEVEN GREAT FEATURES OF S.T.700

1. **INSTANTANEOUS TUNING WITH AUTO-DIAL**
2. **TRIPLE EXTRACTOR ABOLISHES "SWAMPING"**
3. **AUDIO REACTION — A REVOLUTIONARY INVENTION**
4. **UNI-PLANE CONSTRUCTION SLASHES BUILDING TIME**
5. **LOW COST OF SET AND VALVES**
6. **DISPENSES WITH CABINET COSTS**
7. **SUPERB PERFORMANCE**

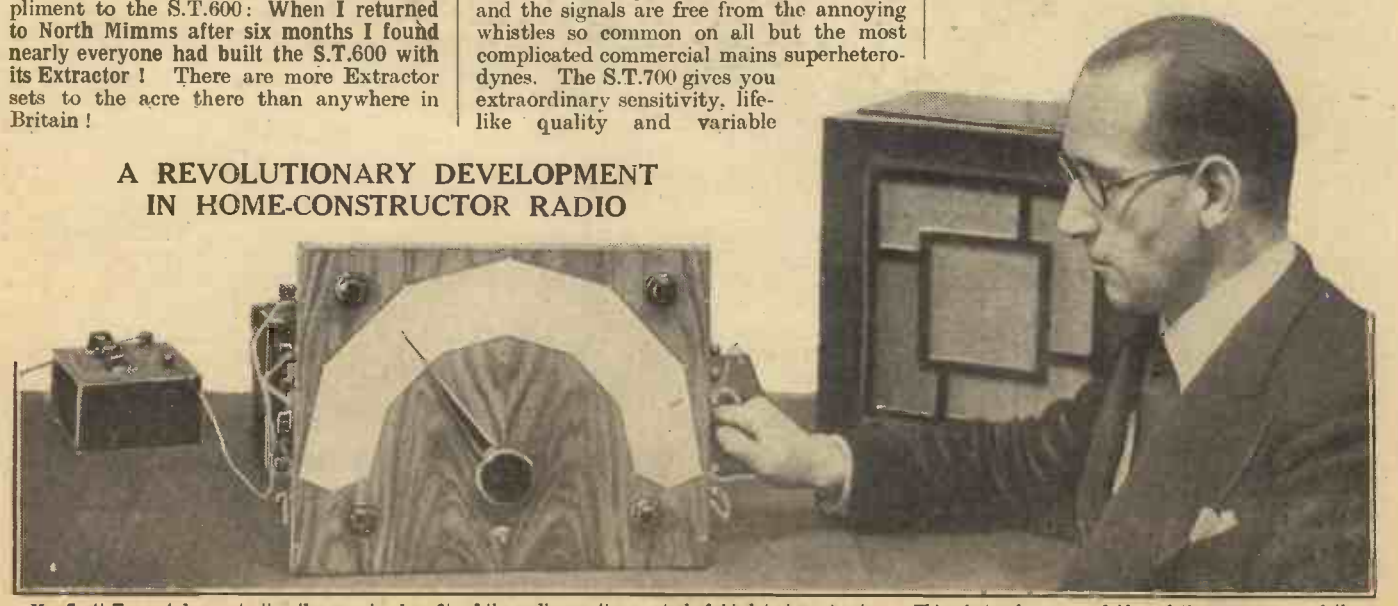
Accurate Tuning.

I have exploded the fallacy of the complexity of having extra knobs so often that no amateur now worries about extra controls which add enormously to performance. Nowadays, however, I refuse to let any improving controls affect wavelength. This was not so before last year. But on the S.T.700 you can adjust any knob you like, except the main tuning knob and the aerial tuning knob (which is called the "aerial balancer") without affecting wavelength. This simplifies operation enormously. On the S.T.700 there are only these two knobs which you must turn correctly; *you can work all the others incorrectly and you will do nothing fatal to reception.* You will merely be getting the same results as on an ordinary set. A few hours' practice, and the S.T.700 will give you real racing-car performance.

And now let us turn to the second great feature of the S.T.700 which will put you ahead of any ready-made receiver; I mean the 112-station dial. It is the largest and easily the most accurately tunable dial of any set I have ever seen. It represents the result of my dissatisfaction with modern hit-or-miss dials.

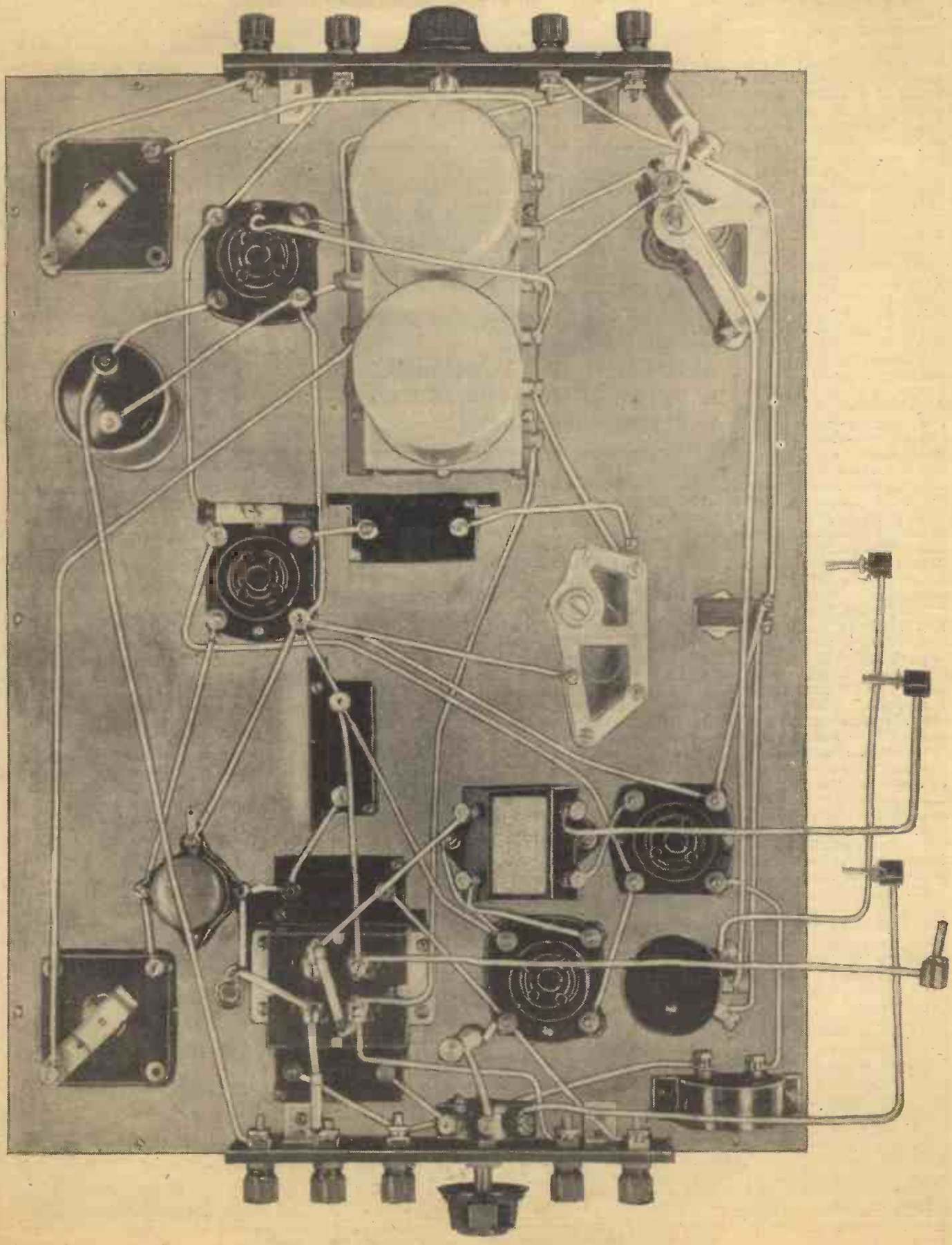
The average dial is sprinkled with dashing-sounding names that emit, when tuned-to, a magnificent reproduction of Niagara, a storm in Chile or merely a couple of lifts and a refrigerator.

A REVOLUTIONARY DEVELOPMENT IN HOME-CONSTRUCTOR RADIO



Mr. Scott-Taggart demonstrating the amazing benefits of the audio-reaction control of his latest masterpiece. This photo gives a good idea of the appearance of the magnificent dial when fitted to the receiver. Note the Triple Extractor box on the left.

NOTE THE SIMPLICITY OF THE UNIPLANE CONSTRUCTION



UNI-PLANE CONSTRUCTION MAKES BUILDING UNIQUELY SIMPLE

We get "Deutschland uber Alles" from Toulouse, Henry Hall from Santiago, "Valentina" from Breslau and an electric sewing machine from a station-name Viipuri, which some designer, in a spirit of cynical bravado, has slung on to the celluloid tube cores. The public is so used to the vagaries of dials that not an eyebrow would be raised, not a grunt discerned, if Berlin played the "Red Flag" or if Rome ended its programme with the Abyssinian national anthem.

So broadminded have the public become, so Geneva-conscious, so superbly international, that these little incongruities are accepted as a matter of course, instead of a matter for curses.

The Greatest Feature of All.

But work the S.T.700 for an evening, wandering idly from named station to named station with hairbreadth accuracy, and *you will wonder why you ever were satisfied with ugly degree dials, peering at scrappy bits of paper with numbers, or juggling with inaccurate wavelength scales or name dials that raised you up in hopefulness only to let you down in practice.*

Read about this new dial later on another page, and meanwhile I'll tell you about the third and greatest feature of the S.T.700—Audio-Reaction.

You will hear of nothing else for weeks in radio circles. **It will be howled down, pulled to pieces, declared impertinent, impracticable and impossible.** And all by people who know just that dangerous amount of science that has martyrised every pioneer since Galileo was put in prison or Archimedes met his death.

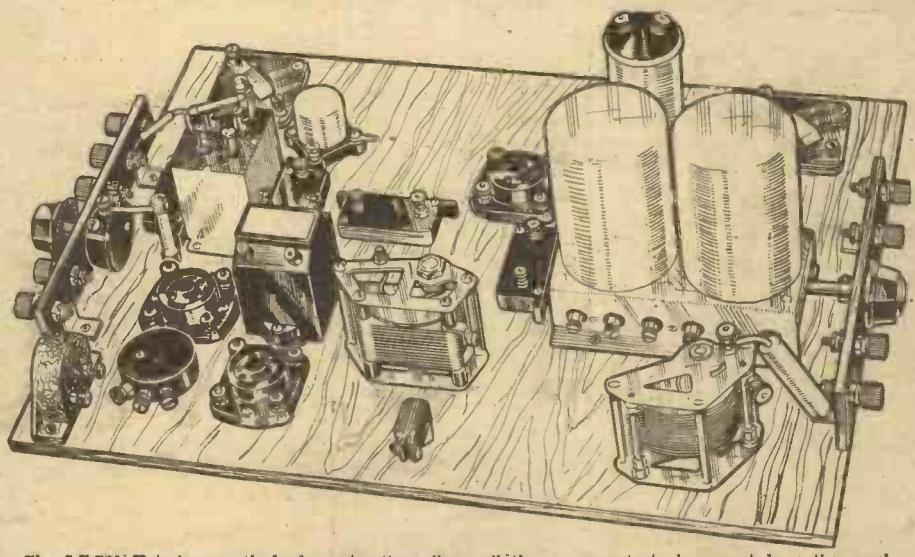
Not that I expect—or, for that matter, deserve—such distinctive treatment, but I do foresee that those who see only my proposals on paper will find all their instincts cringing at the thought of what I have done with such success—namely, applying to the low-frequency side of a broadcast receiver the reaction principles that are so enormously useful on the high-frequency circuits.

A Colossal Improvement.

I can understand the dismay. A year ago I would have felt the same. Every engineer knows how unwanted low-frequency reaction can wreck a set—"motor-boating" being the worst result. Every good design does everything it can (chiefly by decoupling) to stop L.F. reaction.

So keen have we been to stop the erratic L.F. reaction that no one before has attempted to apply smooth and adjustable Audio-Reaction under perfect control. Yet this is what is done in the S.T.700. **Working primarily to improve quality, I developed really helpful Audio-Reaction and, achieving the effect almost as a by-product, was able to increase signals by anything from twelve times upwards—a colossal improvement.** Demonstrations of it were given in London, Birmingham, Manchester and Glasgow. **As you "turn up" the Audio-Reaction you will recapture the same thrill you obtained when you first turned up ordinary reaction.** If you who read this feel that L.F. reaction is a practical impossibility, I urge you in all friendliness to keep your counsel till you have tried the principle as I have developed it. *It may save you many a gulp and many an eaten word!* Schoolboys of fifteen will be ready to demonstrate the effect to you within a week. *People who have never built a set before will gleefully ask you to listen, as they slowly turn that knob on the right of the S.T.700. Audio-Reaction—a wild and hitherto abandoned dream—is here!*

PARTS ARE MOUNTED ON ONE SURFACE



The S.T.700 Uni-plane method of construction allows all the components to be mounted on the panel. Here is a sketch showing the components in position and ready for wiring.

These three features, the Dial, the Triple Extractor, and Audio-Reaction, are one and all obtainable only with the S.T.700 *Not one has been or could be incorporated in a commercial set.* The factory set is essentially a job for the multitude. The S.T.700 calls for that ten per cent extra intelligence and interest which enables these great new features to be incorporated. The Dial would be nearly accurate without the addition of the dots, but the S.T.700 builder can get absolute accuracy, while his neighbour never knows quite where he is. The half-minute or so when installing the Triple Extractor would not please the general public who do not want to do *anything.* The Audio-Reaction means another knob, and would therefore be taboo on a factory set.

Unobtainable in Factory Set.

Many designers for the technical Press merely produce imitations of commercial sets—imitations which are usually dearer. My own policy is to provide results or features which cannot be obtained on a factory set. I take advantage of the extra interest and intelligence of the constructor public. There is no need to give you a "C-A-T cat, D-O-G dog, the CAT is on the MAT" sort of set.

On this occasion the S.T.700, which costs little more than seventy shillings, is about the cheapest set I have ever designed, and its performance is far ahead of commercial sets of much higher price. But if the S.T.700 cost ten pounds it would still have unique features making its choice worth while.

Time Taken for Construction Halved.

The "easy-cabinet" construction dispenses with a separate cabinet at a great saving of cost, while the Uni-plane construction I have devised halves the time of construction and makes it child's play. All the apparatus is mounted on one panel of ply-wood.

A hundred per cent success in construction is my aim this time—a set with the solidity and reliability of a carthorse, but the lines and performance of a racehorse.

The tuning is also very simple. There are only two controls which have to be correct, namely, an aerial-tuning condenser or "balancer," and the main tuning knob, which virtually give all the advantages of single-knob tuning without the opportunities of mistuning, which seem so liable to occur with ganged tuning, even in handling the S.T.600 of last year.

The aerial coupler which controls the aerial circuit selectivity and "volume," the volume-control potentiometer which controls the selectivity and "volume" on the second circuit, and the anode reaction, all have no effect on wavelength, and are therefore "improving controls." The Audio-Reaction knob can be set at zero (full left) under normal conditions, and Audio-Reaction is then not in use.

The Set is Much Simpler.

The instructions for building the S.T.700 are contained in my Rapid Construction Guide. These guides have been given with all my star sets for years, and have proved an extremely useful help. At first I wondered whether the almost ridiculously detailed instructions would frighten off constructors, but they are now eagerly welcomed. After all, a rapid guide to getting up in the morning and eating your breakfast would look very detailed on paper!

This year the set is much simpler, but the instructions are given in even greater detail. Absolute novices are spoon-fed

throughout; there is even a rapid guide for pinning the dial to the panel! There is a quickest-and-best way even of stamping an envelope, and lest the public think these guides too childishly simple (and I admit you can build the S.T.700 from the blue print alone), my own laboratories use the Guide when I want duplicate S.T.700 sets; it saves time and ensures accuracy. **Simply do what I say, and the set will almost build itself.**

This issue is complete in itself. But anyone who resolves to build the S.T.700 will be extremely foolish if he fails to buy the following weekly issues of this paper, which will contain further articles by me. There is, however, not the slightest reason for waiting before starting. **There will be some readers who will have the S.T.700 built within twenty-four hours.** I shall personally reply to all reports (which will be welcomed) received from readers, and can assure them that this journal will maintain interest in the S.T.700 for many more months.

The dial gives some idea of the results obtainable. Of the 112 stations on the dial there are five whose carrier-waves only were received. Of the rest I have received nearly 100 stations on the speaker, a very large percentage giving results of excellent programme value.

In every way, I am—with a full knowledge of my responsibility—recommending this S.T.700 to you. I am confident of the goodwill of those who may not be ready just yet to make it; and I am doubly confident of the delight and gratitude of those who build it.

J. S.-T.

THE BATTERY MODEL S.T.700.—Keep Strictly Within this List

Components.	Make Used by Designer.	Suitable Alternative Makes.
	MAIN SET.	
1 Coil unit for S.T.700	COLVERN	No alternative advised
1 ·0005-mfd. air condenser	ORMOND R483 (with small knob) (Note.—To match other knobs you can buy a Graham Farish knob.)	J.B. "Popular Log," Formo direct drive
1 Main tuning condenser, with special pointer	J.B. (Specify for S.T.700)	No alternative advised
1 Aerial coupler, ·0005-mfd.	GRAHAM FARISH Litlos log-mid-line	Polar, B.T.S., J.B.
1 Anode reaction condenser, ·0005-mfd.	GRAHAM FARISH Litlos log-mid-line	Polar, B.T.S., J.B.
1 Volume control, 100,000 ohms potentiometer with terminals	GRAHAM FARISH	Inverse log-law models by following: Bulgin 100,000-ohms (requires coupling terminals), Colvern, 50,000-ohms
1 Potentiometer, 500,000 ohms	GRAHAM FARISH	Log-law models by following: Bulgin (requires coupling terminals), Colvern, Dubilier metallised volume control log type without switch but with terminals
1 3-point toggle switch	BULGIN S87	
1 Condenser block (2 mfd. + 2 mfd. + 1 mfd.)	T.M.C.-HYDRA B.1007	Or separate condensers by Dubilier, T.C.C., T.M.C.-Hydra, Graham Farish, B.I.C., Amplion, Ferranti
1 0·1-mfd. tubular condenser	T.C.C.	Dubilier, Polar-N.S.F., Ferranti, T.M.C.-Hydra, Graham Farish, B.T.S., Bulgin
1 ·00005-mfd. mica condenser	LISSEN	Dubilier, T.C.C.
1 ·0005-mfd. mica condenser	LISSEN	Dubilier, T.C.C., Graham Farish, Ferranti
2 ·006-mfd. mica condensers	LISSEN	Dubilier, T.C.C., Graham Farish
1 2-mfd. condenser	DUBILIER (9200)	T.C.C., Graham Farish, T.M.C.-Hydra, Ferranti
1 1-megohm resistance (1 watt)	ERIE	Formowatt, Ferranti, Polar-N.S.F., Bulgin, Dubilier
1 500,000 ohms " "	DUBILIER	Bulgin, Formowatt, Ferranti, Erie, Polar-N.S.F.
1 75,000 " " "	ERIE	Dubilier, Bulgin, Formowatt, Ferranti, Polar-N.S.F.
1 20,000 " " " (½ watt or 1 watt)	FERRANTI G.5 (half-watt)	Erie, Dubilier, Formowatt, Bulgin, Polar-N.S.F.
1 30,000 " " " "	FERRANTI G.5 (half-watt)	Erie, Dubilier, Formowatt, Bulgin, Polar-N.S.F.
1 Screened reaction choke	WEARITE H.F.P.J. (actual component is marked H.F.J.)	Graham Farish, type H.M.S. (not disc), Bulgin H.F.8
1 H.F. choke (as for S.T.600)	B.T.S. (disc type)	Wearite H.F.P.J., Bulgin H.F.8
1 L.F. transformer	VARLEY Niclet 1 : 3·5 standard	No alternative recommended
9 Terminals (black): H.T. + 1, H.T.+2, H.T.+3, L.T.+, L.T.—, Pick Up, A, E, L.S.—	BELLING-LEE (type R)	Clix, Bulgin
8 Wander plugs: H.T.+1, H.T.+2, H.T.+3, H.T.—, Grid+, Grid—1, Grid—2, Grid—3	BELLING-LEE (Midget No. 1019)	Clix, Bulgin
4 4-pin Valve holders	BENJAMIN VIBROLDERS	No alternative recommended
2 Terminal strips	PETO-SCOTT (supplied drilled)	
4 Aluminium brackets	PETO-SCOTT (supplied with nuts and bolts)	Or home made
1 Panel	PETO-SCOTT (supplied drilled, french polished and with seven nickel-plated screws	Or locally made (thickness is important)
2 Cabinet side-pieces, cabinet top, and grid-bias battery spar	PETO-SCOTT (supplied drilled, french polished and with ten nickel-plated screws	Or locally made
30 ft. wire for wiring	PETO-SCOTT "Maxamp" (easiest to use, as insulation can be pushed back, but any stiffish wire, e.g., bell wire, may be used)	I strongly recommend the "Maxamp" for easy construction
	TRIPLE EXTRACTOR BOX	
1 Triple Extractor iron-core coil	WEARITE	
3 ·0005-mfd. air variable-condensers	POLAR No. 4 with knob (mention S.T.700)	J.B. "Popular Log" (without dial or slow motion, but with small knob), Ormond R483 (log condenser) with small knob
1 Wooden box—5 wood pieces	PETO-SCOTT	
2 Terminals, A1, A2	BELLING-LEE (type R)	Clix, Bulgin

Optional Aerial and Earth Equipment: Aerialite "Levenstrand," Electron "Superial," Graham Farish "Filt" Earthing-device.

VALVES

	Make Used by Designer.	Suitable Alternative.
V1.	Cossor 210 V.P.T. met., 4-pin base	Hivac V.P.215 met., 4-pin base.
V2.	Cossor 210 R.C.	
V3.	Mazda L.2 met.	
V4.	Hivac P.X.230.	

SCREWS REQUIRED (Unless in Kit):

For fixing panel, 2-¾ in. No. 4 round-head brass (or plated).
For fixing top to sides, 4-¾ in. No. 4 round-head brass (or plated).
For fixing components to panel, 10-¾ in. No. 4 round-head brass (or plated).
For fixing more components to panel, 10-½ in. No. 4 round-head brass.
For fixing B.T.S. disc choke, 2-¾ in. No. 4 round-head brass.
For fixing terminal strip brackets, 4-½ in. No. 4 round-head brass.
For fixing other components, 10-¼ in. No. 4 round-head brass.
For fixing grid-bias clamping spar, 2-1½ in. No. 8 round-head brass.
For mounting brackets to terminal strips, 4-⅜ in. 6 B.A. round-head brass screws with one nut for each screw.
For fixing Triple Extractor coil assembly to Triple Extractor box panel, screws and nuts are supplied by Wearite with coil.
NAILS for Triple Extractor box, 14-1 in. nails.

NOTE.—This is my official and only list of components. The makes in black capitals are those actually used in my original set and referred to in my Rapid Guide. No apparatus outside the lists on this page has been recommended. Any departures are without my approval. Check all statements about apparatus against above official list.

(Signed) JOHN SCOTT-TAGGART.

AN AUTOMATIC TUNING DIAL AT LAST!

You can tune instantaneously to stations chosen from 112 names, with hair-breadth accuracy.

A Unique Feature Which Will Add Enormously to the Delight of Listening.

THE weakest feature of the modern wireless receiver is its dial. With very few exceptions, home-constructed and commercial receivers do not permit you to tune-in with absolute certainty to any given station.

The fault, of course, is the public's. Owing to the absence of station names on dials, and owing to the indifferent performance of many of the receivers, the majority of the public do not make a rendezvous with a particular foreign station. They do not say, "They are doing "I Pagliacci" from Milan to-night at 8; we must listen to that." Given adequate performance and a suitable dial with station names, absolutely accurate as regards calibration, the habits of the tuning public would entirely change.

Names Will Become Universal.

The performance of receivers has improved, and in a few years' time a receiver without names will be as unusual and almost as useless as a telephone directory with only telephone numbers in it and no names.

The odd thing is that those who are keenest on making sets simple to operate are often the most backward in calibrating dials with station names.

Dials, of course, in the ordinary way are printed things, and for a given set are all alike. No two wireless sets are ever the same, and so the manufacturer is faced with a dilemma.

The ideal, of course, is to have some method of individually calibrating receivers, but this seems to be far too expensive for the ordinary manufacturer to undertake, and some modification of the printed dial, or a special type of dial, becomes necessary.

The placing of station names around a dial without providing any accurate tuning

AUTO-DIAL
Shows how, even in an unlikely case of sloping function lines, utmost accuracy is maintained.

point gives the listener some idea where to look for the station, but the fact remains that he still has to look for it.

Imagine the feelings of a railway traveller who was put out at St. Helens or Wigan (with apologies to readers who dwell in these towns) when he wanted Southport. It would be little comfort if a railway authority retorted: "Well, we put you on the London, Midland and Scottish Railway."

No, what is wanted is a dial calibrated in station names so absolutely accurate that the user can instantaneously tune to any particular station, and the receiver itself must be good enough to bring in that station.

That was my ambition with the S.T.700, and I consider that I have fulfilled it.

The present Auto-Dial is a very distinct advance on the Spot-On dial of last year. The station names are now arranged in a semicircle instead of in groups. The group system is better where the size of the dial is smaller, but it is apt to be a little confusing, since one cannot tell *at a glance* which station one is receiving. This is because the pointer may cross as many as eight station names, and the listener must look down the group to find the dot. In the present new dial one can tell at once which station is being received or is to be received.

A further improvement is that by having a much larger dial and longer pointer the accuracy of all calibrations is very much greater.

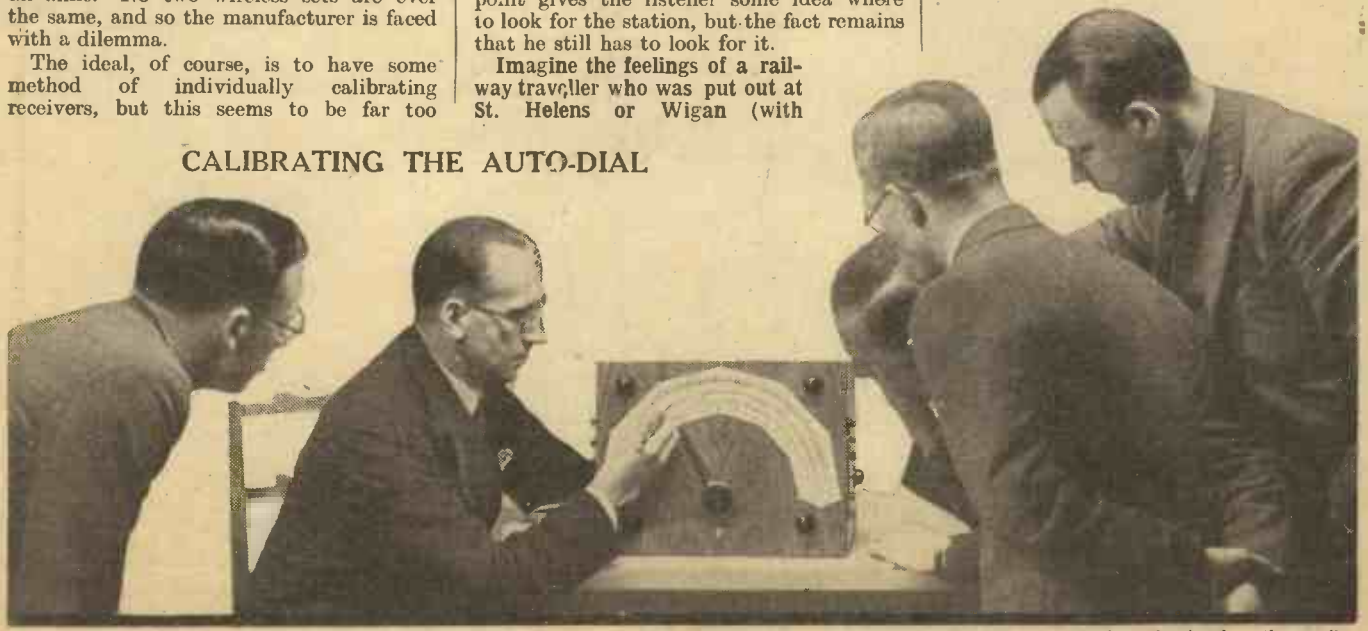
Simplicity of Wide Open Scale.

The farther the tip of the pointer has to move in passing from one station name to another the greater the accuracy of the calibration. A very wide open scale, such as that used on the Auto-Dial, makes it extremely simple to set the pointer to any given station.

The third merit of the Auto-Dial is that it provides against those small differences between sets, differences which are an almost complete impediment to ordinary calibration systems.

In the Auto-Dial there is ample angular tolerance; in fact, if you were "out" by as much as quarter of the dial—a fantastic and impossible situation—the Auto-Dial would still indicate the exact position of the station. Actually the wide angular

CALIBRATING THE AUTO-DIAL



The designer of the S.T.700 explains the method of calibrating the dial to members of the staff of "Popular Wireless." He is seen here showing how the pencil mark is made on the semi-circle to denote the exact position of the station.

tolerance permitted is far less required than it was on the S.T.600 receiver, the reason being that the tuning condenser is of the plain type and has no trimmers associated with it. Moreover, *the calibration is on a single isolated circuit not subject to capacity changes.*

This absence of a trimmer on the main tuning condenser of the S.T.700 not only makes for greater simplicity, but adds enormously to the certainty of accuracy of the dial.

The dial system which I have specially invented for this set is illustrated in the two middle pages of this issue of POPULAR WIRELESS. It will be noticed that at the end of each station name there is a black dot (or small black triangle in the case of the more important English-speaking stations). The listener himself puts a dot in pencil (subsequently in ink if desired) on a semicircular line which runs between the medium-wave station names and the long-wave station names. It will be seen that there are two of these lines, which I shall refer to as the "medium-wave dot line" and the "long-wave dot line," the latter being nearer the long-wave station names.

When a certain station, say Toulouse, is accurately tuned-in, the pointer will point approximately towards the word "Toulouse," but it may be a trifle to either side. This does not make the slightest difference, as the listener's own dot is the true calibration point. Having marked the dot with a fine pencil, he moves the pointer away, and joins the dot he has marked to the dot at the end of the name of the station he has just received, namely Toulouse. Whenever he wishes to tune-in Toulouse he simply turns the main tuning knob until the pointer crosses the dot joined to Toulouse. **It is as though he had a telephone exchange, and simply plugged in Toulouse. Nothing could be simpler.**

If you desire a particular station you have not previously received you can, with the Auto-Dial, arrive at the correct tuning point by drawing a line from the dot on the station name to the dot-line, taking care that this line follows the same general direction or angle as the junction lines on each side.

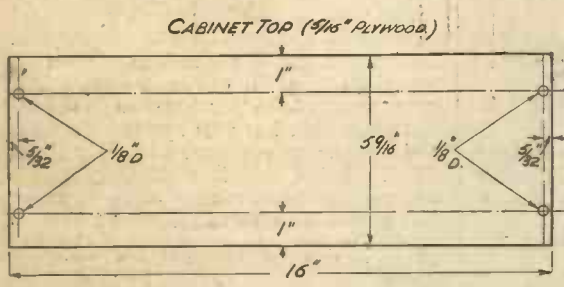
The Auto-Dial enables you to identify hitherto unrecognised stations.

The procedure now is to put the dot on the dot-line and then draw upwards to the medium waves or downwards to the long waves a line parallel with the other junction lines near to it. Where your new junction line reaches a station name is the station about whose identity you have been uncertain.

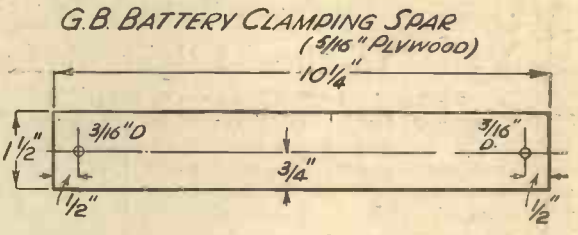
The ability to identify stations, or to go to stations hitherto not heard, by simply drawing a line in the same general direction as other junction lines, is of incalculable value to the beginner.

The junction lines to the medium waves named may tend to point in one direction, while the junction lines to the long-wave stations may slope in the other direction.

This emphasises the value of the system, since, if in other dials—by a stroke of luck—the medium-wave stations come out in their right places, it is extremely unlikely that the long-wave stations will do so as well.



On the left (Fig. 1) are the dimensions of the wood for the top of the cabinet, while the right-hand diagram shows (Fig. 2) the G.B. battery clamping spar.



THE TWO SIDES

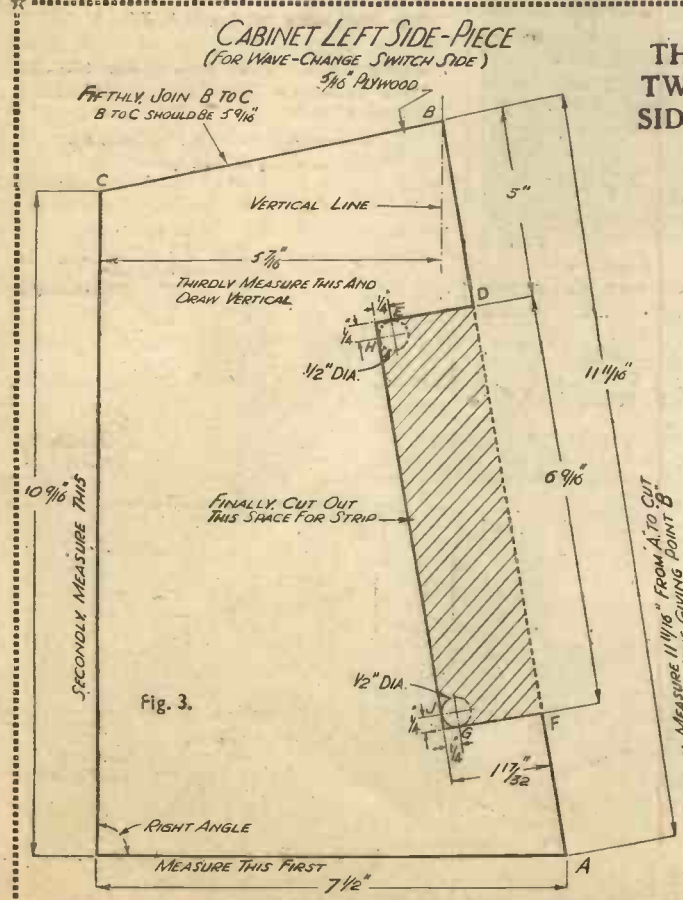


Fig. 3.

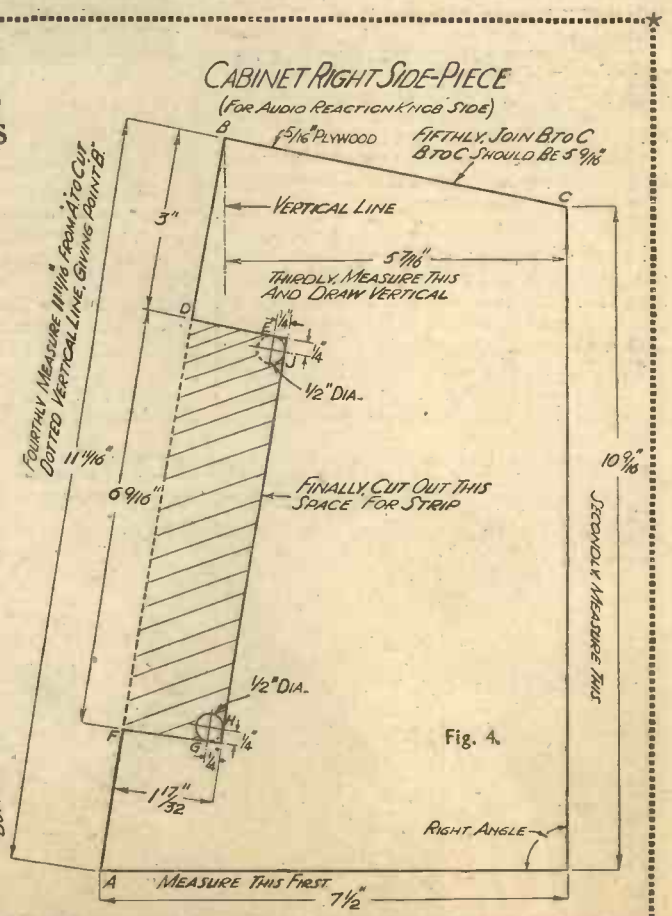


Fig. 4.

The sides of the cabinet should be cut out in the manner shown. The ¼-in. diameter holes are to allow the saw to complete the cutting of the space for the terminal strips. If wood surfaces are polished, lines marked "vertical line" should be drawn on paper affixed to wood.

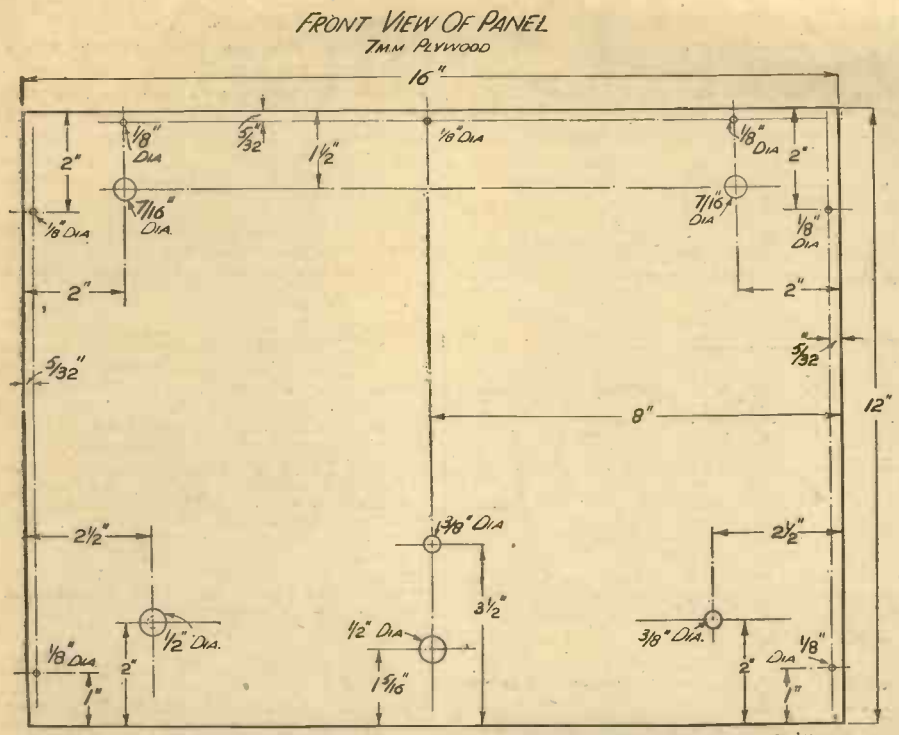


Fig. 5. Every hole, including the screw holes, is shown in this complete drilling diagram for the panel of the S.T.700. Do not attempt to use blue-print as drilling template.

I have, however, in telling you this, kept an important "tit-bit" up my sleeve. **It is possible to make the pointer point at the station name by the very simple process of slackening the grub-screw on the main tuning knob, and bodily moving the pointer a little to either side, so that when a chosen station, say Toulouse, is tuned-in, the pointer will point towards Toulouse.**

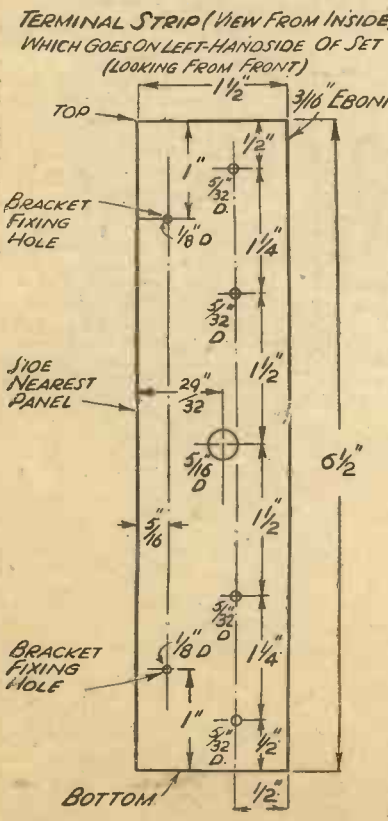
All the other stations will then automatically fall into their right positions, or extremely close to them; when you tune-in to them the pointer will point towards their names. Detailed instructions are given elsewhere in this issue for carrying out this simple operation. It might be thought that the method would obviate the need for the junction line system, but although it would prove very nearly accurate it would not give the 100 per cent accuracy which is obtainable by means of the dot system, which supplements the approximate adjustment of the pointer.

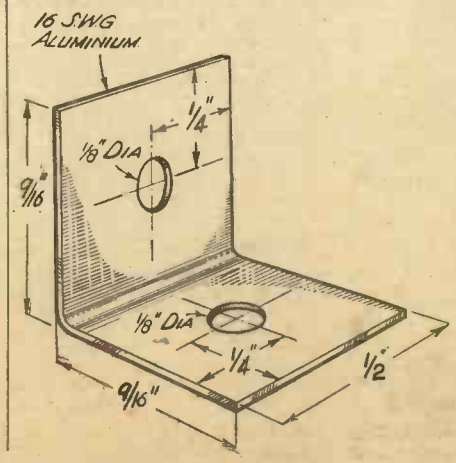
As it is my intention to give all instructions for such operations in brief extremely explicit words, this is done elsewhere in this issue. The above is simply a general discussion of the merits of the new dial which, when used in conjunction with the particular condenser and coil unit specified, **will so simplify operation, and enlarge the possibilities of enjoyment from the receiver, that this feature alone should ensure a huge popularity for the S.T.700.**

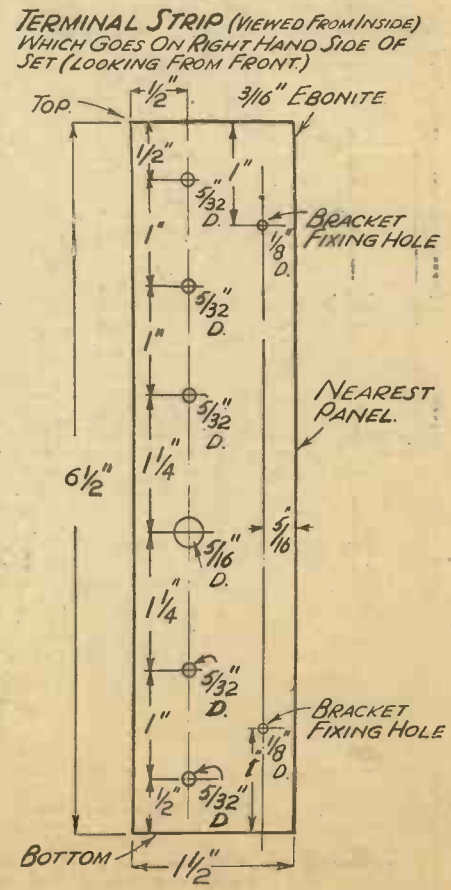
VITAL PARTS OF THE CONSTRUCTION

BRACKET FOR TERMINAL STRIPS

(TWO BRACKETS ARE USED ON EACH STRIP)







The two outside diagrams (Fig. 6, left, and Fig. 8, right) show how the terminal strips are drilled, while the centre sketch (Fig. 7) depicts one of the brackets used for mounting the terminal strips. There are four of these brackets used in the set, two for each strip.

FAMOUS RADIO SCIENTIST'S OPINION OF AUDIO REACTION.

DR. ROBINSON, inventor of the Stenode and pioneer of automatic tuning and direction-finding systems, confirms the great benefits obtained.

Dr. James Robinson, D.Sc., Ph.D., F.Inst.P., M.I.E.E., formerly Chief of Radio Research of Air Ministry, after trying out the S.T.700, writes:

I have operated the S.T.700 and find that Mr. Scott-Taggart was justified in departing from usual technique which was to avoid low-frequency reaction.

By departing from standard practice, and there are few engineers with sufficient foresight and courage to do so, he has made it possible, by his audio-reaction scheme, to increase signal strength, whilst greatly improving quality.

His success in this direction deserves to arouse the greatest interest.

(*Signed*) *JAMES ROBINSON.*

Our Readers' Opinions of

51 STATIONS AT 1 MILE FROM B.B.C.

Dear Sir,—I have been permitted to attend a demonstration of your S.T.700. This took place about one mile from the aerials at Brookmans Park—under the aerials, so to speak. London National and Regional were all over the dial at a volume that left one deaf. Then the Triple Extractor was brought into use; the London National and Regional were cut out dead, not to mention our big baby Droitwich. Fifty-one foreign stations were brought in at more than full loudspeaker strength, this with no effort on the part of Mr. John Scott-Taggart—no searching, no fiddling; plain, straightforward get-your-station as marked on the dial.

I could hardly believe the Brookmans Park aerials were so near, yet we could see the red lights on top of the masts. I wonder how many commercial sets could pass this test as well as the S.T.700?

The same number of foreigners were brought in on an aerial flung over the beam, about seven feet long. There are other details about the S.T.700 which will be shared by thousands; no, tens of thousands, I hope. They will be surprised when they build and hear the set of the season, the S.T.700. I will be pleased to answer any question from readers who may be doubtful.

J. E. SMITH, 78, *Milton Avenue, Harlesden, N.W.*10.

64 STATIONS IN CENTRAL LONDON.

Dear Sir,—Many thanks for the pleasure and privilege of hearing a demonstration of your latest set, S.T.700. I must say that I was amazed at the performance of it. I will attempt to touch briefly the points which appealed strongly to me.

1. Selectivity is absolutely marvellous, the locals being completely cut out.

2. Using Audio Reaction, weak signals were brought up to the strength of more powerful ones. In a demonstration of increase in signal strength, the measured increase, using Audio Reaction, was twenty-five times.

3. Output volume is enormous, without affecting the quality in the least.

4. Sensitivity was astonishing. With only a small aerial (about five feet) across the room, and using no earth, the reception was very good indeed, stations coming in very loud.

5. Audio Reaction strengthens signals considerably, and gives the bass a deeper note which is very pleasing to hear.

6. The quality of reproduction was very fine, in fact, better than any other set I have heard, and will not fail to satisfy the most severe critic.

7. The Triple Extractor is a blessing to all constructors. All three locals were effectively cut out as if they were not working.

8. The Auto-Dial is absolutely the last word in dials, the ease with which each station was found was really amazing, and the ingenious method of calibration deserves the highest of praise. It will be welcomed by many anxious to construct a receiver for family use.

9. In all, 64 stations were received, every one being identified. All were received at amazing volume and not one interfered with another.

Mounting the set on the front panel is a revolutionary feature which gives greater ease in assembling.

The tuning of the set was not affected by alterations of any of the other controls. Therefore you have no trouble in tuning back to any given station.

I do not hesitate to say that it is the greatest set I have heard, and I congratulate you on a grand piece of workmanship.

L. R. OAKES, 47, *Norman Road, Bow, E.*3.

QUALITY WAS SUPERB.

Dear Sir,—I thank you for the invitation to attend a demonstration of the latest radio triumph.

The exclusion at will of any or all of the three B.B.C. stations was complete, and the new form of dial, fully adequate and of generous size, rendered the finding of and return to all the foreign stations easy and precise.

The quality of reproduction was superb, and the set is undoubtedly the high-water mark of design.

GEO. MACLOCHLAN, 10, *Warkworth Gardens, Great West Road, Isleworth, Middlesex.*

"UNCANNY RESULTS."

Dear Sir,—The other evening I attended a demonstration of the S.T.700. The results obtained can be described as uncanny. Tuning simply meant putting a pointer on to the required station, and bringing another knob in tune. The quality and tone were excellent.

Another remarkable feature is the low-frequency reaction which increases the power and tone in a remarkable way; in fact, it has to be heard to be believed.

The amazing demonstrations, given within one mile of the Brookmans Park stations, prove the extraordinary selectivity of the S.T.700. The new Triple Extractor 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 & Nash, illustrated above—where Mr. Scott-Taggart began his work on extractors last year. The extractor principle has now been improved to give 25 times the efficiency.

I should think the most interesting feature of the set is the Triple Extractor, which absolutely eliminates the unwanted stations; in fact, it is really a remarkable set.

C. J. BREHAUT, c/o *Leale, Ltd.*, 7, *Bordage Street, Guernsey, C.I.*

67 STATIONS RECEIVED.

Dear Sir,—It gave me great pleasure to be able to attend your demonstration of the S.T.700, and I cannot but congratulate you on the construction of what must undoubtedly become the most popular circuit of the present year.

On first seeing the S.T.700 the outstanding point is the neatness of the controls, which are grouped around a dial of generous proportions, bearing with great clearness the names of about 100 stations. Although considered by many a luxury, the clearness of the dial most certainly adds to the efficiency and ease of operation.

However, a good dial is no use without an efficient circuit, and, as we soon found out, this requirement was amply fulfilled by the arrangement of a variable-mu pentode, followed by a detector and two L.F. valves, the latter three all being triodes. An aerial of about 50 ft. length was used for the major portion of the test.

The first task on switching on was to reduce the powerfulness of the B.B.C. stations to the general level of the best foreign stations. This apparent herculean task was accomplished by the Triple Extractor, a small box containing three very efficient circuits incorporating iron-core coils. With extraordinary quickness the two medium-wave extractors were set for the National and Regional Stations, and the remaining one to reduce Droitwich, and they were then left untouched for the remainder of the test.

We were now in a position to tour Europe at our ease, a matter which we did with great success, obtaining 67 stations at excellent volume and quality, and except for the four common waves, free from interference from other stations. The operation of the set was further simplified by the fact that any alteration of the subsidiary controls, such as reaction and selectivity, had no effect on the tuning, and by the complete absence of any complicated ganging arrangements.

In accordance with his usual custom, Mr. John Scott-Taggart had incorporated something entirely new in this set; it was, in fact, the Audio Reaction. This control does the same for the low-frequency portion as normal reaction has done for the high-frequency side of reception. By turning the knob the signal strength could be increased 25 times as was visibly shown on a voltmeter, and by the amazing way in which the low notes were increased without a loss to the high. Here, indeed, was a tone control which positively increased the volume, seeming to bring the broadcast into the very room, a fitting climax to a truly remarkable circuit.

To further try the sensitivity, an aerial of about 9 ft. long was tried and no earth used, a test which the set easily passed bringing in several foreign stations at excellent volume.

I can therefore recommend the set to both quality and long-distance listeners, a difficult matter to combine in any circuit, and yet, strange to say, this is about the cheapest set yet designed by Mr. John Scott-Taggart. It is, in fact, the circuit for everyone requiring the best and latest in present radio.

HAROLD F. PELLOW, 371a, *Uxbridge Road, Acton, W.*3.

(Demonstration was in Central London.)

50 STATIONS AT B.B.C.

Dear Sir.—As I was in a party privileged to witness a demonstration of the S.T.700 at one mile from Brookmans Park, probably the less fortunate of your readers will like to know the impressions I formed after this very severe test, which took place between 8.30 and 11 p.m. on the night of October 15th, whilst our near-by "enemy" was going strong.

At my first view of the S.T.700 I was impressed with the simplicity of the panel; also with an improved station dial, which greatly facilitates the search for foreigners. The S.T.700 is undoubtedly the set for the man with moderate means; but lest this suggestion of cheapness should raise false impressions, let me add that I consider the set the embodiment of simplicity, extreme selectivity and general all-round efficiency.

Under test it was found possible to cut out all traces of interference from Brookmans Park by a clever development of the "Extractor" in the S.T.700. As 50 stations were tuned-in at good strength, several of which were only a few kilocycles on either side of our powerful neighbours, it is not hard to imagine what could be done in situations less exacting. You will see from the above that the S.T.700

Amazing Demonstrations

came through the most difficult of tests with flying colours. Truly a wonderful set. Hearty congratulations to the designer.

There are several unique points about this new set, but as these will be fully described in POPULAR WIRELESS, it is not necessary for me to enlarge on them, beyond saying that they are very effective, and they place considerable powers in the hands of constructors of the S.T.700, which are not vouchsafed to users of other sets.

I was very impressed with the demonstration, and my advice to all home constructors is to build the S.T.700. You cannot fail to be pleased with the results of your labours, *providing, of course, you use the components specified by Mr. Scott-Taggart.*

Many of the stations referred to above were also tuned-in with an aerial consisting of a short length of wire suspended from a beam in the building.

I certainly intend to built the set as soon as the specification is published.

T. POLLETT, 2, *Greenham Rd, London, N.*10.

SELECTIVITY AMAZING.

Dear Sir,—I am writing to thank you for the opportunity of hearing your new set, S.T.700, in my own home, working under the normal reception conditions of the district.

The Auto Dial is by far the most accurate tuning dial I have yet seen. The quality of reproduction was the S.T. standard —beyond reproach.

The selectivity was amazing; the way the set cuts out the locals completely in half of a degree!

Talk about volume of output!—it is a good thing there are means of controlling it.

The number of stations received was in all 71 at full loudspeaker volume.

When the Triple Extractor was demonstrated it appeared as if the local stations were being faded out, and as soon as the tuning condenser was moved to the adjacent station on either side, the local station might just as well have been closed down, for there was no indication that it was still radiating.

The Audio-Reaction was the most amazing of all. I think it is one of the "wonders of the world"; it brings the studio right into your home with fine quality.

There was a demonstration of measured increase of signal strength by 36 times using Audio-Reaction.

It was wonderful the way the set would pick up stations when using as aerial only a short piece of wire and with no earth; some of the stations received I had never heard of before, far less heard.

The S.T.700 has put the constructing fever into my blood again.

E. BIGGS, 96, *Swinton Hall Road, Swinton, Manchester.*

71 STATIONS IN MANCHESTER.

Dear Sir,—I had much pleasure in attending a demonstration at No. 96, Swinton Hall Road, Swinton. In my opinion the Auto Dial is a greater improvement in your S.T.700 than on your S.T.600. The S.T.700 Auto Dial is absolutely fool-proof, very easy to manipulate by anyone, and remarkably accurate, even on the most difficult stations.

As you kindly demonstrated to us last night, the quality of reproduction of your new set is of very rare quality indeed; even when reaction was applied it caused no harshness or distortion, as is usual in most cases.

I was greatly impressed by the comparatively small spread of locals and general selectivity of the S.T.700.

One of the most outstanding points of this set was the volume, by which I was greatly impressed.

I was amazed at the remarkable number of stations received by your set. We received 71 stations in about an hour.

When the Triple Extractor was demonstrated it appeared as if the local stations were being cut out, and as soon as the tuning condenser was moved to the adjacent station on either side, the local station might just as well have been closed down, for there was no indication that it was still radiating.

A great new feature of this set is the Audio-Reaction; it gives fine quality.

You gave a demonstration of measured increase of Audio-Reaction effects; it registered 36 times greater volume.

The sensitiveness of the set was shown when you connected a short piece of wire without earth; we logged dozens of stations, some of which I had never even heard of before.

Considering everything, it is the finest, most amazing set I have ever heard.

A. ECKERSLEY, 10, *Bingham Street, Swinton, Manchester.*

P.W. READERS AT BROOKMANS PARK

A flashlight photograph of Mr. Scott-Taggart demonstrating the S.T.700 to "Popular Wireless" readers. Fifty-two stations were received—and reception of considerably more would have been possible if time had permitted. The aerials of Brookmans Park—one mile away—could be seen through the window shown.

Reading from left to right: Messrs. S. M. Pettet, T. Pollett, E. J. Pollington, W. J. Edgington, H. E. Goss, W. Haynes, S. G. Lines, R. L. Erbe, B. D. Dye, W. Wigg, R. Walthan, J. Smith.

QUALITY SUPERB.

Dear Sir,—I was privileged in being able to attend a demonstration of Mr. Scott-Taggart's new set, the S.T.700, held in Glasgow on October 19th; 64 stations were received with perfect ease, and the set gave one the impression of being capable of receiving every station in Europe—and beyond—if more time had been available.

The quality was superb, speech being very natural and a large output volume being obtained without distortion.

The new dial is the best I have ever seen, every station being accurately marked, so that anyone could tune the set. The Extractor circuits were very effective, reducing the local stations to the status of good non-fading foreigners, and once they have been set, need never be touched again. The big advantage of this scheme is that the sensitivity of the set is in no way affected.

The new Audio-Reaction will prove a popular feature, needing no adjustment while tuning, and increasing the output about 25 times. This method shows a marked improvement in quality, lending body to speech and music such as is rarely heard.

One expects selectivity from a Scott-Taggart set, but when this is combined with the power and quality of the S.T.700, at such a low price, then in my opinion he has excelled himself.

JOHN FLEMING, Roschill Dairy, Whifflet, Coatbridge, Scotland.

S.T.700 IN GLASGOW.

Dear Sir,—**With regard to the demonstration which I was privileged to attend in Glasgow recently, I have nothing but praise for this marvellous production. The selectivity of the S.T.700 was excellent, also the sensitivity, as 66 stations came through as clear as crystal, most of them on an inside aerial of 15 ft. in a small room.**

Your Triple Extractor fills a long-felt want in the cutting out of B.B.C. stations.

As regards signal strength and quality of the Audio-Reaction, it has to be heard to be realised, as was also the demonstration of measured increase of signal strength by 25 times by using above type of reaction.

Quality of reproduction on the 66 stations was perfect, all being received at splendid volume.

The large Auto Dial is another of the many outstanding points of this set.

In concluding I would strongly recommend any one of the many satisfied readers of "P.W." on no account to miss this colossal success.

THOS. MORE, 1064, *Argyle Street, Glasgow*, G3.

BIRMINGHAM SAYS:

Dear Sir,—I once again had the pleasure of a visit by Mr. Scott-Taggart who demonstrated his S.T.700.

Good as his previous sets have been, and still are, the S.T.700 is an improvement over all, even the S.T.600. The new dial is much better than the one on the S.T.600, as the pointer passes only one station at a time. The use of separate controls for the two tuned circuits presents no tuning difficulties, while ensuring accurate tuning, giving maximum results. The three extractors are ideal, because when once set to reject the local stations they need not be adjusted again. The locals, as on the S.T.600, are still receivable, but instead of occupying the whole of the dial, only require as much of it as the distant ones. **The Audio-Reaction greatly increases the strength of the weaker signals, giving them body and fullness which they otherwise lack.** A test was made with a meter, which proved that a considerable increase in strength was obtainable.

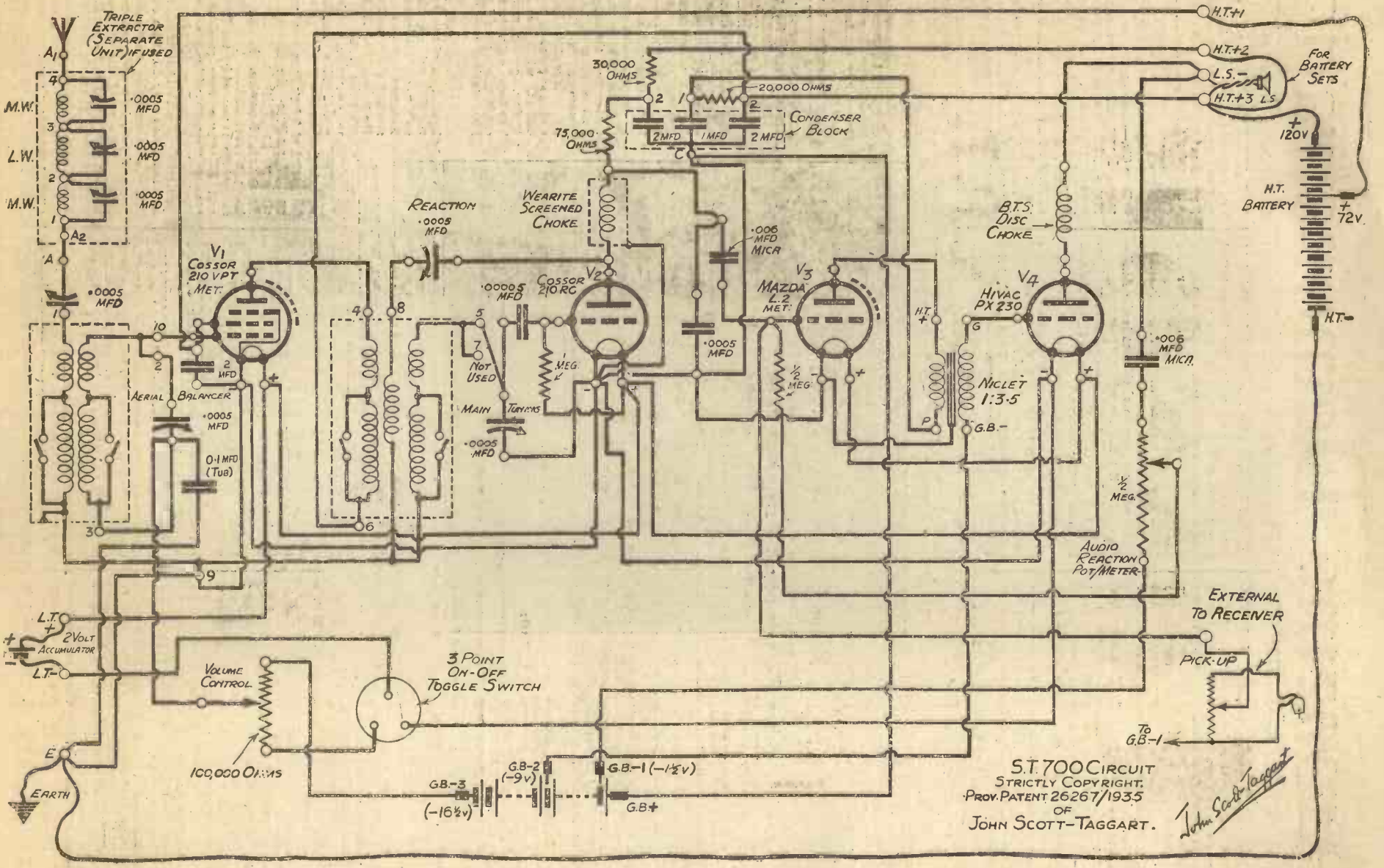
A total of 76 stations was received—9 long and 67 medium—the strength of such weak stations as Valencia, Bucharest, Belgrade, Barcelona, Katowice, Madrid and Turin II being a revelation. The efficiency of the extractor was proved by the fact that Heilsberg and Hilversum were received at full loudspeaker strength without a trace of Midland Regional. The Deutchlandsender was also well received with little trouble from the 150-kw. Droitwich only 18 miles away.

The demonstration was carried out on an indoor aerial, in a badly congested area, and to prove the sensitivity of the set numerous stations were heard at full loudspeaker strength with an aerial of only a few feet of wire lying on the floor.

The selectivity of the set is excellent and the quality extremely good.

As before I shall most certainly build this set, and pleased to demonstrate to and help anyone who cares to visit me in any way I can.

THE CIRCUIT OF THE S.T.700 RECEIVER



S.T.700 PILOT AUTHOR KITS

Mr. JOHN SCOTT-TAGGART *again chooses* A PETO-SCOTT CABINET

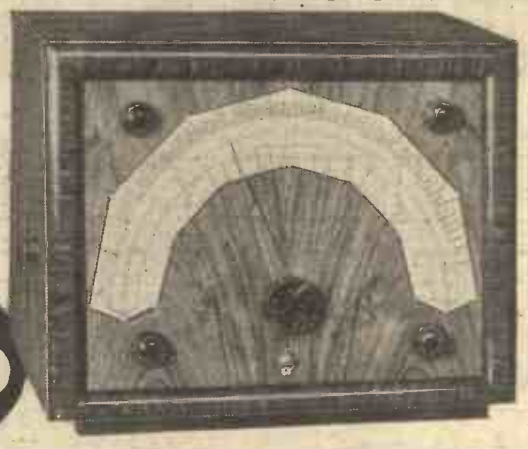
CABINETS

Here are, without a doubt, the finest Cabinets even Peto-Scott, Cabinet Craftsmen since 1919, have ever produced. Designed, assembled, finished and hand French polished by experts of London's piano trade. They are specially constructed to allow both terminals strips to be housed inside, and are supplied complete with extension spindles for side controls. Each model will accommodate all necessary batteries and accumulators.

FINISHED INSTRUMENTS

All the 3 Cabinets illustrated and described below are available either separately, for the home constructor of the S.T.700, or in the form of a complete, finished instrument, housing the S.T.700, fully assembled, exactingly tested and READY TO PLAY.
Every Peto-Scott Finished Instrument is AERIAL TESTED ON ACTUAL BROADCASTING.

Peto-Scott TABLE CABINET



2/6 DOWN

Demonstrations daily at 77, City Road, London, E.C.1 and 62, High Holborn, London, W.C.1.

Overall dimensions, W. 18½ in., H. 14½ in., D. 12 in.

S.T.700 A.C. VERSION KIT

CASH or C.O.D. *Carriage Paid* **£9:5:0**

"A" Balance in 11 monthly payments of 17/- ● OR YOURS FOR **17/-**

Comprises complete kit of components as FIRST SPECIFIED and used by Mr. J. Scott-Taggart, including Peto-Scott Ready Drilled and polished Walnut plywood panel, ready drilled terminal strips, aluminium brackets, mains lead, nuts and bolts, less valves, cabinet speaker and Extractor Kit.

KIT "B" CASH or C.O.D. *Carriage Paid* **£11:18:6**

Balance in 11 monthly payments of 21/9 ● OR YOURS FOR **21/9**

As for Kit "A," but including set of 3 Specified Valves, less cabinet and speaker.

KIT "C" CASH or C.O.D. *Carriage Paid* **£13:16:0**

Balance in 11 monthly payments of 25/3. ● OR YOURS FOR **25/3**

As for Kit "A," but including valves and specified Peto-Scott A.C., S.T.700 Cabinet, with speaker baffle, less speaker.

If Extractor Unit Kit is required with any of the above Kits, add £1:4:0 to Cash or C.O.D. prices, or 2/3 to deposit and to each monthly payment.

KIT-BITS *You pay the Postman. We pay Post Charges on all orders over 10/-.—GREAT BRITAIN ONLY.*

		£	s.	d.
1	Peto-Scott Ready Drilled and Polished Walnut Veneered Panel		3	3
1	Peto-Scott 10ft. Mains lead		1	3
4	Peto-Scott Aluminium brackets with nuts and bolts for fixing terminal strips and 1 Aluminium bracket for electrolytic Condenser		1	3
2	Peto-Scott Ready Drilled Ebonite Terminal strips		1	4
1	Ferranti mains transformer	1	11	6
1	Westinghouse Metal Rectifier		18	6
1	Set of 3 first specified valves	2	13	6
1	W.B. type EM/S Speaker	3	10	0

Or if required with above kits add 6/6 to deposit and to each monthly payment.

EXCLUSIVELY SPECIFIED

PETO-SCOTT Walnut veneered Consolette "lift up lid" cabinet as used by Mr. John Scott-Taggart for his A.C. S.T.700 complete with baffle boxboard assembly.
CASH or C.O.D. Deposit 5/- and 6 monthly payments of 6/6. **37/6**

S.T.700 TABLE CABINET (Battery Model)

Exquisitely designed walnut finished cabinet with sloping front and crossbanded moulding. Constructed of carefully selected wood and hand French polished. Cash or C.O.D. 17/6. (Carriage and part packing 2/6 extra.)
Balance in 5 monthly payments of 4/-.

Yours for **2/6**

This Consolette Cabinet. *Overall Dimensions:* W. 20½ in. H. 15½ in. D. 14½ in.

5/- DOWN

This Specified A.C. S.T.700 Cabinet Type LL *Overall Dimensions:* W. 20 in. H. 24 in. D. 12½ in.

5/- DOWN

FINISHED INSTRUMENT (Battery Model)

Built exactly to Mr. J. Scott-Taggart's specification by Peto-Scott's expert technicians. Complete with FIRST SPECIFIED valves and Peto-Scott Walnut table cabinet illustrated above, less batteries. Cash or C.O.D. Carriage paid £8:0:0.
Balance in 11 monthly payments of 14/9.

Yours for **15/-**

S.T.700 CONSOLETTE CABINET (Battery Model)

Another beautiful cabinet built from the finest woods, Australian Walnut veneered front and wings, attractive corded silk fret backing and complete with speaker baffle board and battery shelf. Cash or C.O.D. 35/-. (Carriage and packing 2/6 extra)
Balance in 6 monthly payments of 6/-.

Yours for **5/-**

FINISHED INSTRUMENT (Battery Model)

Exact to Specification Complete with FIRST SPECIFIED valves, Peto-Scott S.T.1 matched speaker and walnut consolette cabinet (illustrated on left), less batteries. Cash or C.O.D., Carriage Paid, £9:17:6.
Balance in 11 monthly payments of 18/-

Yours for **20/-**

NOTE: This instrument can also be supplied in the Peto-Scott type "LL" Consolette Cabinet with S.T.700 De Luxe S.3 Speaker, Cash or C.O.D., Carr. Paid, £10:12:6, or Deposit 20/- and 11 monthly payments of 19/6.

S.T.700 CONSOLETTE CABINET Type "LL"

For Mr. J. Scott-Taggart's A.C. version of the S.T.700, but equally suitable and highly recommended for the Battery Model. Australian walnut veneered front. Hand French polished macassar fret with corded silk backing. Speaker baffle board. Lift-up lid. Cash or C.O.D. 37/6. (Carr. and part packing 2/6 ex.)
Balance in 6 monthly payments of 6/6.

Yours for **5/-**

FINISHED INSTRUMENT (A.C. Mains Version)

Exact to Specification. Complete with valves and specified W.B. speaker in Peto-Scott type "LL" Consolette Cabinet (illustrated left). Cash or C.O.D. Carriage Paid, £19:19:0.
Balance in 11 monthly payments of 30/-.

Yours for **£5**

Buy by Post—its Quicker—CASH-C.O.D.-EASIWAY

Guaranteed Exact to Mr. John Scott-Taggart's FIRST SPECIFICATION—Fit the Blueprint EXACTLY

IMMEDIATE DELIVERY—CASH—C.O.D.—H.P.

STRUCTAKIT

Exactly as Specified by Mr. John Scott-Taggart.

Every Peto-Scott Structakit includes a FREE COPY OF S.T.700 ISSUE OF "POPULAR WIRELESS," with full size blueprint, dial card, etc.

8/6

Postage 9d. extra.

COMPRISES ● 2 **Peto-Scott** cabinet side pieces, all **ready drilled and French** polished, cabinet top and grid bias battery spar, and complete with necessary fixing screws. ● **Ready drilled and polished** walnut veneered panel, 16 ins. x 12 ins., with nickel-plated screws. ● 2 **Ready drilled** ebonite terminal strips, ● 4 aluminium brackets, and 4 nuts and bolts. ● 30 ft. Maxamp. wire. *Total Value* 9/7.

Cash or C.O.D. 8/6. Postage 9d. extra.

S.T.700 £1 PARCEL

The Peto-Scott Kit of essential S.T.700 components, comprising:
1 J.B Main tuning condenser, with Special Knob and Pointer.
1 Colvern S.T.700 Coil Unit.
1 Peto-Scott Ready Drilled and Polished Plywood panel.

Cash or C.O.D. Carriage Paid £1

S.T.600 to S.T.700 CONVERSION KIT

COMPLETE KIT of first specified components to convert the S.T.600 to the new S.T. triumph. **Comprises:** Peto-Scott **S.T.700 Structakit,** as detailed at top of column, **Colvern** S.T.700 Coil Unit, **J.B.** Main tuning condenser with special knob and pointer, **2 Graham Farish** potentiometers, **Bulgin** switch, **3 Lissen** condensers, **Dubilier** condenser, **Dubilier** 500,000 ohm resistance, **Ferranti** 30,000 ohm resistance, **Belling Lee** G.B.-Iwander plug, screws, flex and FREE COPY OF S.T.700 ISSUE OF "POPULAR WIRELESS," with full-size blueprint, dial card, **Cash or C.O.D. Carriage Paid,**

£2:2:0

5/- DOWN

or 5/- down and 7 monthly payments of 6/-.

IMPORTANT Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash or C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY), Hire purchase terms are NOT available to Irish and Overseas customers.

KIT "A"

CASH or C.O.D. *Carriage Paid* **79/6**

These are the Parts FIRST Specified and USED by Mr. John Scott-Taggart. AND INCLUDED IN KIT "A"

		s.	d.
2	**PETO-SCOTT** ready drilled and polished cabinet sidepieces, 1 cabinet top, and 1 grid bias battery spar, with 6 screws	3	6
1	**PETO-SCOTT** ready drilled and polished walnut, plywood panel, 16" × 12", with 7 N.P. screws	3	3
2	**PETO-SCOTT** ready drilled ebonite terminal strips	1	4
4	**PETO-SCOTT** aluminium brackets, with 4 bolts and nuts		6
30ft.	**PETO SCOTT MAXAMP** wire	1	0
1	**COLVERN** S.T.700 coil unit	12	6
1	**ORMOND** ·0005-mfd. air condenser, type R.483	4	0
1	**GRAHAM FARISH** Litlos knob for Ormond R.483 condenser		6
1	**J.B.** S.T.700 main tuning condenser, with special knob and pointer	5	6
2	**GRAHAM FARISH** ·0005-mfd. Litlos log-mid-line condensers	4	0
1	**GRAHAM FARISH** 100,000-ohm Potentiometer with terminals	2	9
1	**GRAHAM FARISH** 500,000-ohm Potentiometer with terminals	2	9
1	**BULGIN** 3-point toggle switch, type S.87	1	9
1	**T.M.C.** Hydra condenser block, 2-mfd. × 2-mfd. × 1-mfd.	6	6
1	**T.C.C.** 0·1-mfd. tubular condenser	1	4
1	**LISSEN** ·00005-mfd. mica condenser		6
1	**LISSEN** ·0005-mfd. mica condenser		6
2	**LISSEN** ·006-mfd. mica condensers	2	0
1	**DUBILIER** 2-mfd. condenser, type 9200	3	6
1	**DUBILIER** 500,000-ohm 1-watt resistance	1	0
1	**ERIE** 1 megohm 1-watt resistance	1	0
1	**ERIE** 75,000-ohm 1-watt resistance	1	0
1	**FERRANTI** 20,000-ohm G.5½-watt resistance		6
1	**FERRANTI** 30,000-ohm G.5½-watt resistance		6
1	**WEARITE** screened choke, type H.F.P.J.	2	0
1	**B.T.S.** disc H.F. choke, S.T.700 type	2	6
1	**VARLEY** L.F. transformer, ratio 1 : 3.5	7	6
9	**BELLING LEE** type "R" terminals—HT+1, HT+2, HT+3, LT +, LT—, LS—, P.U., A. E.	2	3
8	**BELLING LEE** Midget 1019 wander plugs—HT+1, HT+2, HT+3, HT—, Grid +, Grid —1, Grid —2, Grid —3	1	4
4	**BENJAMIN** Vibrolder 4-pin valve holders	3	4
3	Dozen miscellaneous screws, 6 yds. 2 mm. rubber-covered flex	1	6
	Copy of S.T.700 issue "POPULAR WIRELESS" with full-size Blue Print, dial card, etc.,	**GRATIS**	
	KIT "A," Cash or C.O.D. Carr. Paid	**£3**	**19** **6**

EXTRACTOR UNIT

		s.	d.
1	**PETO-SCOTT** Extractor plywood panel and 4 side-pieces, all ready drilled and French polished, complete with necessary screws	2	0
1	**WEARITE** Triple Extractor iron-core coil	7	6
3	**POLAR** No. 4 ·0005-mfd. air variable condensers with knobs, S.T.700 type	13	3
2	**BELLING LEE** "R" terminals, A1, A2		6
	MAXAMP connecting wire and component screws		9
	Extractor Kit, Cash or C.O.D. Carr. Paid	**£1**	**4** **0**

If Extractor Kit is required with the Kits "A," "B," "CT," "CC" and "CLL" add £1/4/0 to Cash or C.O.D. prices or 2/3 to deposit and to each monthly payment.

OR YOURS FOR **7/- DOWN**

Balance in 11 monthly payments of 7/6

Complete Kit of components exactly as FIRST specified and used by Mr. J. Scott-Taggart and shown in the detailed list in centre column, including FREE copy of S.T.700 issue of "Popular Wireless," but less valves, Extractor Kit and Peto-Scott Cabinet.

Cash or C.O.D. Carriage Paid £3 : 19 : 6, or Deposit 7/- and 11 monthly payments of 7/6.

KIT "B" CASH or C.O.D. *Carriage Paid* **£5:11:6** ● **OR YOURS FOR 10/-** Balance in 11 monthly payments of 10/3.

As for Kit "A," but including set of 4 FIRST Specified valves, less cabinet and speaker.

KIT "CT" CASH or C.O.D. *Carriage Paid* **£6:9:0** ● **OR YOURS FOR 12/-** Balance in 11 monthly payments of 12/-.

As for Kit "A," but including FIRST SPECIFIED valves and **Peto-Scott S.T.700 table cabinet,** less speaker.

KIT "CC" CASH or C.O.D. *Carriage Paid* **£7:6:6** ● **OR YOURS FOR 13/6** Balance in 11 monthly payments of 13/6.

As for Kit "A," but including FIRST SPECIFIED valves and **Peto-Scott S.T.700 Consolette cabinet, with speaker baffle,** and battery shelf, but less speaker.

KIT "CLL" CASH or C.O.D. *Carriage Paid* **£7:9:0** ● **OR YOURS FOR 13/9** Balance in 11 monthly payments of 13/9.

As for Kit "A," but including FIRST SPECIFIED valves and Peto-Scott Consolette Cabinet type "LL," with speaker baffle. Less speaker.

If Extractor Kit is required with any of the above Kits, add £1 4 0 to Cash or C.O.D. prices, or 2/3 to deposit and to each monthly payment.

RECOMMENDED SPEAKERS

PETO-SCOTT S.T.700 High Fidelity Matched Speaker, specially produced for Mr. J. Scott-Taggart's latest set. 8-in. Cone, free from boom and resonance. Type S.1. Cash or C.O.D. Carriage Paid 19/6 or deposit 2/6 and 8 monthly payments of 2/6.

2/6 DOWN

PETO-SCOTT S.T.700 de luxe. Another specially designed speaker with 9½-in. oversize cone. Type S.3. Cash or C.O.D. Carriage Paid 32/6, or 2/6 deposit and 11 monthly payments of 3/-.

EXPRESS DELIVERY COUPON

PETO-SCOTT CO., LTD., 77 (P.W.16), CITY ROAD, LONDON, E.C.1. Telephone: Clerkenwell 9406/7
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ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/- SENT C.O.D. CARRIAGE AND POST CHARGES PAID

TRIPLE EXTRACTOR ANNIHILATES B.B.C.

"Swamping" Permanently Overcome

NEW "MAGIC BOX" THAT WORKS WONDERS

52 Stations Received at Brookmans Park!

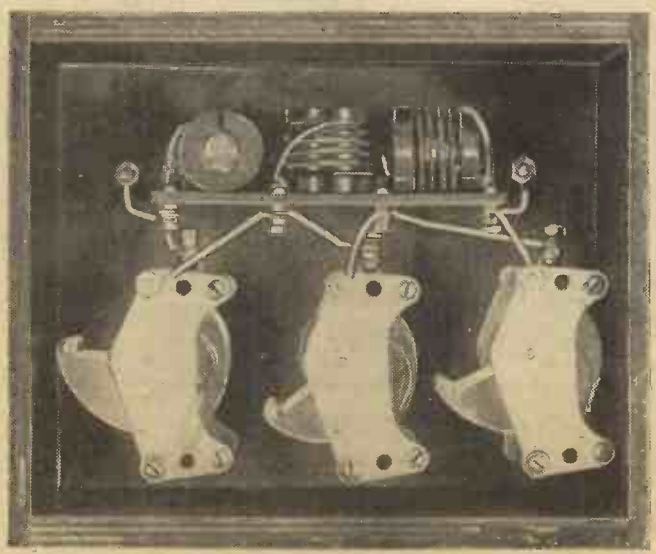
The Triple Extractor, which exerts such a powerful suppressing influence over the local stations, is wonderfully compact, as can be appreciated from this photograph which shows Mr. Scott-Taggart holding his latest selectivity device.

Last year, in connection with the S.T.600, I formulated the doctrine that local station interference was an entirely separate problem, on any ordinary set, from the cutting out of interference of stations of similar general strength. This doctrine I hold now even more strongly. It means that the separation of, say, two foreign stations of about equal strength is a much easier problem, and calls for much simpler technique than the separation of, say, Fécamp from London National, when one is situated near the latter station. Those in the swamp areas know to their cost how difficult it is to be rid of the turbulent B.B.C.

Astonishingly Effective Results

I have carried out tests at one mile from the Brookmans Park stations, and found that the only system of real value involves the specific elimination of the local station by means of an extractor circuit. My solution is the Triple Extractor system which I am describing in this issue. A single Extractor circuit was used in the S.T.600, and there are thousands to testify to its almost miraculous efficiency. **I have improved this efficiency 25 times for each Extractor circuit,** as measured by an output wattmeter, by the simple process of using a more efficient tuning condenser across the iron-core coil. This tremendous improvement on an already extremely efficient arrangement gives astonishingly effective results. **At one mile from Brookmans Park it is possible to set the three Extractor condensers so that the operator cannot find Droitwich or either of the local B.B.C. stations blazing away within sight.** Yet, leaving alone the Extractors, you can at once obtain scores of stations at full loudspeaker strength without altering anything else. **In broad daylight it is possible to receive Fécamp—only 36 kilocycles away from London National. Under these stringent conditions the local station must be many thousands of times as strong as Fécamp. On an actual test the Triple Extractor made the audible strength of the local 350,000 times weaker. This terrific figure is almost impossible to conceive.**

AMAZING EFFICIENCY ATTAINED



Three air-dielectric condensers, tuning three iron-cored coils, provide amazing efficiency in the triple extractor.

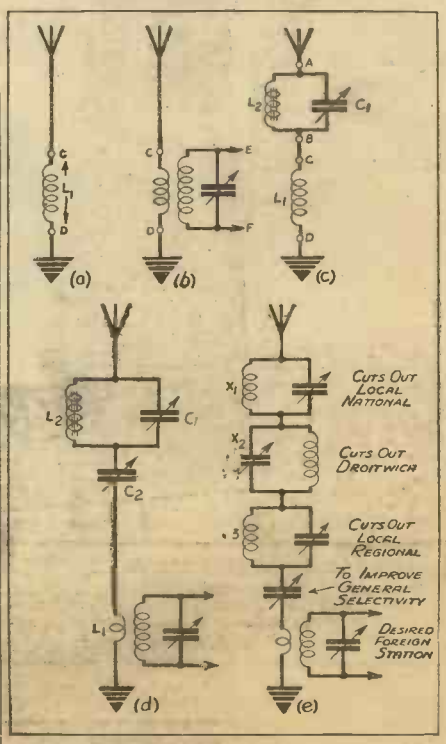
In the case of the Triple Extractor, the signals coming down the aerial really consist of scores of stations including the Three Bugbears of Radio, namely Droitwich and the two "locals." The main receiver is sufficiently selective to separate the various foreign stations, but three powerful doorkeepers are required to keep out the particularly unruly B.B.C. stations. Each of the Extractor circuits therefore makes a point of tackling one of the B.B.C. transmissions and keeps it from getting into the main receiver.

The most practical point in connection with my Triple Extractor is that its presence does not have any disturbing effect on the tuning of the main set, nor does the main set tuning affect the success of the Extractors. Moreover, the tuning of each Extractor does not upset the successful operation of the other Extractors. But do not imagine that the Triple Extractor can be applied to all other sets; the advantages are tied up with the S.T.700, although also applicable to the S.T.600. The input coil of the main set bears a very important relation to the Triple Extractor arrangement.

Reduced To Silence

The Triple Extractor unit can be tuned in as little as fifteen seconds, each Extractor condenser taking five seconds to adjust to the position where the interfering local station is reduced to silence. If you desire to do the job thoroughly and carefully, it

EXTRACTOR EVOLUTION



The above diagram shows the progressive development of the remarkable triple extractor.

may take half a minute for each condenser. The three condenser knobs on the Extractor box have no dials, and do not need them. You do not even need to look at the knob. *You simply turn it round until the interfering station disappears.* On either side of this point the interfering station will come in loudly. Having adjusted one condenser, you then tune the other two to cut out their respective stations. **Having done this you can forget all about the Triple Extractor, since you will not have to touch it again.** The main set is tuned in the ordinary way and you need never go back to the Triple Extractor. **In fact, it is no more trouble than a fuse-box in the hall of a house fitted with electric light.**

Some of those who have had a demonstration of the Triple Extractor say: "But we certainly want the B.B.C. sometimes." If, after adjusting the Extractor, you find that the B.B.C. stations simply cannot be received at all on the main set, you can adjust any of the condensers so as to allow just enough of the B.B.C. to come through to give you the desired signal. Under these conditions the B.B.C. will appear to be the same strength as a good foreign station without, of course, any risk of fading. **If you live even as close as one mile from the B.B.C., and you set the Triple Extractor accurately, you may be astonished to find that you have to use full volume control and reaction to hear the B.B.C. at desirable strength.**

Those who have built the S.T.600 will perhaps wonder why I now use three Extractor circuits at a time, whereas in the S.T.600 I used only one at a time. I suppose the reason is that you cannot keep a good designer down! The Extractor in the S.T.600 was so successful that the scheme has been improved and extended.

In the S.T.600 the procedure is, when on the medium waves, to tune the Extractor to the medium wave local which is causing interference at that point on the dial, say, the local National. As you tune to a different foreign station on the dial you may come into the zone of the local Regional which will blot out that portion of the dial; you therefore retune the Extractor condenser to cut out the Regional. If you live close to the B.B.C. you may experience trouble from the other "local" which has *not* been extracted, especially if the foreign station lies on the dial between the two local stations. I ought to explain that only one Extractor was used in the S.T.600 because the B.B.C. intended then to close down the National locals.

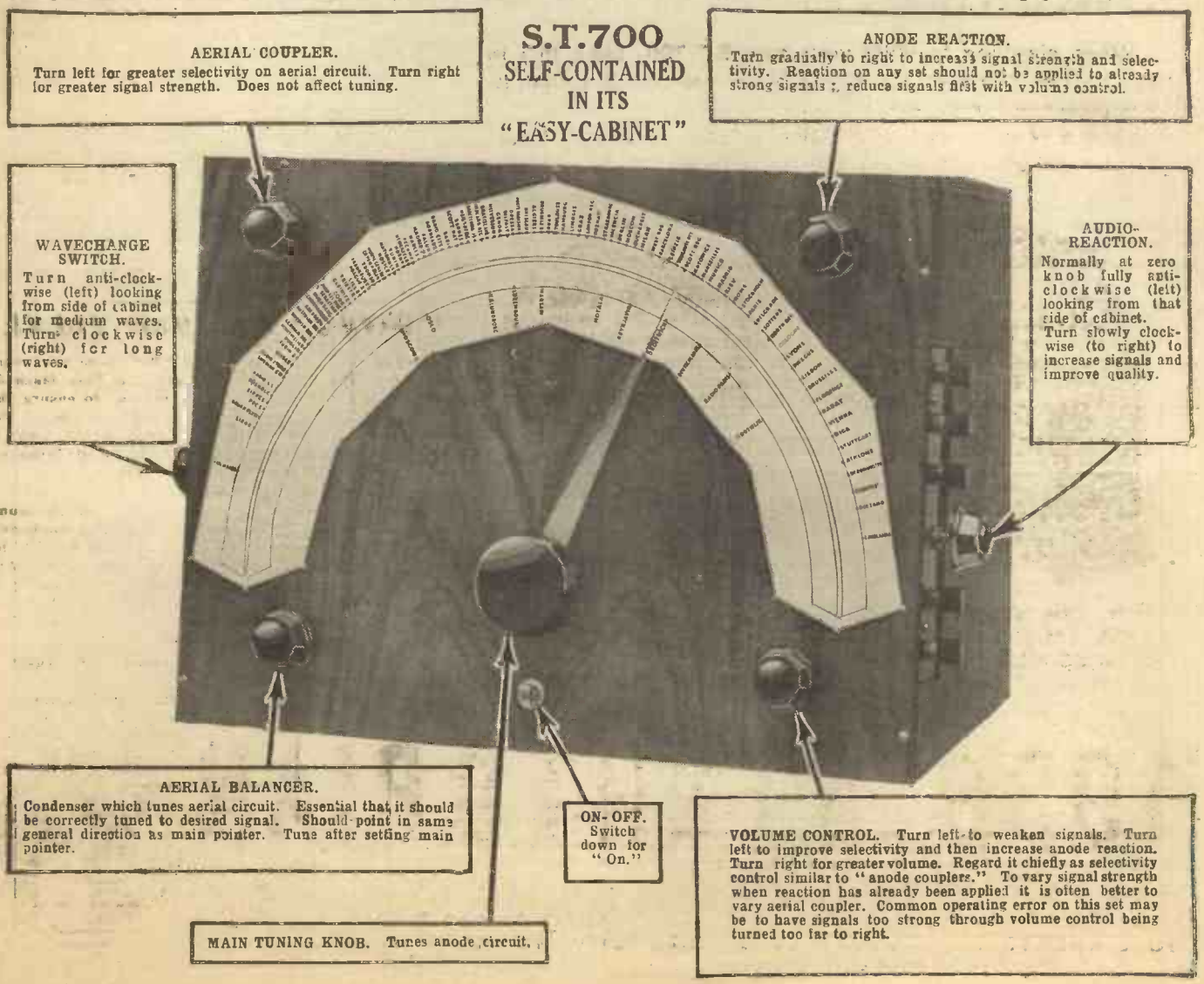
Having to tune the Extractor every time you change to a different portion of the dial is an obvious disadvantage, which is now overcome by having the extra Extractors permanently tuned and not requiring alteration. In the S.T.600, when working on the long waves, the long-wave Extractor was switched into the aerial circuit and no medium-wave Extraction was carried out. **This means that the Extractor condenser had to be tuned once more to cut out Droitwich. On going back to medium waveband, the Extractor had to be tuned again to the local. Anyone who wanted to receive a variety of foreign programmes in a short time would find that they were kept fairly busy with the Extractor. All that is now altered, and the complete Triple Extractor outfit is adjusted once and for all.**

The figure accompanying this section article shows the progressive development of the Triple Extractor.

Three Extractor circuits are connected in series as shown on the previous page. In this figure X1 has its condenser tuned to the local National, while X2 has its condenser tuned to Droitwich, while X3 has its condenser tuned to the local Regional.

If, of course, you do not experience any interference from one or other of these stations, you can either leave out that particular Extractor or set it with its condenser to maximum, or else you can use it for cutting out any other station in the ether that might possibly give trouble. **It is not everyone who will need this Triple Extractor. There are plenty of places in this**

(*Continued on page* 243.)



SPECIFIED

FOR THE S.T.700 (Battery Model) . .

EXCLUSIVELY SPECIFIED

FOR THE S.T.700 (A.C. MODEL)

Although Mr. Scott-Taggart's remarkable new Receiver differs in many respects from orthodox practice, it has this in common with any ordinary Set, *it gives incomparably better results when operating a W.B. "1936 STENTORIAN" Speaker.*

The "S.T.700's" high quality output is, when a "1936 Stentorian" is connected, reproduced faithfully and realistically. The Receiver's outstanding volume is enhanced by the amazing sensitivity the *exclusive* "1936 Stentorian" Magnet provides. The "Whiteley" Speech Coil (unique in W.B. Stentorians), allows full advantage to be taken of the S.T.700's wide range of response.

When planning to build your own S.T.700, bear this in mind—that no Receiver can give better reproduction than is available from the Speaker it uses.

Hear a W.B. "1936 STENTORIAN" for yourself! Your Dealer will gladly demonstrate.

W.B. 1936 STENTORIAN, TYPE EM/S. EXCLUSIVELY SPECIFIED FOR THE S.T.700 A.C. PRICE £3.10.0

W.B. 1936 STENTORIAN, TYPE 36S FOR THE S.T. 700 BATTERY MODEL 42/-

"HIVAC" PX. 230 VALVE

Owing to the increasing following this Valve has among "quality" enthusiasts particular care has been taken in designing the W.B. "1936 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 PX. 230 valve :—

Dear Sir,

We are pleased to inform you that we have found your "1936 STENTORIAN," type 36 S, eminently suitable for use with the Hivac PX. 230 Valve. The matching arrangements are perfectly satisfactory, and the Speaker does full justice to the quality of the valve's output

Yours faithfully,
HIGH VACUUM VALVE COMPANY,
(Signed) H. Diggle.

● **Send for interesting illustrated leaflet.**

1936 STENTORIAN

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Simple to build, up-to-date in design, powerful and efficient, these Melody Makers are real *quality* Kits. In performance and appearance all previous standards have been beaten. And because every part is built in the huge Cossor Works—the largest self-contained radio factory in the Empire—they are like all Cossor Radio—RELIABLE.

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SUPER-SELECTIVE IRON-CORED COILS
●
MOVING COIL SPEAKER
&c.
●

BATTERY MODEL 362

Variable-mu H.F. Pentode, H.F. Pentode Detector, and Economy Pentode Output. Super-selective Iron-cored Coils. Single Knob Tuning. Wave-length calibrated scale. Combined On/Off, Wave-change and Pick-up Switch. Selectivity and Volume controls. 8 in. Moving Coil Speaker. Walnut finished cabinet 17⅛" x 13¾" x 9¼" accommodating all batteries. Terminals for Pick-up; plug and sockets for extension loud-speaker.

£5.19.0
(Less batteries)

H.P. Terms: 12/6 deposit and 10 monthly payments of 12/5.

A.C. MAINS MODEL 361

Variable-mu H.F. Pentode, Screened H.F. Pentode Detector, and Triode Power output. Heavy duty rectifier. Super-selective Iron-cored Coils. Single knob tuning. Illuminated scale, Wave-length calibrated. Combined On/Off, Wave-change and Pick-up Switch. Selectivity and Volume controls. 8 in. Energised Moving Coil Speaker. Walnut finished cabinet 17⅛" x 13¾" x 9¼". Terminals for Pick-up. Plug and sockets for extension speaker. A.C. Mains only. 200/250 volts (adjustable). 40-100 cycles.

£7.19.0

H.P. Terms: 15/- deposit and 11 monthly payments of 15/-.

Prices do not apply in I.F.S.

THIS COUPON BRINGS CONSTRUCTIONAL CHART

To A. C. COSSOR LTD.,
Melody Dept., Highbury Grove, London, N.5.

Please send me Constructional Chart which tells me how to assemble the Cossor Melody Maker,
Model No..... (Please state model required.)

Name.....

Address.....

P.W., 2/11/35.

21/22

7823

The S.T.700—here shown in another external cabinet suggested by Peto-Scott—has evoked scores of letters praising the effects of Audio-Reaction.

AUDIO-REACTION!

A Revolutionary Development

Described by John Scott-Taggart, M.C., M.I.E.E., F Inst. P., Fel I.R.E

IN announcing Audio-Reaction—a vital feature of my new S.T.700 receiver—I am boldly claiming the first practical use of adjustable reaction to the low-frequency side of a broadcast receiver. As far as I know, this is the first occasion on which the principle has been successfully applied, or, for that matter, attempted.

Everyone knows the value of ordinary reaction. Practically every straight circuit ever designed has used it on the high-frequency side with enormous benefit. There was a time when several sets deficient in H.F. amplification were designed without it, but performance was so poor that they were a commercial failure. The same principles are now in the S.T.700 being applied to magnify the low-frequency signals or "audio-frequency" currents in a broadcast receiver.

A Technical Bombshell.

I am expecting controversy. I have retrieved from the morass a jewel which, long ago, was thrown away in the belief that it was paste. Having scraped off the mud, recut the facets and polished it, revealing a sparkling gem, I am fully prepared for the annoyance and criticism of those who originally threw it away.

The whole training and all the experience of a modern radio engineer revolt at the idea of applying reaction to the low-frequency side. What are his likely reactions on being suddenly presented with a *fait accompli?* **Within a week or so, thousands—probably tens of thousands—of constructors will be demonstrating the newly-applied principle of Audio-Reaction to their astonished friends' amazement and their own ever-fresh delight.**

I realise that at this annual season of fireworks I am throwing a technical bombshell into circles which only yesterday would have expressed contempt for a suggestion which to-day, in its practical form, will arouse, when actually heard, the keenest interest and appreciation.

Hearing is Believing.

Most of those who have let the precious principle slip through their fingers will, unless a certain technical generosity comes to their aid, declare either that the idea is not at all new, or that it is not at all good. It is the only defence of a certain type of mind.

Actually the position is, that not only has low-frequency reaction found no place in broadcast receivers, but it has been regarded as the enemy of stable and effective low-frequency amplification. When motor-boating, which is nothing more nor less than low-frequency reaction of an unintentional and excessive kind, occurred in earlier days, we all turned our faces from the germ of an idea which to-day is flourishing in the S.T.700. When every radio engineer is putting resistances and condensers here, there, and everywhere to stop any trace of low-frequency reaction, it is not surprising that the principle has found no place in our modern receivers. **Unable to tame and domesticate a giant conception, technical opinion has killed it. In reviving the corpse, and training it to perform extremely valuable and productive work, I am clearly inviting every kind of criticism and controversy.**

If anyone questions the merits of audio-frequency reaction as utilised and brought to perfection in the S.T.700, let him hear the set. Hearing is believing. I fully realise the heretical nature of my use of low-frequency reaction. But I am a pragmatist in these matters. Because it works, and works very well, it is good.

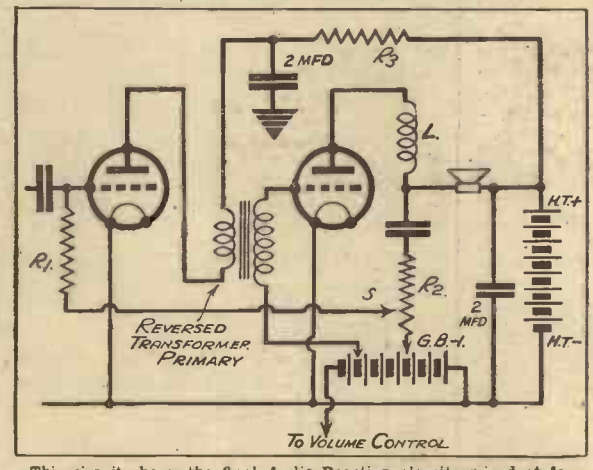
As regards low-frequency or audio circuits the disadvantages unintentionally obtained by spurious reaction have sterilised invention and deadened enterprise. The ground seemed too dangerous to tread on, far less as a foundation for any new technical structure.

In other words, low-frequency reaction was strangled before it was born. When I began to experiment on these lines, I found, as I expected—and as, in fact, we all knew—that it would tend towards instability. But, I argued, the same applied to ordinary high-frequency reaction. The correct policy I went on—in my own mind—is surely to make the set extremely stable from a low-frequency point of view, and then to apply correctly phased low-frequency reaction.

A second objection which I fully foresaw was that low-frequency reaction would accentuate certain frequencies only and not give a uniform amplification. Just as high-frequency reaction accentuates the carrier-wave and reduces the high notes, so would low-frequency reaction accentuate parts of the musical register and not others. Far from this being a disadvantage, however, it was this very fact that prompted me to undertake research into low-frequency reaction. I actually wanted to discriminate as regards frequencies. **I sought to improve quality of reproduction by developing the lower portion of the musical register which, especially in battery receivers, is so woefully under-developed, especially on weak signals. Owing to the fact that the human ear and the loudspeaker both fall off in response rapidly as the bass notes are approached, realistic reproduction can only be obtained by maintaining signal strength at a value which *may* be excessive in a living-room or, is, under certain circumstances, undesirable, e.g., when children or invalids are asleep.**

The same applies to weak signals. Broadly speaking, there is no such thing as a good quality weak signal or even a good quality medium strength signal. Loud signals are very frequently distorted in a battery receiver, but when signal strength is reduced to avoid certain kinds of distortion a more insidious form of distortion occurs, in that the lower register becomes weakened, and the reproduction lacks realism and vitality.

AS USED IN THE S.T.700



This circuit shows the final Audio-Reaction circuit arrived at for the S.T.700. Low-frequency potentials, produced by the last valve across the potentiometer R_2, are tapped off by the slider S and fed back to the grid of the preceding L.F. valve.

Hundredfold Increase.

False bass and boom caused by cabinet resonance, or the bass resonance in a loudspeaker, are deplorable. It does not represent an improvement in true quality at all, and normally occurs on a very narrow band of frequencies. **What is wanted is a graduated and general lifting of the lower half of the musical register, this process of lifting being variable and under the perfect control of the operator of the receiver. This is what I aimed at and achieved.**

In the process I have increased the general signal strength 12 times, and in some cases as much as 100 times. I have explained this part of the history of the development of Audio-Reaction to show that I originally aimed at, and finally achieved, a great improvement in the quality of reproduction. The great increase in signal strength is an extremely useful by-product.

The final circuit arrived at for the S.T.700 is given in a figure accompanying

(*Continued on page* 244.)

INSTALLING THE S.T.700

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

SEE that free end of lead (52), which is for later connection to 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 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. The 2-volt accumulator is placed behind the left-hand end of set. The high-tension battery, which should be of the 120-volt type (the bigger capacity is always the cheaper in the long run), is placed behind the right-hand end of set.

(a) L.T. + terminal (second terminal down on left side of set) joins positive (+) terminal of accumulator. The L.T. leads may be of "Maxamp" wire, but heavier wire is necessary if leads are long.

(b) L.T. − terminal (third terminal down on left side of set) joins negative (−) terminal of accumulator.

(c) Prepare three leads for connection to high-tension battery. Note that the H.T. − lead will come from terminal E of set. These leads may be of "Maxamp" wire or flex, and have at their ends the correct Belling-Lee Midget wander-plugs, viz., H.T. + 3, H.T. + 1 and H.T. −. (Note that there is no separate H.T. + 2 for H.T. battery users.) If "Maxamp" wire is used, pull back insulation half an inch, bend bare wire one-quarter of an inch from the end back on itself and push the loop so formed into hole in side of wander-plug; tighten up head of wander-plug. I strongly favour testing such leads by aid of a voltmeter, flash-lamp battery and bulb, or other method, as more trouble than you would imagine is caused by bad contacts in leads. The wander-plugs recommended are, however, very satisfactory.

(d) Clean end of earth lead where it will later be connected to terminal E on set, using a knife or sandpaper. Twist this end with the bared end of H.T. − lead and connect to earth terminal E (bottom terminal on left side of set).

(e) Connect bared free end of H.T. + 1 lead to H.T. + 1 terminal (top terminal on right of set).

(f) Connect with a short length of wire H.T. + 2 terminal (second terminal down on right side of set) to H.T. + 3 terminal (fourth terminal, not third, down on right side of set).

(g) Connect one of the two leads from the loudspeaker (the negative lead, if marked) to L.S. − terminal (third terminal down on right side of set).

(h) Twist the bared end of the other lead from the loudspeaker (the positive lead, if marked) together with the bared end of the prepared H.T. + 3 lead. Connect this twisted pair to H.T. + 3 terminal (fourth terminal down on right of set).

(i) Insert H.T. − plug in negative (−) socket of 120-volt H.T. battery. Insert H.T. + 1 plug in + 72 volts (or nearest voltage) socket. Insert H.T. + 3 plug in + 120-volt socket.

(k) 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 only affect the efficiency of the set. There is no excuse for this on the S.T.700, the terminals being easily identified. All terminals should be thoroughly tightened up. The plugs should also make good contact, and should not be smeared with bitumen. The pick-up terminal should under no circumstances have an H.T. connection made to it by mistake, as this may ruin the valve. The terminal should be left free.

(l) Press down on-off toggle switch on set, unless already down.

(m) A good precaution, especially if the set wiring has not been checked (which it should have been), 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 very bright or bulb is fused, external wiring—and, if necessary, internal wiring—should be checked. If a voltmeter is used, it should read about 2 volts. If it reads much more, wiring should be checked.

(n) Switch off set by raising toggle switch. Take out H.T. − plug from H.T. battery.

(o) Insert H.F. pentode (Cossor 210V.P.T. metallised or Hivac V.P.215 metallised) in valve holder nearest aerial terminal. Connect free end of wire (52) which has been "in the air" to top of this valve. Insert detector triode valve (Cossor 210 R.C.) in valve holder nearest centre of panel. Insert "first L.F." valve (Mazda L.2 metallised) in valveholder nearest audio-reaction knob. Insert power valve (Hivac P.X.230) into valveholder nearest toggle switch.

(p) Check that valves are in correct valveholders. Here, again, constructors quite often get poor results through having valves in their wrong valve holders.

(q) Check grid-bias plug positions. The positive end of G.B. battery should be at the top. G.B. + should be in positive socket (the extreme end socket at top end of battery). G.B. − 1 should be at − 1½ volts (socket next to the G.B. + socket). G.B. − 2 is in − 9-volt socket (voltage is printed on side of battery). G.B. − 3 is − 16½ volts, which is bottom socket on battery. All plugs should make perfect contact with their sockets, and no trouble should be experienced with the Midget plugs recommended.

(r) Put H.T. − plug back into H.T. − socket on H.T. battery. Connect aerial lead, after cleaning the end, to aerial terminal A (top terminal on left looking from left side of set); set is now on medium waveband. Turn aerial coupler knob half-way. Turn anode reaction fully anti-clockwise (fully to left). Turn volume control fully clockwise (fully to right). Turn aerial balancer knob so that its pointer, or spot on its knob, points in a direction parallel with the direction of the main pointer on dial. Turn audio-reaction knob on right side of set fully anti-clockwise (fully to left, looking at it from the left side of set).

(t) SWITCH ON by pressing down toggle switch. The set is now ready for use.

HOW TO OPERATE THE S.T.700.

Very brief instructions only are given this week. Further details will appear next week.

Study photographs of the controls and note what they do. Think of the set in terms of its two circuits—aerial circuit and anode circuit.

Aerial Coupler. Turn left for cutting down signals and improving selectivity of aerial circuit. Turn right for increasing signals, but this decreases selectivity. Regard it as adjustable feeder for aerial circuit.

Does not affect tuning of aerial circuit to any noticeable extent.

Aerial Balancer. This tunes the aerial circuit. It is a vital control, and if not correctly tuned you will not receive desired station. You do not, however, need to know its position, but beginners should have it pointing approximately in a direction parallel with the main pointer. It is always adjusted *after* adjusting main tuning knob.

Volume Control. This is a potentiometer varying the voltage on the grid of the variable-mu H.F. pentode. It varies the high-frequency amplification. Turn left (anti-clockwise) for selectivity and weaker signals. Turn clockwise (right) for stronger signals. Regard it as a feeder or controller of the H.F. current in the anode tuned circuit. Constructors accustomed to S.T.300, S.T.400 or S.T. 500 should work it as they would the anode coupler on those sets. Its purpose is chiefly for increasing selectivity on the second (anode) circuit; you turn down the volume as necessary and increase the anode reaction for improved selectivity. It is preferable to use aerial coupler for controlling volume if you are using much reaction. The volume control is to the second circuit what the aerial coupler is to the first circuit. You will very rarely use volume control full up (fully right).

Main Tuning Knob. Tunes the second circuit, i.e., anode circuit. It is used in conjunction with volume control and anode reaction when tuning weak stations. This knob is always used first when tuning, and its pointer set to desired station.

Anode Reaction. This increases signal strength and improves selectivity. It has the great merit over differential reaction, in that it does not affect the calibration of the second circuit, i.e. altering reaction does not alter position of pointer for any given station. Added advantage is that it greatly simplifies tuning, as it is not essential to re-tune as reaction is increased (although one instinctively *does* check the tuning after altering reaction).

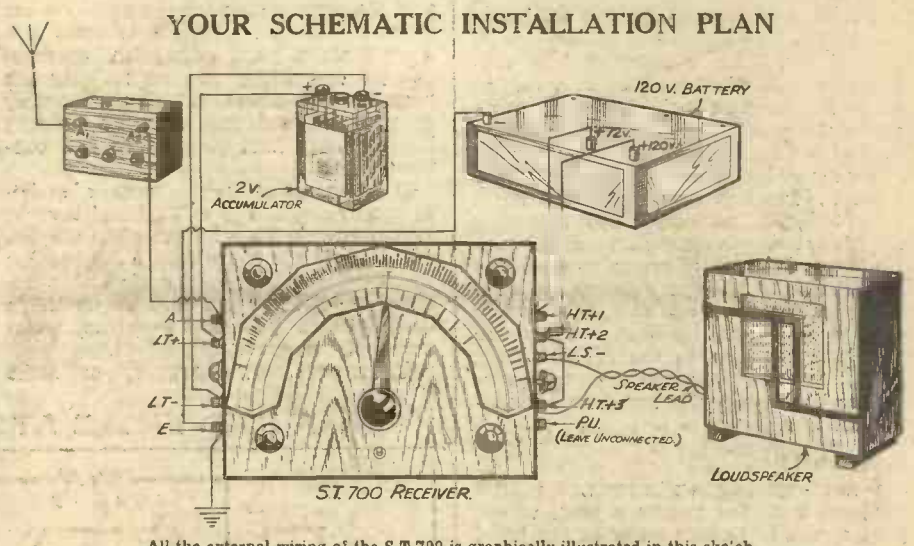
On-Off Switch. Up for "off," down for "on."

Wavechange Switch. For medium waveband turn anti-clockwise (fully left, looking from side). For long waveband, turn clockwise (fully right, looking from side).

Audio Reaction. Knob on right of set controls degree of audio reaction. When knob is turned fully anti-clockwise (fully left looking from that side of set), there is no audio reaction at all. This is the normal

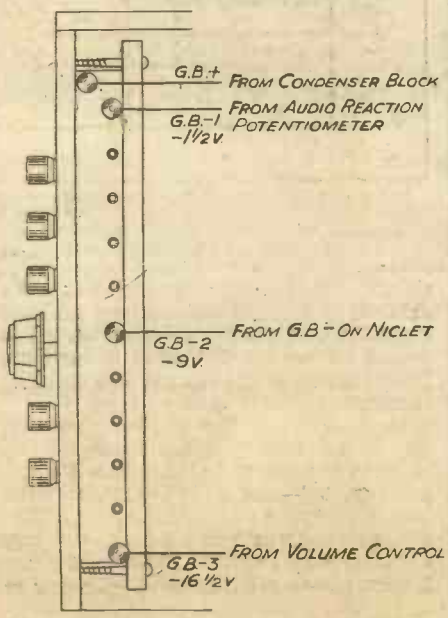
(*Continued on page* 245.)

YOUR SCHEMATIC INSTALLATION PLAN



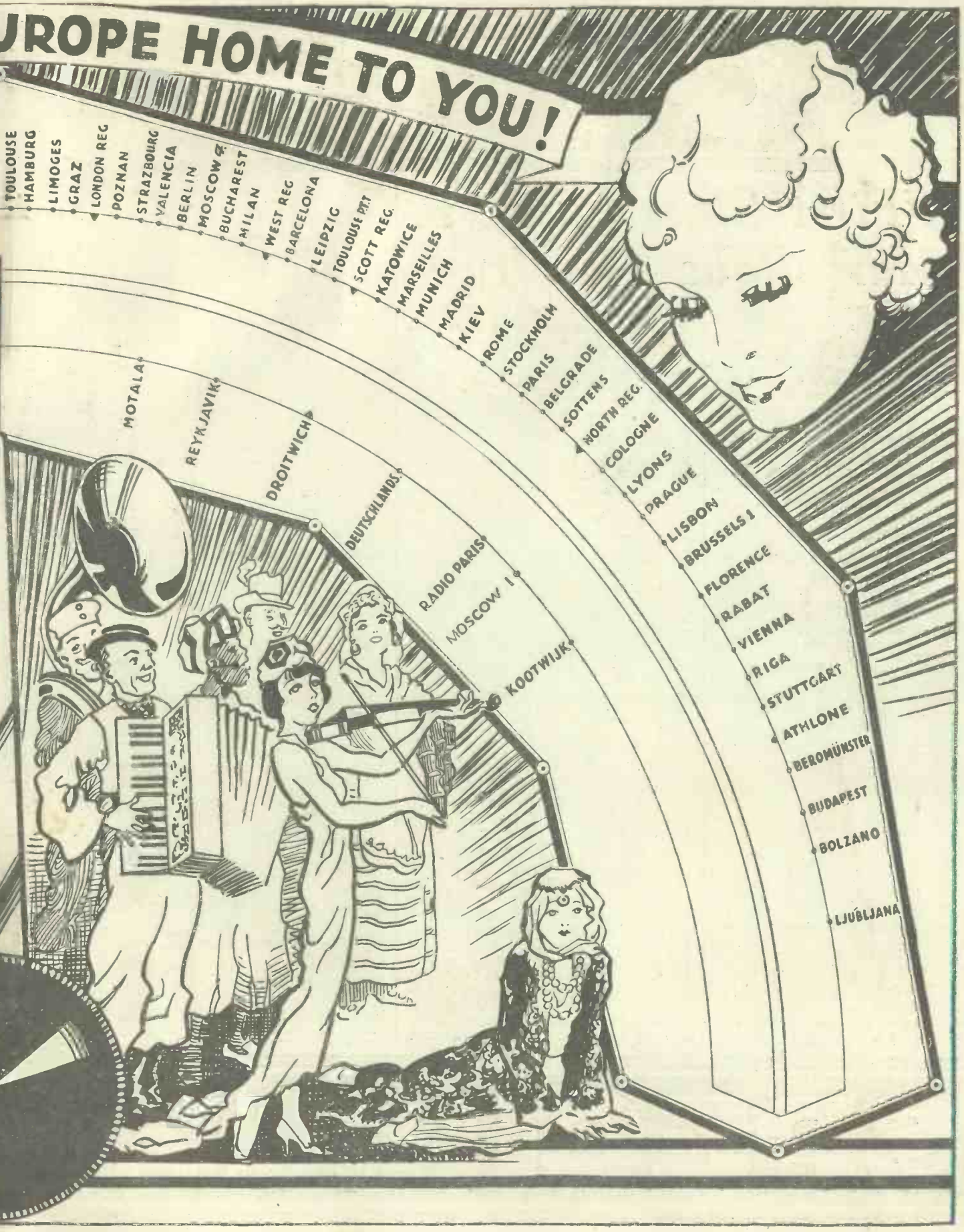
All the external wiring of the S.T.700 is graphically illustrated in this sketch.

THE G.B. CONNECTIONS



The grid bias connections are shown in this diagram.


THE S.T.700 BRINGS EU
BRNO
BRUSSELS 2
ALGIERS
BRESLAU
POSTE PARISIEN
ODESSA
BELFAST
GENOA
HILVERSUM
BRATISLAVA
MIDLAND REG.
BARCELONA 15
HEILSBERG
RENNES
SCOTT NAT
BARI
RADIO CITE
BORDEAUX
FALUN
MADRID 7
NAPLES
FECAMP
NEWCASTLE
HORBY
TURIN
NATIONALS
KOSICE
MONTE CENERI
COPENHAGEN
TROMSO
FRANKFURT
PRAGUE 2
LILLE
TRIESTE
GLEIWITZ
CORK
JUAN-LES-PINS
S. SEBASTIAN
NÜRNBERG
CHRISTIANSAND
ABERDEEN
AUSTRIAN REL.
SWEDISH REL.
GERMAN REL.
MONTPELLIER
DUBLIN
TURIN 2
BASLE
RADIO-LYONS
SWEDISH C.W.
BEZIERS
MISKOLC
EIFFEL
PECS
BOURN-PLYM
LIEGE
KARLSKRONA
MOSCOW 2
OSLO
KALUNDBORG
LUXEMBOURG
WARSAW


UROPE HOME TO YOU!
TOULOUSE
HAMBURG
LIMOGES
GRAZ
LONDON REG
POZNAN
STRAZBOURG
VALENCIA
BERLIN
MOSCOW 4
BUCHAREST
MILAN
WEST REG
BARCELONA
LEIPZIG
TOULOUSE PTT
SCOTT REG
KATOWICE
MARSEILLES
MUNICH
MADRID
KIEV
ROME
STOCKHOLM
PARIS
BELGRADE
SOTTENS
NORTH REG.
COLOGNE
LYONS
PRAGUE
LISBON
BRUSSELS 1
FLORENCE
RABAT
VIENNA
RIGA
STUTTGART
ATHLONE
BEROMÜNSTER
BUDAPEST
BOLZANO
LJUBLJANA
MOTALA
REYKJAVIK
DROITWICH
DEUTSCHLANDS
RADIO PARIS
MOSCOW 1
KOOTWIJK

SCOTT

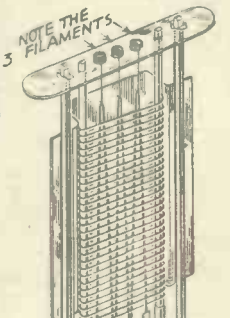
A "First Class Pass" to Marvellous Quality

MR. SCOTT-TAGGART in designing the "S.T.700," set out to and has certainly succeeded in giving you "quality" receiver in every sense of the word. It is evident that from the earliest stages of its construction, the "S.T.700" has been built up from carefully chosen components and valves that have successfully stood the exhaustive tests applied to them before receiving a "first-class pass" to the list of specified makes used by the designer.

To ensure undistorted reproduction Mr. Scott-Taggart required an output Valve which would not starve the speaker and which would, without undue strain, pass on powerful signals. His ultimate choice was HIVAC.

The Valve for High-Fidelity Reproduction.

The HIVAC PX 230 is a sensitive valve having a large undistorted power output, though the overall dimensions of the valve itself are small. The power output is obtained by the use of three Hairpin Filaments suspended by the latest type of self-adjusting springs (see illustration), which maintain the even tension of the filaments and so increase their life and maintain constant characteristics of the valve.



These valves are pumped by the latest type of Automatic Vacuum Pump which produces a vacuum of such low pressure that the valve is able to operate under optimum conditions for a long period.

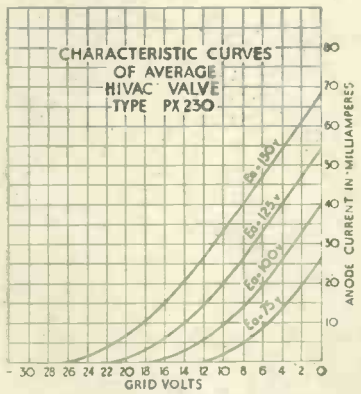
The valve is manufactured throughout from the best possible material, all of which has been specially selected. The excellent characteristics of the PX 230 can be judged from the curves reproduced on this page.

In addition to specifying the Hivac PX 230, Mr. Scott-Taggart has chosen the HIVAC VP 215 (4-pin type).

A Valve Specially Developed for "S.T." Sets.

This is a variable-mu H.F. Pentode valve and was specially developed for S.T. Sets. The VP 215 Met. (4-pin) is without doubt the most perfectly shielded valve of its type on the market. As will be seen from the illustration the valve is built up in such a way that the split Anodes are entirely enclosed in two Faraday Boxes, thus producing the best shielding system possible.

It is essential to shield the anode from the rest of the electrode system in order to obtain the minimum anode control grid capacity so necessary when efficient high-frequency amplification is desired.



For Minimum H.T. Consumption use recommended bias.

Specially Tested for the "S.T.700."

All valves for the S.T.700 have been specially selected and tested. This means that in addition to the usual strict tests a further and final test is applied, and only valves that are suitable for this receiver are passed out for distribution to the home constructor. During the past month the HIVAC Factory have been laying up a large supply of these valves, and elaborate arrangements have been made for a nation-wide distribution so that constructors will be able to obtain them without delay in every town throughout Great Britain.

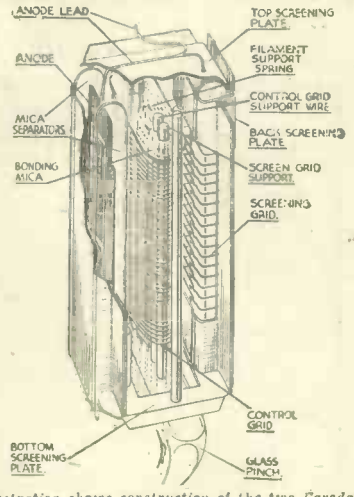


Illustration shows construction of the two Faraday Boxes in Hivac V P 215.

Our Letter to the Editor of "Popular Wireless."

"We wish to assure you that from the moment we first heard that you were specifying two HIVAC valves for the S.T.700 we have applied the full resources of our factory to the production of ample supplies of the HIVAC PX 230 and VP 215 Met.

"So that constructors of the S.T.700 will not experience any aggravating delay in securing Hivac valves, we are inserting a special notice to Dealers in our advertisement in "Popular Wireless," dated November 2nd.

"This notice states that Dealers can have further supplies in their shops within 24 hours of our receiving their orders. For those readers in remote villages we are willing to post valves direct to them, if necessary; but, in fairness to the Trade, we ask that wherever possible they will order through their nearest local dealer."

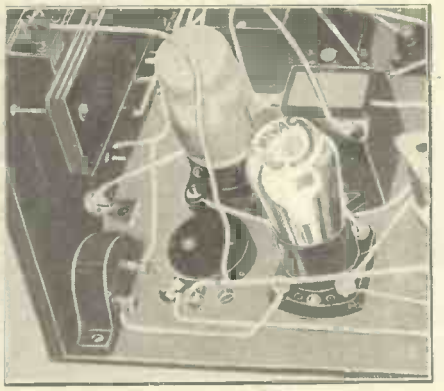


Illustration shows the Hivac P X 230 used in Output Stage of the "S.T.700."

SPECIFIES

The Rapid Construction Guide

FOLLOW THESE DETAILS AND YOU CAN'T GO WRONG

THIS Guide is even much more detailed than previous ones of mine although the set is much simpler to construct. The absolute novice is told where to start and what to do, even to the best way of pushing in a pin! If you prefer, YOU CAN BUILD THE S.T.700 FROM BLUE-PRINT ALONE. But tens of thousands have reported that my Rapid Guides save them time and guarantee success. This year the Guide is better than ever.

This Guide is obviously most useful if you stick strictly to the original components used in my own set. If you use other components (but do not use ones outside my list of alternatives), simple modifications of the Guide will be necessary.

If you have bought a complete Author Kit, including my "Easy-Cabinet," or if you have bought a kit of the Easy-Cabinet, cross out sections C, D, F, J, K.

(A) Collect and examine required components. If an 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) Using Fig. 5 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 ¼ in. twist-drill, start each ¼ in. hole carefully, using light pressure and turning the drill in a reverse direction at first; this is to avoid splitting the veneer. Continue drilling these ¼ in. holes in ordinary way. Centre-bits are recommended for all the remaining larger holes in panel, but twist drills may be used. Drill these holes.

(D) If you are going to use my Easy-Cabinet system and have not bought the pieces ready prepared, carry out instructions in this section (D). If you have bought the pieces ready prepared skip this section (D). Cut to size and drill panel top, drilling ¼ in. holes as advised above. Using Fig. 3 and Fig. 4 and keeping to the order of drawing the lines shown, mark out the cabinet side-pieces on the sides which will show. Do not cut out the shaded portions (the slots where the terminal strips will fit later), but cut along the general outlines of the side-pieces. Drill two ¼in. holes in each side-piece as shown in each figure.

From the edge, saw with a tenon saw down the lines marked DE and FG to the sides of these holes. Start sawing along the line marked HJ which forms the bottom of the slot, by placing the leading corner of the saw in the hole and using very short strokes of the saw. Continue sawing until other hole is reached. Repeat on other side-piece. Square up corners of slots with file or chisel.

(E) Take the left-hand (looking from front) side-piece and the top-piece and hold them together and resting on a flat surface as shown in photograph (Fig. A). Prick with a bradawl through the prepared holes in the top-piece into the top of the side-piece. Insert two ¾ in. No. 4 round-head brass screws and screw top-piece to side-piece.

Now do the same with the other side-piece (see photograph, Fig. B). The assembled top and sides are shown in photograph Fig. C.

Lay the assembled top and sides on the table with slots uppermost. Lay the panel the right way round and veneer side uppermost, in its correct position on the framework assembly.

With a bradawl prick through the seven ¼ in. fixing holes in panel and secure the panel in position with ¾ in. No. 4 round-head brass screws.

(F) Mark out and drill the two terminal strips as Fig. 6 and Fig. 8. Prepare four mounting brackets as Fig. 7.

(G) Fit two mounting brackets to inside of each terminal strip using ¾ in. 6BA round-head brass screws and nuts, these screws going through the ¼ in. holes in strip.

(H) Lay the completed Easy-Cabinet face down on a cloth-covered table. Place each terminal strip in its correct position on the back of the panel inside the slots, so that the outer surfaces of the terminal strips are flush with the side-pieces of the Easy-Cabinet (see Fig. C). With bradawl prick fixing holes through the four holes in the brackets, into the panel. Remove the terminal strips. Turn the Easy-Cabinet over and take out the seven panel fixing screws. Remove panel.

(J) If you wish to stain the side-pieces and top, do so now. (I used Jackson's, of Mitcham, Surrey Oil Varnish Stain, colour walnut, size 6 tin.)

(K) Cut out, drill and stain the spar (see Fig. 2) which holds grid-bias battery in place.

(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. Using bradawl, prick through to panel the fixing holes of all the components that go on the back of the panel. If in doubt about any holes, check by laying component over its picture. Remove blue-print. Using blue-print as check for their positions, screw down the following in order given: the two terminal strips (making sure the right ones are in the right place) using ¼ in. No. 4 round-head brass screws to hold down the brackets; S.T.700 coil unit with extension piece in position and slipped through its allotted hole in terminal strip, ¼ in. No. 4 round-head brass screws being used; slacken grub screw on extension-piece and slip extension-piece into position shown in blue-print. Tighten its grub screw; four Vibrolders (get them right way round) using ¼ in. No. 4 round-head brass screws; bend up the soldering tag which projects from terminal G on V2 valve holder; T.M.C.-Hydra condenser block (right way round) using ¼ in. No. 4 round-head brass screws; four Lissen mica condensers using ¾ in. No. 4 round-head brass screws

THE FIRST STAGE

Fig. A. The first stage in assembling the "Easy-Cabinet": Fixing the left-hand side piece to the top.

taking extreme care that the right capacities are put in the right place, as all these condensers look alike from the top; Niclet transformer (right way round) using ¾ in. No. 4 round-head brass screws; Wearite screened choke (marked H.F.J. although catalogued HFPJ) with its earthing-tag to correct side as shown in blue-print, using ¼ in. No. 4 round-head brass screws; 2 mfd. Dubilier cylindrical condenser (mounted by fixing the base cup which unscrews) using ¼ in. No. 4 round-head brass screws. In screwing condenser into its socket see that its terminals are finally positioned as in blue print; B.T.S. disc-type choke, using ¾ in. No. 4 round-head brass screws.

Fit terminals in their correct holes (check carefully). Fit audio-reaction half-megohm (500,000 ohms) potentiometer in terminal strip, checking to see you have used the right potentiometer. Fix knob to this potentiometer. Fit aerial coupler condenser without knob. Fit anode reaction condenser without knob. Fit aerial balancing condenser without knob. Discarding the on-off indicator plate, fit the on-off toggle switch. Fit the 100,000 ohm volume control without knob. Taking care that the whole panel will not rest on the spindle of the J.B. main tuning condenser (whose moving vanes should be closed), fit the J.B. condenser (without knob and pointer) to panel, putting its bush washer on the front side of panel under fixing nut which should not be too tight.

THIS COMPLETES THE FIXING OF COMPONENTS.

Now you are going to wire the components, and for this you need the blue-print and the Hi-Speed series of wiring diagrams. Use the Hi-Speed drawings as useful help in finding wire on blue-print and the Hi-Speed hints (under the drawings) as guide to the shape. You also place a tick against wire numbers below Hi-Speed diagrams as each wire is completed. **Blue-print is always final authority.**

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

TURN TO HI-SPEED WIRING SERIES on page 230. 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 recommended wire is of the kind that permits the insulating covering to be slipped back, revealing the bare end of the wire. "Maxamp" wire by Peto-Scott is about the best I have tried, and is also of suitable thickness. It is strongly recommended as being very much easier to use than bell-wire or similar stiffish wires. A 30-ft. coil is ample for the set. My advice is to use it as follows:

Cut off 6-ft. lengths at a time from the coil, as required. Push back insulation about ¼ in. and, without increasing this inch, slide the bunched-up fullness of the insulating covering well back along the wire. Using only about ¼ in. of the bared end, connect the wire looping it (preferably clockwise) round under the terminal-head of the component to be wired up. Shape wire along route indicated in blue-print (helped out by the hints under the Hi-Speed diagrams and a reference, if desired, to the photographs.

Allow an extra ¼ in. on the length of the wire for connection to the terminal it is going to. Cut through the insulated wire, slip insulation back ¼ in. and, without increasing this ¼ in., work the bunched-up fullness back along the wire, thus covering the bareness at the starting end. Now loop the finishing end (preferably clockwise) under its terminal-head. This detailed account is of a process which actually takes only a few seconds and will enable you to do the wiring more neatly and in double-quick time.

(M) USING BLUE-PRINT AND HI-SPEED DIAGRAMS (WITH ATTACHED HINTS), WIRE UP THE SET.

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

The grid-bias leads are prepared as follows: Take the proper length of "Maxamp" wire, as stated on blue-print, and prepare it as usual to have ¼ in. of bare wire at each end. Bend one of the ends ¼ in. from the end back on itself and push the loop so formed into the hole in the side of the G.B. + Belling & Lee Midget wander-plug, having loosened the head of wander-plug. Tighten head of wander-plug. Fit other end of wire to correct component.

(N) Now check the wiring by getting someone to read out the **S.T.700 WIRING CHECK** while you give your full attention to the set itself. The description of the wires is so complete that you can follow them out on the set. (This cuts out any risk of losing track of a wire through your having to turn aside to a diagram.)

(O) If you have built the Easy-Cabinet frame (as I assume), fix the completed panel on the frame.

(P) Mark in following manner the fixing holes for grid-bias battery spar, which clamps the battery to the left side of the Easy-Cabinet looking from the back. Prick with bradawl the lower fixing hole, which is ¾ in. up from the bottom edge of the side-piece and 2 in. from the back edge (farthest from panel). Slip a 1¼-in. No. 8 round-head brass screw through the hole in one end (either end will do) of the grid-bias battery clamping spar and insert the point of the screw in the fixing hole just pricked. Give the screw one turn to prevent its falling out. Swing the spar round until it is parallel to the back edge of side-piece. Holding spar against side-piece, prick through the other hole (in spar) into cabinet side-piece, with bradawl.

Insert a second 1¼-in. No. 8 round-head brass screw through the upper hole in spar into pricked hole in side-piece. Give this screw one turn to prevent its falling out. Slip spar along the screws and insert the 16½-volt grid-bias battery between spar and side-piece of cabinet, with the battery sockets facing towards the back (away from panel) and the positive end of battery nearest top of cabinet.

Taking care that the voltage figures on side of battery remain in view, screw up spar fixing screws until battery is firmly clamped into position. (If you have used screws that are too long, you will need to put cardboard or a wad of paper between spar and battery, otherwise screws would go right through cabinet side-piece). FIT G.B.+ plug in positive (+) socket, G.B.−1 in −1½V. socket, G.B.−2 in −9V. socket, G.B.−3 in −16½V. socket.

(Q) FIT DIAL CARD AS FOLLOWS:

Leaving the centring tab attached, cut out dial card along borders. Cut out (razor blade essential) the hole for slipping over bush, where marked on the tab. Stand the set up in its normal position, front of panel facing you. The moving vanes of the main tuning condenser should be "closed." Put your left hand round the back of set and gently hold the rear end framework of main tuning condenser. Do not touch the vanes. Remove the fixing nut and washer from the main tuning condenser's spindle portion, which can be seen from the front of the panel.

Slip the hole in the centring-tab over the spindle bush (the threaded brass collar), and hold centring tab against panel by fitting washer and then nut *loosely*. Lay set (in Easy-Cabinet) on its back, front of panel uppermost. Centre the dial card into its correct general position; as a guide it may be noted that the top point should come opposite the middle fixing screw of panel (i.e. half-way along top edge).

Ensure dial is in correct position by measuring the distance from the lowest point on the left-hand end of dial to the bottom edge of panel; this distance should be the same as that from the right-hand end of dial to bottom edge of panel.

(R) Prepare 16 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 ½ in. from their heads. You now have 16 very short and pointed pins. Any other type of very short miniature nails may be used.

There are 16 small circles with white centres along the border of dial. Keeping dial card flat on panel, start with the top circle and prick through centre of circle with some thin pointed instrument (I used a drawing-pin) for about 1/16 in. Insert a prepared pin into this hole and push home with any hard flattish ended instrument (I used the handle of a screwdriver). Carry out the rest of the fastening-down of dial in following order: Circle between pin just inserted and condenser spindle, the two circles (on outer border) on each side of top circle; the two circles (on inner border) between last-inserted two pins and spindle. Carry on in this way, working towards the ends, keeping dial card flat.

(S) CUT CENTRING TAB OFF WITH SAFETY RAZOR BLADE by cutting along inner border where indicated (where tab is joined on). Tear away the tab from the condenser bush; there is really no need to remove the fixing nut to do this. Tighten up the fixing nut on bush of main tuning condenser.

STAND SET IN ITS NORMAL POSITION WITH DIAL FACING YOU.

(T) Turn projecting spindle of main tuning condenser fully anti-clockwise (fully left). Slip the large J.B. knob and long pointer on to end of spindle with the pointer pointing exactly horizontally to the left. Tighten grub-screw, which is the little screw which fits into edge of knob and is on opposite side to pointer. (Do not touch screw which secures the pointer.)

(U) Turn spindles of aerial coupler, anode reaction condenser and aerial balancing condenser fully anti-clockwise (fully to left). Fit their knobs with their white spots or pointers pointing exactly in a horizontal direction to the left. Tighten up their grub-screws.

Turn volume-control spindle (on panel) fully clockwise (to right) and fit knob with its spot pointing towards the bottom right-hand panel fixing screw. Tighten its grub-screw.

(V) Fit knob on wavechange switch spindle (no special direction).

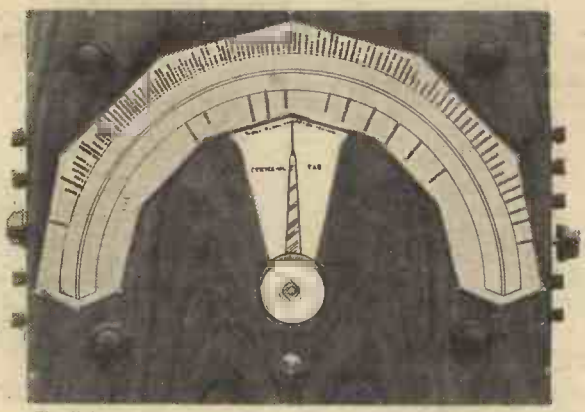
YOUR SET IS NOW COMPLETE. (See separate article on installation and operation.) J. S.-T.

Fig. B. Here the right-hand side piece and top piece are being fitted together.

A CABINET FREE!

Where a kit for the S.T.700 includes the price of side-pieces and top remember you will have a complete cabinet model of S.T 700. No other cabinet is needed as my set is self-contained. Remember this when considering price of S.T 700 kits.

FITTING THE DIAL CARD



The dial card is here shown in position on the panel in accordance with the instructions given on this page.

THE "EASY-CABINET" EXPLAINED

The S.T.700 as described appears as a very handsome cabinet model complete. You need the panel in any case so you really get a complete cabinet model for 3/6 extra—the cost of ready-drilled and cut side-pieces and top which can be put together in a few minutes. **You do not need any further cabinet.** Peto-Scott's will provide a panel, side-pieces and top all ready cut, drilled and polished so you do not need the detailed dimensioned drawings. This firm also have suggested special alternative cabinets of their own design.

Fig. C. Marking fixing holes for terminal strip brackets.

THE S.T.700 WIRING CHECK

How to Use. Having built the set, ask a friend to read out this check while you look at the internal wiring of the S.T.700 before you. He should read out the first component printed in heavy black type and then pause. You find this component in the set and say "Yes." Your friend then reads on, describing the terminal on that component. When you have found the terminal you say "Yes." He then reads the word "joins" and the name of the second component, also printed in black type. You who have followed the wire now say "Yes" if you see the wire goes to the proper component. Your friend then describes the exact terminal, and you make sure that the wire actually goes to it. If it does, you say "Yes" and your friend starts to read out the second wire. If you have found a mistake in the wiring, you must stop and put it right. Ask your friend to repeat from the *beginning* of a wire, if you lose it.

This system of pausing and saying "Yes" is the only satisfactory one. It is perfectly simple. Reading out a long sentence is, on the other hand, quite hopeless.

Wire (1). Terminal E on terminal strip nearest coil unit *joins* coil unit terminal 9.

Wire (2). Coil unit, terminal 9, *joins* valve holder nearest aerial terminal, terminal F (nearest coil unit).

Wire (3). Valve holder (nearest aerial terminal), terminal F, nearest coil unit, *joins* neighbouring valve holder, terminal F (nearest Niclet).

Wire (4). Coil unit, terminal 10, *joins* valve holder (nearest aerial terminal), terminal G.

Wire (5). L.T.+ terminal on terminal strip nearest coil unit *joins* valve holder (nearest aerial terminal), terminal F (nearest aerial terminal).

Wire (6). Valve holder (nearest aerial terminal), terminal F (nearest aerial terminal), *joins* neighbouring valve holder terminal F (nearest to 2-mfd. condenser).

Wire (7). Coil unit, terminal 8 *joins* reaction condenser in corner of panel (terminal nearest corner of panel).

Wire (8). Valve holder (nearest aerial terminal), terminal A, *joins* 2-mfd. condenser terminal nearest aerial terminal.

Wire (9). Valve holder (nearest aerial terminal), terminal F (nearest coil unit), *joins* 2-mfd. condenser terminal farthest from aerial terminal.

Wire (10). Aerial terminal, *joins* neighbouring aerial coupler, terminal farthest from aerial terminal.

Wire (11). Coil unit, terminal 1, *joins* aerial coupler terminal nearest aerial terminal.

Wire (12). Coil unit, terminal 2, *joins* aerial balancing condenser (·0005-mfd. air condenser near corner of panel), fixed vanes terminal at side.

Wire (13). Coil unit, terminal 3, *joins* aerial balancing condenser (·0005-mfd. air condenser near corner of panel), moving vanes terminal on top.

Wire (14). Coil unit, terminal 6, *joins* condenser block terminal marked 2 nearest audio-reaction knob.

Wire (15). Grid condenser ·00005-mfd. (next coil unit), terminal nearest main tuning condenser, *joins* main tuning condenser, fixed vanes terminal on side.

Wire (16). Coil unit, terminal 5, *joins* main tuning condenser, fixed vanes terminal on side.

Wire (17). Grid condenser ·00005-mfd. (next coil unit), terminal nearest neighbouring valve holder, *joins* neighbouring valve holder, terminal G nearest grid condenser.

Wire (18). Valve holder near centre of panel terminal G, via 1-megohm resistance joining same valve holder, terminal F, nearest 2-mfd. condenser.

Wire (19). Valve holder near centre of panel, terminal F, nearest 2-mfd. condenser, *joins* valve holder nearest toggle switch, terminal F, (nearest audio-reaction knob.)

Wire (20). Valve holder (nearest toggle switch), terminal F, (nearest audio-reaction knob,) *joins* neighbouring valve holder, terminal F, nearest corner of panel.

Wire (21). Valve holder (nearest centre of panel), terminal F (nearest Niclet), *joins* valve holder (nearest toggle switch), terminal F (nearest toggle switch).

Wire (22). Valve holder nearest centre of panel, terminal F, (nearest Niclet), *joins* main tuning condenser moving vanes terminal (on top).

Wire (23). Valve holder (nearest centre of panel), terminal F (nearest Niclet), *joins* ·0005-mfd. Lissen condenser, (which is nearest the valve holder just mentioned, and which points towards condenser block), terminal nearest coil unit.

Wire (24). Lissen ·0005-mfd. condenser (near centre of panel and pointing towards block condenser), terminal nearest neighbouring valve holder, *joins* block condenser terminal marked C on the block itself.

Wire (25). Valve holder (nearest audio-reaction knob), terminal F (nearest Niclet), *joins* Niclet fixing screw nearest condenser block.

Chosen for the S.T.700

FULLY DESCRIBED IN THIS ISSUE BY

MR. JOHN SCOTT-TAGGART

BECAUSE OF THEIR

TYPE B.1007
Specially made to
Mr. Scott-Taggart's
Specification

★ ACCURACY
★ UNIFORMITY
★ RELIABILITY

T.M.C. HYDRA

BRITISH MADE

CONDENSERS

TABLE OF CONDENSERS FOR S.T.700

***Fixed (paper) condensers required for S.T.700 Battery Model**

Quantity	Capacity	Type		Price
†1	2μF + 2μF + 1μF	B.1007	Made specially for the S.T.700	6/6 **
1	0·1 μF	T.24	Tubular	1/3
1	2 μF	30	—	3/-

** *Compare this price with cost of 3 separate condensers—note saving.*

***Fixed (paper) condensers required for S.T.700 A.C. Model**

Quantity	Capacity	Type		Price
1	0·25 μF	T.49	Tubular	1/9
†1	0·006 μF	T.15/5	Tubular	-/9
†1	0·05 μF	T.23	Tubular	1/-
†1	0·1 μF+0·1 μF	T.82	Multi-capacity Tubular	2/3***
†1	2 μF	40	—	3/9
3	1 μF	30	—	2/3
2	4 μF	30	—	5/-

*** *Compare this price with cost of 2 separate condensers—note saving.*

* *Fit T.M.C.-HYDRA Condensers for Reliability.*

† *Specified by Mr. Scott-Taggart as first choice. Balance specified as alternatives.*

You cannot do better than follow Mr. Scott-Taggart's lead in your choice of condensers. He used T.M.C.-**HYDRA** Condensers. So should you. Not only will you get the best, but you will also save money. For instance, the block condenser B.1007, which was specially designed for the S.T.700, costs about 20% less than three separate condensers which would otherwise be necessary. Be wise, be sure — insist on T.M.C.-**HYDRA** Condensers.

Your local dealers sell them — write for name of nearest stockist to

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Britannia House, 233 Shaftesbury Avenue
London, W.C.2 (A few doors from New Oxford St.)

Telephone: Temple Bar 0055 (3 lines)

MADE BY TELEPHONE MANUFACTURING CO. LTD.

Wire (26). Valve holder (nearest audio reaction knob), terminal F (nearest Niclet), *joins* Lissen ·0005-mfd. flat condenser (near centre of baseboard and pointing towards condenser block), terminal nearest neighbouring valve holder.

Wire (27). Valve holder (near centre of panel), terminal A, (farthest from coil unit), *joins* Wearite screened choke terminal nearest anode reaction condenser in neighbouring corner of panel.

Wire (28). Wearite screened choke, terminal nearest anode reaction condenser in neighbouring corner of panel, *joins* anode reaction condenser in neighbouring corner of panel, terminal nearest Wearite screened choke.

Wire (29). Valve holder (near centre of panel), terminal F (nearest Niclet), *joins* Wearite screened choke fixing screw which passes through the earthing tag on nearest side of Wearite screened choke.

S.T.700 CONSTRUCTION FEATURES

This set, is we believe, the simplest it is possible to construct thanks to Mr. Scott-Taggart's Uni-plane system of construction. All components are screwed down on to a single straight-forward wooden panel.

The blue-print, for the first time, is a true picture of the wires. Where a set uses a vertical panel and flat baseboard, the blue-print cannot show the correct positions of wires.

The blue-print, together with the notes under the Hi-speed wiring drawings, tells you all you need about the wires; perspective drawings (previously essential) are now unnecessary.

The number of dimensioned drawings are only necessary if you cut and drill these parts yourself; if you buy them ready prepared these drawings can be ignored.

Remember that if you add the top and side-pieces, you have a handsome cabinet-type receiver which needs no extra cabinet.

Wire (30). Lissen ·008-mfd. coupling condenser (next Wearite screened choke), terminal nearest Wearite screened choke, *joins* Lissen ·0005-mfd. flat condenser near centre of panel and pointing back towards condenser block, terminal nearest condenser block.

Wire (31). Wearite screened choke, terminal nearest condenser block, *joins* Lissen ·006-mfd. coupling condenser, next Wearite screened choke terminal nearest Wearite screened choke.

Wire (32). Wearite screened choke, terminal nearest condenser block, via 75,000-ohm resistance, *joins* that terminal marked 2 on condenser block which is nearest anode reaction condenser in corner of panel. Make certain you have used the correct resistance.

Wire (33). Valve holder (nearest audio-reaction knob), terminal G (nearest audio-reaction knob), *joins* Lissen ·006-mfd. coupling condenser (nearest Wearite screened choke), terminal nearest Niclet.

Wire (34). Valve holder (nearest audio-reaction knob), terminal A (farthest from audio-reaction knob), *joins* Niclet terminal marked on the Niclet as H.T.+.

Wire (35). Condenser block; terminal marked 1 (nearest Wearite screened choke), *joins* Niclet terminal marked P.

Wire (36). Valve holder (nearest toggle switch), terminal G (nearest main tuning condenser), *joins* Niclet terminal marked G.

Wire (37). Toggle switch, terminal nearest neighbouring valve holder, *joins* 100,000-ohm volume control potentiometer near corner of panel, terminal nearest B.T.S. choke.

Wire (38). Valve holder (nearest toggle switch), terminal A, (nearest corner of panel), *joins* B.T.S. disc choke in corner of panel, terminal nearest corner of panel.

Wire (39). L.S.— (this terminal is one of a group of three and is next audio-reaction knob), *joins* B.T.S. disc choke, terminal nearest audio-reaction knob.

Wire (40). L.S.— terminal (one of a group of three and nearest audio-reaction knob), *joins* neighbouring ·006-mfd. Lissen audio-reaction condenser, terminal farthest from audio-reaction knob.

Wire (41). Lissen ·006-mfd. audio-reaction condenser (nearest audio-reaction knob), terminal nearest audio-reaction knob, *joins* audio-reaction potentiometer on terminal strip, terminal nearest condenser block.

Wire (42). H.T.+3 terminal (next audio-reaction knob in the direction of B.T.S. disc choke), *joins* condenser block, terminal marked 2, nearest audio-reaction knob.

Wire (43). Pick-up terminal (next B.T.S. disc choke), *joins* valve holder (nearest audio-reaction knob), terminal G (nearest audio-reaction knob).

Wire (44). This is a 500,000-ohm resistance (make sure you have the correct one) connected between valve holder nearest audio-reaction knob, terminal G (nearest audio-reaction knob), and audio-reaction potentiometer on terminal strip, middle terminal.

Wire (45). This is a 30,000-ohm resistance (not marked in figures but coloured as follows: orange body, black tip at one end, orange band (which, being on the orange body, does not show up), connected between terminal H.T.+2 on terminal strip (the middle of the group of three terminals on one side of the audio-reaction knob) and condenser block, terminal marked 2 nearest anode reaction condenser in corner of panel. Make absolutely certain you have the correctly coloured resistance of 30,000 ohms in this position.

Wire (46). Terminal H.T.+1 (the farthest from the audio-reaction knob of the three terminals next to the audio-reaction knob), *joins* 2 mfd. Dubilier condenser, terminal nearest aerial terminal.

Wire (47). This is a 20,000-ohm resistance, and is not marked in figures, but colour-coded as follows: red body, black tip at one end, and orange band round the middle, and is connected between condenser block, terminal 1 (nearest Wearite screened choke), and condenser block, terminal marked 2 (nearest audio-reaction knob).

Wire (48). L.T.— terminal (terminal nearest terminal 1 on coil unit) on terminal strip next coil unit. *joins* three-point toggle switch, terminal nearest panel on that side of toggle switch which is nearest aerial balancing condenser.

Wire (49). Toggle switch, terminal farthest from panel and on that side of toggle switch nearest aerial balancing condenser *joins* valveholder nearest toggle switch, terminal F. (nearest toggle switch.)

Wire (50). 100,000-ohms volume-control potentiometer (near corner of panel), middle terminal, *joins* aerial balancing condenser, moving vanes terminal on top.

Wire (51). This is a 0·1-mfd. tubular condenser connected between terminal E (that terminal on the terminal strip which is nearest the aerial balancing condenser *and* aerial balancing condenser, moving vanes terminal on top.

Wire (52). This is an ordinary "Maxamp" wire about 9½ in. long, connected at one end to terminal 4 on coil unit, and at the other end *joins* the anode terminal at the top of the H.F. pentode valve which goes into the valve holder nearest aerial terminal; this wire should be kept ¼ in. away from the metallising on the valve, and the same distance if possible from the metal work of the coil unit. Do not use flex

Wire (53). This is an 8-in. "Maxamp" wire, one end of which is first connected to a G.B.+ Belling-Lee Midget wander-plug. Far end of wire *joins* condenser block terminal marked C, (terminal nearest Niclet.)

Wire (54). This is a 10-in. long piece of "Maxamp" wire, fitted with a G.B.—1 wander-plug; the other end *joins* the audio-reaction potentiometer (on terminal strip), terminal nearest B.T.S. disc choke.

Wire (55). This is an 8-in. long piece of "Maxamp" wire, fitted at one end with a G.B.-2 wander-plug; the other end *joins* the Niclet G.B.— terminal.

Wire (56). This is a 10-in. length of "Maxamp" wire, fitted at one end with a G.B.—3 wander-plug; the other end *joins* the 100,000-ohm volume-control potentiometer near corner of panel, terminal nearest toggle switch.

HOW THE WOOD IS CUT

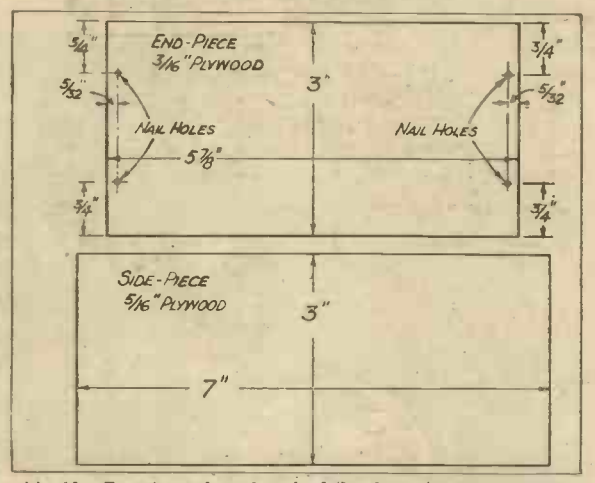

Fig. 10. Two pieces of wood, each of the above sizes are required to carry the Triple Extractor panel.

TRIPLE EXTRACTOR DRILLING DETAILS

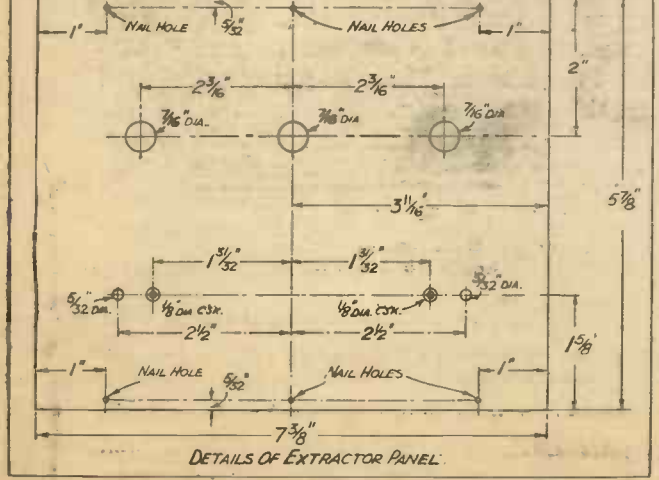

Fig. 9. The positions and sizes of all the holes in the Triple Extractor panel are given in this diagram.

TRIPLE EXTRACTOR RAPID CONSTRUCTION GUIDE AND WIRING CHECK

IF you use ·0005 mfd. air condensers of other makes, you will most probably need a larger box. You must not fit your condensers closer together than described, and the coil assembly should not be nearer to the side of box or nearer to condensers. If you use the S.T.600 Extractor coil, together with a single Colvern medium-wave Extractor (which costs 5s.), the same precautions should be taken.

N.B.—The Extractor condenser used in S.T.600 should not be used; but the better Ormond condensers (e.g. as used in S.T.300, S.T.400, and S.T.500) are all right. The efficiency of the condensers is of extreme importance; for that reason I have given as alternatives to Polar only condensers proved on measurement to be satisfactory.

(A) Collect and examine (handling carefully) the three specified ·0005-mfd. air variable condensers and the Wearite Triple Extractor coil assembly which I designed for this set.

(B) Using Fig. 9 and Fig. 10, mark out and prepare the wooden top and sides of box, unless bought prepared. The blue-print is only to show wiring and not dimensions.

(C) You are now going to build the box. Lay one end-piece of box, face upwards, on a table. Knock in about ¾ in. deep four ¾ in. ordinary nails at the points indicated in Fig. 10. Hold one side-piece vertical on end. Driving in two of the nails in the prepared end-piece, nail end-piece to side-piece. Drive the other two nails through into the end of the other side-piece which is held vertical on end.

Drive four ordinary ¾ in. nails ¾ in. into other end-piece in the same way and complete frame of box. Now lay drilled wooden panel right way up on the table and knock in about ¾ in. deep six ¾ in. ordinary

(*Continued on page* 246.)

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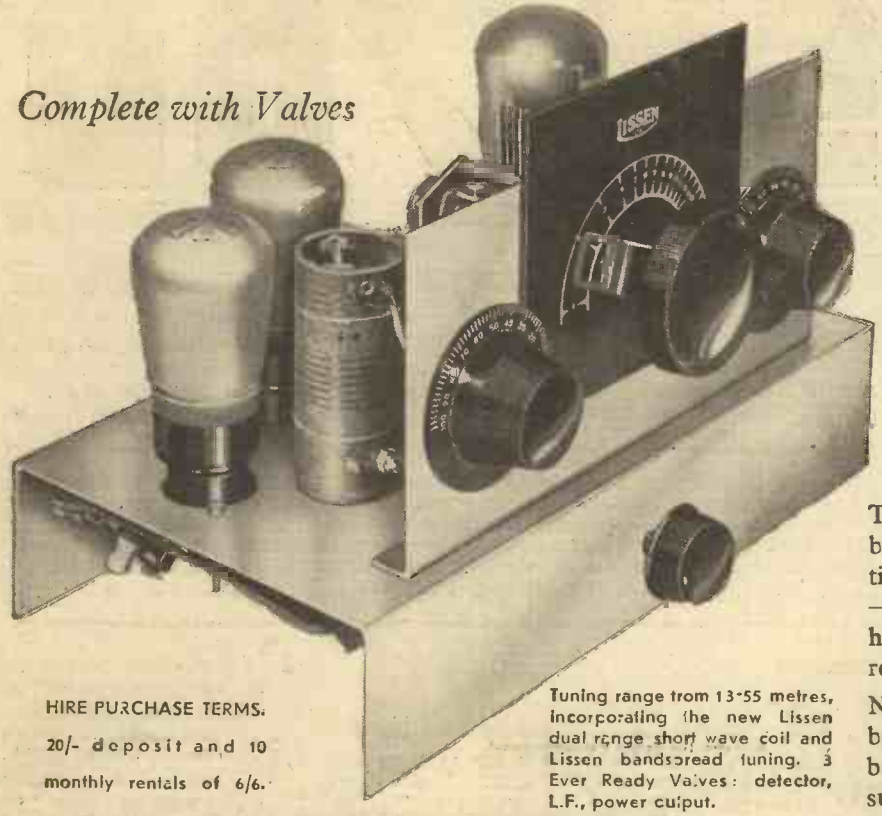
Complete with Valves



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The A.C. S.T.700

FIRST DETAILS OF THE ALL-MAINS VERSION OF MR. SCOTT-TAGGART'S GREAT NEW SET

Here at last is a magnificent A.C. Set which is really easy to build, yet is extremely handsome to look at. The Uni-plane system of construction is embodied and permits an unusually attractive cabinet to house the set. Glorious quality and 3½ watts output are combined with great selectivity. The 112-station auto-dial is only one of the features unobtainable on any factory-built set.

THERE is a very considerable home-constructor public that favours the all-mains set. It is composed of keen amateurs who seek special results, or are interested in radio as a hobby.

Not one of this band builds an A.C. set to save money—for the simple reason that he will not do so. Factory sets cannot compete in the battery-set field with Press sets, but mass production and concentration on the mains "superhet" has resulted in good value being given. It is impossible to compete on price. But just as I regard it folly to imitate the commercial set in the battery field, so I feel that the amateur who seeks an A.C. design to build should be given something which he cannot obtain with a mass-produced article, which—good though it is—is, after all, designed down to the general mass of the listening public.

The cheapening of the superhet, as commercially produced, has undoubtedly resulted in the skimping of the design in certain directions, while the new vogue for cheap A.C. straight sets has renewed public interest in the straight receiver. These sets, however, are really only "local" receivers, their selectivity being very poor indeed, and subject to swamping by the powerful B.B.C. transmissions.

No "Local" Trouble.

The A.C. S.T.700 is emphatically a distant station getter, and as it will be used in conjunction with a Triple Extractor, the local interference problem is completely solved, leaving the set itself free to pick up and select any one of a large number of foreign stations.

The Triple Extractor used with the battery version of the S.T.700 under B.B.C. swamping conditions, is equally good on the A.C. S.T.700, and the same "magic box" is therefore built by both classes of constructors. This feature alone puts the A.C. S.T.700 in a unique class, and the most frightening conditions of swamping are as nothing to the Triple Extractor.

Here then is a highly selective A.C. set completely free from interference, and possessing all the great merits which attach to straight-circuit reception. It is generally recognised that you cannot possibly beat a good straight circuit for quality of reproduction and life-like speech and music. On the local stations, therefore, you cannot better a straight circuit. Nor on a really good foreigner can you improve on it. The weaker foreign stations often call for a higher degree of selectivity, and the superhet wins here against most ordinary straight circuits. The selectivity of the A.C. S.T.700 is, however, excellent in any British zone you like to think of—even within a mile of the B.B.C. And it is, of course, free from all the background mush and hiss and whistles which people are getting used to on superhets—until they hear a really good mains "straight" set.

No Hum.

This question of background noise is a matter of great importance in my view. The A.C. S.T.700 is extremely quiet when there is no programme. Hum is entirely absent, due to cautious

THE LAST WORD IN ALL-MAINS DESIGN

Mr. Scott-Taggart with the extremely handsome A.C. S.T.700. As can be seen, the auto-dial and controls are neatly arranged immediately beneath the cabinet lid, while the loudspeaker is "built-in."

MAKE YOUR S.T.700 an ALL-WAVE SET!

B.T.S. *SHORT AND ULTRA-SHORT WAVE* CONVERTER

COVERS 5 TO 80 METRES. Enables your S.T.700 or any receiver, whatever type, make, mains or battery (providing an electricity supply is available) to be operated on the Short and Ultra-Short wave-lengths, bringing you WORLD-WIDE ENTERTAINMENT. No alterations to receiver—the Converter simply plugs into the mains. Long and Medium wave reception of your existing set may be continued without disconnecting the Converter—a special change-over switch being incorporated.

Every B.T.S. Converter is tested down to 4.75 metres before dispatch. Beware of imitations. Look for the B.T.S. Trade Mark.

PRICE, including Coils and Walnut cabinet illustrated, less Valves. FROM ALL DEALERS. **£5:0:0**

Valves recommended: *Cossor 13 P.G.A. & 40 S.U.A., 30/- the pair.*

● *SEND FOR FREE ILLUSTRATED BROCHURE.*

B.T.S. SHORT WAVE ADAPTOR

Simply plugs into your Battery or A.C. Set with no alterations whatsoever, and instantly converts it to 100% efficient Short-Wave operation.

May be used either as a complete Detector unit or as a super-heterodyne Converter.

PRICE (including Coils, 13–52 metres) **52/6**

Extra Coils: 46-96 and 90-199 metres, 4s. 6d. each.

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ALSO SPECIFIED (A.C. Version)

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Aerial Reaction (Type 601) ·0005 **2s. 6d.**

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THE IDEAL SET FOR THE ALL-MAINS ENTHUSIAST

choice of components, (*e.g.*, the well screened Ferranti mains transformer) and to ultra careful lay-out—a matter of the greatest importance if one desires to cut out hum. It is also possible in a constructor's set to build into the receiver a greater margin of reliability as regards the components. In the United States, sets that go wrong are often scrapped. To keep prices down, risks as regards component breakdown are taken. Money is also saved in this country on smoothing chokes and condensers. In the S.T.700 an extra amount of smoothing is incorporated. Hum is consequently abolished.

A First-Class Design.

The loudspeaker used in the present receiver is of a considerably better type than is fitted to the generality of factory-built sets. The constructor who seeks a really first-class mains design will not be unwilling to equip it with a speaker which will still further help to put his receiver in a class well above the usual domestic set.

Inadequate bass response in many mains speakers is rather welcomed by some manufacturers, as it makes hum reduction less necessary. But, of course, quality suffers. The already generous bass response of the A.C. S.T.700, the great volume (3½ watts output are obtainable), and other design factors have decided me against the introduction of audio-reaction in this version. Moreover, to reproduce the same circuit, I should have had to add an additional valve which—owing to the greater magnification obtainable from mains valves—would be quite unjustifiable on other grounds.

This, however, is the only feature not in the A.C. set. Besides the Triple Extractor unit, the A.C. S.T.700 enjoys the merits of my new Uni-plane construction, which simplifies construction and makes an A.C. set simpler to build than the old method of constructing a battery receiver. This is a very important point, because an A.C. set used to be quite a complicated apparatus to construct. In appearance the A.C. S.T.700 easily beats any set I know. The panel is horizontal, and when the lid is down the set cannot be recognised as a radio receiver; it becomes a luxurious-looking jewel box. Everyone who has seen this receiver has been filled with admiration of its appearance.

LOGGING THE STATIONS

To calibrate the dial you simply tune to a known station and place a dot as shown. Then draw a line from the dot to station named.

Finally, of course, there is my new Auto-dial—a device which alone, in my opinion, should have an overwhelming appeal. To "try out" scores of different stations by actual name, to be able to "go back" to any station with infallible accuracy—and revel in a luxurious choice of Continental or British programmes, brought in with flawless quality—is every radio listener's dream come true.

(*Constructional details will be given next week; meanwhile, the component list is published to enable you to order the parts or a complete kit.*)

PRAISE FROM THE TRADE

The Managing Editor, POPULAR WIRELESS,
Tallis House, Tallis Street, E.C.4.

Sir,—I wish to thank you very much for the honour you have done me in affording me the opportunity to have an advance demonstration of the S.T.700 (battery model).

It has been my privilege to devote the best part of my working life during the past sixteen years to the interests of the Home Constructor and, as you know, nothing pleases me better than to know that they are to be given once more the benefit of the brains of that wireless wizard—John Scott-Taggart.

I feel that again Mr. Scott-Taggart has in his S.T.700 an entirely new circuit and has incorporated several novel technical features about which I know he would rather tell the public himself, but as regards simplicity of construction—combined with low price without sacrificing performance—one must acknowledge it to be a supreme achievement.

POPULAR WIRELESS is extremely fortunate in having at its sole disposal one of the most outstanding brains in the Home Constructor field, whose technical genius in embodying his ideas is unique.

I think your vast number of readers will agree with me that Mr. Scott-Taggart will surpass all previous records and that home constructors all over the world will be clamouring for kits which will enable them to build *duplicates* of this latest and greatest triumph.

Wishing your journal the success which it so richly deserves,

I am, Yours faithfully,
PETO SCOTT COMPANY, LIMITED.
W. SCOTT WORTHINGTON, Managing Director.

THE PARTS YOU NEED TO BUILD THE A.C. S.T.700

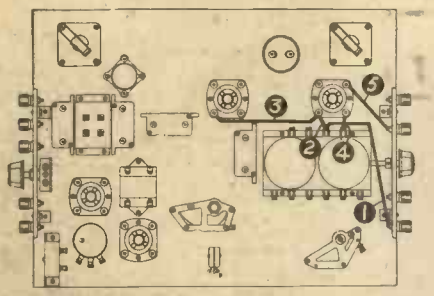
Component.	Value.	Make Used by J. Scott-Taggart.	Component.	Value.	Make Used by J. Scott-Taggart.
Coil unit	For S.T.700	Colvern		1 10,000 ohms	Erie, 1 watt
Aerial balancing condenser	·0005-mfd. air condenser	Ormond R.483 with small knob free.		1 500 ohms	Ferranti GH·5, ½ watt
				1 150 ohms	Erie, 1 watt
				1 50,000 ohms	Ferranti GH·5, ½ watt
Main tuning condenser	·0005 mfd.	J.B. "Popular Log" with special pointer		1 100 ohms	Erie, 1 watt
Aerial coupler	·0005-mfd. solid dielectric	B.T.S. type 601	Screened H.F. choke	———	Ward & Goldstone type S.H.F.
Reaction condenser	·00015-mfd. solid dielectric	B.T.S.	Tone control	50,000-ohms potentiometer	Graham Farish "Ohmite"
Volume control	10,000-ohm wire-wound (must be wire-wound)	Colvern S.T.5C. To match other knobs use a B.T.S. knob	Mains transformer	———	Ferranti SM34
			L.F. choke	———	Varley DP10 (250 ohms)
			Metal rectifier	———	Westinghouse type H.T.8
Valveholders	3 7-pin	Bulgin V.H.22.	On-off switch	———	Bulgin S.80
Mica condensers	1 ·00005 mfd.	Lissen	Safety twin mains fuse holder	———	Bulgin type F.19
	1 ·0001 mfd.	Lissen	Energised loud-speaker	———	W.B. special type for S.T.700 with 1,500 ohms field and output transformer, either multi-ratio or suitable for Mazda A.C./2 Pen.
	1 ·0003 mfd.	Lissen			
	1 ·01-mfd.	Dubilier B.773			
Tubular condensers	1 0·25 mfd.	Polar-N.S.F., 350 v. working			
	1 ·006 mfd.	T.M.C.-Hydra, type T.15/5			
	1 ·05 mfd.	T.M.C.-Hydra, type T.21	3 Terminals	A. E. Pick-Up	Belling-Lee type R
	1 0·1 mfd. + 0·1 mfd.	T.M.C.-Hydra, 600 v. working, type T.82	Valve hoods	2 low-loss valve hoods with connections	Belling-Lee Cat. No. 1234
Paper condensers	2 1-mfd.	T.C.C. type 50	Screened lead	6-in. length	Ward & Goldstone type R.34/192
	1 1-mfd.	Graham Farish Mansbridge type	3 Terminal pillars	———	Bulgin S.W.49
	1 2-mfd.	T.M.C.-Hydra, 400 v. working, type 40	2 Terminal strips	———	Peto-Scott (ready drilled)
	2 4-mfd.	Amplion, 700 v. test, type T.B.	4 Brackets	For mounting terminal strips	Peto-Scott (with nuts and bolts)
Electrolytic condensers	2 8-mfd. Aqueous type	T.C.C. type 802	1 Bracket	(On which to mount 2 T.C.C. type 802 electrolytic condensers)	Peto-Scott
	1 50-mfd.	Dubilier, 12 v. working, type 3013	Mains lead	10 ft.	Peto-Scott
Fixed resistors	1 1 megohm	Erie, 1 watt	Mains plug	———	Bulgin P.28
	1 500,000 ohms	Erie, 1 watt	Cabinet with panel and baffle assembly	(Specify S.T.700 A.C. model and speaker when ordering)	Peto-Scott
	2 20,000 ohms	Dubilier, 1 watt			
	1 20,000 ohms	Formowatt, 1 watt			
	2 50,000 ohms	Erie, 1 watt			
	1 15,000 ohms	Erie, 1 watt			

The Triple Extractor Unit is the same for A.C. S.T.700 as for Battery S.T.700.

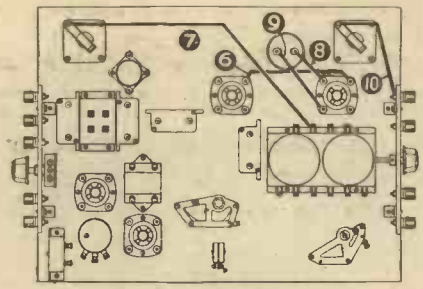
VALVES

Osram or Marconi V.M.P.4G. Osram or Marconi M.S.P.4. Mazda A.C. 2/Pen.

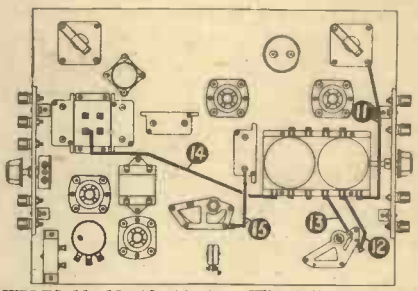
S.T.700 HI-SPEED WIRING DIAGRAMS



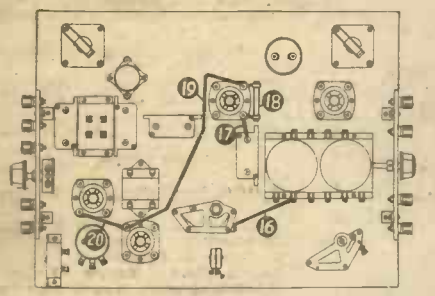
WIRES 1, 2, 3, 4, 5. No wire in any of the Hi-speed series should be longer or go by a different route than that on blue-print. Wire (4) should be not less than quarter of inch above wire (1).



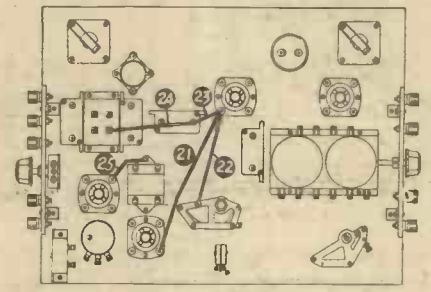
WIRES 6, 7, 8, 9, 10.



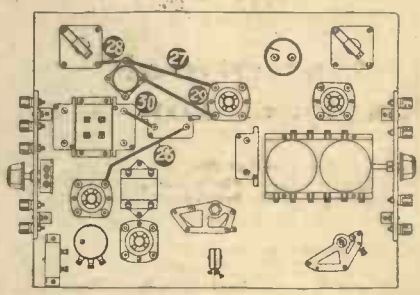
WIRES 11, 12, 13, 14, 15. Wire (11) runs 1½ in. above wave-change switch spindle and ¾ in. from side of coil can. Wire (12) runs horizontal from terminal 2 for two inches, then rises to fixed vanes terminal. Wire (13) rises from terminal 3 vertically 1¾ in., then horizontal to top terminal. Wire (14) hugs panel. Wire (15) runs from ·00005-mfd., close to panel, but ¼ in. above (14), rises after 2¼ in.



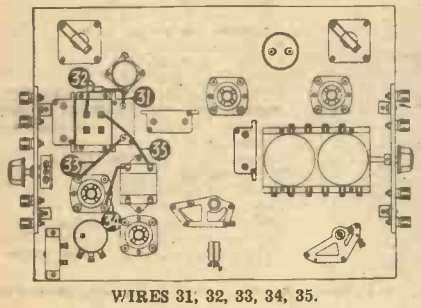
WIRES 16, 17, 18, 19, 20. Wire (17) is ¼ in. above wire (3). Connection (18) is 1 megohm wire-ended resistance. Make certain correct resistance is used.



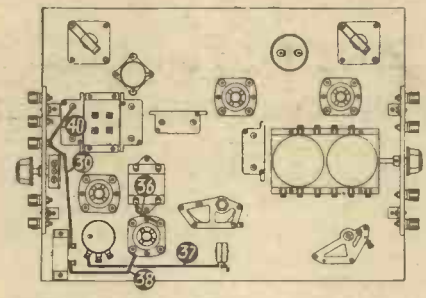
WIRES 21, 22, 23, 24, 25. Wire (22) slopes up from valve holder to clear moving vanes when half-out, then horizontal.



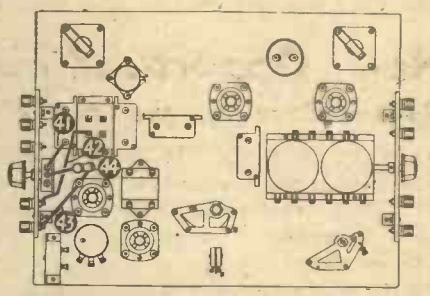
WIRES 26, 27, 28, 29, 30.



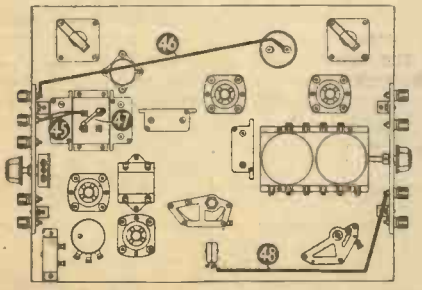
WIRES 31, 32, 33, 34, 35.



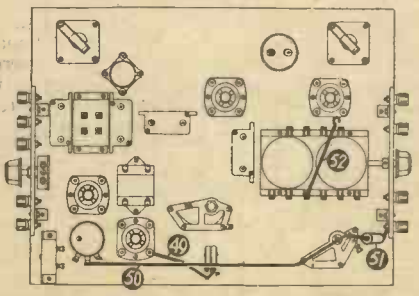
WIRES 36, 37, 38, 39, 40. Wire (39) hugs panel.



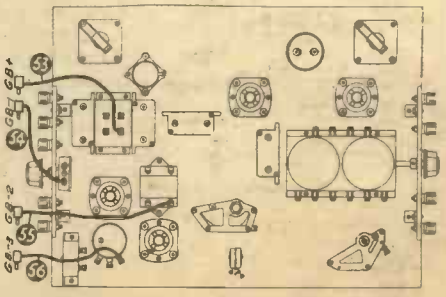
WIRES 41, 42, 43, 44. Wire (43) must be one inch above wire (39). Connection (44) is wire-ended 500,000-ohm resistance; make sure correct resistance is used.



WIRES 45, 46, 47, 48. Connection (45) is wire-ended 30,000 ohms marked orange body, black tip at one end, orange band (which being on orange body does not show up). Wire (46) goes direct between terminals. Connection (47) is wire-ended 20,000 ohms (red body, black tip one end, orange band round its middle). Do not confuse resistances.



WIRES 49, 50, 51, 52. Wire (49) goes straight from toggle switch (terminal farthest from surface of panel) to valve holder. Wire (50) goes straight in mid-air from volume control to end frame of aerial balancer. Wire (52) rises vertically for 4½ in. from terminal 4, then later straight to top of valve.



WIRES 53, 54, 55, 56. Preferably "Maxamp," as flex is frequent source of faults. (53) is 8 in. long, (54) is 10 in., (55) is 8 in., (56) is 10 in.

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Factory Fittings.
Faults and Fault Location.
Gaseous Discharge Tubes.
Gramophones, Electric.
"Grid" System.
Heaters and Heating.
Lighting: Modern Methods and Fittings.
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Motors: Principles, Types and Characteristics.
Resistance in D.C. Circuits.
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P.W. 4-1935.

DEMONSTRATIONS OF S.T.700 IN LONDON, BROOKMANS PARK, BIRMINGHAM, MANCHESTER, GLASGOW

From L. Marsland Gander,
"Daily Telegraph"
Radio Correspondent.

I thought that in 1935 it was impossible
(a) to simplify home construction still more, and
(b) to reduce the cost of construction, however slightly.

I was wrong. Scott-Taggart has done it again. Mounting the parts in one plane is a most ingenious simplification of construction. How he has reduced the cost, and at the same time incorporated new technical features I do not, at the time of writing, know.

Audio-Reaction and the Triple Extractor offer practical advantages, and do not come under the heading of "gadgets." Finally, the Auto-Dial recognises the important principle of easy and precise tuning.

From the Radio Correspondent of The "News Chronicle."

I had tested and examined so many up-to-date and super-efficient receivers that, up to a few days ago, I did not believe it possible for the present season to witness the introduction of any really new and outstanding technical improvements.

Then came your request that I should try the new S.T.700, and the consequent shattering of my previous opinions. Results from a set costing little more than 70/- were so remarkable that I must ask you to convey my heartiest congratulations to the designer.

UNANIMOUS PRAISE

Mr. Scott-Taggart has personally demonstrated his S.T.700 in Central London (just north of Hyde Park), Brookmans Park (one mile from B.B.C. stations), Birmingham, Manchester and Glasgow. Demonstrations have also been given by POPULAR WIRELESS technical staff, at Tallis House, London, E.C.4.

Typical results have been 67 stations in Central London, 52 at Brooksmans Park, 71 at Manchester, 66 at Glasgow, and 75 at Birmingham. Scores of letters will be published. A few appear in this issue.

SPECIAL DIALS COMING

The Dial Card presented free with this issue will be available later in a de luxe version. A white celluloid dial, will' it is hoped, be on sale very shortly. Look out for an announcement in POPULAR WIRELESS.

S.T.700 ON MAINS UNITS

The S.T.700 has been designed with an especial eye to its use with mains units. It works excellently on such "eliminators" and connections will be given next week.

NO BREAK THROUGH

Due to the design of the coils there is no risk of break through on the long waves. This has been most carefully tested in different parts of the country. This applies even without the Triple Extractor which keeps out the "locals" even at one mile from the B.B.C.

Those who do not live in a swamp area do not need the Triple Extractor.

THE TECHNICAL EDITOR OF "POPULAR WIRELESS" SAYS:

There is so much that is entirely original in John Scott-Taggart's great new set that I find it extremely difficult to render an adequate appreciation of it in a few words. But perhaps the S.T.700 can best be summed up by saying that it brings higher performance levels within the reach of even greater numbers of constructors than the tens of thousands who have already experienced the proved superiority of Scott-Taggart designs.

The new Uni-plane method of construction is both a structural simplification and a technical improvement, and in an ingenious manner the advantages of precision single dial calibration have been obtained without using a ganged condenser with its attendant possibilities of trouble.

And if I was surprised at the exceptionally effective way in which the Triple Extractor is able to silence three stations at once without any "pulling" between the adjustments, I was quite staggered by the remarkable results achieved by Audio-Reaction. It increases the volume of a weak station many times, and, moreover, improves the quality.

The S.T.700 is certainly a fine achievement, and each one of the numerous tests conducted with it, many in the presence of "Popular Wireless" readers, seemed to reveal hitherto undiscovered qualities.

In the whole history of this journal there is no set which has aroused a keener interest, and none, we believe, will excel its destined spectacular success.

(Signed) G. V. DOWDING.

LARRY ADLER, the mouth-organ virtuoso, accompanies one of his own records on the table radiogram reviewed below.

No. 3 OF OUR NEW SERIES

THE COSSOR TABLE RADIOGRAM

A high-performance four-valve super-het for A.C. mains.

THE post-war generation is more of a nation of flat-dwellers than any preceding it, and although this present phase in the domestic life of the community may be only a temporary one pending a solution of the housing problem, the fact remains that there has been a very noticeable drift of recent years towards the flat-dwelling idea.

There can be little doubt that these changed conditions have been responsible in no small measure for the modern conceptions of interior decorations and furnishings, and to-day there is a craze, brought about by the smallness of the accommodation available in the average flat, for extreme compactness everywhere.

Now this may appear to be rather a thin argument to advance in favour of a table-model radiogram, but is it, when you really think about it, so very thin?

The listener desiring both record programmes and radio has got to use a radiogram of some sort or other, and where space considerations must enter into it, there can be little doubt that the table type of instrument is the ideal thing. But possibly you are wondering in what way a table model can be considered as a genuine space-saver. It might be argued, for instance, that it has to be stood on something, and that in these circumstances there can be no real saving of space as compared with the orthodox type of instrument.

Housing the Records.

Is it not a fact with an ordinary type of radiogram that the question of record storage is an ever-present problem, and that short of strewing the records over the floor (alas, not an uncommon practice!) the only solution lies in the use of a separate cabinet in which to house them? And might not this separate cabinet well be the ideal thing on which to stand the Cossor Table Radiogram?

When approaching a review of the Cossor Table Radiogram, one is inclined to wonder whether it was, in fact, such thoughts as these that were responsible in the first case for the design. We all know of old that Cossors are nothing if not enterprising. Their policy has never been to follow the beaten track, but always to strike out for something just that little bit different. Not that they ever take shots in the dark.

Whatever they produce is planned; planned to work well, planned to cost less and planned to serve a section of the listening community which is not catered for, or which is catered for but poorly elsewhere. Little wonder that their most recent production, the Model "736" Table Radiogram, is already enjoying such universal popularity. Is not that fact alone a striking exemplification of the wisdom of being original?

Where else is it possible to get an instrument combining the advantages of radio and records—an instrument, moreover, that carries the same guarantee of perfection as all products bearing the name of Cossor—for 16 gns.? And is not this table radiogram just the very thing that so many listeners have been waiting for?

A Compact Instrument.

That Cossors should thus have breached the gap is only what might have been expected of a firm in whose history enterprise has played such a prominent part. They foresaw what so many other firms have apparently overlooked—that with the increasing post-war popularity of flat accommodation, there has arisen a demand for a "pocket-size" but none the less efficient radiogram. A radiogram, in other words, not appreciably bigger than the standard table type of radio instrument, but indistinguishable in performance from its "big brother."

The extent to which they have succeeded in catering for this important section of the listening community was strikingly evident in the tests which we have just concluded of their Model "736." Our unconditional verdict is that the "736" is in every way a first-class instrument, and, having regard to the extraordinarily low price, one of which the makers have every reason to be proud.

The "736" is a four-valve (excluding rectifier) superhet for operation on A.C. mains, and, as one might expect of a set of such recent vintage, it is provided with every worthwhile modern refinement. An ingenious anti-fading circuit takes care of the "wandering foreigners," and ensures genuine programme value on a much larger number of stations, and the incorporation of the renowned Cossor feature of "Thermometer" tuning reduces operating procedure to a minimum.

"Thermometer" tuning—an innovation for which Cossors were responsible—is perhaps one of the most outstanding of all the recent attempts to simplify the reception and identification of distant stations. It consists of two scales—one for medium waves and one for long waves—very similar in general appearance to an ordinary thermometer—in which the "columns of mercury" are actuated by the tuning dial. The station names and wavelengths are the "degrees" on these tuning thermometers, and the great advantage of the scheme is that parallax effects are entirely eliminated, and in consequence there can be no possibility of confusion in the identity of a particular station due to the angle at which the dial is being viewed.

Instantly Replaceable Scales.

Incidentally, Cossors are to be commended for having looked ahead when designing their "Thermometer" tuning scheme. It isn't altogether improbable that further changes may take place one of these days in the wavelengths of certain European stations, and it is reassuring to know that the scales on the Cossor scheme are instantly replaceable.

As will be apparent from the illustration on this page, the controls of the "736" are extraordinarily simple. The large knob in the centre is the one and only tuning control, while below this to the left is the volume control, which is effective both on radio and gramophone. The small knob on the right is a four-way switch with the usual "medium" "long," "gram." and "off" positions.

The gramophone arrangements include a silent induction motor, a 12-inch turntable, a speed regulator, an automatic stop device, and a high-grade pick-up and arm.

Under our conditions of test, which may be taken as being average, the radio performance of the "736" was excellent, and we found it the simplest thing in the world to tune-in dozens of different stations, all of which, thanks to the effectiveness of the anti-fading device incorporated, were really up to programme value.

We were also particularly impressed with the quality of reproduction given by the instrument on both record and radio.

THERMOMETER TUNING

The Model "736" incorporates the Cossor "Thermometer" tuning system.

THE SET IN BRIEF

GENERAL DESCRIPTION.—Four-valve (excluding rectifier) superhet table-model radiogram for operation on A.C. mains (200-250 volts, adjustable, 50-60 cycles).

CIRCUIT ARRANGEMENT.—Pentagrid frequency-changer, H.F. pentode intermediate frequency amplifier, double-diode second detector and power pentode output. An A.V.C. or "anti-fading" circuit is incorporated.

CONTROLS.—Excluding gramophone speed-regulator, the controls are three in number, consisting of one main tuning control, a volume control, which is effective on both radio and records, and a four-position switch giving medium and long waves, gramophone and "off."

SPECIAL FEATURES.—(1) Compactness without sacrifice of efficiency; (2) The Cossor "Thermometer" tuning scheme with calibrations both in station names and wavelengths; (3) Extreme simplicity of control; (4) Noticeably above average quality of reproduction.

MAKERS.—Messrs A. C. Cossor, Ltd., Highbury Grove, London, N.5.

CASH PRICE AND HIRE PURCHASE TERMS.—16 guineas, or 20s. deposit and 18 monthly payments of 20s.

NOTES AND NEWS

(*Continued from page* 191.)

Not Approved.

A LETTER from a reader complaining that his neighbour creeps out and cuts his aerial through with pliers if he works his speaker after eleven p.m., reminds me that radio has had some doughty opponents in its time.

There was the cowboy in El Paso who hated a certain crooner so much that if this chap came on the air within hearing the cowboy emptied two six-shooters straight into the unlucky loudspeaker. (This Texan procedure generally emptied the bar, too—in about 0·25 sec.)

And there was an Arab merchant in Rabat who could not stand sopranos. He used to remove his fez, walk over gravely to the loudspeaker and, quite simply, spit in it. (For East is East, and West is West !)

Probably the funniest of the lot was the Chinaman who went over to an offending set, placed a handful of lighted giant crackers in it, shut the lid, and blew up half the village. ("*No likee. Too much noisee !*")

The Yanks Are Coming.

JUST as I was going to turn in the other night one of the boys arrived on the doorstep, to see if he could borrow a valve. Of course he had to come in "just for two minutes"; and when I had got rid of him (five minutes to one, and I hope he reads this !) I ran round the dials to see what Uncle Sam was doing in the way of transatlantic entertainment.

There were lots of promising carriers, and I feel sure I could have captured an identifiable programme if my luck had been in. But, unfortunately, in speeding the parting guest I had let the door slam like an earthquake, and awakened Arieline. At one a.m. her usual piquancy is accentuated, almost to acidity—so I forsook the U.S.A. and chose peace and quiet !

I had heard enough, though, to convince me that the medium-wave programmes are finding their way right across the Atlantic again this year. Anybody heard *South America* yet ?

Radio Slips and Quips.

AN announcer, describing a baseball match: "Down, and up again. His face is covered with mud from head to foot."

* * *

A lady, describing how Girl Guides should be dressed: "There should be two breast pockets, just below the belt."

* * *

Lecturer on Pioneers of the Empire: "What we could all do with now is more of the old Scotch spirit."

In the history talk to schools by a flustered professor: "And as they crept forward, silent and indomitable, they intimidated the enemy by a blood-curling yell."

* * *

By a regular fellow: "So Mr. Lemon will take the Hour next week, but after that I shall be on every Hour till Christmas."

Out of the Blue.

ONE of the most curious law cases connected with radio that ever vexed the judiciary came before a magistrate in Tangier recently. It concerned a listener who sat in peace one evening, idly attending to a radio drama, while the sunset turned the ocean's blue to gold. On the floor beside him lay his faithful hound, and all was calm and bright, to the *n*th degree.

Unfortunately the action of the radio play demanded that a dog should bark loudly. And no sooner had this sound emanated from the loudspeaker than the listener's Fido—one of the ever faithful, ever sure type—leapt up and flew at the set, chewing it up in the firm belief that some infidel dog had entered unawares.

The listener sued the broadcasting concern to recover damages. And the magistrate decided in his favour, on the ground that no radio station should disturb a

(*Continued on page* 238.)

THIS AMAZING TELEVISION

WITHIN a very few months the first high-definition television service in this country will begin. We have heard a great deal about television during the last five or six years. All sorts of rumours and counter rumours have been circulated, but now the real thing is actually on the way.

And high-definition television is good, too. Make no mistake about that. Clear, steady pictures, bright enough to be viewed in comfort without the room being plunged in darkness, will be broadcast from London early in the New Year.

What are you going to do about it? Are you going to sit back and take no notice? If so, you will soon be left behind in the march of broadcasting progress. Or are you going to keep in touch with the new developments so that you will understand how and why things are done?

A Fascinating Subject to all.

Television is a fascinating subject from every point of view. Whether you are an experimenter, a home constructor, or just a listener to radio, you will be affected by the newcomer to the ether.

Television is the greatest thing that has happened in radio since the beginning of broadcasting itself, and it will take up a most important position in the daily life of all of us. It therefore behoves us to know something about it.

How much do you know about television? We ask in no critical mood, but as a straightforward, if blunt, question. Here is another one. Do you *want* to know anything about it? About the programme side of it with its special fascinating production requirements. About the transmitting side with the new-found ultra-short waves. About the reception side with the magical cathode-ray tube and the amazing patterns the electrons trace on the fluorescent screen as they build up the pictures.

But, you will say, "Television is a new thing. There is no source of information. We would like to have some comprehensive book that will tell in simple language *all* about television. But such a book would inevitably cost far more than we could afford. Those scientific books always do."

Very true. You do need a book. And a good book, too! One that will cover the subject from A to Z in theory and in practice. One that will not skimp the subject but will explain everything.

The Only Book!

But where is such a volume to be found? There is only one book dealing really thoroughly with the vast subject of television that is available *regardless of price.* That book is "The Book of Practical Television," *which has just been published for readers of* POPULAR WIRELESS *only.*

With its 26 chapters, 384 pages (including 63 pages of art plates), and over 300 illustrations, this remarkable book is completely unique, for not only can it not be obtained other than through "P.W.," but there is no other book at any price to take its place.

And it costs a mere three shillings—over ten pages a penny!

The whole subject of television has been covered in a most thorough manner by a band of experts under the editorship of "P.W.'s" Technical Editor. Special research has been undertaken for the purpose of obtaining information for the book, and every aspect of the new science has been dealt with authoritatively.

But, though the book is thorough, it is not "heavy." Nor is it difficult to understand. The intricate mathematics that are inevitably employed in a modern science, especially one including optics and electronics like television, have been boiled down to simple terms, so that there is no reason why anyone should fail to understand any portion of the book.

Television is nearly here. Make sure that you are ready for it by reading "The Book of Practical Television" which is offered to every reader of "P.W." at a most amazingly low price.

You will see exactly how to avail yourself of this astonishing and unique offer on pages 181 to 184, and also a full contents of this outstanding work. Read that contents carefully and see for yourself the terrific scope of the book and the detail with which every branch of the subject has been covered.

IN OUR NEXT ISSUE.

As we go to press with this issue we have received for test from Messrs. Lissen Limited a kit of parts for their popular Bandspread Shortwave Three Receiver.

This kit is at present in the course of assembly in our Research Department, and a detailed test report will appear in the next issue of "P.W."

NOTES AND NEWS

(*Continued from page 236.*)

peaceful home and upset the meditations of a true believer.

5 Metres and 5 X X.

THE site of the old 5 X X station at Daventry now centres the Empire Service, on short waves, but some surprise has been occasioned by talk of work there on only five metres. However, it appears to have been a kind of for-domestic-use-only arrangement, carried out by engineers who were tired of shouting and signalling from one mast to another, or from the ground to 500 ft. up.

As five-metre sets are as self-contained as a hard-boiled egg, somebody suggested that such a set carried on the back would obviate all this "hollering" and "Hi, there, be-low!" business. So now, when Jack goes aloft, he uses ultra-short waves to save lung-power and arm-waving.

Progress at Alexandra Palace.

IT has been disclosed that one of the little troubles that bothered the B.B.C. engineers in connection with the new television station at Alexandra Palace, London, N., was the special aerial required.

The aerial system will consist of two aerials, one for radiating the sound, and the other for the vision programme. Being of the ultra-short-wave type they will not need to be large or long, so it is hoped to mount them on one mast for the two. But this must be done without disfiguring the building's architectural charms.

A solution has now been worked out, and the south-east tower should soon be sprouting accordingly.

A Mixed Blessing.

IF you have been hunting in vain for the Sottens programme on 443·1 metres, dry your tears and try again. For Sottens has been away on business, exchanging his old transmitter for a bigger and better one.

In place of the 25 kilowatts hitherto employed, the new outfit will work on 100 kilowatts.

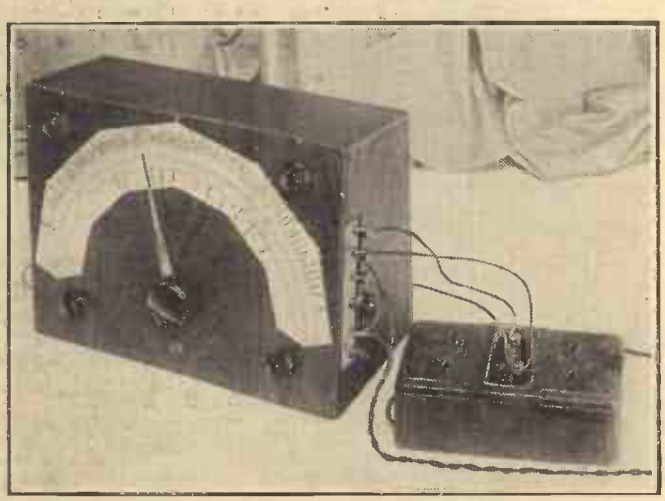
Ordinarily I am all for an increase of power if a good station wants it, but I cannot help wondering whether the stronger Sottens is an unmixed blessing. He occupies the very next wavelength below North Regional, and since Rome, Stockholm, Cologne, Lyons and Prague are all clustered in the vicinity, this is already a warm corner of the medium waveband. I shall be glad to hear from my northern friends how they get on with the newcomer.

Underneath the Arches.

HEAVE a sigh for good old "No. 10," the big B.B.C. studio that was a converted warehouse on the south bank of the Thames, under the arches of Waterloo Bridge. When it was proved that Broadcasting House had no studio big enough for a full orchestra and choir, good old "No. 10" stepped into the breach, and many's the "bit of (acoustic) all right" that we have heard from there.

Now they have converted the skating rink at Maida Vale to B.B.C. studio needs, and large bewhiskered spiders will soon be thinking of the possibility of moving into "No. 10," to do a little quiet spinning.

ARIEL.



The S.T.700 battery model connected up to an Ekco mains unit for H.T.

A THRILLING PLAY

Our broadcasting critic has a few words to say about recent programmes.

I START with the week's drama. What a thrilling story "Bull-Dog Drummond" is! And what nasty people Lakington and Peterson are! Still, they provided the thrills. But how quickly the story was told! Though Gordon McLeod was quite outstanding as Peterson, I didn't think Leslie Perrins had quite the right timbre voice for the title role. Antoinette Cellier as Phyllis Benton was at her best throughout. Kenneth Kove was the dude par excellence. He provided most of the humour.

* * *

The highlight of the broadcast, of course, was Lakington's ghastly end, a victim of his own invention. He is thrown by Drummond into a bath of acid (actually intended for Drummond himself), is dissolved, and drained away through his own bath-plug. What a delicious noise the Effects Department provided here!

* * *

Billy Quest (Travers) did his little bit well, and succeeded in showing what detestable people these crooks were. On the whole I enjoyed the play, which is perhaps surprising, seeing that I had already read the book and seen both the stage and film versions of the story. One couldn't help comparing the three versions. The broadcast compared well with the other two whenever it could be said it was competing with them.

Boisterous Programme.

The Hen-party *chez* Mrs. Vane was more remarkable for its boisterousness than for any scintillating wit. I had misgivings at first lest it should peter out before its time was up. But Marion Dawson worked like a demon to get things going. That she was succeeding was apparent at half-time, for there wasn't a sign of a let or hindrance anywhere. Everything was moving splendidly. It was a very talented selection of girls at this party, representative of almost every section of the variety stage.

* * *

Chrissie Thomas played an unusual instrument. She told us its name—a long one that conveyed nothing. The only clue to its identity was Marion Dawson's moan after the turn "that whereas she had spent all her savings on a piano, she might have got all the music she wanted out of the empties."

Jenny Howard was in good form in a Lancashire dialect song, "At Mary Hellen's Hot-pot Party."

Mabel Constanduros was on the trail of a lost "Belgium 'arc." You can imagine the rest. Her "asides" were very funny.

* * *

Between the turns there was always a babel of applause and noise generally, out of which issued a wealth of reminiscences, scandal, back-chat and repartee. It was a breezy hour, but I was sorry that all the guests sported a common dialect.

A B.B.C. Miracle.

Seeing that Nelson Keys' revues are what they are, it is a great pity that they happen only once a month, that they are never repeated, and that they are given at the late hour of 10 p.m.

There is body in a Nelson Keys production. There are good people doing good stuff. There is little or nothing that is pointless. The little skit on "Night Falls in Budapest" was very clever. It ridiculed the features that just invited ridicule. I was not surprised that "Night Falls in Tooting" was included in the October revue. The sketch "The Age of Miracles" was just as funny and apropos. The miracle that appealed to me most was the announcement from a B.B.C. studio: "We are sorry to have to fade-out the Symphony Concert for the Music Hall that is to follow."

* * *

There was also some delightful fun at the expense of that doctor-baffling prodigy, the thought-reader. "Questa" cut no ice with her audience, thanks to a bungling manager, Nelson Keys. Arthur Marshall was there, too. This time he was "At the Bridge Table." More fun!

Good Dialect Variety.

There was much of a muchness about some of the sound pictures in "Dinner is Served." The result was that the impressions created in some cases were not as vivid as they were intended to be. When good pictures are drawn or created I think we might be given a few more feet of them. Or is the reckoning in seconds in broadcasting? The best feature of this outside broadcast was the number of different dialects we heard.

* * *

As yet, the Saturday Magazine hasn't produced anything to set the listening public talking. I think it is a sign of weakness to have to include an instalment of "In Town To-night" in its pages.

C. B.

BARRY KENT CALLING

News and Views from the "Big House."

The Classics in Jazz.

AT the initiative of the Germans, an international move has been made to put a stop to the practice of taking liberties with classical music. What is aimed at is the adaptation of symphonic works for dance and military band purposes. The B.B.C. is very reluctant to give the pledges sought, and rightly so.

Both Henry Hall and Walton O'Donnell put on some very ingenious and attractive programmes in which selections from the classics are re-scored to suit the vehicle. I, for one, am delighted that the music highbrows have been defeated in this endeavour to put back the clock of entertainment progress.

* * *

Opening Private Letters.

There is a good deal of indignation among the staff at Broadcasting House because of a new order that the private and personal letters of individuals may be opened in the central registry. The ostensible purpose of the order is to increase efficiency, it being the practice for a good many ordinary business letters to an individual to be marked "Personal" or "Private."

The order is encountering such firm and general resistance that I doubt if it will be workable.

* * *

Sunday Programme Possibilities.

The R.M.A. is still pressing for a development of B.B.C. programmes on Sunday. The two reforms now sought are the moving forward of the religious broadcasts in the evening from 8 o'clock to 6 or 6.30, and the provision of an entertainment alternative to religious broadcasting. The former is opposed strongly by the churches, and the latter is contrary to a fundamental of B.B.C. high policy. But the pressure is increasing, and it will be interesting to follow the progress of the struggle.

* * *

Wavelength Changes.

Sir Noel Ashbridge, the Chief Engineer of the B.B.C., has been warning the programme officials that there is no certainty of the permanence of the present wavelength plan. The international situation is becoming more difficult, and Britain may have to accept an arrangement under which the B.B.C. would give up some of the present channels. If this should come about, it means the reorganisation of Regional broadcasting, perhaps its termination.

Meanwhile, Mr. Roger Eckersley, the entertainment chief at B.B.C. headquarters, is working on his favourite plan of filling five waves from London, giving the whole country five metropolitan alternatives, thus largely replacing Regional broadcasting. Although the governors of the B.B.C. have not yet made up their minds about these far-reaching suggestions, the fact that they are under serious review portends big changes in the next few years.

(*Continued on next page.*)

BARRY KENT CALLING

(Continued from previous page.)

No Threatened Strike.

There is no truth in the rumour that the staff of the News Department of the B.B.C. has threatened to go on strike unless its rates of pay and working conditions are improved. But I hear there is dissatisfaction, and that unless the B.B.C. does something to meet the situation, several members of this staff will resign before long.

The grievance is that the B.B.C. does not regard the news staff as specialists, worthy of high rates of pay and exceptional consideration. From what I know of the attitude of the B.B.C. there is not much chance of any exceptional treatment being accorded. The official attitude is that the whole staff are in the same business and must be treated alike.

* * *

Sir John Reith's Future.

Friends of Sir John Reith tell me that he has decided to stay on for another ten years with the B.B.C. He is determined, however, to relinquish his job at the end of 1946.

* * *

More Money.

I understand on the best authority that the Treasury has now withdrawn its opposition to the proposal of the Ullswater Committee to give the B.B.C. an additional million a year for programmes.

* * *

Who Is The Vagabond Lover?

Who is the Vagabond Lover who is appearing before the microphone for the first time on November 14? The B.B.C. is creating an anonymous character whom they have called the "Vagabond Lover." He is an artist who possesses great appeal in his voice and is also a brilliant violinist. The idea of creating an anonymous character grew out of the fact that many letters arrive at the B.B.C. stressing the enjoyment that listeners, especially women, experience from the beauty and appeal of a romantic voice singing love songs old and new.

Out of this knowledge grew the idea of enlisting the services of an artist who possessed great appeal, and by featuring the Vagabond Lover fortnightly a programme will be rendered for those listeners who thoroughly enjoy an atmosphere of romance created by an anonymous artist.

Both the artist and the lyrics will be chosen for their sentimental appeal, and the Vagabond Lover's "hour" will be built up with a romantic background. It is hoped to enlist the services of a feminine artist with voice of great appeal who will help the Vagabond Lover by talking to his unseen audience and introducing his songs. He himself will only be heard singing and playing the violin. Like all the world's true vagabonds, he speaks many languages and sings in most of these.

* * *

Variety From Morecambe.

An excerpt from the Variety bill at the Winter Gardens, Morecambe, will be relayed to Northern listeners on November 6. The bill includes Master James Phelan, the King's Jubilee soloist, Bertini and Clarke (violinists), and Louis Almer (mouth-organist).

THE LINK BETWEEN

By G. T. KELSEY.

THIS issue of "P.W." is the greatest event of the year in the home constructor's calendar. It is the issue that is anxiously awaited by hundreds of thousands of keen constructors all over the country, and it marks the commencement of a period of activity both on the part of manufacturers and constructors that is not equalled on any other single occasion.

Everybody everywhere in the radio world is interested in only one topic of conversation, Mr. Scott-Taggart's set of the century, the "S.T.700." And what a set!

I count myself lucky to be among the privileged people who have already had a demonstration of this magnificent receiver, and I must confess that I have never heard anything even remotely to touch it. In fact, my immediate reactions were similar to those of the country "bumpkin" who, upon seeing for the first time in his life a giraffe, was heard to remark "There b'ain't no sich animal."

I certainly cannot say in this case that "There b'ain't no sich set," but I can say that there never had been such a set until Mr. Scott-Taggart designed the "S.T.700." For a battery set it is streets ahead of anything I have ever heard, and that ingenious dial makes it a delight to handle.

Now from what I know of Mr. Scott-Taggart's previous successes, there will be hardly a reader of "P.W." who does not decide to make the "S.T.700" his set for 1936, and I feel, therefore, that this issue calls for a very special effort on my part to give you as much assistance as I can from the trade angle.

SPECIAL POSTCARD SERVICE.

I have accordingly made arrangements which I think will meet the case, and which I am confident will be of considerable help to all potential constructors.

For the next four weeks it will be possible for any reader to obtain, absolutely free of charge, through the medium of our postcard service fully descriptive literature of any or all of the approved "S.T.700" accessories.

Below you will find a list of the accessories which are covered by this service, and you will notice that against each item is printed a key number. To obtain literature concerning any or all of the items so marked, it is simply necessary to send a postcard to me at John Carpenter House, John Carpenter Street, London, E.C.4, giving the reference numbers of those in which you are interested, together with your name and address.

As the number of applications for literature under this service is likely to be particularly heavy, may I ask you to print your names and addresses in block capitals? Your co-operation in this respect will greatly facilitate matters at this end, and the earlier you apply the better, for all applications will be dealt with in strict rotation.

Here, then, is the list:

VALVES.

Battery Mode!: Cossor 210 VPT met., 700/1; Cossor 210 R.C., 700/2; Mazda L.2 met., 700/3; Hivac P.X.230, 700/4; Hivac V.P.215 met. (alternative to H.F. pentode), 700/5.

Mains Version: Osram V.M.P.4G., 700/6; Marconi V.M.P.4G., 700/7; Osram M.S.P.4, 700/8; Marconi M.S.P.4, 700/9; Mazda A.C.2/Pen., 700/10.

SPEAKERS.

Battery Model: W.B., 700/11; Rola, 700/12; Blue Spot, 700/13; Amplion, 700/14; Wharfedale, 700/15.

Mains Version: W.B. type for S.T. 700 (700/16).

BATTERIES.

H.T.: Drydex, 700/17; G.E.C., 700/18; Aerialite, 700/19; Milnes, 700/20: Lissen, 700/21: Fuller, 700/22.

G.B.: Drydex, 700/23; Lissen, 700/24.

L.T.: Exide, 700/25; Lissen, 700/26: Fuller, 700/27.

AERIAL AND EARTH EQUIPMENT.

Aerialite, 700/27; Electron, 700/28: Graham Farish, 700/29.

MAINS UNITS.

Ekco, 700/30; Atlas, 700/31.

VALUABLE
FREE GIFT
NEXT WEEK.

TRIPLE EXTRACTOR ANNIHILATES B.B.C.

(*Continued from page 210.*)

country where the main set is quite capable of tackling any interference the B.B.C. is likely to give. It is up to you to decide whether you need the Triple Extractor or not. Possibly a great many constructors will first build the main set, and then subsequently the Triple Extractor Unit, if they find it necessary. It would obviously be unfair to burden those who do not need to cut out the B.B.C. with the extra cost of apparatus which is not essential.

Finally, bear in mind the extraordinary demonstrations I have given recently at Brookmans Park, over 50 stations being received with the B.B.C. working with both stations "at full steam." Read the letters!

POPULAR WIRELESS "DATAGRAMS"

One of the gifts inserted in this triple-gift number of "P.W." is POPULAR WIRELESS "Datagram" No. 1. As the number obviously indicates, this is but the first of several of these "Datagrams."

There are six in all, and the remaining five are to be given away with consecutive numbers of POPULAR WIRELESS. No. 2 will be found inserted next week.

All aspects of radio, including listening, practical work, and so on, will be covered, and no efforts have been spared to make the information given intensely practical. All the data is presented in a manner which is simple to follow and yet very compact in presentation.

When you have collected these six "Datagrams," you will have a most valuable collection of radio facts and figures, classified in such a way that instant reference to any particular item is possible.

You will note that the printing matter is slightly to one side to enable the complete set of "Datagrams" to be bound together. A binding, consisting of a cardboard cover, simply fixed in place with a paper-punch or even with small nuts and bolts, string or wire, can easily be devised.

You will then have handy the most compact and useful collection of data ever made available to the radio enthusiast. Make sure of obtaining a complete set of these concise and up-to-date charts by placing a regular order for POPULAR WIRELESS

AUDIO-REACTION!

(*Continued from page* 213.)

this section article. It will be seen that from a point on the anode circuit of the last valve a fixed condenser of ·006-mfd. capacity is connected in series with a one-half megohm potentiometer, the lower end of which is connected to a point on the grid-bias battery. The sliding contact on this potentiometer is connected through a half-megohm resistor in the grid circuit of what is usually called the first low-frequency valve. The earlier portion of the receiver is capable of exercising a profound effect on the Audio-Reaction, particularly when a mains unit is employed as a source of high tension. But as this previous part of the circuit is more a matter of design it is omitted from the explanatory figure. The low-frequency current, which is actually very small, passing through the fixed condenser and potentiometer sets up alternating electro-motive forces at a point on the sliding contact.

Building Up Signal Strength.

These electric-motive forces are communicated to the grid of the first L.F. valve, which amplifies them and passes them on through the inter-valve low-frequency transformer to the grid of the output valve. A chain of reaction is thus produced.

The movement of the slider is a control effected by the knob on the right-hand side of the S.T.700. If this knob is turned fully anti-clockwise, the slider is down at the bottom of the potentiometer resistance, and no Audio-Reaction is obtained. As however, the knob is turned slowly clockwise, the slider moves "up" the potentiometer resistance, gradually increasing the Audio-Reaction, thus building up signal strength and developing the lower half of the musical register.

Extreme Stability.

Any degree of low-frequency reaction can be applied just as in the case of ordinary high-frequency reaction, and if too much Audio-Reaction is applied the set will oscillate at a low frequency, producing an audible note. Obviously one works below this particular point. **One can go in and out of oscillation perfectly smoothly, as there is no hysteresis or ploppiness. Even on the verge of oscillation extreme stability is a most noteworthy feature, and an additional attraction is that no alteration of the main receiver controls alters the amount of the Audio-Reaction or kicks the set into low-frequency oscillation.** The audio-frequency reaction system is therefore completely self-contained and independent, and is as reliable and independent as a low-frequency tone control. Whereas, however, ordinary tone controls increase apparent bass by cutting off the higher register, Audio-Reaction leaves the higher notes at least at their former strength, and creates greater signal strength on the lower notes; the effect is therefore a constructive and not a destructive one.

As I said at the beginning, I expect a storm of controversy. **Meanwhile, I hope you will be one of the thousands who will be able to demonstrate in practice what I conceived in theory and carried out to what I am confident you will—after trial—consider a triumphant conclusion.**

Read the opinions of those who have actually heard Audio-Reaction at work.

INSTALLING THE S.T.700

(Continued from page 214.)

position. Always turn knob to normal when beginning. Audio reaction is increasingly obtained as you turn the knob *very* slowly clockwise. Do not test out on strong signals; try it out on weak or medium signals. The first tests may be on, say, the local station "turned down" in strength by aerial coupler and volume control. The most striking effect is often obtained on speech signals, which may be increased about sixteen times, and quality vastly improved, the bass "coming up" with startlingly life-like effect.

Increasing audio reaction too much will cause a steady growling noise. This is equivalent to "oscillation" when ordinary reaction is "turned up" too much. You should at once reduce the audio reaction. The nearer you get to the growl without the growl starting, the greater the signal increase. (This applies to ordinary reaction as well, of course.) The control is smooth and stable, but only a small movement of the knob will produce a considerable increase in the audio reaction.

It is a little difficult to demonstrate the great signal increase without a switch which suddenly cuts off the audio reaction. This is because you increase the signal strength gradually on the set, and forget the original strength. But to demonstrate to yourself or others, adjust audio reaction to the best point, listen carefully and then suddenly, and as quickly as you can, turn audio reaction knob to zero (fully to left). Signals will drop in strength. If you were to cut off the audio reaction with a switch, you would get an even more striking demonstration of the great merits of audio reaction: I thought of putting such a switch in the set, but did not feel the expense was justified merely for demonstration purposes.

How to Calibrate the S.T.700. As the aerial balancer is not calibrated in any way, "Old Stagers" may feel this strange at first. But this feeling rapidly goes as you put "dots" on the dot-line of the dial and thus calibrate the main tuning. To calibrate, the incoming signal should be on the weak side, and you make it weak by reducing aerial coupler (turn to left); the volume control is also turned down and critical anode reaction applied. Under these conditions you can tune to a hair's-breadth. Tune-in to one of your local stations (preferably the Regional) which is easily recognised, having greatly reduced its strength. Note if long pointer comes opposite the station's name on the dial. If pointer points to the left of the station's name, measure on a loose strip of paper the amount it is out along the outer "dot-line." Now turn main tuning knob fully to right, slightly loosen its grub-screw just sufficiently to permit the knob to be turned slightly beyond its usual travel.

Turn knob until the pointer drops below the horizontal by the amount you have marked on the strip of paper. The knob should preferably be sufficiently tight on the spindle to enable you to tune in the ordinary way. Now go back to the correct tuning-point of station. It should now be opposite the station name. If pointer is still a little to the left of station name, repeat correcting process until you get it right.

If in the first place (or after the above correcting) the pointer points to the right of the station's name, you should note the error and turn the knob to the left and readjust pointer below its normal horizontal line.

By over-turning the knob to left or right you will be able to position the pointer where desired. Then tighten grub-screw.

Tune-in to original station, and, with pencil slightly inclined outwards, mark a pencil-dot lightly underneath the pointer exactly where it crosses the outer dot-line. Join this dot with a light pencil-line to the triangle at the end of your station's name. You can now always go back to this station, but do not forget to turn the aerial balancer. It is very easy to forget to do this.

To go back to your local you set the long pointer to cross the dot connected to the station name. You then turn the aerial balancer knob (there is no need even to look at it) until you hear your desired station.

Now do the same with your other local; the pointer may not come opposite, but this does not matter at all, as you join the dot to the station name with a pencil line. Repeat process on other main stations. You will soon have the dial fully calibrated.

But do please remember that your set will not give its profusion of stations unless you "balance" the aerial balancer to match up with the main tuning knob, i.e., unless you tune it. The process becomes very rapidly easier as you complete the dial.

How to Adjust the Triple Extractor. Connect Triple Extractor Unit between aerial lead and aerial terminal of set. Aerial lead goes to A1 on Triple

(Continued on next page.)

INSTALLING THE S.T.700

(*Continued from previous page.*)

Extractor, while A2 on Triple Extractor is joined by a wire to aerial terminal on set.

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

(b) Tune the S.T.700 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 volume control if necessary. Now slowly alter that knob on the Triple Extractor which is nearest terminal A1, until the local National is cut out. On either side of the silent point the National will become louder.

(c) Tune S.T.700 to receive your other medium wave local—the Regional. Signals should be loud but not be allowed to overload set. Reduce volume control and aerial coupler if necessary. Now slowly turn that knob on the Triple Extractor nearest to terminal A2 until Regional disappears.

(d) Switch S.T.700 to long wave-band and tune-in Droitwich in the ordinary way, not permitting it to overload the set. Reduce volume if necessary. Now slowly turn middle knob on Triple Extractor until Droitwich disappears.

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

(f) Never let the Triple Extractor knobs be "just anywhere." They may be extracting the very station you are looking for. Midland Regional listeners may set both outside Extractor knobs 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.

THE RAPID CONSTRUCTION GUIDE

(*Continued from page 224.*)

TRIPLE EXTRACTOR RAPID CONSTRUCTION GUIDE AND WIRING CHECK.

nails in position marked on Fig. 9). Lay panel on box frame and hammer in the nails. Sandpaper any rough edges and, if desired, stain. (I used Jackson's—of Mitcham, Surrey—oil varnish stain, walnut shade, a size 6 tin being more than enough for both set and Triple Extractor.)

(D) Using two ¾ in. No. 6B.A. countersunk head brass screws and nuts, fix the Triple Extractor coil assembly inside the box the right way round. Fit terminals A1 and A2. Fit the three Polar ·0005-mfd. condensers. Write with a pencil the markings C1, C2 and C3 on the ends (not vanes) of condensers in order shown on blue print. This will enable you to identify each condenser.

(E) Preferably using "Maxamp" wire in the manner described in S.T.700 Rapid Construction Guide, wire-up as follows: (Do not confuse coil numbers with wire numbers; wire numbers are in circles.)

A HANDSOME CABINET

This is a photograph of the battery S.T.700 in one of the special cabinets suggested for it by Peto-Scott. Slots at side of panel allow easy access to the wave-change and audio-reaction controls and room is provided for speaker.

(*Continued on next page.*)

THE RAPID CONSTRUCTION GUIDE

(Continued from previous page.)

Tick off wire numbers in list as connections are completed.

Wire (1). C3 fixed vanes terminal at side *joins* coil terminal 3.
Wire (2). C2 fixed vanes terminal at side *joins* coil terminal 2.
Wire (3). C1 fixed vanes terminal at side *joins* coil terminal 1.
Wire (4). A2 terminal *joins* coil terminal 1.
Wire (5). A1 terminal *joins* coil terminal 4.
Wire (6). Coil terminal 4 *joins* C3 moving vanes terminal on top.
Wire (7). Coil terminal 3 *joins* C2 moving vanes terminal on top.
Wire (8). Coil terminal 2 *joins* C1 moving vanes terminal on top.

(F) Check wiring by asking a friend to read out the above wiring instructions while you look at Triple Extractor. In case of error, correct at once.

(G) Fit knobs of condensers.

THIS COMPLETES TRIPLE EXTRACTOR.

J. S.-T.

S.T. 700.
THE POWER SUPPLY.

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

BEFORE YOU BUILD THE S.T.700

A Warning By J. S.-T.

I WANT to warn you! It's about components and valves; insist on getting those I used or recommend in my signed list. Every statement you hear or read should be verified by looking at my official list.

You obviously cannot do better than build an exact duplicate of my own set. That is clearly the safest method. It will also enable you to get the full benefits from the Rapid Construction Guides. If your dealer will not supply the components, order direct from the manufacturers or reliable kit people.

Check Your Choice.

I ask you to check your proposed choice against my own list of components in this article and to trust to my judgment. Remember that every S.T.700 kit does not necessarily include even the alternative components in my list; there is a real danger here, and the responsibility for substitution becomes the supplier's and not mine.

The valves specified are those I found the best for this particular set.

Speakers should be chosen by ear. All the makers produce good models, and I cannot single one out to recommend; the order in my list means nothing. Hear your speaker first.

Don't upset my design. You don't know why I have done this and not that. I do. Only the Colvern coil unit and specified J.B. condenser can be used with the Auto-Dial. Only a Niclet transformer is advised.

Don't ruin the set to save twopence. Keep to my list of components. If you don't, and your set's a failure, it's your own funeral. You've been warned. J. S.-T.

TECHNICAL JOTTINGS

Items of Interest to Every Enthusiast.

By Dr. J. H. T. ROBERTS, F.Inst.P.

Keeping Down Distortion.

DISTORTION may occur at a number of different parts of a receiving circuit, and this point is important to remember when considering the question of volume control. If there is a "weak spot" in the circuit, that is to say, a spot where distortion is more liable to occur, it is obviously to your advantage to keep the strength as low as possible at that point rather than to let full strength pass through the weak point and then cut it down afterwards. This means that it is better to place the control at some point *before* the weak spot rather than *after* it. In this way the load which is thrown on the place where distortion is liable to occur is reduced and the distortion itself is correspondingly reduced.

Multi-Mu Valve

The multi-mu valve is, of course, a screen-grid valve of special design, and with this you can adjust matters so as to avoid overloading and therefore avoid valve distortion. The output from the valve can also be adjusted so as to keep it within the capacity of the detector to handle. The magnification afforded by the multi-mu valve depends upon the grid bias and so this gives a means of varying the magnification. It is important that the bias on the screen-grid multi-mu valve shall be so adjusted that the valve does not over-magnify and so overload the detector. In the same way the valve which immediately follows the detector must be capable of handling whatever comes to it from the detector without causing distortion. In fact, in a properly designed circuit every stage is able to handle what it receives from the preceding stage and, as this increases, so the capacity of the stages must increase accordingly.

Volume Control by Multi-Mu.

As regards the volume control by means of the adjustment of the grid bias on the multi-mu valve, this has the advantage that it does not interfere with the tuning. If you get your volume control by some kind of detuning with an ordinary set, especially

(*Continued on next page.*)

NEXT WEEK

Full Constructional Details of the

A.C. S.T. 700

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TECHNICAL JOTTINGS

(Continued from previous page.)

if the set is particularly sensitive, you run into trouble, first of all by distortion and then by bringing in stations on adjacent wavelengths. But with the multi-mu grid-bias scheme you don't have this trouble.

Adjusting a Moving Coil.

Sometimes with a moving-coil speaker you will get a grating or jarring effect as though the coil is grating against the poles. As you know, the clearance between the coil and the poles is extremely small, or should be in a well-designed instrument, and so it does not take much out-of-adjustment to cause the trouble. But as a rule it is not the coil which has gone out of adjustment, but some grit or minute iron filings which have got into the space between the two. Obviously any such foreign matter there will cause the same effect as if the coil were actually touching the poles.

If you have this kind of trouble, much the best thing to do is to dismantle the diaphragm with its attached coil and see that everything is thoroughly cleared out. Make a very careful examination for minute iron filings, because these adhere so tenaciously to the pole pieces that you cannot easily remove them with a brush or even with the fingers. They have a way of staying there even after you have made, as you think, a clean sweep. Ordinary non-magnetic particles will be quite easily removed.

Cleaning and Reassembling.

After you have made certain that there is nothing of the kind left, then reassemble, taking great care that the coil is properly centred. This is fairly simple as a rule, and there should be no trouble in centring the coil by means of the screws which secure it. The arrangements differ in different makes of moving-coil loudspeakers so that I cannot give you precise directions, but it should be quite simple. One very good dodge is to insert small strips of wood or cardboard between the coil and the poles so as to keep the coil central until you have got everything fairly well secure, the strips being then pulled out before the final tightening up. You will have to find out what thickness of strip is necessary, but something about twice the thickness of a visiting card is generally right.

Once you have got everything cleaned and put back symmetrically, you will be very well satisfied with the trouble you have spent in overhauling the instrument.

Transformer Ratio.

It is curious how much importance people attach to L.F. transformer ratios. Often enough the transformer ratio is not nearly so important as people think. For example, the results which you get with a 1 to 3 transformer will as a rule not be appreciably different from those with a 1 to 4 or even as far as a 1 to 5. When the ratio becomes comparatively high, naturally these transformers are not interchangeable with those of the lower ratios.

Overall Magnification.

Speaking generally, a low-ratio transformer of, say 1 to 3·5 can be used in most positions in a circuit.

(Continued on next page.)

TECHNICAL JOTTINGS

(Continued from previous page.)

I would like to add a word of warning, more particularly intended for newcomers to radio, who are sometimes apt to think that the higher the transformer ratio the greater the overall magnification.

This does not follow at all, and you have to consider the question of the impedance of the valve with which the transformer is to be used.

Summing up, the relationship of the transformer and the valve is really far more important than the mere transformer ratio itself, and there are plenty of cases where a high-ratio transformer is not so suitable as a low-ratio one.

Class B Transformers.

With Class B amplification the quality of reproduction depends very largely on the special input transformer with the last stage. There is grid current in the secondary of this transformer and it is essential that the resistance of the secondary of the transformer should be as low as possible so as to avoid distortion. The transformer carries current in both primary and secondary windings and it needs careful and specialised design. Some people make the mistake of trying to use any old transformer for this purpose, but it is quite impossible to get really first-class results unless the transformer is suitable.

Fortunately, excellent transformers are available on the market for the purpose, at very moderate prices, and so there is no reason why you should not get a large volume of undistorted output if you use proper components.

Mains Receivers.

People who have electric-light supply will naturally go in for an all-electric set, since this is so much more convenient. When all-electric sets first began to be popular the proud possessors of such sets were apt to look down upon those who hadn't any electric-light supply and who had to be content with battery sets. This disparity which existed at first was soon got over, however, when Class B amplification came into vogue. The coming of this new amplification arrangement gave a great fillip to battery sets, not only in regard to the greatly enhanced volume obtainable from such sets, but also in reducing the running costs. Now that the battery set has been brought up to the same sort of level of performance as the mains set, it is the turn of the battery-set owners to crow, because they say that the battery set gives an absolutely *silent background*, more silent than is ever obtainable with a mains set. This, of course, is a matter of opinion. I know there are a good many mains sets that are far from being silent, but the best types of up-to-date all-electric receivers can be made to have so little background noise that there is not very much to choose between them and battery sets.

Running Costs.

The owners of battery sets also say that, whereas at one time the battery set was more expensive to run, now, owing to the very small H.T. current under the new conditions, the running costs of the battery set are negligible. There is, of course, the further advantage that the battery set can be made completely portable, which cannot be strictly true of the all-electric set.

All this is very comforting to those who are obliged to use a battery-operated receiver because they have no electric light,

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WEEDON'S Radio Repair Services, 262, Romford Road, Forest Gate, London, E.7. Maryland 1782.

S.T.700. We stock Peto-Scott S.T.700 first specified sealed kits, and will take your own set in part exchange. Prompt delivery. Below—
AN EXTRA GOOD ALLOWANCE made on your old set or parts in part exchange for any new receiver for cash or easy terms. We take your goods as deposit. Peto-Scott kits and components supplied for cash only, or part exchange. Highest allowances; prompt attention.—R. Wigfield, Wireless Agent, Furlong Road, Goldthorpe, Yorks.

FREE SERVICE guarantee on all kits supplied by us. Short-wave converter-adaptor kit for 30/-. Receivers constructed, repaired, modernised, 2/6 per valve. Diagrams supplied to invididual requirements: theoretical, 2/6, wiring 1/9 per valve. Send stamp for details of our comprehensive home-constructors' service. Radio S... Shepherds Bush Road, Hammer...

(*Continued on pag...*

MISCELLANEOUS

(*Continued from page 251.*)

SITUATIONS VACANT

RECEIVERS FOR SALE

TECHNICAL JOTTINGS

(*Continued from page 250.*)

but I suppose the fact remains that anyone who has the electric supply will be very tempted to go in for an all-electric set.

We are sometimes apt to overlook the fact that more than fifty per cent of the homes in this country are still without electric light.

Modulated Hum.

We all know *mains hum,* and most of us who use all-electric sets suffer from it quite a lot. There is another kind of hum, however, sometimes called "modulated hum" or "tunable hum." This often causes a good deal of trouble and people are apt to mistake it for ordinary mains hum. Perhaps a simple description of tunable hum which will enable you to recognise it is this: you will tune in a powerful local station and on that station you get a very loud hum, whereas over all the rest of the dial the set will behave itself perfectly well. I dare say you have experienced this, and it is quite a fair example of what may be called tunable hum.

Buffer Condenser.

Fortunately, it can be cured comparatively simply by means of a pair of condensers, say 0·1 microfarad each, these being connected together in series, with the centre-point to earth, whilst the two remaining terminals are connected to the anodes of the rectifying valve. This arrangement is sometimes called a "buffer condenser," and you can get twin condensers especially made up into a single unit for the purpose; these units have three terminals, the centre one being for earth connection and the other two for the rectifier anodes as mentioned.

INDEX TO ADVERTISERS

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S.S. S.G. S.L.

EKCO Power Unit Model AC10/20

Specified for the S.T. 700

Only the best is good enough for Mr. John Scott-Taggart. That is why he specifies Ekco Power Supply Unit Model AC 10/20 for use with his latest triumph, the 'S.T. 700'.

Model AC 10/20 will operate *any* 'S.T.' set or other battery set (without alteration to valves or wiring) from A.C. mains at negligible cost. Ekco Units are supreme in performance, reliability and all-round value.

Your S.T.700 *must* have an Ekco Unit!

To E. K. CO. E. Ltd. (Dept. A 2), Ekco Works, Southend-on Sea.

Please send me full details of Ekco Power Supply Units.

Name .....

Address .....

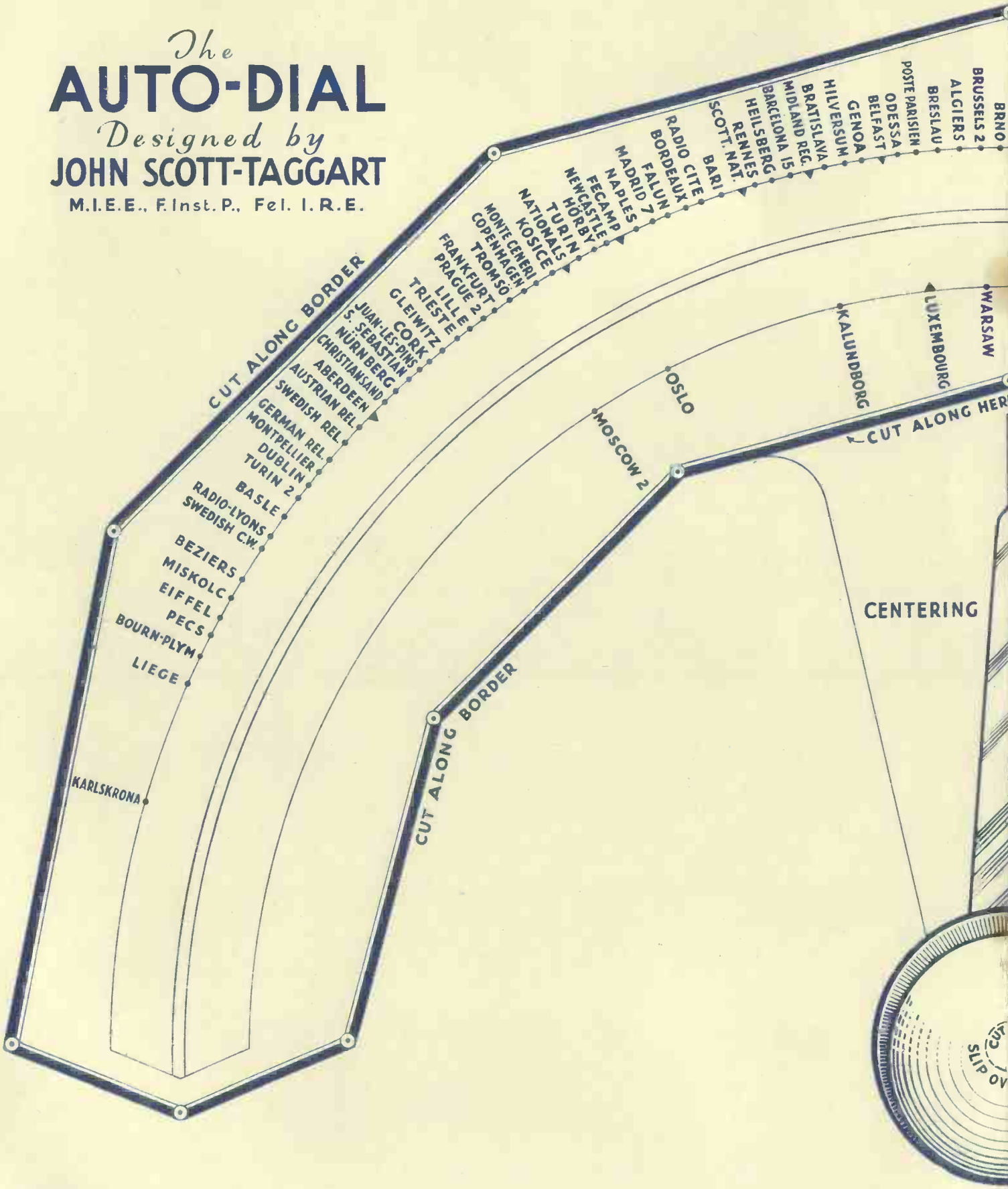
EKCO

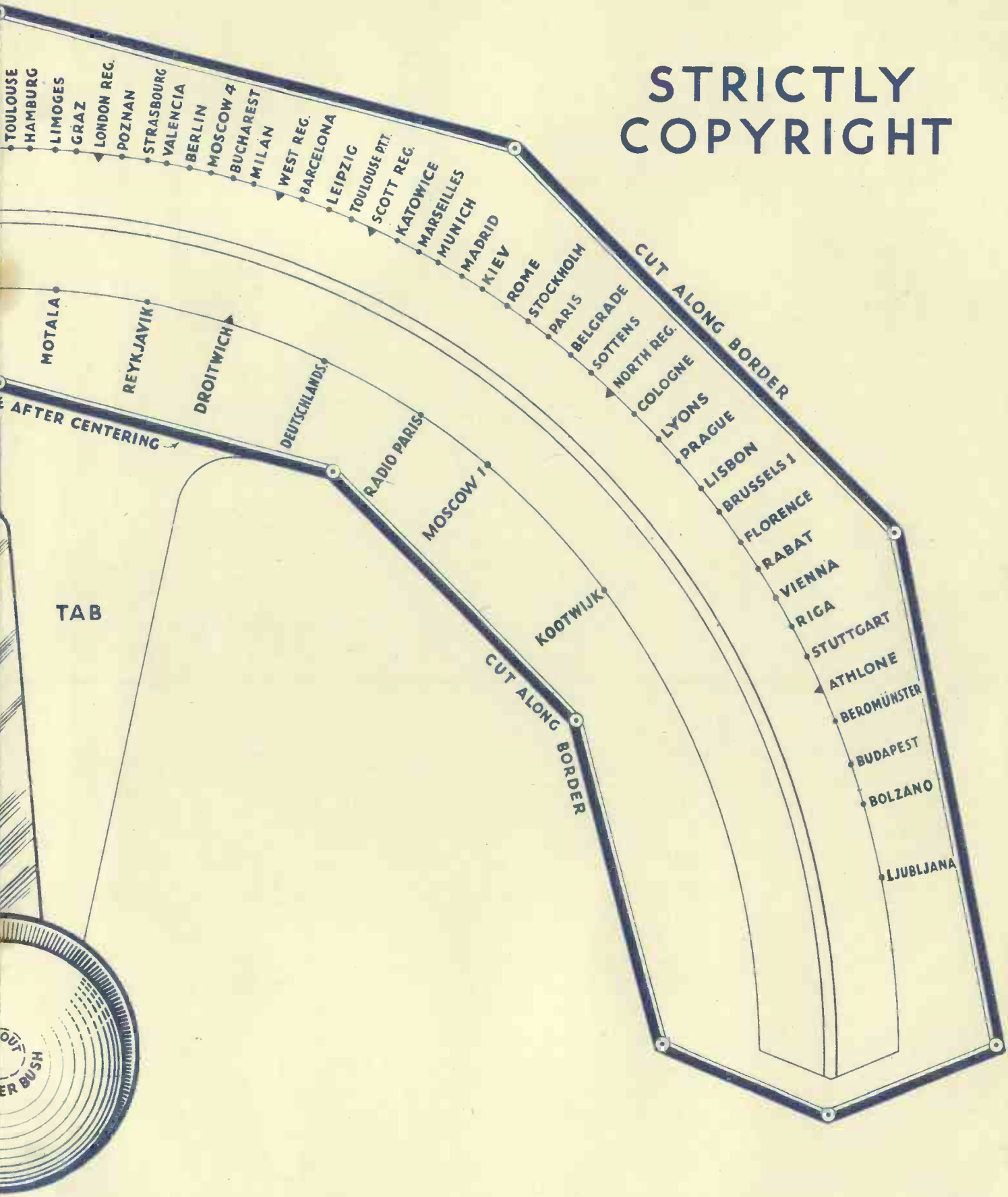
POWER SUPPLY UNITS

The AUTO-DIAL

Designed by JOHN SCOTT-TAGGART

M.I.E.E., F.Inst.P., Fel. I.R.E.



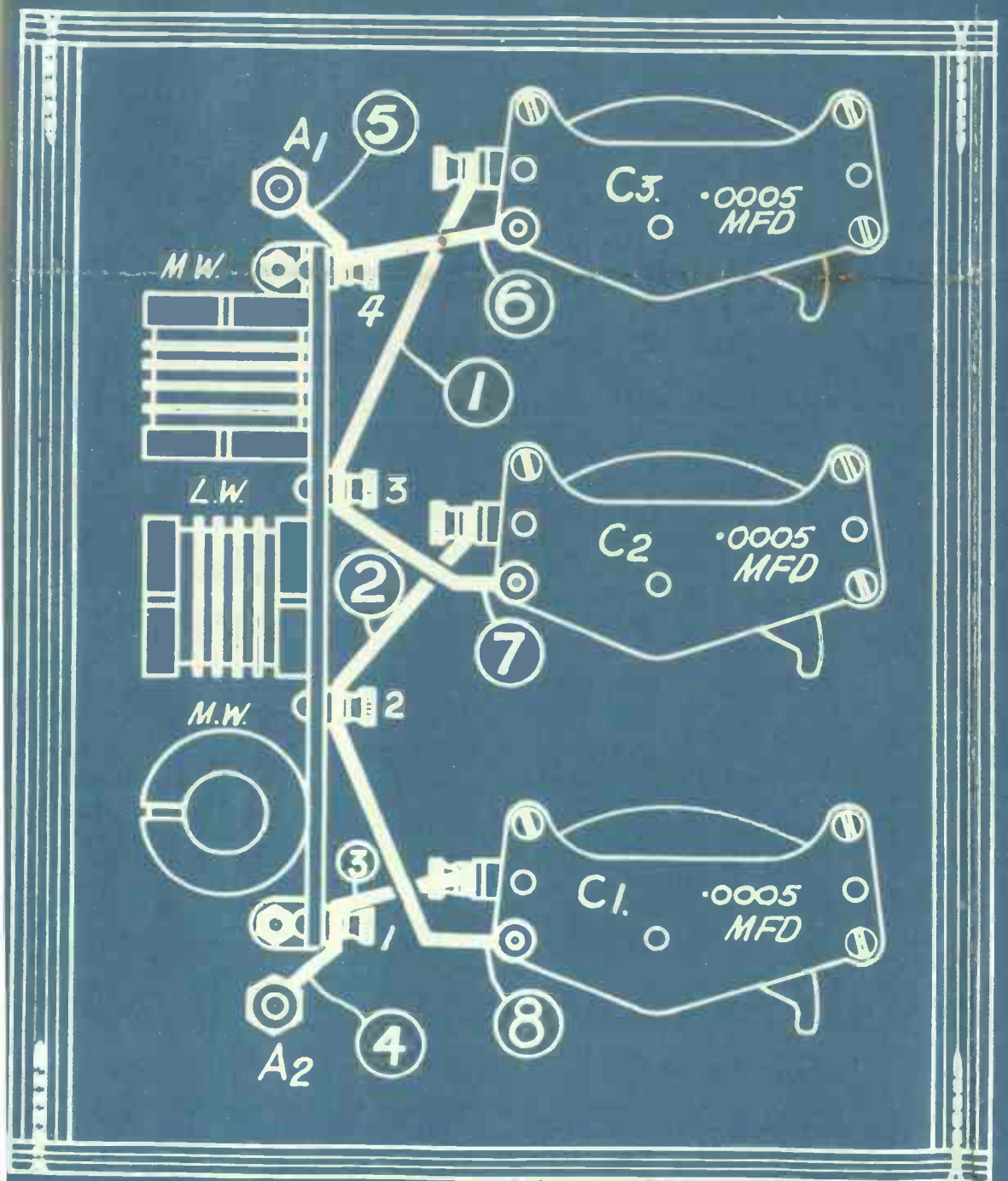


1/- FULL SIZE BLUEPRINT

S.T.700

DESIGNED BY JOHN SCOTT-TAGGART

POPULAR WIRELESS, November 2nd, 1935



TRIPLE EXTRACTOR UNIT
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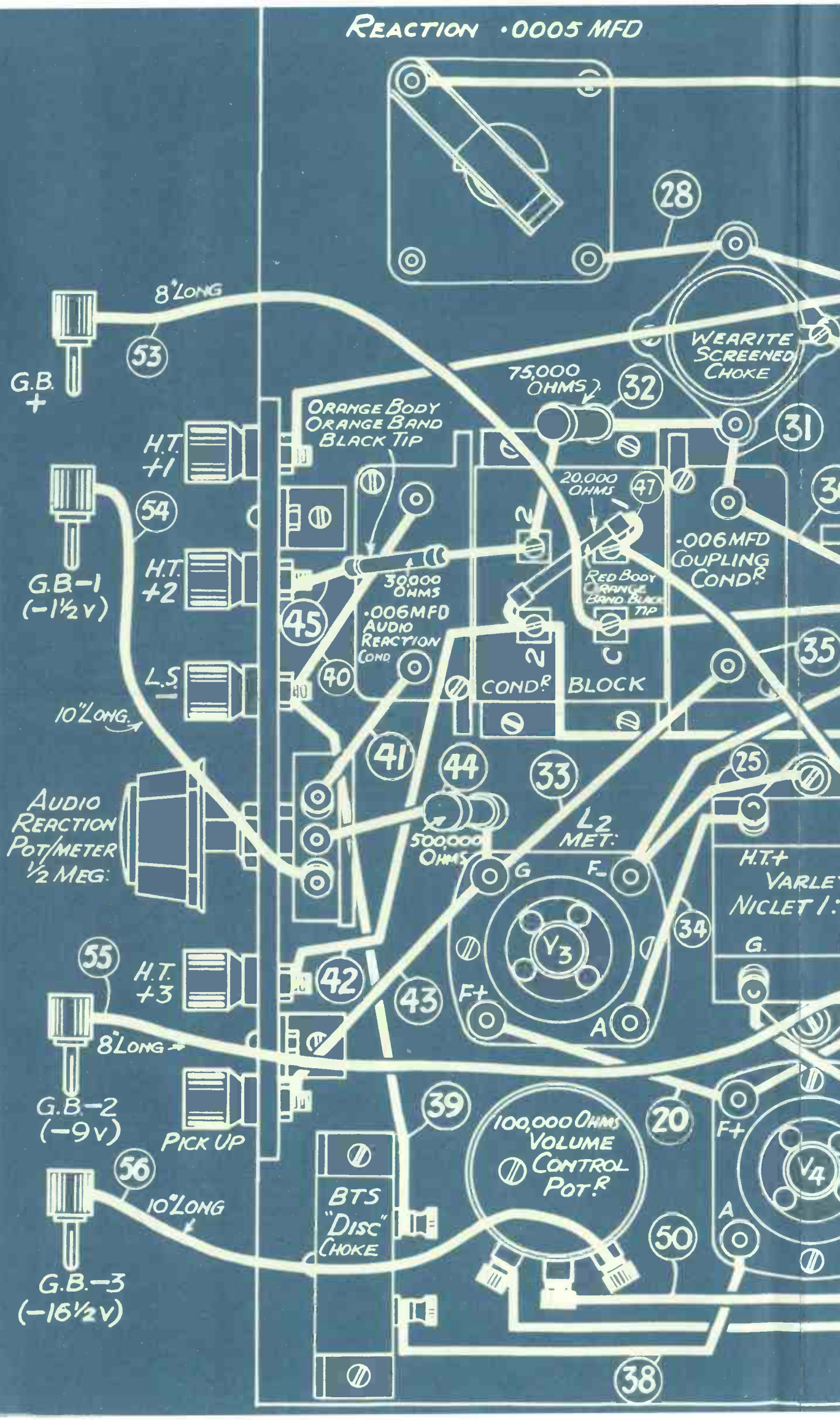

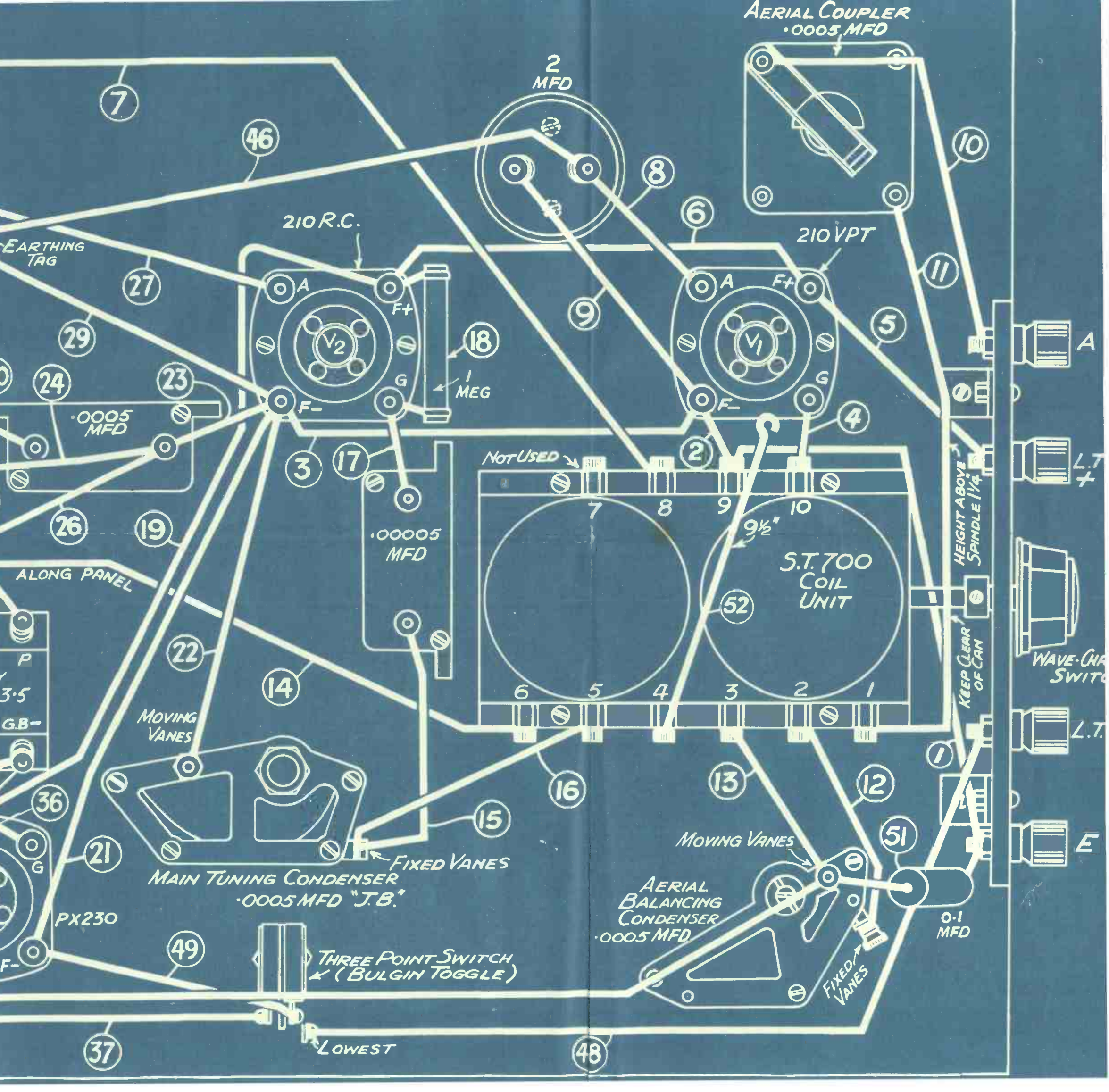
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(BULGIN TOGGLE)
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POPULAR WIRELESS, November 9th, 1935. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE S.T.700—A COLOSSAL SUCCESS

Popular Wireless & Television Times

VETERANS OF THE MICROPHONE

★ ★ ★

OUR BROADCAST BANDS

EVERY WEDNESDAY PRICE 3D

No. 701. Vol. XXVIII. Nov. 9th, 1935.

THIS WEEK

JOHN SCOTT-TAGGART

DESCRIBES THE

A.C. S.T.700

AND GIVES FURTHER DETAILS OF THE AMAZING DEVELOPMENTS INCLUDED IN HIS GREAT NEW SET. REPORTS FROM READERS ALL OVER THE COUNTRY PROVIDE PROOF OF ITS UNPRECEDENTED PERFORMANCE UNDER ALL CONDITIONS.

Another Free Gift for Readers this Week

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING, Associate I.E.E.

THE S.T.700
TEN METRES
A GREAT BOOK

RADIO NOTES & NEWS

WHY NOT JOIN ?
"RADIO NATIONS"
HUMAN WIRELESS

The World-Beater.

YOU have now had seven days in which to think over the S.T.700, which was laid before you in our last issue. And you have another long instalment this week to read and rejoice in. I can leave it to you—as the best judges of what you want—to appreciate the technical achievement, but may I draw your attention to one easily overlooked aspect of this latest design ? I refer to its journalistic significance.

If all the world's set-builders could, at this moment, be asked which set they were building this year, by far the greatest group would say "S.T.700."

As Britons we can all be proud of this. As a "P.W." reader you have every right to be cocky about it. And as a journalist I admit to a profound professional gratification that the world's greatest set-building group are the readers of "P.W."

Progress at Burghead.

DID you know that shells had roofs on ? Not *all* shells, perhaps, but the shell of the new B.B.C. station building at Burghead has its roof on now, and they tell me it looks awfu' bonnie.

With the roof in place the work on installation and wiring can go forward, and it is hoped that the station will be ready for test transmissions early in the New Year.

The single vertical mast is sprouting in fine style, too, and is now four hundred feet high. The final height is to be about five hundred feet, so four-fifths of the job has been done before Old Man Winter comes in to bat.

What About It?

SUPERIOR know-alls, who haw-hawed when I reported some years ago that a range of 200 miles had been obtained in "P.W." experiments on less than 10 metres, have now got something more to think about. They said 200 miles was *impossible* because it was beyond visual range. But it's no good saying impossible to a real radio man, as the following exploit—by Mr. E. J. Laker, of Cranleigh, Surrey—shows. Read on, Macduff . . .

Ultra-shorts to Australia.

IN the early hours of Sunday, October 13th, Mr. Laker was listening-in, when he heard an "Aussie" Morsing away happily on about 10 metres. Consigning to perdition all theory, Mr. Laker answered Australia, and listened again.

There was a pause—while the amazed Aussie pulled himself together !—and then (Oh, boy, what a thrill !) the Australian transmitter came back with an unmistakable answer. And that's how Lil' Old England and Big Old Australia got acquainted on the 10-metre waveband !

The high-brow theorists would certainly have said that such a performance was a non-repeatable freak, had they been given the chance. But now—enter Miss Nellie Corry, of Walton-on-the-Hill, another 10-metre enthusiast. She, too, listened for Australia, and heard a veritable Queenslander disporting himself in the small hours. Miss Corry, scorning chaperons, hailed the bonny boy, who came back with a Morse Coo-eeeeeee that was vibrant with delight at the chance meeting like that !

Then she calmly called up—and worked —four more continents !

No. 2 of our special series of "Datagram" cards is given FREE with this issue.

HARRY ROY SEES HIS VOICE

Harry Roy, the popular dance-band conductor, tries the effect of his voice on the Cossor cathode-ray oscillograph. With him is Mrs. Harry Roy.

Please to Remember.

IN a letter from Lanarkshire, J. P. reminds me of the hard lot of some of the boys up his way, who are keen followers of W. L. S. *on paper*, because they cannot afford to buy the necessary short-wave equipment for actual experience. I know. I know. And I will confess that at one period of my own chequered career, when the fell clutch of circumstance well-nigh strangled me, it was my inability to afford a wireless set that stung as badly as any of the hardships.

So now the nippy weather is here again, don't let us forget those unemployed-assistance committees, which welcome the cast-off wireless components of us luckier set-owners. It's a grand transformer that can transform a workless man's despair into a radio set that works like a charm.

Major-General Greely.

ONE of radio's big figures has just passed in the person of Major-General Greely, soldier, Arctic explorer, writer, engineer and wireless administrator.

He once led a party of 25 men farther north than anyone else had ever penetrated, but most of the party perished of famine owing to the failure of a relief ship, and he returned with only six of his men.

Thousands of miles of telegraphs were built and operated under General Greely's instructions. In Alaska a 107-miles section from Nome to St. Michael was the first successful long-distance wireless link to operate as part of a commercial system.

One of the outstanding events in the ninety-one years of General Greely's crowded life was when, in 1911, he represented the United States at the Coronation of King George.

A Great Book.

THE BOOK OF PRACTICAL TELEVISION — there you have it all. From the welter of conflicting evidence and interests there has arisen, in the last year or so, a solid basis for television progress. For a long time "P.W." technicians have been preparing, behind the scenes, a careful and comprehensive survey of the progress made and the lessons learned, as they concern YOU. The *practical* angle—that

(*Continued on page* 278.)

THE S.T.700 has "rung the bell."

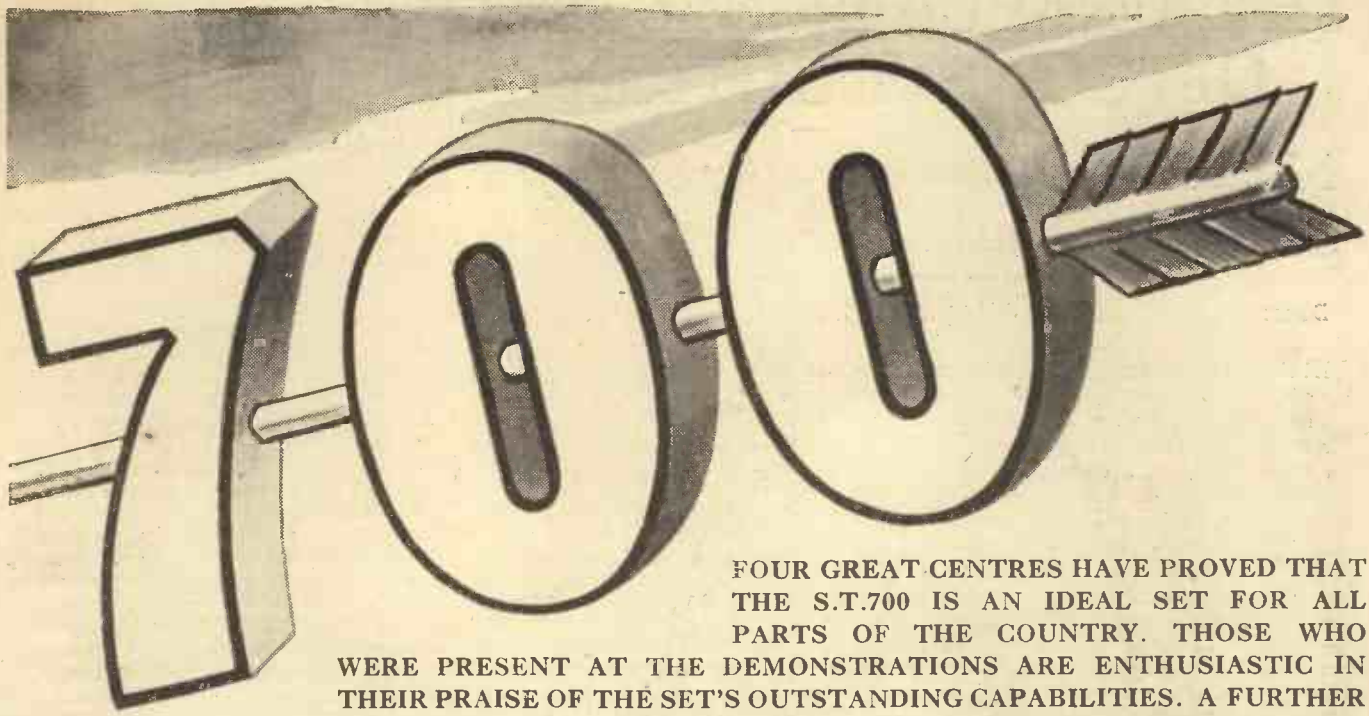
Although at the moment of "going to press" it has only been before the public for a very brief period, its success is assured.

I am naturally very gratified that for the fifth season in succession my chief set has been accepted by the home constructors of this country. I do not wish to appear smug or priggish when I say that I am not surprised. Remember that I have met scores of readers like yourself who, picked at random from hundreds of letters, have attended my demonstrations. Their unanimous enthusiasm prepared me for a great success—and now the snowball has begun to roll. It will attain huge dimensions by Christmas—which reminds me that you could not give yourself and your family a better gift than the S.T.700.

The Personal Demonstrations.

First let me thank all those who have applied for demonstrations. I doubt if any set of mine has aroused so much preliminary interest. To those not invited to a demonstration I apologise; it would be quite impossible to invite *all* who are interested. But I have done my best. Four great centres have proved that the S.T.700 is an ideal set for all parts of the country. I hope every one of you will read every one of the letters which delighted readers have sent in.

I specially asked the Editor that no editorial adjective or description of the S.T.700 should be used unless it came from the stack of appreciative letters. This has been done. If the set is "amazing," it is because readers themselves can think of no better word to describe it.



FOUR GREAT CENTRES HAVE PROVED THAT THE S.T.700 IS AN IDEAL SET FOR ALL PARTS OF THE COUNTRY. THOSE WHO WERE PRESENT AT THE DEMONSTRATIONS ARE ENTHUSIASTIC IN THEIR PRAISE OF THE SET'S OUTSTANDING CAPABILITIES. A FURTHER SELECTION OF LETTERS FROM DELIGHTED READERS WILL BE FOUND ON OTHER PAGES OF THIS ISSUE. MORE WILL APPEAR NEXT WEEK.

I gave personal demonstrations in four districts: Central London (just north of Hyde Park), Birmingham, Manchester, and Glasgow. In each case a reader's private house was used, conditions being those of the average constructor. In Manchester and Glasgow I had not the faintest idea of the house or aerial I was going to. In Birmingham an indoor aerial was the best available. **But at every demonstration in every centre I demonstrated the set's great capabilities with only a few feet of wire carelessly arranged in the room—often just flung on the floor.**

But as a good aerial is always better than a bad aerial, I always recommend the fixing of a good aerial. On sets of poor selectivity a large aerial often makes matters worse, but the Triple Extractor alters all that.

Spectacular Tests at Brookmans Park

In addition to my personal activities, entirely independent demonstrations were given at Tallis House, London, E.C.4, by members of the Technical Staff of this journal. Those who demonstrated had no previous knowledge of the S.T.700, and this speaks volumes for the simplicity and convincing merits of the set. Some readers always imagine I have some magical operating skill!

The most spectacular demonstrations I gave were those at Brookmans Park. Here, at one mile from the two B.B.C. stations, the set proved itself up to the hilt. **At every one of the tests there have been two or three "tough guys" spoiling for a fight, and ready to pull the performance of the set to pieces. Yet they have gone home immensely impressed**—as, indeed, I, pretty cynical and hard-boiled myself!—have been. To come through tests of this kind unscathed speaks volumes—far more than any volumes I might write about the set. Read and re-read the reports. Scores of them have been sent in.

Of course, I have already been asked why I did not go here, there and everywhere.

"I declare with full responsibility — and with a great radio experience of Britain from Land's End to John o' Groats — that the S.T.700 is as good for west as for east, for north as for south. It is wholly free from any tendencies which might result in different performances in different parts."
J. S.-T.

The answer is, as before, that I am not Queen Elizabeth. No designer has ever travelled about as much as I; there is nothing of the "London designer" about me. **My laboratory—for these great national sets—is the whole country.**

I declare with full responsibility—and with a great radio experience of Britain from Land's End to John o' Groats—that the S.T.700 is as good for west as for east, for north as for south. It is wholly free from any tendencies, e.g., breakthrough, or lack of selectivity or sensitivity, which might result in different performances in different parts.

Completed in Two Hours

The cost, of course, is very low. If you leave out the "easy-cabinet," H.T. plugs (not part of the set, anyway), wire and screws, the cost is 74s. 11d. If you consider the S.T.700 in its cabinet it is easily the cheapest set I have ever designed. The valves also are cheap.

A special series of photos have been taken of the S.T.700 being built by an experienced constructor who had, however, not seen before the Rapid Guide or blue print. Working with these, he completed the job in two hours. A complete novice would take a little longer, but not much. The Uni-Plane system explains the record speed of construction.

After I wrote my article on Audio-Reaction I invited Dr. Robinson to try out the system. You can read his opinion. It is a scientific endorsement of the "proof-of-the-pudding" reports of scores of readers.

I think it is already plain that where stations are at sixes and sevens, the weapons will be six hundreds and seven hundreds. The S.T.700's career is only starting Hundreds will have acted in October But thousands will be numbered in November.

J. S.-T.

THE UNI-PLANE SYSTEM OF CONSTRUCTION

A New Method Which Greatly Simplifies the Building of a Set

Described by John Scott-Taggart, M.I.E.E., F.Inst.P., Fel.I.R.E.

FOR eleven years the constructional design of wireless receivers for amateurs has been stagnant. The good old ebonite front panel mounted at right angles to a baseboard has held undisputed sway. The only departure has been in the direction of the so-called chassis system, which gives the "internals" of a set a certain professional appearance. This system is used on commercial sets. In certain cases the chassis system possesses merits from a technical point of view, for example, where there is a large number of components which cannot conveniently be mounted on one flat surface; there are also certain standard circuits where the screening of components and the many connections to "earth" can be simply effected by the use of the chassis system. **Whatever may be said from an appearance point of view, the fact remains that, constructionally, the chassis system is a source of confusion and error.** Connections which for part of their length are above and partly below the baseboard are extremely difficult to illustrate. The constructor has to remember which way up the drawing is, which hole on the top corresponds to the same hole as looked at underneath the panel.

Where Two-Plane Method Fails.

No chassis receiver has yet had a large vogue amongst home constructors; they very rightly fight shy of it, and have preferred the good, old-fashioned panel and baseboard. But it nevertheless *is* old fashioned, and since components are mounted on two different planes, namely the panel and baseboard, which are at right-angles to each other, it is impossible either to make the set or to illustrate it in one piece. Although the blue print of such a set is not as fearsome as that of a chassis job, yet the drawing is apt to be confusing, and, in any case, is definitely inaccurate. In all blue prints of such sets the panel does not occupy its true position; it has to be laid flat as though it were level with the baseboard. **As a considerable number of wires go between a panel and baseboard, it is absolutely impossible in a blue print to show even their approximate length or position.**

The most a blue print can do is to show the points between which the wires go. *The wires themselves are invariably distorted;* in addition, they frequently cross over many of the other wires and components and, to avoid confusion, the draughtsman has to bend them this way or that in order to avoid complications.

The two-plane system cannot be properly represented by a blue print, and so it has been my own practice to give pictorial drawings and many photographs of the set to show the shape of the wires. Apart from the difficulty of illustrating the set properly, the two-plane system presents extra difficulties of construction. These matters have preoccupied my mind for a long time, and with the **S.T.700 I make a great and radical change in construction. The whole of the apparatus is mounted on one flat sheet of plywood. For the first time the blue print becomes a really true drawing of the set. All the components can be clearly seen and every wire occupies its true position.** The set could be built, in fact, directly from the blue print, which is quite impossible with the two-plane system of construction which is often used. Everyone who has seen the S.T.700, mounted as it is complete on one piece of wood, has expressed amazement at the simplicity of construction. Even I, when I handle it, cannot get used to the idea; I keep feeling that there must be more of the set somewhere else! Look at the photograph of me holding the complete set on edge, and you will be struck by the "thinness" or simplicity of one-plane construction.

Complete in Itself.

You could get some idea of the simplicity of the S.T.700 by regarding a lattice mast or pylon such as is used for suspending electric power wires used for the grid system, and then looking at the solid simplicity of a telegraph pole. As regards rigidity, solidity and strength the Uni-plane construction has every other system beaten by several lengths. From the purely technical point of view, there are also great merits in this new layout. **Long wires connecting components on the panel to components on a baseboard are completely eliminated; everything is compact and where you want it. A child could build the S.T.700 with absolute certainty of success.**

Once the panel has the components fitted to it and wired up the set is made. You could prop up the panel in any way and your set would be ready to work. **But I have gone farther and provided a top board and two side pieces which, at a ridiculously low figure, provide a complete and effective cabinet.** If you are frightfully anxious to have a bottom and a back, there is nothing to prevent your adding these at small extra cost, but I see no reason why you should. The set is going to rest on the table or sideboard and there is no need for a bottom. As regards the back, this will ordinarily face a wall. If you like, however, you could cover the back with a piece of cloth tacked into place. As regards the absence of bottom and back it is interesting to note that many mains sets have no back, and that one of the finest radio-gramophones on the market to-day has neither a back nor a bottom.

Its Own Cabinet.

I recognise that this set is going to be a big blow to the cabinet-maker, who will see with dismay that I have provided what amounts to a first-class cabinet at a cost of only a shilling or two. My own private opinion is that you cannot better my arrangements, but should tastes differ you can use any suitable cabinet that may be designed for this set. The valves, of course, are absolutely secure in their valve holders, if the particular type of valve holder specified is used; the valves fit excellently and require very definite pulling on their bases to take them

(*Continued on page* 281.)

A CHILD COULD BUILD IT

The whole of the S.T.700 is mounted on one flat sheet of plywood, a feature that greatly simplifies construction. With the Uni-plane system long wires connecting components on the panel to components on a baseboard are completely eliminated. Everything is compact and where you want it.

THE S.T.700 CIRCUIT

TWO MAJOR DEVELOPMENTS: THE TRIPLE EXTRACTOR—AUDIO-REACTION

In these pages John Scott-Taggart explains the vital features of his latest circuit

I HAVE always maintained that "the circuit is the thing," and I cannot introduce the S.T.700 from a purely technical point of view without re-emphasising this fact.

I should like to say that a set is as good as its circuit, but that is not true. Give the identical circuit to a dozen designers and the ultimate receiver will be different in performance in each case; so much depends upon choice of components, valves and layout. It is more correct to say: *No receiver can be better than its circuit.* This means that a third-rate circuit will give third-rate results however you may clothe it.

There is scope for skilled design work in the layout, the arrangement of the cabinet, and so forth. There is, in the choice of components, scope for technical integrity, independence and keen discrimination—often embittered by experience. The choice of a suitable conventional circuit is also a matter of experience and simple experiment, and there are scores of really excellent designers in the country who will produce a first-rate receiver. But you have only to compare the different circuit diagrams to realise how similar to each other are the different sets. **Designing is an utterly different department from inventing. The inventor is untrammelled by any considerations other than technical ones. The designer, however—even though a technical man—is under the shadow of the shareholder and often under the thumb of the works manager.**

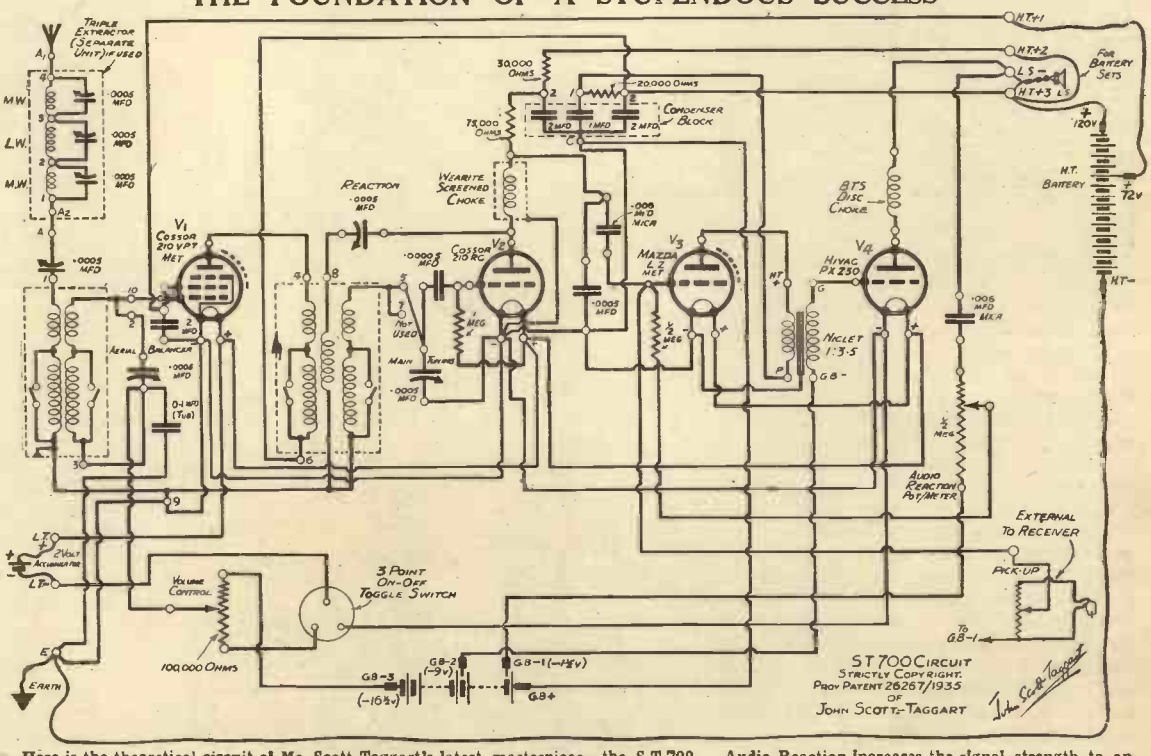
Contrast this situation with that of the independent designer who carries through his idea from beginning to end, with no other constraint than that this set should be capable of duplication by the public. The independent designer for the home-constructor has, of course, a further tremendous advantage: he can introduce adjustments which no commercial designer would dare to incorporate, even if he could think of them. In fact, he does not dare to let himself think of them lest his mouth should water over possibilities which will be denied to him. The dithery old spinster beats him every time. *The intelligent home-constructor, however, does not mind additional controls, provided a real improvement in performance is obtained by them.* A 10 per cent increase in the average intelligence of the listening public could improve the performance several hundred per cent. If, in addition, one can evolve new inventions, the increase is vastly greater.

The circuit of the S.T.700 presents several minor improvements and two major developments. Let us deal with the first of the two developments. This is what I have called the Triple Extractor, which consists of three separate tuned circuits in a separate box connected between the aerial and the aerial terminal of the main S.T.700 set. This sounds somewhat fearsome, but actually it is nothing of the kind. Each of the circuits will cut out an undesired station; there are two circuits tunable on the medium waveband, and one circuit tunable on the long waveband. In practice you would tune to Droitwich on the long waves, and your two local regionally placed stations on the medium waveband. **This tuning is effected in a few seconds.** The knobs for the Extractor condensers are not calibrated in any way. You simply turn them round in turn until the stations you want to cut out are—at a certain point on each condenser—reduced to silence. **All three Extractor condensers may be adjusted within 15 seconds, while if great accuracy is observed, the time taken is about half a minute. They need not be subsequently altered.**

These Extractors do not affect the main tuning of the set, nor do they affect each other. The Triple Extractor box may be placed near the set, or on the window sill, or at some other convenient spot not too far from the receiver. **You can forget all about it once you have set the condensers.**

It calls for *some* intelligence, but very little indeed, to adjust the three condensers to the silent point for the station it is desired to cut out, and therefore *we are not likely to see any such extremely useful device incorporated in a commercial set.* It must, however, be admitted that interference from high-powered stations has become so acute that some form of rejector circuit is beginning to find its way into commercial superheterodyne receivers; this rejector has to be adjusted by the local wireless dealer, since the listener cannot be trusted; there are also indications

THE FOUNDATION OF A STUPENDOUS SUCCESS



Here is the theoretical circuit of Mr. Scott-Taggart's latest masterpiece—the S.T.700. Audio-Reaction increases the signal strength to an astonishing degree.

NO BREAKTHROUGH—NO LOCAL INTERFERENCE

that something of the sort is being extensively but reluctantly incorporated in the German receivers.

When last year I introduced the high-efficiency Extractor into the S.T.600 a great step forward was taken, and there are so many people who have proved the value of this device, that a new reader has only to ask his friends and they will tell him how effectively the Extractor will cut out the local station.

In the S.T.700 three Extractors are used, and—what is more—they are all in circuit at the same time. In the S.T.600 there was one Extractor only in circuit at a time; on the medium waves its tuning had to be changed according to the portion of the dial used; even so, there are some portions of the dial where, although one of the local stations might be cut out, there is still some background from the other. When going over to the long waves, the Extractor had to be retuned to cut out Droitwich. On going back to the medium waves the Extractor had once more to be retuned to cut out medium-wave interference. **The use of three Extractors eliminates all that trouble, and after the initial few minutes—giving the beginner plenty of time—the Triple Extractor box need never be touched again.**

More Efficient.

A fuller account of the merits of the Triple Extractor was given in an article last week. I would like to mention, however, that **EACH EXTRACTOR CIRCUIT IS CAPABLE OF CUTTING DOWN INTERFERENCE TWENTY-FIVE TIMES AS EFFECTIVELY AS THE EXTRACTOR CIRCUIT OF THE S.T.600,** which itself cuts down local interference by a large figure. The improvement has come about by the use of more efficient air-tuning condensers. A large series of measurements has shown the vital importance of a good condenser in this position. I shall leave it to others to use such expressions as "amazing" and "revolutionary." I will confine myself to stating that **the Triple Extractor unit, as used in the S.T.700 on an accurately measured test, cut down the audible signal strength of an interfering local station to one 2,125,000,000th of the strength it would be without the Extractor.**

The Triple Extractor box is a separate unit which need not be used in all parts of the country. *There are places where there is no great local interference problem, and the dwellers in these areas can build the main S.T.700 receiver and dispense with the Triple Extractor unit.*

BUT IF YOU LIVE IN THE SWAMP ZONE THE AUDIBLE SIGNAL STRENGTH OF THE LOCAL MAY BE OVER TWO THOUSAND MILLION (2,000,000,000) TIMES STRONGER THAN IF YOU USE MY TRIPLE EXTRACTOR.

Adjacent-Station Selectivity.

The problem of local station interference is, I contend, an entirely different one from that of ordinary selectivity. But selectivity is still required for cutting out stations close in wavelength to that which it is desired to receive. Adjacent station selectivity in the S.T.700 main set is very high, and many constructors will, I believe, rely on the set to cut out strong local stations, subsequently building the Triple Extractor unit if they find it necessary.

Double reaction—used on several previous sets of mine—has been omitted in the S.T.700; previous experience has indicated that, in average hands, the benefits undoubtedly given by double reaction were not taken advantage of. The reason for omitting double reaction in the S.T.700 is very simple: it was found not to be necessary.

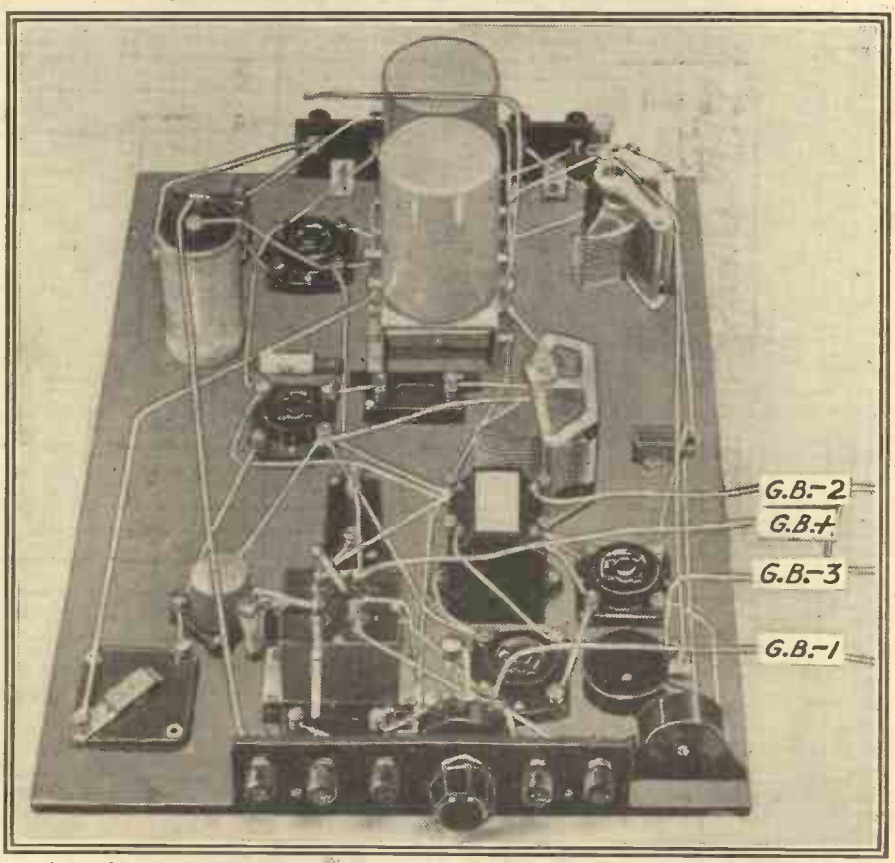
The second feature of the S.T.700, which cuts across current practice, and will create, if I am any judge, a furore of interest and a howl of controversy—until it is actually tried in this set—is audio-frequency reaction.

Put in a nutshell, I have done for the low-frequency side of the receiver what has been done by reaction on the high-frequency circuits. Perhaps the most astonishing thing is that **by Audio-Reaction I have been able to increase signal strength by at least 12 times, and at the same time improve quality of reproduction.** This combination of effects will, to a technical man, be most unexpected, and I may say that the circuit and the values of components are of great importance. For years the most elaborate attempts have been made to stop any unintentional reaction on the low-frequency side of the receiver, and decoupling methods have become universal, largely with this object in view. Even if there were a theoretical inclination to use low-frequency reaction in broadcast receivers—which there has never been—there would still be the problem of incorporating it effectively. Anyone who studies the circuit will realise how extremely well decoupled is the S.T.700; before applying Audio-Reaction I have gone to great pains to avoid any unintentional low-frequency reaction. The result is that the set is extremely stable and may be used on mains units with excellent effect. **The audio-frequency reaction works well and with perfect stability under all conditions.**

Quality Improved.

As I have just said, the surprising element is the improvement in quality. One might expect that any low-frequency reaction would cause violent distortion and instability. Actually, I was not surprised myself, because the system was deliberately developed not to increase signal strength but to *improve* quality of reproduction. **It was really a by-product of better reproduction that the signal strength also received such a great increase.** The subject of audio-frequency reaction is so important, and its introduction so startling, that I

BEHIND THE PANEL OF THE S.T.700



A very large proportion of the leads can be seen in this illustration, which admirably portrays the simplicity of construction achieved by the Uni-Plane method.

AUDIO-REACTION INCREASES SIGNAL STRENGTH

dealt with the subject under a separate heading, last week, in greater detail.

And now for some of the minor details of the circuit. Four valves are involved, the first being an H.F. pentode used as a high-frequency amplifier, and three triodes. The first triode is a detector, which is coupled by the usual resistance capacity method, to the grid of the so-called first L.F. amplifying valve. This valve is in turn coupled to the output valve by means of an L.F. transformer. *Note that this transformer has its primary winding reversed because of audio-frequency reaction requirements.* I strongly advise constructors to adhere to my specification of a Varley Niclet standard transformer (unless perhaps when H.T. batteries are used), since the rest of the design has been adopted with this transformer in use.

There is no combination of valves, in my opinion, that gives anything like the same tremendous sensitivity combined with excellent quality. A pentode output valve may be somewhat more sensitive, but it calls for correct matching with the speaker, and the quality is even then not as good as with the triode ; as the S.T.700 will be used with all kinds of speakers, the choice of a triode output valve is undoubtedly the best. The actual makes and models of the valves govern the sensitivity and quality of reproduction. Actually there are few circuits where such excellent results can be obtained with other valves than those used and specified, and the last three valves in the set will be possessed (in reasonably satisfactory types) by a large number of constructors already. Nevertheless, the particular valves I have chosen represent those that are best from the sensitivity and quality of reproduction point of view.

Best By Measurement.

The detector valve particularly gave results well ahead of other makes and types. A whole series of measurements were made on different types and makes of valves and the results were certainly startling ; they show that it was possible to get an increase of sensitivity of twelve times by using the valves I have specified. This does not necessarily mean that the valves chosen are much better than other valves ; they *may* be so in some cases, but they are certainly the best for this particular set.

The first two valves are certainly the most important. The Cossor 210R.C. came well ahead of all makes that I tried ; while the Cossor 210V.P.T. and the Hivac H.F. pentode V.P.215 were about equally good, and better than other makes tried in this particular circuit.

As an H.F. pentode calls for a high impedance in its anode circuit, all measurements were taken under actual operating conditions using reaction. Without reaction, the Hivac H.F. pentode was considerably more sensitive. My recommendations are therefore that either Cossor or Hivac should be used for the H.F. pentode in this set, while the preference should be given to Cossor's for the detector. The last two valves are less important, although I found the Mazda definitely superior, both on paper and on actual measurement, in this set over other makes. As a result of measurement I also prefer the Hivac P.X.230 for the last stage in the set. If you are getting all new valves, or any new valves, I very strongly advise you to adhere to my first specifications or to bear in mind what I have just written.

The ordinary high-frequency reaction calls for comment since I have used a plain ·0005-mfd. solid dielectric variable condenser for feeding the high-frequency currents into the reaction coil. A very common practice, and one to which I have subscribed myself, is to use a differential condenser for reaction. It is a very useful device in some receivers, although **the main claim put forward for the differential condensers—a claim, incidentally, which I have never once voiced myself—is a complete and preposterous fallacy.** This claim is that the differential condenser does not affect the tuning of the circuits to which reaction is applied.

My search for greater and greater accuracy of tuning soon made it obvious that a differential reaction condenser could not be used in spite of its other merits : it fails because it causes too big a change in the tuning. This, of course, would affect calibration and, instead of always being able to find a station on a particular dot, as is necessary with my new dial, you would find small changes would occur. I found that the most effective arrangement, and one which causes no change in tuning, is that illustrated in the circuit. Even at different settings of the reaction condenser one can always go back to the same dot and be certain of receiving the desired station.

Smooth Reaction Control.

Another point in connexion with the reaction on this set is that it is extremely smooth. this making for greater selectivity and ease of operation. A further point is that circuit values have been chosen so that full reaction can be obtained on all stations on the medium waveband under every conceivable condition, and whether mains units or an H.T. battery is employed. Accumulated experience shows that insufficient reaction, due perhaps to the detector valve being old or of poor quality, is a prolific source of unsuspected trouble. **Reaction is such a valuable help that I determined that on the S.T.700 there should never arise, under any circumstances, any defect in either the quantity or the quality of reaction.**

The grid condenser used for detection has a capacity of ·00005-mfd., a value which was first used in the S.T.500. The use of such a small condenser—a value of ·0003-mfd. used to be the standard—was introduced by myself to improve reaction, increases the high-note response of the receiver and, above all, increases selectivity of the second tuned circuit owing to the reduction of the load put upon it. It is a small and not very obvious feature, but one which definitely raises the performance of the set in certain directions.

High-frequency currents are liable to get into the low-frequency side of wireless receivers, and many obscure faults as regards reaction, instability under certain conditions, and distortion are traceable to high-frequency currents getting into the

(*Continued on page* 282.)

FAMOUS RADIO SCIENTIST PRAISES AUDIO-REACTION.

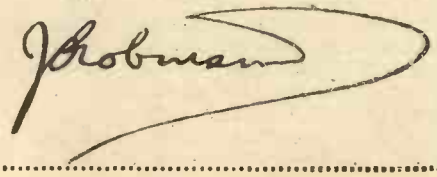
Dr. James Robinson, D.Sc., Ph.D., F.Inst.P., M.I.E.E., formerly Chief of Radio Research of the Air Ministry, after trying out the S.T.700, writes :

I have operated the S.T.700 and find that Mr. Scott-Taggart was justified in departing from usual technique, which was to avoid low-frequency reaction.

By departing from standard practice—and there are few engineers with sufficient foresight and courage to do so—he has made it possible, by his Audio-Reaction scheme, to increase signal strength, whilst greatly improving quality.

His success in this direction deserves to arouse the greatest interest.

Signed



[Mr. Scott-Taggart demonstrating the S.T.700 to Dr. Robinson in the "P.W." laboratories.

Mounting the components on the chassis is a very easy task, for everything fits properly.

THE LISSEN BANDSPREAD THREE

Peter Simple tries out a new Short-wave Kit.

IT is claimed by the designers of the Lissen "Bandspread Short-Wave Three" that within two hours of acquiring the kit you can be listening to programmes from the farthest corners of the earth.

Now I have had a lot of experience of kit sets, and in consequence I am in the habit of accepting claims of that description with a certain amount of reserve. I usually find that, taking things calmly and collectedly, one has to wink an eye at any reference to the time factor when it has been calculated by the enthusiastic designers who know where everything goes, and who can in consequence proceed at breakneck speed.

But I take off my hat to Lissen in that their claim is correct to within five minutes! I was actually listening to stations from all over the globe in exactly one hour and fifty-five minutes from the moment I opened the box containing the kit of parts.

A Very Important Feature.

Perhaps this time-factor question does not appeal to you as being of very great importance. On the contrary, I think it is of the greatest importance, for it shows not only that the instructions are adequate but that everything fits. That everything should fit is, I quite agree with you, what one expects to find, but alas, how often does that work out in practice?

When everything is made under mass-production conditions (the only way to produce kits at really low prices) it is a very difficult matter to ensure that all the pieces fit together like a jig-saw puzzle.

But the Lissen "Bandspread Short-Wave Three" kit does, and I think it is a great tribute to the care and precision with which the kit has been designed and produced. It is, in fact, in my opinion one of the best kit sets I have ever built.

As a completely impartial observer, and one who has built the kit entirely in accordance with the instructions provided, I have only one or two quite unimportant criticisms to offer. First, I think that this otherwise excellent kit is deserving of a little more space on the constructional side in the Lissen Short-Wave Manual in which it is described.

I am prepared to admit that my other points of criticism are really very trivial, but there are just one or two ways in which the absolute beginner might welcome a bit of help in connection with, shall we say, the finer details. For instance, a short length of three-eighths-inch diameter sleeving is provided with the kit, and it is a matter for conjecture as to where that is intended to be used.

Some Minor Points.

Then there are three small rubber insulating washers with the kit, and although it is obvious that these are intended as bushes for the holes in the chassis through which wires pass, the fact that there are five large holes and only three rubber insulators is a point that might with advantage be covered. True, one can determine the positions by pondering over the blueprint, but a few words in the instructions would obviate that.

I would, too, make one serious suggestion, not only to the makers of this kit, but to the makers of all kits, in connection with wire-ended resistors. When these tiny components are painted to determine, in accordance with the colour-code, their values, it often happens, owing to the speed at which they are produced, that some of the paint gets on the connecting wires. I think it advisable to point out that any paint should be scratched off the wires before the component is used.

But please do not misunderstand me. I should perhaps emphasise the fact that these minor constructive criticisms are not intended to detract from the excellence of the kit as a whole, for, as I have previously said, I consider this to be one of the finest kits at present available.

And the amazing ease with which it can be built is not the only telling factor in its favour. When completed, the set is as fine a short-waver as anybody could wish for. It is a detector and two L.F. with a number of ingenious refinements which make it not only simple to operate, but remarkably efficient in use.

Unusually Easy To Tune.

Tuning is always apt to be a bugbear on short waves unless particular pains are taken in the design to overcome the known difficulties, and in this connection Lissen have undoubtedly succeeded where so many others are inclined to trip up.

The designers of the "Bandspread Short-Wave Three" have not relied entirely upon the main tuning condenser for the reception of stations, but have introduced as a refinement—and a very worth-while one, too—a small bandspreading condenser.

But wherever two condensers are thus used in parallel, there is always the difficulty of calibration, and I believe I am correct in saying that Lissen, in the design of this set, are the first people successfully to overcome that snag. At any rate, I have never seen anything like it before.

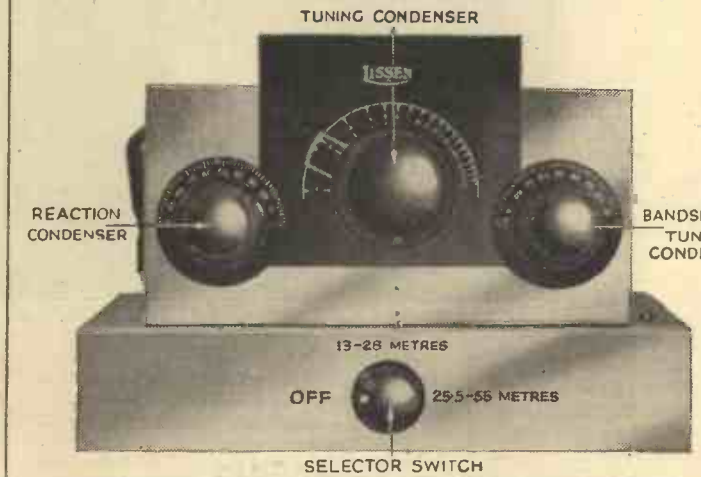
Their main tuning condenser scale, which is exclusive to this set, is divided into twenty "zones," which are numbered from one to twenty. A full 180-degree movement of the tiny bandspreading condenser that is in parallel with this condenser just about covers one "zone," so that calibration is easily possible.

Another thing that I like about this set is that coil-changing is obviated. By the use of a specially designed coil and a low-loss switch, the set covers from 13 to 55 metres in two bands—from 13 to 28 and from 25·5 to 55 metres.

From the very moment when I first switched on the set worked wonderfully, and I must have heard, I should think, hundreds of stations between the time that I started and the time when a sudden shiver reminded me that I had sat the fire out.

But I shall long cherish memories of my tour with the Lissen "Bandspread Short-Wave Three." It is a grand set, and at only 69s. 6d. complete with valves it is in my opinion unbeatable value.

THE FINISHED RECEIVER



Clean design and efficient operation characterise the Lissen Bandspread Short-Wave Three, here seen in complete form.

Veterans of the MICROPHONE

BY A SPECIAL CORRESPONDENT

Following on recent articles by "Uncle Jeff" on the early broadcasting days, the following reminiscences of some of our first radio artists will be of particular interest.

HOW many of the original wireless entertainers are still regular performers at the B.B.C.? How many have stood by since the trials and vicissitudes of experimental broadcasting and remain associated with the mighty, elaborate system that radio is to-day? And how many have, through this means of expression, found lasting fame?

In the early days wireless was an extreme luxury. Anxious however to sample the new miracle, many of us may remember visiting the various little restaurants in London where "Wireless Teas" were no mean attraction, and one could listen to a series of incoherent grunts that purported to be children's stories while sipping tea.

Associated with broadcasting from the very start were two well-known pianists and accompanists who still appear frequently before the microphone—Maurice Cole and Cecil Dixon. Both are extremely able musicians. Miss Dixon is connected not only with the B.B.C. but with the Royal College of Music, where she holds the post of staff professor.

The Leading Entertainers.

Radio's leading entertainers at this time were Ronald Gourley, Norman Long and John Henry, who died recently in very tragic circumstances. Ronald Gourley, the blind pianist, entertainer and whistler, has always been a great favourite with listeners. Norman Long was known, rather obscurely, as "The Charlie Chaplin of Broadcasting"; but, as listeners know, he is now identified with "a song, a smile and a piano." Once, in those early days, he was leaving the B.B.C. when two girls pounced on him for his autograph. This he obligingly gave, and the autograph hunters, after deciphering the signature, cried in dismay: "Oh, dear! we thought you were Arthur Burrows!"

"I'm very sorry," remarked Norman Long politely.

"That's all right," retorted one of the girls, hastening to assure him that they had not been unduly inconvenienced, "we can tear this page out."

Dance music was provided by the 2 L O Dance Band and the Savoy Havana Band relayed from the Savoy Hotel every night. Such numbers as "Yes, We Have No Bananas" and "Little Nelly Kelly" were then popular, and all admirers of piano syncopation listened eagerly to Billy Mayerl, who made his microphone debut as pianist to the Savoy Havana Band. He joined this band when he was twenty.

The Roosters, the first concert party on the air, and one of the brightest spots in contemporary wireless entertainment. This delightful troupe owes its origin to Captain G. U. B. Roose, Commandant of Summerhill Camp, Salonika, where the party was first formed in March 1917. It is probably the only surviving concert party of its kind still to be heard on the air—and of its six artists four are original members.

Above is Norman Long, the first British radio entertainer, and still a regular broadcaster. Ronald Gourley (left,) has always been a favourite with listeners, while Stainless Stephen (right) has carved a niche in broadcasting history that is undoubtedly unique. All these artists were early comers to the microphone—and are still broadcasting.

Without Any Rehearsal.

Soon after the B.B.C. had moved from Marconi House to Savoy Hill they gave their first broadcast—without any rehearsal—being shoved in front of the microphone and told informally to "go ahead"!

The names of announcers were freely published with all the broadcast programmes in the newspapers. Some years later, as listeners will recall, the B.B.C. enveloped its announcers with the utmost secrecy, only to lift the cloak of mystery about a year ago. In 1923 the B.B.C.'s literary critic was John Strachey; a weekly talk on films was given by G. A. Atkinson, and Archibald Haddon spoke on the theatre.

Joseph Lewis was also a prominent broadcasting personality in the first year of wireless.

When radio was a year old Stainless Stephen (real name: Arthur Clifford comma Comedian question mark) made his debut at the mike, having derived his peculiar style of humour from his signalling experiences during the war when he was obliged to articulate the punctuation signs in every message transmitted.

While travelling to London to appear at Radiolympia, he stopped his car at Andover to inquire of a policeman if anyone had been hurt in a motor-smash he had just encountered.

"You're Stainless Stephen!"

The policeman assured him that there were no casualties and then remarked, "You're from Sheffield, aren't you?" "How did you know that?" asked Stainless. "I could tell by your accent," replied the policeman. "And I'll tell you another thing," he added a moment later. "Oh, what's that?" "You're Stainless Stephen!"

Letters from listeners arrived at the B.B.C., not in such great numbers as they do now, but in considerable batches. Some were very amusing: there was, for example, a post card prepared in mourning edges and inscribed with the words:

In Memory of
TANNHAUSER
murdered by the
London Wireless
Orchestra
19th Sept. 1923.

In 1926 the British Broadcasting Company became the British Broadcasting Corporation, under governmental control for a provisional term of ten years. Next year, therefore, the Royal Charter under which the present broadcasting organisation carries on will be due for reconsideration. This charter demands that the B.B.C. shall carry on the service "to the satisfaction of the Postmaster-General." What will be the verdict of the inquiry next year?

Whatever decision is made about the Charter we shall still have our broadcasting—and our microphone favourites.

OUR BROADCAST BANDS

Interesting pen pictures of the leaders of some of our most famous radio dance bands.

By K. D. ROGERS

MOST of us turn to dance bands for radio relaxation at some time or another. Many will listen regularly to dance music every night—to Charlie Kunz, Marius B. Winter, Henry Hall, Jack Jackson, Billy Cotton, Ambrose, and the rest.

On this page I want to give you a few pen pictures of some of our well-known dance-band leaders—men whose orchestras are more or less regular broadcasters in this country.

Let us start with **Ambrose**, who for so long has entertained us from various London hotels and clubs. Bert Ambrose was born in London, but first made his name in America, where he not only ran a dance band, but conducted a symphony orchestra. Luigi, of the Embassy Club, London, heard the dance band and persuaded Ambrose to come to England. Thereafter he played at the Embassy for some seven years. Followed the May Fair Hotel, where over six years were spent.

Believes in Straight Music.

Percival Mackay is a dance-band leader who has not broadcast as many times as some of the "regulars," but is very popular.

Percy Mackay is a believer in straight, tuneful music. He is very English in his blond fresh way. Mackay started music early. He accompanied his banjo-playing father on the piano at the age of eleven. At sixteen he was still playing the piano—in a Clacton beach concert party. The musical direction of touring revues followed, and then came the war.

After the war he joined up with a band at the Cabaret Club and Murray's. It was at the former club that Mackay met Jack Hylton—having a wash. Jack gave him a chance to join his band, and Percy Mackay took the chance. Piano solos and arranging were his work, the latter becoming world famous owing to his arrangement for Jack Hylton of "Felix Kept On Walking."

Then another "break," and Mackay was conducting the orchestra for "No, No, Nanette." He formed another band, and now, what with film musical-background work, recording, broadcasting, and so forth, he leads a busy life.

The Popular Jack Payne.

"Say It While Dancing." How often has that proclaimed the arrival of **Jack Payne** and his band on the radio? Jack has left the B.B.C., but we often hear his band. Started life in Leamington in 1899. His first dance band was in an R.F.C. mess with other officers. His first broadcast was on Boxing Day, 1925, from the Hotel Cecil. Shortly after joined the B.B.C., where he remained till Henry Hall took over at the beginning of 1933.

Now he and his band of 20 spend their time on tour—in fifteen cream-coloured Singer cars—all of the same type. They boast that they have never been late for an engagement, and during the summer months they as often as not camp out during their long trips. The average mileage per year is over 20,000. The band runs a cricket team and a football team.

Private Dance Work.

During the absence of the ebullient Harry Roy and his band from the May Fair Hotel **Marius B. Winter** has been holding the fort. Marius is coming to the fore rapidly—and he is making money, too. It is said that his turnover for private dance work, which he has been doing mostly till he took over at the May Fair, is about £25,000 a year. He caters for Society and has the largest connection in Europe, I am told.

A vast diary of dates and a map of the places at which he is engaged, with flags stuck in to remind him, are kept at his offices in Regent Street, and he is filled up for more than a year ahead. No wonder we do not hear him on the air as often as we should like.

Marius Winter's band is noted for its "sweetness" of tone, and is strongly reminiscent of the famous Royal Canadians, run in America by Guy Lombardo. Tunefulness is the keynote of all its playing, and here a very wise course is being taken.

The great honour of a Royal Command to play at the Jubilee celebrations in the Guildhall was paid Marius Winter and his band.

Started in a Tailor's Shop.

A comparative newcomer to the ranks of broadcast bands, though he has not broadcast often, is **Nat Gonella**. A staunch follower of Louis Armstrong, the famous Negro trumpeter, Gonella is the trumpeter leader of The Georgians, and does a bit of "scat" singing too. Gonella has been with several well-known bands, Lew Stone's, Roy Fox's, Billy Cotton's, and so forth. He became a star name during his association with Lew Stone, and began making records for Decca. Now he is in the Parlophone lists, and between recording sessions he and his band spend most of their time on tour.

Though he and his brother "Bruts" had band training from their schooldays, Nat Gonella started his career as an apprentice in a tailor's shop. This lasted three days. Then he became a messenger boy for a furrier, spending his spare breath in practising with his beloved trumpet. Then he saw an advertisement for a boys' band to accompany a new show. He applied and got a job in the band—the "Busby Boys' Band" in Gracie Fields' famous "Mr. Tower of London." The conductor was Bertini, the now popular Blackpool band leader.

Ex-Wireless Operator.

Way back in 1915 in the R.N.A.S. was a young wireless operator. He had been a clerk in Nottingham till the outbreak of war. After hostilities ceased he returned to civil life, and devoted much of his time to writing music. He wrote a musical play called "Cupid the Pilot," which was broadcast from 5 I T in 1922. He formed a dance band to accompany the artists, and played the banjo himself.

That is how **Billy Merrin**, of "Commanders'" fame, began his dance-band career. As banjoist Billy came to London to the Royal Opera House dance band at Covent Garden. Then he returned to Nottingham and formed his own band. Thenceforth the Commanders were well-known broadcasters.

Billy Merrin is a teetotaller and non-smoker, and leads the usual busy life of the dance-band leader. Records for Regal-Zonophone, tours, broadcasts, does film studio work, and plays at dances all over the country.

A FAMOUS LEADER

Jack Jackson, leader of the famous Dorchester Hotel band, conducting his boys during a recording session at the H.M.V. studios.

THOSE HIGH NOTES

PEOPLE talk very glibly about the higher audio frequencies, by which I mean those above, say, 5,000 cycles per second. But there must be still a lot of loudspeakers, especially old types, in use which cannot properly reproduce frequencies anything like this, let along frequencies up to 8,000 or 10,000 cycles.

Manufacturers of loudspeakers are becoming more and more alive to the importance of the upper audio frequencies, because it is largely these upper frequencies which give the naturalness to the reproduction. The B.B.C. transmissions are supposed to retain a large percentage of the higher audio frequencies, even up to as much as 10,000, and I daresay they do, but, on the other hand, this is not of much use to you unless your set and loudspeaker are capable of reproducing them. If you have doubts about your set listen to some of the "whiskery" heterodynes on some stations. If you cannot find any there is a bad high-note cut off in your set somewhere.

J. H. T. R.

S.T.700 PILOT AUTHOR KITS

IMMEDIATE DELIVERY OF S.T.700 PILOT AUTHOR KITS. Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash, C.O.D. or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). Hire purchase terms are NOT available to Irish and Overseas customers. Efficient Overseas Order Dept.

•A.C. VERSION•

KIT "A" CASH or C.O.D. *Carriage Paid* £9:5:0
● OR YOURS FOR 17/-
Balance in 11 monthly payments of 17/-

Comprises complete kit of components as FIRST SPECIFIED and used by Mr. J. Scott-Taggart, including Peto-Scott Ready Drilled and polished Walnut plywood panel, ready drilled terminal strips, aluminium brackets, mains lead, nuts and bolts, less valves, cabinet speaker and Extractor Kit.

KIT "B" CASH or C.O.D. *Carriage Paid* £11:18:6
● OR YOURS FOR 21/9
Balance in 11 monthly payments of 21/9

As for Kit "A," but including set of 3 Specified Valves, less cabinet and speaker.

KIT "C" CASH or C.O.D. *Carriage Paid* £13:16:0
● OR YOURS FOR 25/3
Balance in 11 monthly payments of 25/3.

As for Kit "A," but including valves and specified Peto-Scott A.C., S.T.700 Cabinet, with speaker baffle, less speaker.

If Extractor Unit Kit is required with any of the above Kits add £1:4:0 to Cash or C.O.D. prices, or 2/3 to deposit and to each monthly payment.

Peto-Scott EXCLUSIVELY SPECIFIED CABINET

Overall Dimensions:
W. 16¾ In.
H. 15¼ In.
D. 13 In.

5/- DOWN

S.T.700 CONSOLETTE CABINET

Exclusively specified for Mr. J. Scott-Taggart's A.C. version of the S.T.700. and specially constructed to allow both terminal strips to be housed inside Supplied complete with extension spindles for side controls. Australian walnut veneered front. Corded silk backed fret. Speaker baffle board. Lift-up lid. Cash or C.O.D. 37/6. (Carr. and part packing 2/6 ex.)
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Exact to Specification Complete with valves and specified W.B. speaker in Peto-Scott specified Consolette Cabinet (illustrated above). Cash or C.O.D. Carriage Paid, £19:19:0.
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Exactly as Specified by Mr. John Scott-Taggart. *Every Peto-Scott Structakit includes a FREE COPY OF S.T.700 ISSUE OF "POPULAR WIRELESS," with full size blueprint, dial card, etc.*

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COMPRISES ● 2 Peto-Scott cabinet side pieces, cabinet top and grid bias battery spar, all ready drilled and French polished, and complete with necessary fixing screws. ● Ready drilled and polished walnut veneered panel, 16 in. x 12 in., with nickel-plated screws. ● 2 Ready drilled ebonite terminal strips. ● 4 aluminium brackets, and 4 nuts and bolts. ● 30 ft. Maxamp. wire. *Total value* 9/7.
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S.T.700 £1 PARCEL

£1

The Peto-Scott Kit of essential S.T.700 components, comprising:
1 J.B Main tuning condenser, with Special Knob and Pointer.
1 Colvern S.T.700 Coil Unit.
1 Peto-Scott Ready Drilled and Polished Plywood panel.
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COMPLETE KIT of first specified components to convert the S.T.600 to the new S.T. triumph. Comprises: Peto-Scott S.T.700 Structakit, as detailed at top of column, Colvern S.T.700 Coil Unit, J.B. Main tuning condenser with special knob and pointer, 2 Graham Farish potentiometers, Bulgin switch, 3 Lissen condensers, Dubilier condenser, Dubilier 500,000 ohm resistance, Ferranti 30,000 ohm resistance, Belling Lee G.B.-1 wander plug, screws, flex and FREE COPY OF S.T.700 ISSUE OF "POPULAR WIRELESS," with full-size blueprint, dial card, Cash or C.O.D. Carriage Paid, £2:2:0

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or 5/- down and 7 monthly payments of 6/-.

KIT "A" BATTERY MODEL

CASH or C.O.D. *Carriage Paid* 79/6
● OR YOURS FOR 7/- DOWN

Complete Kit of components exactly as FIRST specified and used by Mr. J. Scott-Taggart and shown in the detailed list in our last week's advertisement, including FREE copy of S.T.700 issue of "Popular Wireless," but less valves, Extractor Kit and Peto-Scott Cabinet.
Cash or C.O.D. Carriage Paid £3:19:6.
or Deposit, 7/- and 11 monthly payments of 7/6.

KIT "B" CASH or C.O.D. *Carriage Paid* £5:11:6
● OR YOURS FOR 10/-
Balance in 11 monthly payments of 10/3.

As for Kit "A," but including set of 4 FIRST Specified valves, less cabinet and speaker.

If Extractor Kit is required with any of the above Kits add £1:4:0 to Cash or C.O.D. prices, or 2/3 to deposit and to each monthly payment.

● SEND FOR ILLUSTRATED LISTS OF PETO-SCOTT S.T.700 CABINETS AND FINISHED INSTRUMENTS, TOGETHER WITH PRICED LISTS OF PARTS OF BATTERY AND A.C. VERSIONS.

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Any other recommended S.T.700 Accessory on similar Easy Terms.

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A FURTHER SELECTION OF LETTERS FROM THOSE WHO HAVE ACTUALLY HEARD FOR THEMSELVES THE ASTOUNDING RESULTS GIVEN BY THE S.T.700

READ WHAT THEY SAY!

70 STATIONS AT MANCHESTER.

Dear Sir,—I enjoyed your S.T.700 demonstration on Sunday evening at Swinton, near Manchester.

Although the aerial was not a very good one your set brought in 70 stations—60 medium-wave and 10 long-wave stations at full loudspeaker strength and clear of each other.

When only a piece of insulated wire slung across the room was used instead of the proper aerial a number of foreign stations came in at full strength.

The quality and volume available from this set are certainly very satisfactory.

I consider the set's performance particularly good, as there was nothing used in the way of extra H.T. I saw that the high-tension supply was only a standard 120-volt dry battery.

B. H. SMITH, "Throstledale," Whaley Bridge, via Stockport.

"I WAS AMAZED."

Dear Sir,—I was privileged to see and hear a demonstration of your new set, the S.T.700, here last night, for which I am compelled to write and thank you.

One thing pleased me very much on my first inspection of the set, and that was the new Auto-Dial. Using this dial it is impossible to mistake the identity of any stations one wishes to tune-in and the number of stations which can be tuned-in on the set is remarkable. I counted 66 in slightly over an hour, and these all at full loudspeaker strength.

I have always understood that knife-edge selectivity could only be achieved at the expense of quality. You have disproved this as the quality was on a par with anything I have ever heard. I was amazed when I saw you cutting out Scottish Reg. and bringing in Leipzig, which is temporarily on low power, on one side of it, and Marseilles, a 5 kw. station, on the other. Similarly silencing reception of Scottish Nat. and bringing in Heilsberg and Bordeaux.

I would also like to mention your new device, Audio-Reaction, by means of which the bass response can be increased when required and which also increases signal strength 25 times, proof of which I had by measurements.

Altogether the set gave an outstanding performance on a moderate aerial and a long earth lead. When I add to this the simplicity of construction the set borders on perfection.

Wishing you all the success you deserve.

W. FIRTH, Partick, Glasgow, W.1.

"SO PERFECT THAT IT SEEMS UNCANNY."

Dear Sir,—Although I do not presume to understand the intricacies of wireless, I certainly do know a good set when I hear it, and having been the fortunate recipient of an invitation to a demonstration of the S.T.700, I recently attended at Tallis House, London, with a none too optimistic feeling of hearing anything out of the ordinary, unless it was from a set that was going to be beyond the purse of the ordinary constructor. My first question, therefore, on viewing the set, was the amount it would cost to construct a similar one, and I was astounded to hear the price.

The lay-out was very compact and neat, all controls being at hand without having to fiddle about inside the set—a distinct advantage over a number I have tried. Tuning, after a few minutes' acquaintance, was simplicity itself.

Selectivity: Up to the usual high standard of S.T. Sets.

Sensitivity and Range: Results were as good and even better than some sets employing more valves and costing at least double the price of the S.T.700.

Tone: Excellent.

Refinements: The Triple Extractor circuit for cutting out unwanted stations is so perfect that it seems uncanny. I personally tested this and, on carefully revolving one of the knobs, was successful in reducing the blare of the London Regional to a tiny whisper, a remarkable refinement, particularly for those in the so-called swamp areas.

A further refinement and one which I was given to understand has been successfully exploited for the first time, was what is termed "Audio-Reaction," which is incorporated after the power stage in the set, and on being tried on a weak station had the opposite effect of the extractor circuit in that it brought up that station to the equal of one of the London stations, and, most surprising of all, without a trace of distortion, a wonderful asset to any set.

In conclusion, I give the unbiased opinion that the S.T.700 is a set which will fulfil the requirements of the most critical listener, and give pleasure and satisfaction to all home-constructors who build it.

H. ELLMERS, 229, Byron Avenue, Manor Park, E.12.

PERFORMANCE ASTOUNDING.

Dear Sir,—As one who had the privilege of attending your recent demonstration of the S.T.700 at Brookmans Park, I must write and give you my opinion of this wonderful set.

In the first place we have to bear in mind that the test was taking place about a mile from Brookmans Park—in fact, across the field were the towering masts of the B.B.C.

The performance of the set under those conditions was astounding. The new idea of the Auto-Dial was worthy of note, making station-finding and the calibration of the set much easier than in former sets. The quality of reproduction was all that could be desired, and the volume of output enormous.

Regarding the selectivity of the set, this was amazing. The number of stations received was 52 in less than an hour, all long enough to get a good impression of the particular station, all at full volume and clear cut, and without the slightest trouble.

Another great innovation is the Triple Extractor unit. The effect of this was most interesting. With the local at full strength, a slight turn of the extractor, and it was lost—almost dead silence, so that the pointer could be moved over a stretch of the dial with stations all round. This was most effective.

Another feature which was surprising in its results was Audio-Reaction. From a whisper it will bring the signal strength and quality to something hitherto unknown.

The results from a small length of aerial wire—about nine feet—were the same, station after station being received as before.

After witnessing such a wonderful demonstration one would naturally expect to find a most elaborate set, with all the latest valves, etc., but such is not the case. There are no fancy valves, the wiring and layout is simplicity itself; there is no ganging of condensers to worry the constructor. In fact, to sum up the set, it is the finest yet, and I wish to congratulate you on having produced it with such a high degree of efficiency and at so low a cost. I trust the set will meet with the appreciation it deserves. The number of stations picked up under such conditions was amazing, and many more could have been added, given the time.

H. E. GOSS, "Woburn House," 15, Cuffley Hill, Goff's Oak, Herts.

TUNING—SIMPLICITY ITSELF.

Dear Sir,—I wish to thank you for the successful demonstration of your latest set, the S.T.700, which took place at Brookmans Park. I must confess that I did not think it possible to be able to cut out the English stations right under their own aerials. I am more than convinced now.

The S.T.700 received about 60 stations on an ordinary aerial while the B.B.C. were working their hardest.

I think it is wonderful that a set costing so little will do so much.

The tuning is simplicity itself with the wonderful Auto-Dial. Volume is extra strong, and the tone is better than I have ever heard.

I think the two most wonderful new inventions in this set are the Auto-Dial and the Audio-Reaction, which has never, to my knowledge, been used before. The Audio-Reaction

ENTHUSIASTS ALL!

These constructors were among the scores who witnessed the remarkable visual demonstrations of the amazing effects of Audio-Reaction which are illustrated on the opposite page. The names of those in the photograph are Messrs. H. Ellmers, S. Budden, J. Espinosa, W. J. Shipley and R. D. Beebe.

Readers' Opinions of the S.T.700

A COLOSSAL SUCCESS ALL OVER THE COUNTRY

increases signal strength 25 times, and the tone 100 per cent.

On a very small aerial about 8 feet I did not notice any difference from the ordinary one. The stations rolled in just the same.

Wishing you the best of success.

W. R. WALTHAM, 1, *Onslow Mews, South Kensington, S.W.7.*

"SUPERB QUALITY."

Dear Sir,—It was worth the journey from Leicester to Birmingham on a pouring wet afternoon to hear your S.T.700, and I was very much impressed by its quite unique features.

The simplicity of tuning by the large Auto-Dial is very striking, even to those of us who are used to the game. The selectivity is ample; and with the Triple Extractor, a good margin is available in these days of ether crowding. The volume is enough for any household

The output meter held by Mr. W. J. Shipley, 109, Cleverly Estate, London, W.12, during an amazing visual test of Audio-Reaction. Here you see the meter registering the extremely low signal strength given by a weak station before the application of Audio-Reaction.

requirements—more than for some I could name!—and that with superb quality.

As to stations received, I noted a list of practically everything on the long and medium bands, some stations I cannot pull in with the S.T.400, good as that set was and still is.

It nearly broke my heart to come away with only a brief demonstration of the use of Audio-Reaction; but L.M.S. trains are like time and tide—they wait for no man and few women!

I notice with pleasure the moderate cost, and it looks like the "400" giving way to the "700" as quickly as I can get the stuff along.

Thanking you for the opportunity of a convincing demonstration of what can be done in set design by one who knows how.

John C. LUCAS, 28, *Rowsley Street, Leicester.*

"A MARVELLOUS SET."

Dear Sir,—Please accept my thanks for the privilege of witnessing a demonstration of your latest set, the S.T.700, during the evening of October 16th.

I can say that it was a revelation in every respect to me from the moment you switched on and commenced to bring the set to life; and it was certainly full of life, far in excess of my expectations.

It was surprising how easy the stations were brought in during the demonstration, 75 stations were logged, and all at loudspeaker strength. Your new and clearly marked station-finder is a very great asset, and even the novice could not fail to appreciate its aid in logging any station.

The S.T.700 is really a marvellous set combined with simplicity. Its volume was tremendous, and the quality was all that could be wished for. I am telling all my friends of its most wonderful performance.

T. H. TAYLOR, 19, *Exeter Place, Exeter Street, Birmingham*, 1.

STUPENDOUS CAPABILITIES.

Dear Sir,—On October 9th, I had the pleasure to attend a demonstration of the S.T.700, the new creation of Mr. Scott-Taggart, and although I was prepared to see and hear something entirely new I was rather sceptical that any improvement could be made on the last S.T.600, of which I am at present a proud possessor.

After a very adequate and clever introduction of the set made by the Technical Editor, Mr. Dowding, and having observed carefully the meter readings to the response of the set to a wide range of frequencies, his colleague Mr. Rogers started to give a demonstration of the easiness with which stations could be located and heard. I am accustomed to tune and listen to almost any station in Europe, some, naturally, with difficulty on account of their small transmitting power, but I was really astonished to hear how stations kept coming in according to the names marked on the unique dial. I still remained under the impression that such a wonderful performance could only be due to the skill in the manipulation by the demonstrator, who might have had experience in the handling of the set, but when I was invited to try the apparatus myself, an opportunity which I could not let slip by, I was more than convinced that the capabilities of the set were stupendous, selectivity amazing, response fidelity in itself, and quality quite typical of all the S.T. sets; only that in this particular case—a remarkable improvement is noticeable by the use of the new and quite original Audio-Reaction incorporated by Mr. Scott-Taggart, so that when same is applied the volume increases considerably without impairing the realism of the output, but still further improving it with the accentuation of the low notes.

I feel convinced that an enormous success for the S.T.700 is certain, as personally I think it is the ideal set for the home constructor, owing to the new style of construction and the exceptional low cost of the simple components of which it consists.

With my sincere appreciation for having been invited to the stated demonstration and wishing your periodical a long association with Mr. Scott-Taggart, and all the success it deserves.

J. ESPINOSA, 70, *Maycross Avenue, Morden, Surrey.*

"BUILD IT."

Dear Sir,—It was with great pleasure that I received the invitation to attend a demonstration of the S.T.700 at one mile from Brookmans Park.

As the twin transmitters are about four miles from my home, I know only too well how much interference they can cause to foreign stations, and I therefore knew that the S.T.700 would have to be a really good set to deal with the London stations, but it easily surpassed my expectations.

Before actually operating the set, Mr. Scott-Taggart carefully explained the advantages of the new station name dial, which is a distinct advantage over the S.T.600 dial, because the pointer cannot point to more than one name at the same time, although there are 112 names on the dial. The operation of the three Extractors was also explained and it was soon proved how they reduced the London programmes to mere whispers, although the transmitting aerials were only a short distance away and visible from the room we were in.

Then came the test to which I think we had all been looking forward, namely, to see how many stations could be received at loudspeaker strength. Mr. Scott-Taggart received 50, all of which were good enough to sit down and listen to, and if time had permitted, I am certain he could have doubled this number. Berlin and Toulouse were received clear of London Regional, and lower down the dial Radio-Normandie and Lille were heard clear of London National. Between the two London stations, 13 other stations were picked up without any interference from the Regional or National, and at the top end of the medium waves all the stations that were transmitting were heard.

The station which surprised us was Cork, a 1 kw. station, only a few kilocycles from London National, but it was received at excellent volume without any background of the London programmes.

On the long waves all the well known stations were heard, free from interference, as Droitwich was effectively silenced by one of the Extractors, and the medium-wave Extractors also prevented any break-through on the lower end of the long waveband.

(*Continued on page* 284.)

NOTE THE NEEDLE

Without anything else being altered Audio-Reaction was applied to boost up the weak signal. The needle moved right over to the other end of the scale, thus proving by scientific means precisely the colossal amount of additional magnification provided by Audio-Reaction.

ON THE SHORT WAVES

CURING MAINS HUM.

Practical suggestions by our short-wave expert on how to run your S.W. receiver entirely from the mains and yet have absolute freedom from hum.

I SUPPOSE there must be many hundreds of people using battery-operated short-wavers, although they have A.C. mains in their homes. I did so myself for many years, being guided by the principle of letting well alone, and also remembering that it does accumulators good to *use* them.

When one first changes over to the mains, one either says several things that one shouldn't say in public, and hastily goes back to batteries again, or one heaves a sigh of deep content and remains happy ever after.

If you are lucky in devising a mains set that really goes from the start, then you will say good-bye to batteries without a suspicion of regret. It really is a most comforting feeling to know that you have only to switch on, wait a few seconds, and have the set going right away without that feeling that "the L.T. may be down," or "that grid-bias battery is getting noisy."

On the other hand, judging from readers' letters, many of them seem to have considerable trouble in getting rid of mains hum completely, and rather wish they had stuck to batteries.

The guiding principle on which I have always worked is that a mains receiver is *no good* until one definitely cannot tell whether it is mains-operated or not. My own all-mains two-valver has led many people to think that I still stick to batteries (some of them have even had to examine the power-pack to make sure !) because the percentage of hum on it can only be described as "zero."

Careful Wiring Necessary.

There are several little dodges worth passing on. *Of course*, you won't get hum-free operation unless you wire the set up decently (particularly the heaters). Likewise you won't if you use doubtful chokes or smoothing condensers in your power-pack. We won't even consider sets that are handicapped from the start by poor wiring or components.

Let us suppose, rather, that you have a receiver over which you have taken all reasonable pains, both as regards the components and the layout and wiring. You also have a power-pack with adequate smoothing and a rectifier that is above reproach. You still have 1 per cent (or perhaps only ·1 per cent) of A.C. hum, which just spoils the pretty picture for you. How are you going to get rid of it ?

First and foremost I recommend you to try the dodge shown in Fig. 1. Close up to the heater valve-holder, install a pair of ·002 fixed condensers. One side of each is connected to a heater terminal ; the other sides are common and are earthed. You should have a metal or foil-covered baseboard, and the earthing will simply mean an inch of wire to the nearest spot on the board.

A DODGE TO TRY

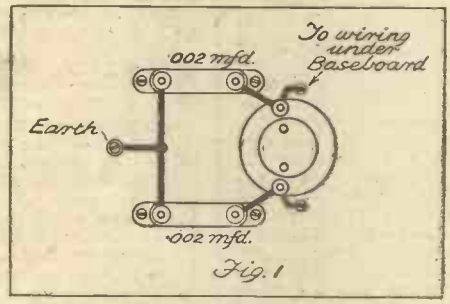


Fig. 1

The first hum-cure to try. The two ·002-mfd. condensers are joined across the heater terminals.

If your small amount of residual hum is anything to do with the heater circuit, it's ten to one that this dodge will cure it. Incidentally, it's not a bad idea to identify the hum at the outset by running your heaters from a 4-volt accumulator for a few moments.

If you still get it you are safe in blaming the H.T. circuit. In that case it is probably just a matter of insufficient smoothing. And in nine cases out of ten the sufferer will just pile on more microfarads without doing the slightest good.

If your hum comes from an imperfectly smoothed H.T. supply, the best thing you can do to it is shown in Fig. 2. Here the detector valve is given a separate H.T. tapping on its own—possibly it already has one—but instead of mere decoupling it has a little extra smoothing, too.

ADDING SMOOTHING

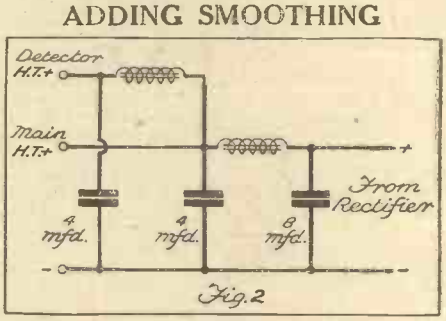


Fig. 2

When hum is due to the H.T. supply, try extra smoothing for the detector, as shown here.

A second smoothing choke is inserted in the positive H.T. lead to the detector, and the "set" end of it by-passed to earth by a further 4 mfd. condenser. If that doesn't cure the hum it's time to start looking for less easy solutions.

One rather elusive one is concerned with the rectifier itself. Certain types of rectifier valve require a pair of by-pass condensers (mica ·002's, for example), from each anode to earth. One often sees these in commercial power-packs, but how often does one see the small refinement of taking them one to each leg to the rectifier filament, instead of to earth or H.T. positive ?

Lay a couple of condensers alongside the rectifier valve-holder, and connect one from each plate terminal to the nearest filament terminal.

By now I can almost hear the unfortunate reader saying "Yes, but I've done all this, and the darn thing *still* hums !" Well, there's more to try yet. The earth connection is an important point that's often overlooked. If you have a direct earth on your set, try removing it. That may cure the hum.

Using an H.F. Filter.

If, on the other hand, you don't use one, put one in and see what *that* does. Likewise find your mains leads where they enter your mains unit ; connect two 1 mfd. condensers in series across the A.C. mains and earth the centre point through a ·01 mica condenser.

No, we haven't exhausted them all yet ! Good thick H.F. chokes in series with the mains work wonders in some cases. You might make a complete filter in a biscuit box, similar to the one that I described a few months ago—two chokes, with a pair of condensers at each end.

To come back to the set—is the detector valve metallised ? An unmetallised detector, especially if it is an H.F. pentode or S.G. type, will often leave a little residue of hum that is quite absent with a metallised valve.

By now, I admit, we *are* getting to the end of our tether. If you can honestly say that you still have a spot of hum, after trying out all these tips, then it's time you started at the beginning again with a new layout and more careful wiring.

The heater leads, by the way, must be kept clear of other wiring, especially grid leads, and if you want to make a thorough job of it, you won't just use twisted flex for the heaters, but will go to the trouble of installing braided cable, such as you can get at any garage for wiring up motor lighting systems.

One last appeal—*please* don't write to me and say you've tried out everything without any luck ! I shan't know what to say to you if you do—I've told you everything I know.

ON THE SHORT WAVES.

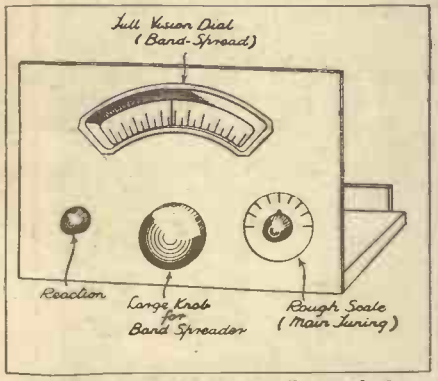
WHAT READERS ARE SAYING

H. A. (Preston) has several remarks to make about the "B.C.L." Two, with special reference to my recent chat on aerials. Having previously cut his own down from 72 ft. to 48, on reading my recommendation to use as much as possible (within limits) he rushed out in the garden and put the extra bit back again.

Results, however, were not so good, and it was cut down once more. I note that H. A. conducted these tests on Sydney (V K 2 M E) in the 31-metre band. It is quite likely that 48 ft. *would* be better than 72 with this particular waveband. He is now proposing to try a doublet, which should give him plenty to think about and to play about with.

Two readers, H. R. C. and R. L. B., both of Southampton, protest against my recent recommendation of a slanting "T" aerial,

THE MODERN IDEA



A reader's suggestion of what the panel of a short-wave receiver should look like in these enlightened days.

with which a friend of mine was getting freakish results. They have tried it, with two different sets, and think it's positively rotten! They would like to hear of other readers' experiences with the same arrangement.

Of course, that's the way *everything* goes in radio. What suits one set and one particular location may be simply useless, or worse, elsewhere.

When to Hear Sydney.

W. F. (Failsworth) has a "Simplex" Two which seems to be going well, but he is a little worried because he hasn't yet heard Australia on it. I should think it's only a question of listening on the proper wave at the proper time. Try Sunday morning, 7 to 7.30, on 31 metres, and unless you are unlucky enough to strike a really bad morning you just can't help getting Sydney. The only trouble is that you may think he's a European and pass him by!

J. E W. (Hillingdon Heath) is. like myself torn between an immense enthusiasm for organs and a terrific interest in short-wave radio. I suggest that he builds a short-wave set to look like a cinema organ console—you know push down the vox humana for wavechanging and the saxophone for automatic volume control, and so forth!

Seriously, though, he wants to use an autodyne adaptor in front of a broadcast receiver. All he need do, of course, is to build a nice single-valve short-waver and to couple the anode thereof, through a small condenser, to the aerial terminal of the broadcast set. Then, barring accidents, the open diapasons will let fly, the tibias will moan, and the glockenspiel will produce a beat-note with the xylophone. (Sorry, I seem to be getting all mixed up.)

The Wrong Frequency.

R. E. (Hadlow Down) has built a 5-metre receiver, and says he can't get much on it, except one Morse station signing M M F. M M F is a radio beacon operating on 1,000 metres, so I imagine that his quench-frequency is all wrong and that he's picking up long-wave stuff on the set. In any case I don't imagine that he would hear anything on "five" except the local transmitters in Heathfield.

I don't know about the P.M.G. certificate for a transmitting licence, R. E. You don't have to pass an exam., in any case—only a Morse test—but you have to satisfy the G.P.O. as to your reasons for wishing to transmit.

L. B. (Stapleford) is thrilled because he heard a two-way conversation between Berlin and Tokio in the region of 30 metres. He wants to know if I think he was receiving Tokio direct. I should think it's more than likely, L. B. Some of those Jap stations come in as strongly as any European nowadays.

Adding an L.F. Valve.

A. A. (Selkirk) has added another L.F. stage to the "Simplex" Two, and recommends other readers who do likewise to take a tip from him. He has reduced the H.T. on the first two valves to 72 volts and only puts 120 on the last, which is resistance-coupled with a 50,000-ohm resistance and a ·01 grid condenser. The grid leak is half a megohm.

B. G. (Coventry) sends a sketch of his idea of what a short-waver's front panel should be like in these enlightened days. He says, quite rightly, that the band-spreader is the most important thing, and should be equipped with a really big dial. For the "band-setter," quite a funny little knob is sufficient, as long as it has gradations that are readable on its scale.

CALIBRATION TIPS

I HAVE often hinted that I think the calibration of a short-waver increases its usefulness tremendously. Calibration has always come as a kind of second nature to me, and I find it difficult to realise that some readers don't seem to have the foggiest notion how to go about it.

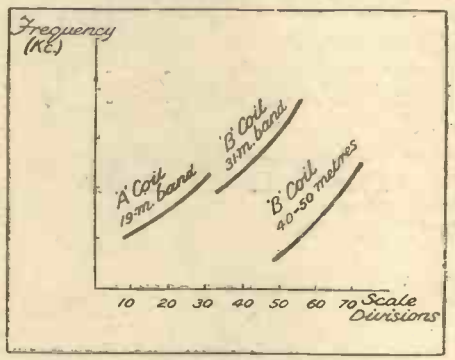
Perhaps a few simple hints will be welcomed by some of them. First of all, and most important, you *must* have a set that "stays put." Try it out on some well-known station that you can count on receiving every night for a week, and see if his dial reading varies at all.

If you have any adjustable controls, such as a capacity-coupled aerial circuit with a "preset" condenser, obviously you must set them to some pre-determined value and leave them there. Don't play about with the H.T. voltage or change the valves.

If all this is in order and your trial station doesn't appear to wander about, you should be able to produce quite a pretty curve. The simplest way for the average reader will be to do it on stations only.

Log all the stations that you hear if you can *positively* identify them, and note their dial readings very carefully. Don't try to get a complete calibration of the whole wave range of the receiver, but take each broadcast band in turn, and settle on some scale units that will give you a nice "spread" on the curve. The diagram shows what I mean.

A COMBINED "CURVE"



Only the area around the wanted bands need be calibrated, thus enabling the curves to be well spread out.

Your frequency scale, up on the left, should not be continuous. It may go from 16,000 to 15,000 kc. (embracing the 19-metre band) and then jump to 10,000 kc., going on to 9,000 kc., thus taking in the 31-metre band.

Then you can draw another curve in different coloured ink and add further frequency readings, plotting the 40 to 50-metre curve on the same piece of paper unless the dial readings happen to be the same as some of those on another coil.

Band-spreading is just as valuable on your curve as it is on the actual receiver, and you won't necessarily need a complete calibration on all the "waste" wavelengths in between the interesting bands.

If you have such a thing as a quartz crystal of known frequency you can rig it up in a simple crystal-oscillator and listen to all its harmonics. These will give you indisputable points all over the short-wave spectrum. But this method is probably out of the reach of most readers.

All the Empire programme wavelengths are given in the published list of short-wave stations, and the call signs are announced frequently. These form invaluable calibration points.

W. L. S.

"NIGHT FALLS IN BUDAPEST"

A dramatic account of the trials and tribulations that beset Eric Maschwitz and Val Gielgud when they went to Hungary recently to broadcast a series of relays from the capital.

By a Special Correspondent.

Val Gielgud and Eric Maschwitz in Budapest discussing some of their plans for the broadcasts.

LISTENERS who heard the four programmes relayed recently from the Hungarian capital probably gave Mr. Maschwitz credit for an ingenious and original programme idea, and Mr. Gielgud sympathy in his endeavours to apply the radio-dramatic technique of multiple-studio production to a conglomeration of "outside broadcasts." But I doubt if anyone who was not actually in Budapest during that week can have any real idea of the problems involved, of the curious circumstances that had to be surmounted.

"He was Frankly Incredulous."

Not that our twin adventurers went about demanding sympathy in their difficulties. They had no more time for that than they had for such other inessential activities as, for example, proper nights' rest. I know that they would be the first to acknowledge the friendliness with which they were received by every representative of the Hungarian people with whom they came in contact; the really terrific efforts made by the staff of the Hungarian Radio Organisation to meet every one of their apparently insatiable demands.

But the fact remains that they had not only to write, rehearse and produce four programmes; they had also to create the organisation necessary where none had previously existed. To both the programme and the engineering personnel of Budapest, such programmes were completely fresh in conception. "Outside broadcasts," of course, they knew.

But that five outside broadcasts should be included in the same programme, that they should be "cross-faded" one to the other and sometimes back again! When faced with the first specimen script, the Chief Engineer—known affectionately to both Hungarians and English as "The Chief"—like the oyster shook his heavy head. He was not appalled, though he was being asked with perhaps a staff of eight available to undertake work which would have demanded the services of four or five times the number if carried out by the B.B.C. But he was frankly incredulous both of possibilities and results. That he should have been so was not surprising.

As everyone knows, Budapest is built on both sides of the Danube. On the one side stand the picturesque monuments and buildings of the past—the Garrison Church, the War Museum, the Palace and so forth. Then down incredibly steep and winding streets you descend to the bridges over the river and cross to the modern city, where are the night-clubs, the coffee-houses, the theatres.

A Third Part of the City.

Then again, on the Margaret Island in the middle of the Danube, lies what is almost a third section of the place, containing hotels, sports clubs, polo grounds, and the like; while such essential sources of material as the famous Budafok Cellars and Mr. Dohnányi's villa were considerable distances outside the city altogether. For programme builders and engineers the communication problem was a serious one. For the former, because with a strictly skeleton "cast," people had always to be on hand to commentate or take part in dialogue, and must not be expected to be in two places at once! To the latter, because their gear was limited, and irreplaceable with all the good will in the world.

The result was a startling spectacle of a couple of municipal motor-cars, with fluttering British and Hungarian flags on their mudguards and police trailers ahead of them to clear the streets, tearing all over the city at every hour of the day or night. Further results were a rather bad cut on the head for Maschwitz—springing out of a car in a hurry—and considerable fraying of nerves—as the sequel to frantic skids—for other members of the party!

A further fence on this generally tough course lay in the invincible habit of the Hungarians—a habit common elsewhere in Central Europe—of starting every appointment at least twenty minutes late, and spending at least the first hour of it in charming courtesies, and consideration of the political situation.

Working Night and Day.

As the visitors had to make anything from thirty to sixty personal contacts, apart from further detailed discussion of plans and the like, it is easy to see why much of their nights were taken up with script writing. There was literally no other time in which it could be done. And this period of night-writing had, as a rule, to follow up a round of visits to various night resorts, all of which had to be combed for possible material.

And such resorts opened late, closed later, and were in themselves sufficiently attractive to militate against the firm closing up of the party on the savagely serious grounds that work had to be done!

Maschwitz endured all without flinching. Parties, interviews, rehearsing, flying over the city, writing in his bedroom till four in the morning—nothing quelled him, not even the blow on his head! But I saw his colleague at intervals watching the proceedings with an eye only truthfully to be called jaundiced! Perhaps Gielgud had the stickier end of the stick—from one point of view. Such programmes, difficult to time, elaborate in organisation, enorm-

(*Continued on page* 281.)

THE SCENE OF THE FAMOUS PROGRAMMES

A fine panoramic view of the famous city on the Danube. Relays were broadcast from places all over the city, fast motor-cars rushing the engineers and artists from point to point as required

The cabinet for the A.C. S.T.700 has been specially designed by Mr. Scott-Taggart so that its acoustic characteristics suit the set.

THE A.C. S.T.700

Readers were introduced to the A.C. S.T.700 last week. This week all the necessary constructional diagrams are given together with information and instructions.

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

THE great benefits of Uni-Plane construction do not by any means cease with the simplicity of the construction. This fact is appreciated when you look at the very handsome cabinet arrangement. On previous A.C. sets of my design the controls appear on the front either above or below the speaker "hole." This time, however, I have made a radical departure both from my own designs and those of others designing for the home-constructor public.

The general appearance is not, however, wholly novel, as two or three commercial sets have horizontal "instrument boards" with a speaker or speakers in front. Personally, I like this arrangement very much. It adds greatly to the compactness of the whole, and when the set is not in use it looks unusually harmless and free of those frightful frightening knobs which have had the lid put on them.

Needless to say the scientist and engineer in me rejoices in dials and knobs top-hamper, but I must admit that the A.C. S.T.700 satisfies almost unsuspected aesthetic instincts. With the lid down it looks like a jewel casket or treasure box, or other exciting mysterious glamorous furniture. The quality of the workmanship and materials adds to its beauty. When you build the A.C. version you should specify the exact cabinet illustrated, partly because I consider it the best for the set, but chiefly because it is the only one which I have designed and tested myself expressly for the A.C. S.T.700 receiver.

Important Considerations.

There is rather a tendency amongst trade and public to regard cabinets as mere houses for sets, whereas I submit they are essentially parts of the sets themselves. A cabinet has acoustic properties of its own and requires to be tested out by the designer of the main set. All kinds of resonances, vibrations, etc., may be set up which can destroy the quality aimed at by the designer; the box-baffle effect also affects the degree to which the various notes are developed. For example, a *very* small cabinet would audibly reduce the bass response. A third and extremely important factor is the possibility of microphony, which causes a valve to "ring"; often a

(*Continued on page* 276.)

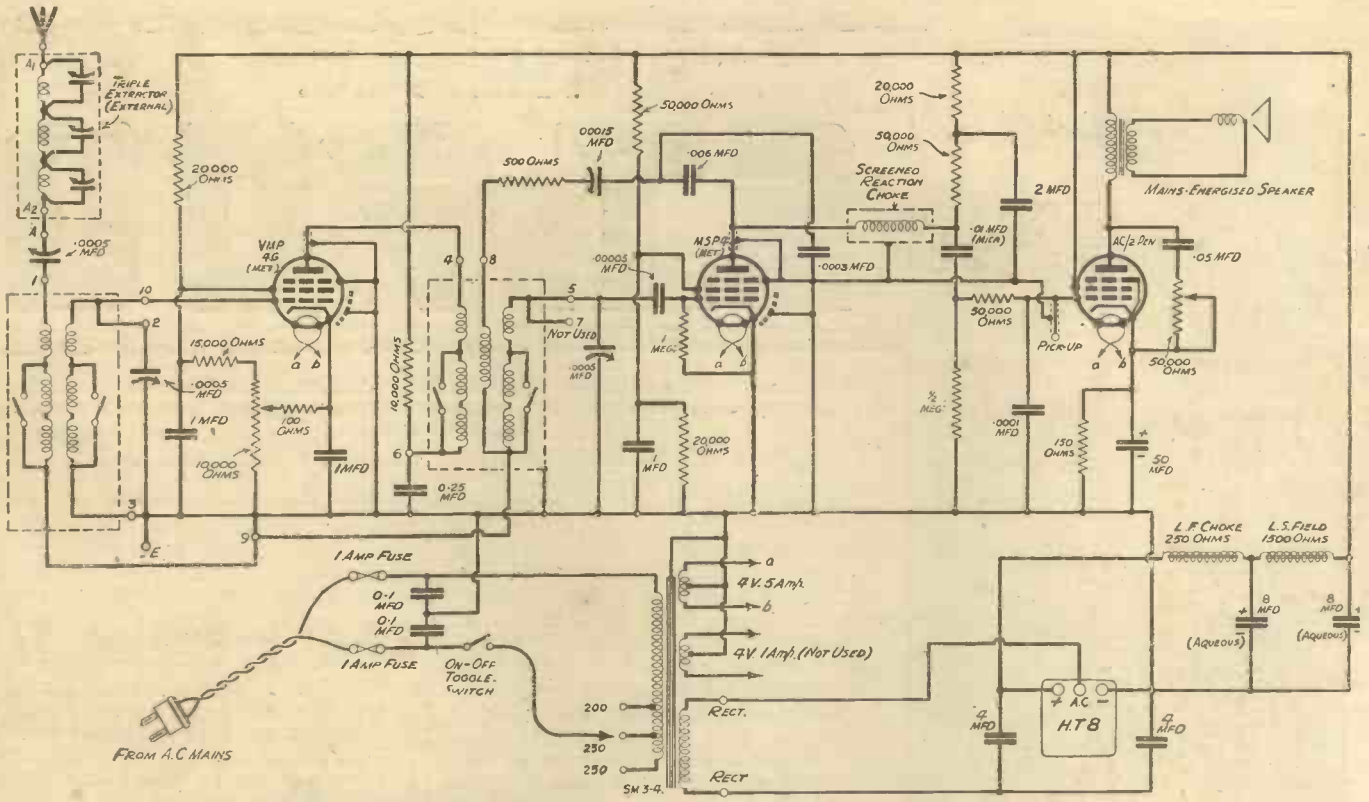
THE PARTS YOU NEED TO BUILD THE A.C. S.T.700

Component.	Value.	Make Used by J. Scott-Taggart.
Coil unit	For S.T.700	Colvern
Aerial balancing condenser	·0005-mfd. air condenser	Ormond R.483 with small knob free.
Main tuning condenser	·0005 mfd.	J.B. "Popular Log" with special pointer
Aerial coupler	·0005-mfd. solid dielectric	B.T.S. type 602
Reaction condenser	·00015-mfd. solid dielectric	B.T.S.
Volume control	10,000-ohm wire-wound (must be wire-wound)	Colvern S.T.5C. To match other knobs use a B.T.S. knob
Valveholders	3 7-pin	Bulgin V.H.22.
Mica condensers	1 ·00005 mfd.	Lissen
	1 ·0001 mfd.	Lissen
	1 ·0003 mfd.	Lissen
	1 ·01 mfd.	Dubilier B.770
Tubular condensers	1 0·25 mfd.	Polar-N.S.F., 350 v. working
	1 ·006 mfd.	T.M.C.-Hydra, type T.15/5
	1 ·05 mfd.	T.M.C.-Hydra, type T.23
	1 0·1 mfd. + 0·1 mfd.	T.M.C.-Hydra, 600 v. working, type T.32
Paper condensers	2 1-mfd.	T.C.C. type 50
	1 1-mfd.	Graham Farish Mansbridge type
	1 2-mfd.	T.M.C.-Hydra, 400 v. working, type 40
	2 4-mfd.	Amplion, 700 v. test. type T.B.
Electrolytic condensers	2 8-mfd. Aqueous type	T.C.C. type 802
	1 50-mfd.	Dubilier 12 v. working, type 3013
Fixed resistors	1 1 megohm	Erie, 1 watt
	1 500,000 ohms	Erie, 1 watt
	2 20,000 ohms	Dubilier, 1 watt
	1 20,000 ohms	Formowatt, 1 watt
	2 50,000 ohms	Erie, 1 watt
	1 15 000 ohms	Erie, 1 watt
	1 10,000 ohms	Erie, 1 watt
	1 500 ohms	Ferranti G.H.5, ½ watt
	1 150 ohms	Erie, 1 watt
	1 50,000 ohms	Ferranti G.H.5, ½ watt
	1 100 ohms	Erie, 1 watt
Screened H.F. choke	——	Ward & Goldstone type S.H.F.
Tone control	50,000-ohms potentiometer	GrahamFarish "Ohmite"
Mains transformer	——	Ferranti SM34
L.F. choke	——	Varley DP10 (250 ohms)
Metal rectifier	——	Westinghouse type H.T.8
On-off switch	——	Bulgin S.80
Safety twin mains fuse holder	——	Bulgin type F.19
Energised loudspeaker	——	W.B. special type for A.C. S.T700 with 1,500 ohms field and output transformer, either multi-ratio or suitable for Mazda A.C./2 Pen
3 Terminals	A, E, Pick-Up	Belling-Lee type R
Valve hoods	2 low-loss valve hoods with connections	Belling-Lee Cat. No.1224
Screened lead	6-in. length	Ward & Goldstone type R.34/192
3 Terminal pillars	——	Bulgin S.W.49
2 Terminal strips	——	Peto-Scott (ready drilled)
4 Brackets	For mounting terminal strips	Peto-Scott (with nuts and bolts)
1 Bracket	(On which to mount 2 T.C.C. type 802 electrolytic condensers)	Peto-Scott
Mains lead	10 ft.	Peto-Scott.
Mains plug	——	Bulgin P.23
Cabinet with panel and baffle assembly	(Specify S.T.700 A.C. model and speaker when ordering)	Peto-Scott

The Triple Extractor Unit is the same for A.C. S.T.700 as for Battery S.T.700.

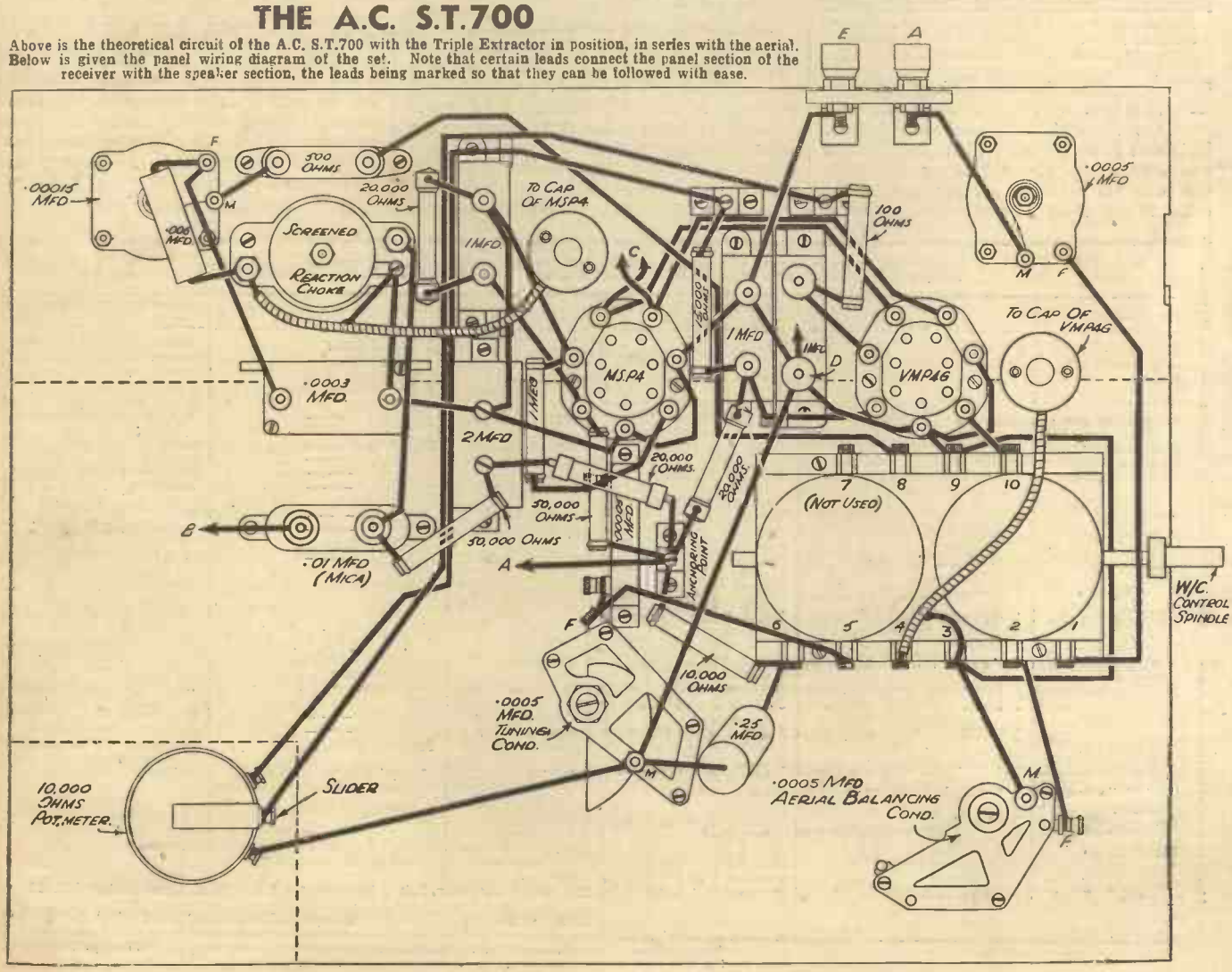
VALVES

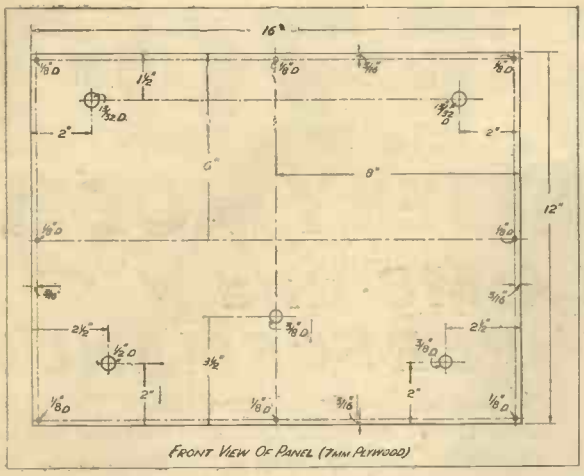
Osram or Marconi V.M.P.4G Osram or Marconi M.S.P.4 Mazda A.C./2 Pen.



THE A.C. S.T.700

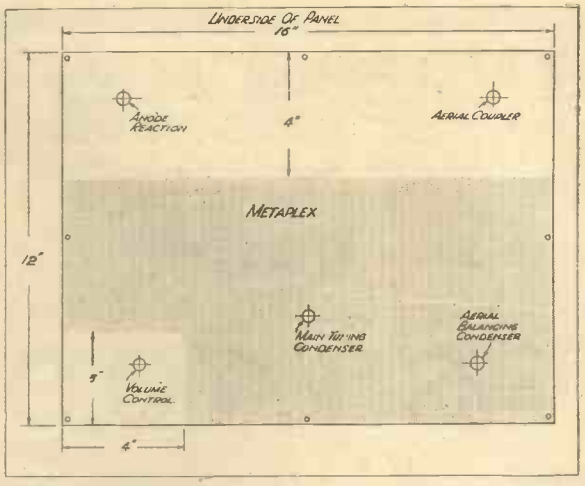
Above is the theoretical circuit of the A.C. S.T.700 with the Triple Extractor in position, in series with the aerial. Below is given the panel wiring diagram of the set. Note that certain leads connect the panel section of the receiver with the speaker section, the leads being marked so that they can be followed with ease.

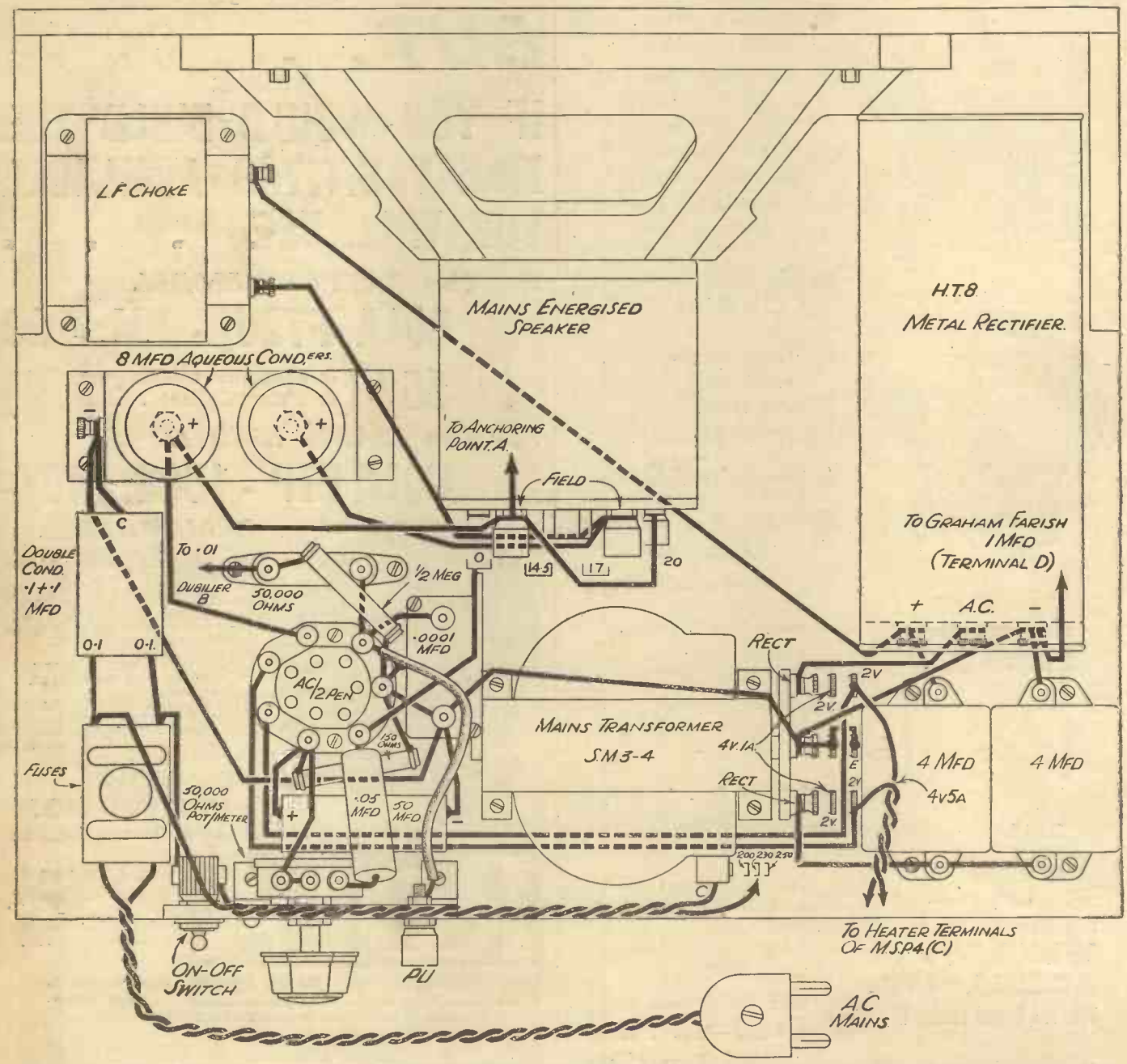




A.C. S.T.700 PANEL DETAILS

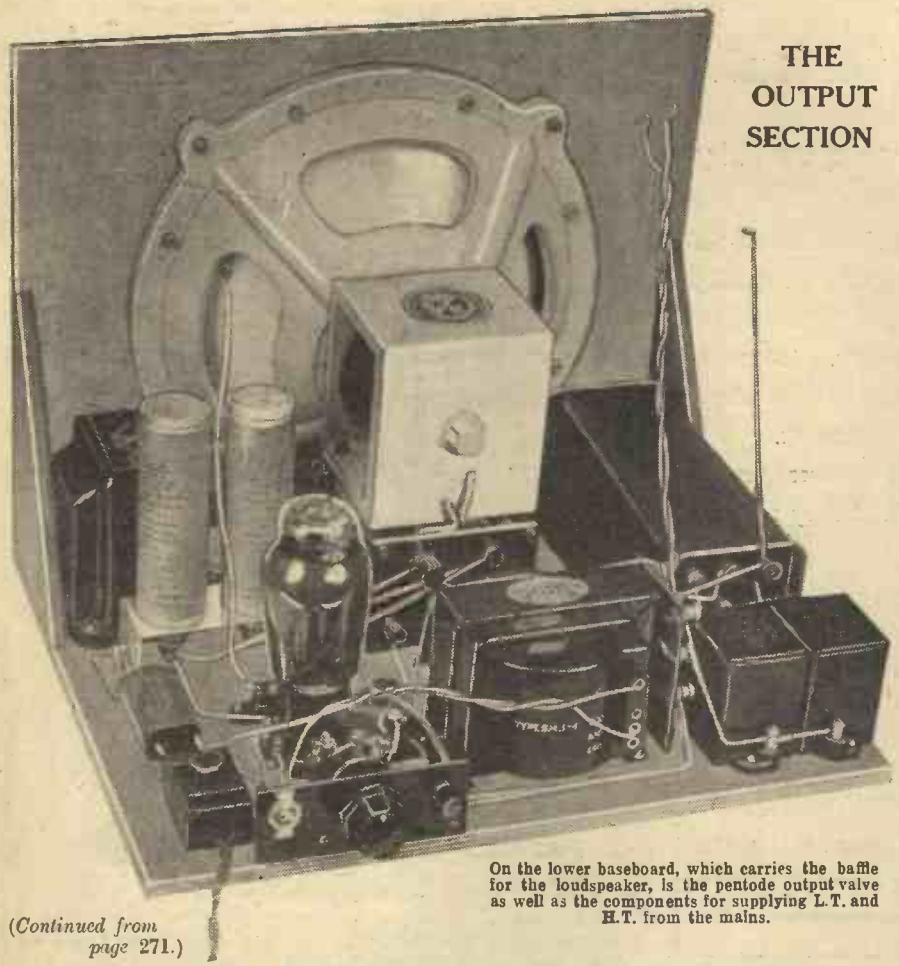
These two diagrams, to the left and right, show the panel. They give full drilling details, show the positions of the components and indicate the area covered by Metaplex.





The diagram above and the one at the bottom of page 272 show all the wiring in the receiver. Above you see the power-supply components, loudspeaker and output stage, while the wiring diagram on page 272 illustrates the top panel wiring.

THE OUTPUT SECTION

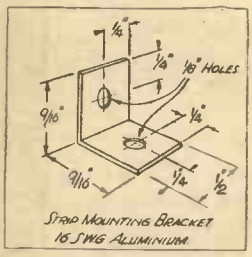


On the lower baseboard, which carries the baffle for the loudspeaker, is the pentode output valve as well as the components for supplying L.T. and H.T. from the mains.

(*Continued from page* 271.)

steady howl is produced. This is always liable to occur in a set where the speaker and valves are in the same "box."

In the A.C. S.T.700, for example, the trouble occurred on the first sample of the cabinet, but by certain reinforcing and the fitting of padding beneath the panel carrying the components the trouble was entirely cured. Some cabinet makers who omit to co-operate technically with the set-designer and evolve designs "on their own" clearly relieve the designer of all responsibility.



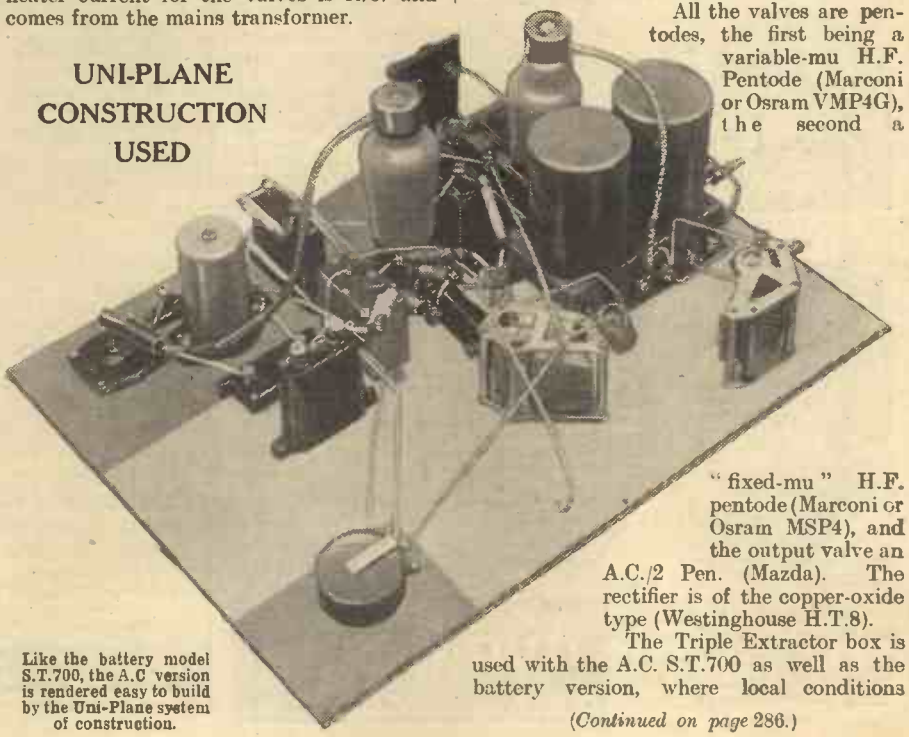
Dimensions for the aluminium brackets used to fix the ebonite strips in position.

The horizontal control panel system used in the A.C. S.T.700 is made possible by the Uni-Plane construction. It is difficult to see how the system could be embodied in any other way without complication. It is, therefore, a by-product—and, in the opinion of those who have seen the set, a most attractive one—of a system of construction primarily developed to facilitate assembling.

An A.C. set is always more complicated than a battery model because the power unit, instead of consisting of two external batteries, is a rectifier and smoother outfit and also supplies current for the radio valve "heaters." Anything that simplifies construction is therefore doubly welcome.

In the present set there are two component boards. One is the main receiver itself (but without the output valve), and this differs practically not at all in appearance from an ordinary battery set; the valve holders are different from those on the battery "700," being of the 7-pin type; the heater current for the valves is A.C. and comes from the mains transformer.

UNI-PLANE CONSTRUCTION USED

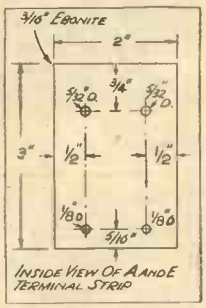


Like the battery model S.T.700, the A.C version is rendered easy to build by the Uni-Plane system of construction.

The other component board accommodates the output valve, the mains transformer, the rectifier valve and smoothing equipment. This board has attached to it a vertical baffle-board for the loudspeaker, which is of the moving-coil type with mains-energised magnetic field.

The receiver board or panel is, of course, at the top of the cabinet, immediately under the lid. It is supported along its four edges on fabric-covered wooden fillets, and is held down by eight fixing screws; these details are important, as they contribute to the complete prevention of microphony. These points may be noted on receipt of cabinet.

The second component board rests on the floor of the cabinet, and when in position the speaker comes opposite the squarish aperture in the cabinet. The controls call for no comment; they are all on the horizontal top panel, except the wavechange switch which is unobtrusively situated on the left side of the cabinet.



Details of the strip which carries the aerial and earth terminals.

The circuit of the A.C. S.T.700 naturally differs from that of the battery version in several particulars. Only three valves are necessary owing to the greater "efficiency" of indirectly heated mains valves. This arrangement also permits full sensitivity without the need for a step-up intervalve transformer; it is therefore possible to obtain at low cost a full reproduction of the bass. As the speaker itself is also capable of giving a good performance at this part of the musical scale, the need for Audio-Reaction is not as urgent as it is in battery sets—and in any case its satisfactory adaptation to mains receivers would add very greatly to the total cost.

All the valves are pentodes, the first being a variable-mu H.F. Pentode (Marconi or Osram VMP4G), the second a "fixed-mu" H.F. pentode (Marconi or Osram MSP4), and the output valve an A.C./2 Pen. (Mazda). The rectifier is of the copper-oxide type (Westinghouse H.T.8).

The Triple Extractor box is used with the A.C. S.T.700 as well as the battery version, where local conditions

(*Continued on page* 286.)

NOTES AND NEWS

(Continued from page 253.)

is what "P.W." has been working on. Now after many months' work and in collaboration with famous scientists and engineers the results have been sorted and simplified into a valuable treatise and made available to you in THE BOOK OF PRACTICAL TELEVISION.

If a new science fascinates you; if a unique first edition tempts you; if the birth of a new industry affects your interests; if you want to get in on the ground floor while the going is good—get that book, and hold on to it. You will see why before 1936 is out.

All-electric Orchestra.

WHAT is probably the first all-electric orchestra to be formed in this country, if not in the world, will be heard by members of the Anglo-American Radio and Television Society this month.

This enigmatic electric ensemble will play to the society at a "Surprise Dance," which only members and their friends may attend. Unqualified readers who feel they simply must go have one obvious opportunity open—they must join the society; it extends a welcome to all via the glad hand of Mr. L. W. Orton, "Kingsthorpe," Hawthorn Drive, Willowbank, Uxbridge, Middlesex.

The League's Station.

IF you are a watcher of political portents you may have noticed that the League of Nations wireless station, "Radio Nations," has mobilised itself, called up its own reserves, and is now issuing proclamations to all classes of combatants.

The most important broadcast in the League's history was that on long waves (4,225 m.) advising governments that a state of war existed. This was transmitted from H B G, and repeated on short waves by Prangins, which is housed in the same building as the long-waver.

Telegraphists who like to be in the know should note the commencement of an exceptional daily service of radio telegrams to all governments from the Secretary-General of the League.

This is where slick students of the dot and dash score heavily, for they can hear the League weightily advising its members of this and that, or trying (often in vain) to get into touch with that radio abyss, Addis Ababa.

Not Good For D.X.

SINCE the introduction of the People's Set (for local-station reception only), and propaganda radio, the Germans have discouraged long-distance reception and relied upon the State-controlled news.

One Nuremberg woman who recommended neighbours to listen to foreign instead of to German broadcasting has been sentenced to five months' imprisonment.

The Young Lady of Riga.

THE original Young Lady of Riga—who went for a ride on a tiger—has been outdone by a ten-years-old girl of that city, recently examined by the Latvian Medico-Legal Institute. She appears to possess the extraordinary power of repeating aloud anything which is being read in the same room, though it is read *silently and in English or another language of which she is entirely ignorant!*

The girl is the daughter of poor people, who are said to have discovered her strange power quite by accident. A local doctor became interested in the case and arranged for further tests to be made, there being some sceptics who thought that wireless was in some way concerned with the strange results obtained.

If she comes through the tests imposed by the scientists we shall at last have some foundation for a belief in "human wireless."

Unfinished Symphony.

SPARE a tear for David Battistoni, of Vancouver. Only a month ago he was an ordinary citizen, unknown to fame; and when the day's work was done David lounged at home at his ease, listening to his wireless set, and dreamily admiring the beautiful cabinet.

And lo, as he looked, *a pair of hands came in through the window behind the set, deliberately grasped it and whisked it away!*

Then David waxed exceeding wroth and cried with a loud voice, "Hoi! Stop!" Rushing to the window he looked out, but the thief and David's wireless set were gone without trace.

And now David is famous, but he sits back disconsolate and wonders why this Goliath of a misfortune should have come to him.

ARIEL.

FASCINATING DISTORTION

IT might appear absurd to suggest that distortion could ever be fascinating, and yet it can. But we are not referring to the distortion of speech and music which even these days is only too often to be heard after it has passed through the process of a radio set.

Our reference is to distortion in television. Weird and wonderful and, yes, fascinating are the distortions which can occur when all is not as it should be with the viewing apparatus.

Remarkable and sometimes perfectly symmetrical patterns appear superimposed upon the pictures. Of course, you won't appreciate the beauties of such pretty patternings if you are eager to see the pictures across which they are drawn!

And then there sometimes occurs a peculiar little sideslipping across a portion of the view, and if this happens to take place across the face of one of the actors the result may be a comical twitching of a nose or an ear.

AN UNPRECEDENTED OFFER

As much as two guineas is sometimes the price of a new book dealing in a thorough manner with a specialised subject. And when you have paid such a price, you are apt to be disappointed with the quantity if not the quality of the contents.

But owing to the fact that the Amalgamated Press (the largest periodical publishing concern in the world, and the only one which possesses its own forests and paper mills to make its own paper) has planned large-scale production, we are able to give our readers the opportunity to acquire the magnificent "Book of Practical Television" on most advantageous terms.

Last week we published full details of its contents, and already have received many congratulations from our friends in the radio industry on, as one well-known manufacturer style it, "Everybody's Modern Television Encyclopedia" at a price at which everybody ought to be eager to buy it."

Details of our great offer appear again in another page in this issue.

Sometimes the pictures get out of frame and lop off legs or heads. Not that such effects will be encountered more than are the various faults and failings of ordinary radio sets, but when they come they are often definitely striking. It is because television faults are mainly evidenced in such a way that they can be seen that they are simple to diagnose.

There are some wonderful photographs of television pictures subjected to various effects in the "Book of Practical Television," the new volume which is the subject of a very special offer to readers of POPULAR WIRELESS. And in this book are full details of "Plasticity," "Hiccoughing," and other curious and interesting things which all "lookers" will in due course encounter.

As a matter of fact, every aspect of television is dealt with in this magnificent work, and even if you are not engrossingly intrigued by the new science at the moment, you ought to secure a copy, because the day is to arrive when television will be very much to the fore. And in view of the fact that early next year the B.B.C. is to go all out on a Television Service, that day is not so very far ahead!

BARRY KENT CALLING

News and Views from the "Big House."

B.B.C. and Television.

THE B.B.C. now feels that it must begin to talk about its plans for a television service that is going to cost a lot of money. Therefore, we can expect a burst of information both from the engineers and from Mr. Gerald Cock, who is straining at the leash in an endeavour to get properly started.

* * *

New American Feature.

A new "actuality" feature programme idea is being worked out by the B.B.C. and the Columbia Broadcasting System of America. The idea is to exchange short "O.B.'s" that will give listeners on each side of the Atlantic a graphic idea of what is happening on the other side. Much is expected of the idea, which will be put into effect as soon as possible after Mr. Felix Greene takes up his job as B.B.C. representative in New York.

* * *

A Snooker Commentary.

There are not many games that remain to be treated by B.B.C. commentary. Snooker is one. A big game between Lindrum and Davis is to be described on the air in the Regional programme from 8 to 8.15 p.m. on Tuesday, December 10th.

Election Results.

On the night of the General Election the B.B.C. will begin to give the results on all wavelengths at ten o'clock. The announcements will go on at intervals until four o'clock the following morning. Light music but not dance music will form the background. Only regular announcers will be used for the broadcasting.

* * *

B.B.C. High Command.

The B.B.C. has now such an elaborate organisation structure that there need be no misgiving about indiscretions being tolerated. There is a Board of Governors, who are supposed to be trustees for the public interest; then there is the Director-General, and the Deputy Director-General, who are the real "owners," and then a squad of Controllers, Assistant Controllers, and numerous Directors. Programmes, Public Relations, Engineering, and Administration each has its own Controller, and I hear that a new Controller is being considered. His title, if appointed, will be "Controller (Private Affairs)," and his duties will consist in the scrutiny and control of the private lives and personal habits of all members of the staff. This function has been carried out by a comparatively junior official in the past.

* * *

More B.B.C. Honours?

There is a good deal of discussion round at the Big House on the prospect of some more B.B.C. names in the next Honours List at the New Year. The last batch included Sir Noel Ashbridge, Mr. Gerald Cock, Miss Somerville, and Mr. Percy Edgar. The betting is running strongly in favour of the chances of Captain Cecil Graves and Mr. "Benjy" Nicolls, the former for his work in starting the Empire short-wave service, the latter for his reorganisation of the whole of the B.B.C. since last year. Both these officials enjoy wide popularity with the staff, and are highly regarded by Sir John Reith and the Board of Governors.

* * *

Appointment in Malaya.

Members of the staff of the B.B.C. have been invited to put in for the post of General Manager of the Malaya Broadcasting Company, the work of which is likely to be based on Singapore. When this appointment is filled, Sir John Reith will have placed his men in India, Palestine, and Malaya. South Africa shows signs of wanting some B.B.C. people soon.

* * *

No More "Request" Programmes.

"Request" Programmes have always been a popular feature with the provincial stations of the B.B.C. It has now been decided by the London headquarters that the practice must cease. I have not been told why. Perhaps the B.B.C. thinks it is not dignified to play numbers that listeners ask for.

"NIGHT FALLS IN BUDAPEST"

(Continued from page 270.)

ously dependent upon the proper handling of a fade unit, would have been a difficult job anyway, even with the help of a Broadcasting House D.C. Panel and "all the fixings." In Budapest the controlling of the programme itself and its mixing had to be done from the Engineers' Control Room, with telephones continually ringing, the ordinary Budapest programme coming out of an adjacent loudspeaker, and before Gielgud's slightly bulging eyes the figures of "the Chief" and his assistant, sliding plugs in and out with the dexterity of professional conjurers while the green cords of the wiring on their panel seemed to take on the aspect of the serpents of Laocoon.

No Item Was Fool-proof.

In addition, too, the party suffered a good deal from the results of a reception otherwise only too delightful in its warmth. But an "outside broadcast" from the terrace of a café is not made easier by a swarm of sightseers three or four deep, nor from the inside of a restaurant when a photographer in his enthusiasm puts up a large tripod and camera immediately between the table with the microphone and the signalling engineer in a distant corner, and, exactly at the moment when a vital cue is expected, smothers everything with a flashlight and the consequent smoke-cloud!

In brief, the experiment was both a trial of idea and method combined with a rather delicious flavour of gambling. Practically no item in the series was fool-proof.

As it was, line-failure spoiled the second evening from the British listener's point of view, while both the water-polo match and the Ostende Café suffered too much from excess of background.

Night has been heard falling in Budapest. Would it have been equally picturesque for that night to have fallen synthetically in three or four studios, with effects? Listeners can consider the question.

THE UNI-PLANE SYSTEM OF CONSTRUCTION

(Continued from page 256.)

out. **Needless to say, the whole set is extremely accessible at all times and for any purpose.** The terminals are also very accessible, and there are excellent technical reasons for their position.

In appearance the Uni-Plane construction gives very modern lines combined with practical utility. In short, the set is handsome as well as robust and practical.

I have timed the construction of this set, and have found that this process takes only half the time required to build a similar general receiver arranged on the two-plane system. Even the blue print itself took only half the time to draw, and when you look at it you will see how amazingly simple it is to follow and how true it is to the actual set.

Constructors can duplicate my own receiver with exactitude and speed, and I am convinced that the Uni-Plane construction, by cheapening and simplifying and making more certain the efficient construction of home-made receivers, will prove a new landmark in amateur radio.

THE S.T.700 CIRCUIT

(*Continued from page 259.*)

output of the set. It will be realised that any high-frequency currents supplied to the grid of the detector stand a chance of being amplified by the detector-valve, the first L.F. valve, and the output valve. Some system of separation is essential for quality reproduction and the maintenance of stability under all conditions. Various filter systems may be used for this separation, but a complicated system is frequently not only expensive but ineffectual for removing all the undesired high-frequency currents. This is because the H.F. currents may drift over to the grid of the first L.F. valve *without attempting to go through the separating filter.* The most complicated costly system of filters is therefore alone not sufficient. Any slight high frequency current which appears in the loudspeaker circuit of the valve will tend to be radiated from the loudspeaker leads and influence the aerial system of the set. This produces a certain degree of reaction throughout the receiver; an effect I have previously termed "chain reaction." This may ordinarily not produce oscillation unless the loudspeaker leads are near to the aerial lead-in. But it may disturb smooth reaction, and instability may arise under certain special conditions, such as a very strong signal on the long waves. I have known sets in which full output from the long waves cannot be obtained because of this rather obscure effect. Incidentally, the test for it is to see whether it increases when the aerial coupler condenser is increased in capacity. The phenomenon does not occur at all in the S.T.700, because a condenser ·0005-mfd. by-passes the H.F. before it gets to the grid of the first L.F.; any drift effect which ordinarily would be so insignificant that it could do no harm is liable to be built up by the chain reaction effect. An air-cored choke is therefore included in the anode circuit of the output valve. This choke does not affect the ordinary audio-frequency currents supplied to the loudspeaker, but it is a valuable refinement. **It contributes to the rock-like stability of the whole set, and the purity of reproduction.**

Keeping Out H.F. Current.

As there is a chain of audio-frequency reaction from the last valve to the input of the first, it is important to prevent any trace of high-frequency current being mixed with the low-frequency reaction currents; the high-frequency choke in the output valve anode circuit effectively ensures this. It may be mentioned here that the audio-frequency reaction is entirely unaffected by any tuning, reaction, or other high-frequency operation. There is not the faintest risk of the audio-frequency reaction arrangement bursting into oscillation as a result of any other adjustment on the set. This may be regarded as a valuable achievement in design.

Decoupling is extremely generous on this receiver, enabling it to be used with absolute confidence on mains units. When I study the circuits of some designs I am appalled at the risks which are taken, as regards instability, which might arise from the mains unit. The instability may even cause feeble motor-boating under special conditions of signal strength reaction and volume control. I believe that I could make nine out of ten Press sets produce interaction under special conditions which might easily arise when tuning the set. With the S.T. 700 it was specially necessary to decouple very thoroughly to prevent a mains unit from altering the phase angle of the audio-frequency reaction currents, or to introduce unintentional and undesired obscure reaction or reverse reaction effects which would conflict with the deliberate audio-frequency reaction currents which are under perfect control.

For the sake of economy, and also to simplify the construction of the set, the decoupling condensers of 2 mfd., 1 mfd., and 2 mfd., are housed in a single metal case, the whole being known as a "condenser block." If you already have some or all of these values you can connect the three terminals together and call the point C, and use the remaining three terminals as shown in the circuit diagram. The condenser across the screen-grid of the H.F. pentode is a 2-mfd.; this may seem a large value, but it is nevertheless desirable when the set is to be used on a mains unit.

Records Can be Played.

A terminal H.T.+2 supplies the H.T. to the detector valve, and this will be connected to a separate point on a mains unit; if an H.T. battery is employed, the H.T.+2 terminal should be connected to the H.T.+3 terminal of the set. This latter terminal being connected to the 120-volt socket on the high-tension battery.

A pick-up terminal is fitted to the set, enabling it to be used for the reproduction of gramophone records.

One end of a gramophone pick-up potentiometer would be connected to the G.B.—1 socket on the grid-bias battery and also to one side of the pick-up itself; the other terminal of the pick-up is connected to the other end of the potentiometer. The sliding contact on the potentiometer is connected to the pick-up terminal on the set. When records are to be played, the volume control on the radio side would be turned to zero and one of the tuning circuits detuned. For example, by setting the main pointer full left. When radio is to be received again the external wire going to the pick-up terminal should be disconnected from it.

The circuit is quite free from any break-through of a medium-wave station on to the long waveband: this is due to the design of the coils specified. As there were some complaints from those very close to North Regional in the case of the S.T. 600 last year, this matter has received particular attention. But even if the coil unit itself permitted under exceptional provocation the slightest trace of breakthrough, the Triple Extractor would completely wash out the slightest possibility, since it would extract two medium wave stations, even when the set was being used on the long waves.

Each Station Exactly Tuned.

The two tuned circuits are tuned by separate condensers. This ensures that every station will be exactly tunable. It also enables, through the elimination of a trimmer condenser, absolute reliability of the station name positions on the dial. I have abandoned, temporarily at any rate, the idea of a gang condenser for home-

(*Continued on next page.*)

THE S.T.700 CIRCUIT

(Continued from previous page.)

constructor designs. To get 100 per cent certainty of results, two condensers are required; on the present set the aerial condenser is used for balancing up the tuning, so to speak; it is not calibrated, and is simply turned round, until the loudest results are heard on the station to which the main tuning condenser is set by means of its pointer. Separate condensers also tend to increase selectivity, as with a ganged condenser tuning is "averaged," sometimes, each circuit being slightly "out." At other times one of the circuits being out of tune brings in interference.

It is important to remind constructors that the circuit is based on the assumption that a wooden panel is used. Such a panel has proved exceptionally useful in practice in the S.T. 600, and not only is metallising not required anywhere in the set, but it must definitely not be used.

My method of presenting the circuit is particularly useful to a constructor using it for checking the wiring of his set. Each component has been provided in the circuit with two or more dots representing its terminals, and the lines joining these dots therefore represent the exact wiring. An ordinary circuit diagram may disclose the general principles, but it is almost useless as the means of checking the finally constructed receiver. The circuit as given is simple enough to the technically understandable, yet it is also a practical wiring diagram.

Further details of the main features are dealt with under separate headings.

"WAR IN THE AIR"

A Brilliant Survey of Aerial Wonders.

War In the Air, the new 7d. weekly part work, is a book that should be read by every man, woman and child in the land, for it touches the heart of the most vital problem of the age. While it traces the fascinating story of the enormous strides made in aircraft from the crude initial machines of the early pioneers to the scientific craft we know to-day, and surveys the whole history and art of flying, its chief purpose is to give a clear and vital impression of the dreaded air menace which further war would inevitably bring.

Here, at last, is a true and undistorted word-picture of the perils which have to be faced. In no way is *War in the Air* a technical work: its fascinating pages can be understood and appreciated by all. The descriptions of various types of aircraft are essentially simple, free from unnecessary technicalities.

The work concerns itself principally with the epic story of air development, its drastic effect upon warfare, the use of aircraft in the Great War, and the compelling influence of the aeroplane in the future.

The illustrations throughout are most impressive, and the completed work will contain considerably over 2,000 photographs and pictures. Great care and thought have been expended in bringing together a truly remarkable gallery of pictures of aerial importance; each part will include at least 4 pages in photogravure. Subscribers to *War in the Air* will be able to have their parts bound in attractive binding cases at very low cost. Part I will be on sale Thursday, November 7th.

BIOGRAPHICAL BROADCASTS

Our radio critic instances the recent "Confessions of an Opium-eater" as perfect material for really virile broadcasting.

IF you are fond of biography, then you can't do better than go to the B.B.C. for it. I am particularly fond of biography, and so I regarded the "Confessions of an English Opium-eater" as a treat. What a galaxy of stars there was to perform it! All fresh from recent triumphs on the air! I cannot see anything really difficult in these biographical broadcasts, especially when there is something to tell. They require few aids or props.

* * *

One notices, however, the use that is made of music in dramatic presentations. I like music in a play only when it is kept separate from the dialogue Preliminary and incidental music between the acts serves a useful purpose. Background music often defeats its own ends because it isn't background music. In the "Confessions," music was heard only between the episodes. It did all that was required of it, and did it very well.

* * *

A Skilful Translation.

A point in the dialogue that intrigued me was de Quincey's amazing skill in translating English into Latin. Extracts from "The Tatler" or "The Spectator" of the day were presented to him. He immediately translated these into excellent Latin. Is this historically correct, I wonder?

* * *

Every week I hear further evidence of the growing impatience of the public towards the novelty number in dance band programmes. Dancing folk frequently express their indignation because dance bands are abandoning their proper function to become pukka music-hall turns. Ambrose especially, and Charlie Kunz are now first favourites among dance bands because they resemble least of all a music-hall turn.

* * *

I even heard it said this week that it is a great mistake to have a permanent dance band in residence at Broadcasting House, because a resident band must inevitably become stale.

* * *

The Kentucky Minstrels gave me great pleasure. Their *joie de vivre* is infectious. Pussyfoot, Bones, and the rest of them are droll characters—and amusing. A gem of theirs was the new definition of sleep. Shakespeare, I believe, calls sleep "Nature's soft nurse." Pussyfoot improves on the immortal bard; he calls it "A gap in my wife's conversation." There's point in both definitions. It is all a question of outlook.

* * *

The singing of the B.B.C. Male Choir, disguised for the nonce as minstrels, was another big feature. I like Ike Hatch's singing. It reminded one of Paul Robeson. He sang as a solo "When the First Piccaninny was Born," whereupon the choir made an anthem of it. It was good to listen to. Then there was a medley of songs called "In Praise of Ladies," followed by a remarkable rendering of "The Lost Chord." The whole performance was obviously well rehearsed. And the company enjoyed giving it. That was plain. I don't often listen to a repeat performance of any sort. I did listen to parts of the Kentucky Minstrels a second time.

* * *

"Congo Landing."

"Congo Landing" dealt with a well-worn theme, the spoilt, conceited child with two standards of values—the one real, the other artificial. In other words, the plot was weak. No plot should be weak when the play has to be heard and not seen. I know, for instance, that musical comedies make little appeal to some people, because of the poorness of the plots. Where broadcasting is concerned the ears have to be completely satisfied. The dialogue must always be good.

* * *

The two items—Tunes from the London Theatres, and Excerpts from the Plays—prove this to the hilt. Whenever the latter have been broadcast I always feel I must see the whole play. This was particularly the case after listening to "Vintage Wine" and Seymour Hicks. I do not feel the same after the tunes, though I am quite sure that the show from which the tunes are taken is, in its own way, every bit as good as the play. The point is that the tunes are not so impressive to the ear as is the dialogue.

* * *

The dialogue in "Congo Landing" wasn't too bad, but its weakness was its unoriginality. The same sentiment has been expressed many times. There was never any doubt in one's mind as to the ultimate end of Lady Susan. In spite of the dreadful plight in which she found herself, it was certain that when the circumstances mended she would revert to type. It would seem that the tom-toms were intended to provide the big moments of the play. Indeed, the play seemed to have been built up round them.

* * *

The B.B.C. seems to have a perfect passion for film studios. The times we have been taken to them! And they are not in the least exciting. The Saturday Magazine, Vol. 1, No. 4, took us to the Lyceum Theatre, where the picture "Street Singer's Serenade" was being filmed. Arthur Tracey sang bits of songs and ballet dancers danced "as silent as the grave." "In Town To-night," saved Vol. 1, No. 4 from being a complete frost with two outstanding items—the story of the blowing up and sinking of the "Audacious," and the reminiscences of the sergt.-major, now "Boots" at the Cumberland Hotel. Good old sergeant-major!

* * *

The Saturday Gala Variety programme is the sort of thing that keeps one in on a Saturday night. Nat Gonella and his Georgians were the foundation on which the programme was built. Perhaps there was a little too much foundation for my taste. But on the whole there was very little padding in the bill. Every performer was a star, well-known in the entertainment world. Arthur Young's own composition, "Thames Rhapsody," which he played on the piano, was perhaps a bit long for such an occasion, while Arthur Marshall, in adding to his list of women we all know, wasn't quite as funny as usual. Ronald Squire and Yvonne Arnaud presented a delightful sketch, entitled "A Christmas Present."

C. B.

READERS' OPINIONS OF THE S.T.700

(*Continued from page* 265.)

Later Mr. Scott-Taggart substituted an 8 ft. length of wire in place of the outdoor aerial which had been used and in a few minutes about a dozen stations were received at good strength.

I must also mention the Audio-Reaction control, which increases volume and quality. The increase in volume was proved by connecting a meter in circuit with the speech coil of the speaker and noting the readings. The meter proved that the volume was actually many times greater. As to its effect on quality, **without Audio-Reaction speech and music sounded thin, but with it, the tone was vastly improved.**

It is no exaggeration to say that the S.T.700 is the most efficient four-valve set I have seen, whether commercially or home constructed, and to anyone undecided whether to build it or not I would say—"Build it—you do not realise the stations you are missing until you have heard it."

SYDNEY G. LINES, 80, *East Barnet Road, New Barnet, Herts.*

REMARKABLE SENSITIVITY.

Dear Sir,—I must say that I was extremely pleased with the demonstration of your S.T.700 on Wednesday evening last.

My first impression was that the set is extremely sensible in design. **The dial is exactly as it should be**—a large indicator and plenty of room between station names; in reference to this, what particularly impressed me was the large number of names on the dial—it made me wonder if this was another expensive "super." When I heard that the circuit was only H.F., D., L.F. and output I was in doubt whether all these stations could be brought in. **That was very soon proven to my satisfaction, for in the first 40 minutes there were 48 stations brought in on the medium wave, including five on different common waves, and during the course of the evening 75 stations in all, including medium and long waves. One thing that really astounded me was to bring in Turin II working on only 2 kw. This certainly proves the remarkable sensitivity of the set, particularly as this performance was all on an indoor aerial.**

In reference to selectivity, this was proven beyond all doubt on the long waves—with the Extractor out of circuit, Droitwich spread all over the dial while with the Extractor set to Droitwich, **Deutschlandsender was received with no interference whatsoever.**

To prove the effectiveness of the Extractor you tuned this to Midland Regional, while bringing in other stations and later, when testing with the oscillator, tried to find this station but could find no trace anywhere even when on the wavelength.

The quality of reproduction brings me to the

(*Continued on next page.*)

READERS' OPINIONS OF THE S.T.700

(Continued from previous page.)

new feature of the set—Audio-Reaction. It is a well-known fact that in a weak signal the reproduction is much attenuated, the lower audible frequencies being reduced. By the judicious application of Audio-Reaction the lower frequencies are again reproduced, giving tonal balance again.

I certainly had an evening of surprises, but my greatest was to see the simplicity of construction and to know the extremely low price.

To sum up—to anyone who is after real efficiency, also sensitivity, selectivity, fine reproduction and value for money, the S.T.700 is the set to build.

I feel that I could write pages more, but must leave a little room for others.

H. F. STENSON, 29, *Linwood Road, Handsworth, Birmingham*, 21.

ANOTHER WINNER.

Dear Sir,—I have to thank you for the privilege of attending the Glasgow test of your latest set, the S.T.700. I consider this set another winner as, for the short time it was in operation, it pulled in 62 stations at full loudspeaker strength. The selectivity of the set is excellent, thanks to the Extractor circuit, which is in a small box by the side of the set, ready for convenient adjustment whenever need be.

Another refinement is the control called **Audio-Reaction, which, I think, makes a vast improvement to the tone.** The set as a whole is very simple to operate, as it does not require to be trimmed as in your last set, the S.T.600. This, I think, should please all those who have had trimming trouble on other sets, and to them I would advise changing over to the S.T. 700.

Wishing the S.T.700 every success, which I have no doubt it will receive.

E. O'NEILL, 10, *Dock Street, Glasgow, C.3.*

BIRMINGHAM SAYS :

Dear Sir,—I once again had the pleasure of a visit by Mr. Scott-Taggart who demonstrated his S.T.700.

Good as his previous sets have been, and still are, the S.T.700 is an improvement over all, even the S.T.600. The new dial is much better than the one on the S.T.600, as the pointer passes only one station at a time. The use of separate controls for the two tuned circuits presents no tuning difficulties, while ensuring accurate tuning, giving maximum results. The three extractors are ideal, because when once set to reject the local stations they need not be adjusted again. The locals, as on the S.T.600, are still receivable, but instead of occupying the whole of the dial, only require as much of it as the distant ones. **The Audio-Reaction greatly increases the strength of the weaker signals, giving them body and fullness which they otherwise lack.** A test was made with a meter, which proved that a considerable increase in strength was obtainable.

A total of 76 stations was received—9 long and 67 medium—the strength of such weak stations as Valencia, Bucharest, Belgrade, Barcelona, Katowice, Madrid and Turin II being a revelation. The efficiency of the extractor was proved by the fact that Heilsberg and Hilversum were received at full loudspeaker strength without a trace of Midland Regional. The Deutchlandsender was also well received with little trouble from the 150-kw. Droitwich only 18 miles away.

The demonstration was carried out on an indoor aerial, in a badly congested area, and **to prove the sensitivity of the set numerous stations were heard at full loudspeaker strength with an aerial of only a few feet of wire lying on the floor.**

The selectivity of the set is excellent and the quality extremely good.

As before I shall most certainly build this set, and pleased to demonstrate to and help anyone who cares to visit me in any way I can.

LESLIE A. PERRINS,
101, *Sycamore Road*,
Aston,
Birmingham 6.

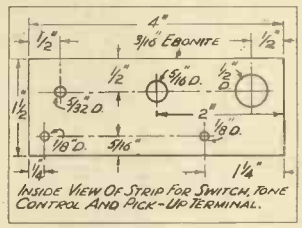
THE A.C. S.T.700

(*Continued from page 276.*)

involve B.B.C. interference. The main circuit of the set itself is illustrated in this issue. A smoothly adjustable tone-control is fitted and applies equally to radio and gramophone work. A 100-ohm resistance gives the minimum bias, this value enabling you to obtain the maximum sensitivity without grid damping. The screen voltage is linked with the setting of the volume control potentiometer, so that a more effective control is obtained.

Note that on this occasion I have made assurance doubly sure by using a mica 1,000-volt test condenser of 0·1 mfd. for coupling the detector valve to the output valve, as even a minute leak through this condenser would upset the grid bias on the last valve.

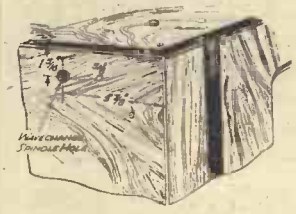
Note also that a 600-volt working ·006 mfd. tubular condenser protects both the



The ebonite strip illustrated here is fixed on to the lower baseboard which carries the loud-speaker baffle.

bakelite-dielectric reaction condenser, and a ·0003-mfd. mica condenser used as an H.F. by-pass. The anode leads to both of the first two valves are screened, the hoods and screened leads being purchased ready prepared; the earth connection, in each case, is made to the metal casing of the screened lead by twisting the bared end of the connecting wire twice round so that it follows the channel in the casing, the end of the wire being then bent back and twisted round the wire itself.

As regards components, there are no alternatives. This does not mean that those chosen are the only ones which will work, but it is obviously outside a designer's capabilities to try *all* the possible permutations and combinations of components



The wave-change switch is on the left of the set, the position of the hole for its spindle being illustrated in this sketch.

and valves. Even a mains transformer which might be thought a standard and interchangeable product will give good service in one set but cause an incurable hum in another. In the present receiver the Ferranti mains transformer has been very well designed in respect of the avoidance of an external field.

The first step in construction is to bolt the loudspeaker to the baffle-board attached to the baseboard, i.e. the lower board. Next fit and wire up all the baseboard components except the two T.C.C. type 802 wet electrolytic condensers, which should be mounted on their bracket and installed and wired up. The construction of the chief radio part of the set, i.e. the rest of the receiver mounted on the panel beneath the lid, is straightforward, all the components being mounted and connected.

(*Further details will be given next week.*)

TECHNICAL JOTTINGS

Items of Interest to Every Enthusiast.

By Dr. J. H. T. ROBERTS, F.Inst.P.

The Death Ray Again.

A GOOD deal has been heard lately about the idea of putting aeroplanes out of action by means of a kind of "death ray" directed from the ground, this ray to interfere with the ignition system of the engine of the aeroplane. This idea, as many of you know, is by no means new. It started, I think, about ten or fifteen years ago and has been periodically revived in the meantime, but curiously enough it always seems to create quite a serious impression on the lay mind.

Probably this is because they do not understand what sort of rays are available for the purpose and what effects could be produced by them. They hear of so many wonderful things being done by wireless that it is perhaps only natural that they should be willing to believe that it is capable of almost anything.

Shielding is Easy

To those with any technical knowledge of radio, however, it is evident that the advantage would lie very much with the aeroplane and very much against the ground station that was operating the ray. It is, as a matter of fact, an extremely simple matter to *shield* any component or machine against the effects of radio waves, so easy that it is the general opinion of radio engineers that any attempt to put an engine out of action at a distance by means of radiation is entirely out of the question.

THE S.T.700

We should like to express our regret to readers that articles by Mr. John Scott-Taggart dealing with further operating details of the battery S.T.700 and also with the connections for using that receiver with a mains H.T. unit do not appear this week as promised. They have been unavoidably held over and the details will be given next week.

In addition, more about the A.C. S.T.700 will be given. Make sure you do not miss your copy of "Popular Wireless."

ON SALE NOVEMBER 13th.

Power by Radio.

In the same way, imaginative writers frequently talk about the possibility of transmitting power by radio, even power in large amounts suitable, for instance, for the driving of tramway cars or industrial purposes. When you consider the amount of power which reaches your aerial and compare this with the power which is radiated from the broadcasting station, you begin to understand the enormous percentage loss which takes place in transmission. Even allowing for some kind of beam transmission, concentrating the energy

(*Continued on next page.*)

TECHNICAL JOTTINGS

(Continued from previous page.)

more or less into one channel, and allowing also for all kinds of improvements in transmission and reception power, it still remains extremely difficult to see how such a method could ever compare even remotely with transmission by present-day methods. I think most sensible people are agreed that transmission of industrial power by radio is just a figment of the imagination.

What About Us?

Moreover there is another aspect of the matter of which I have not seen any mention, and that is the effect upon human beings of such powerful transmissions as would be required. Already there are people who complain that the radiations from the various broadcasting stations and other wireless transmitters are upsetting their health. Up to now it has been the custom to regard such people as cranks. There is little doubt that in a good many cases the complaints are based on nothing more than imagination, but how do we know that in some cases, at any rate, the minute high-frequency electric currents set up in the human body, or in the brain if you like, may not cause some upset? After all, these currents *must* be set up, because the human body is an electrical conductor and, as you know, radio waves set up these currents in any conductor which they strike, exactly the same as they do in a receiving aerial.

Human Aerials.

We know little or nothing about the effects of such high-frequency currents on the human system, and, therefore, it is quite impossible for us to say with any certainty that some sort of ill-effects may not in special cases be produced. At any rate, it seems to me quite on the cards that if transmitting stations were erected which would throw out enormously greater amounts of power into the ether in the form of high-frequency rays—an amount of power millions of millions of times greater than anything radiated at present—they might very well have a serious destructive effect on some parts of the human system. For this reason alone, quite apart from ordinary technical consideration, I personally regard the project of the radio transmission of industrial power as nothing but an interesting dream.

Q.P.P. Components.

When using quiescent-push-pull output for a set, it is very desirable to employ special components for the purpose, but this is not really absolutely essential and you can often get fairly good results, perhaps quite good enough for your purpose, by using ordinary push-pull components if these are all you happen to have handy at the time. Of course, you will not expect the same results with extempore components as with those properly designed, but it may, as I say, carry you on for the time being.

The input transformer for Q.P.P. may have a ratio of as much as 1 to 8, whilst the ordinary push-pull input transformer may have a much lower ratio, say 1 to 3. The chokes and transformers used with ordinary push-pull output are generally intended to be employed with triode valves.

(Continued on next page.)

TECHNICAL JOTTINGS

(Continued from previous page.)

which is a bit awkward if you want to use pentodes with them. You can, however, use small power valves and it is quite possible to get fairly good results, especially if you have a fairly high voltage on the anodes, 120 volts or more, not forgetting to adjust the grid bias so as to bring down the current to about 2 milliamps each. The essence of the Q.P.P. arrangement, as I suppose most people know nowadays, is to make the anode current vary with the strength of the incoming signal so that the normal steady current is quite low, 4 milliamps or less for the two valves, and only begins to jump about when signals come in.

The Milliammeter Shows.

It is interesting to put a milliammeter in the plate circuit, but, of course, you must remember that the indications of the needle bear an entirely different interpretation from what they do in the ordinary way. Under ordinary conditions the evolutions of the needle would be a pretty good (or pretty bad) indication of distortion, but in the Q.P.P. arrangement this is not so.

Coupling Transformers.

I am often asked questions about transformer ratio, and not long ago someone wanted to know whether it was possible to use a couple of low-frequency transformers in series in order to increase the step-up. Connecting in series apparently meant joining the two primaries together in series, and the two secondaries in series so that in a sense it was really one large transformer with separated cores.

You might think that this would give you twice the output voltage, but a moment's thought will show that if both the primaries and the secondaries are in series (let us assume for the moment for simplicity that the two transformers are identical) you will have twice the number of turns in the primary as well as twice the number in the secondary, and therefore the ratio of primary to secondary will remain the same.

A Question of Response Curve.

But although this arrangement does not give you increased step-up ratio it may in some cases be a useful method for improving the response curve. If one transformer is not equal to the job, you can sometimes get a much better and more uniform response curve by the use of the two in the manner just considered, the curve being more free from resonance-points.

There is nothing new in the arrangement; it has often been used for the purpose of improving the output quality, more particularly in the lower register. If you want to try it and have a spare transformer handy it is quite simple, but as you will see, it does not make any material difference to the actual step-up ratio.

This arrangement is, of course, quite a different thing from the use of two transformers with the secondaries in series and the primaries in *parallel*. In the latter case, however, questions of phase-difference may arise, and I have not the space to go into that at the moment.

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RECEIVERS, COMPONENTS AND ACCESSORIES

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(Continued)

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POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING, Associate I.E.E.

A RECORD
THE 700's
OLD SETS

RADIO NOTES & NEWS

B.B.C. TESTS
OUT OF STEP
CROW'S NEST

In Brief.

BAIRD TELEVISION LTD. has concluded negotiations with Australian Radio Manufacturers' Patents Association Limited, of Sydney, N.S.W., whereby the Association exclusively represents the Baird Company in Australia, both for the manufacture of television receivers under Baird patents, and for the construction and operation of television transmitting stations.

* * *

The new North Irish Regional's 11,000-volt generator has been tested at Droitwich, where its performance could be compared with that of its elder brother in service.

Another Record for New Zealand.

ALTHOUGH New Zealand is geographically remote from most of us, she has a habit of nipping round from the other side of the world, pinching a radio record before anybody knows what she is up to, and then displaying her trophies.

Not long ago it was her proud boast that she had, in one city, the oldest and the youngest amateurs in the British Empire. Now she caps that by claiming a world record for amateur-to-population density.

In every 10,000 people in New Zealand there are five amateur transmitters. In the U.S.A.—her nearest rival—there are only two, and in the British Isles only 0·3 per 10,000.

What Versatility !

SO our cheery Technical Editor has scored a double triumph by selling another invention to Marconis and producing the most topical and all-in work on television. By the way, I am able to reveal the fact that the "Book of Practical Television" issued under his skilful control is his first venture into the art of book-making—speaking literarily, of course !

But I also know that he has had to refuse written and tempting invitations to write books on radio because of his desire to concentrate on his work for "P.W." and his inventive and other activities. "Grandfather's Whiskers," his novel and amusing best-seller card game of last year, was in the nature of a light relief, he tells me. Sometimes he indulges in another kind—short stories. He has even been invited recently to write broadcasting material. What versatility !

Happy Coincidence.

HOW many of my eagle-eyed clientele noticed the happy coincidence of our November 2nd issue, in which the description of the S.T.700 appeared ? *That was "P.W.'s" 700th number !*

The curious thing about this "700" 700th number was that it was not a planned-in-advance event, but it just happened that way, and in the earlier preparations nobody realised that the description of the "700" would coincide with the serial number on our cover.

You simply cannot go wrong with a set like that !

ANOTHER FREE GIFT FOR READERS THIS WEEK

"Broadcasting Suburbs."

LONDON may not have its Radio City, like New York, but it seems to be acquiring its Broadcasting Suburbs with great success.

Mrs. Irene Wickes, a very popular American broadcaster. She broadcasts from Chicago ten times a week to five million American children and is known as the "Singing Lady." Writes all her own songs and stories.

The new premises at Maida Vale are not on the doll's house scale, either, for there are five studios (two of which are whackers, and another a walloping whacker, big enough to house an orchestra of 200 and a chorus of another 200). Also at Maida Vale there are six gramophone recording rooms, control room, and eleven listening rooms.

Not long ago two floors of Brock House, Langham Street, were taken over for the Music Department. And now a tenancy of No. 103 Great Portland Street is being acquired. This is a 21-roomed building of four storeys, to be used for offices.

Add this little lot to the already considerable overflows from Broadcasting House and you will no longer wonder why it has been necessary for the B.B.C. to run a bus service for their employées.

Rally of the Veterans.

SOME of the most remarkable radio Methuselahs in the country rallied recently at Kingston-on-Thames, when Bentalls Ltd. held a contest to find the oldest set in the area. Among the incredibly-preserved veterans who tottered up was a coherer-bell set which was dated 1900 ; in the days of its youth it had been used to pick up time signals from Eiffel Tower, long before the broadcasting of speech and music had been thought of !

The judge of the contest, Professor A. M. Low, was so impressed by this relic that he awarded its owner first prize. This took the form of an up-to-the-minute Marconi set, which has now gone to live with great-great-grandpa, to show him what young chaps can do now in the way of radio reception.

Much Ado.

NO doubt you heard all about the Grand Shuffle at Broadcasting House, which gave so many officials new titles, without making the slightest apparent difference to the programmes.

I think Amos, the American radio star, must have had it in mind when he broadcast a recent wisecrack. It was to the effect that once a year a certain radio station put into force a scheme under which the messenger boys were all promoted to be heads of departments, while all the bosses had to run round delivering slips of paper.

Amos said the scheme lasted only for a fortnight a year, because the bosses got all tangled up trying to remember where to deliver their envelopes. "If only the bosses could have carried on for another week," said Amos, "those page-boys would have had the executive work where the laundry has the collars—ironed out, smooth and glossy ! "

The Radio Vote.

THE political importance of a good radio reputation is acknowledged in countries other than our own. Statesmen of the old school are staggered at the way a young parliamentarian—Mr. Eden, for example—has the ear of the whole country if he speaks from Geneva on a topic of national importance ; but in France there is a similar tendency, very noticeable to-day.

One of the names often suggested as successor to M. Laval is that of M. Georges

(Continued on next page.)

MAKING THEM PAY THEIR LICENCE FEES

Mandel. He came into the radio limelight as the man to whom was entrusted the putting through of the Ferrié Plan of Regional Broadcasting, and there is no doubt that every French high-powered station will be a powerful argument in his favour at any French election.

Those Mystery Transmissions.

WHAT'S all this about mystery transmissions on a wavelength of 6·2 metres, from the roof of Broadcasting House? My own set will not sink as low as that, but I am creditably informed that the watchers on this wavelength have found a nice National programme booming out there, and have traced its origin to Portland Place.

Grabbing their notebooks, the sleuths of Fleet Street descended like hawks on the B.B.C. for an explanation, but there was nothing doing. All they could get was a vague admission that certain broadcasts had been made "*for the purpose of testing a receiver.*" The sleuths all laughed, groaned, and said "Gurcha" to that one, but the B.B.C. refused to explain, and there the matter rests.

French Transatlantic Phone.

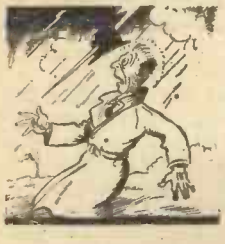
NEXT year will see the end of the nice little transatlantic telephone monopoly which Rugby station has held for so long, arrangements having been concluded for the opening of a direct service between France and the U.S.A.

One of the four two-way circuits now in use between New York and this country will be switched over to the New York–Paris service every day between 2 p.m. and 10 p.m., which is the rush period for stock and share dealings.

The new service will begin on or before July 1st, 1936, and France has agreed to compensate the Post Office for the loss incurred. All other wireless telephony between Europe and America will continue to pass through London.

Keeps the Lightning Off.

WRITING from "Partington-on-Canal," a joker who signs himself D. E. has sent me a cutting from one of the Manchester newspapers. It reads: "If every one with radio sets used insulated aerial wire, which gives just as good reception, and costs just a copper or two more, there would be less loss to both life and property by lightning."



D. E. says: "How much protection would *that* give you? HA! HA!" The answer is: "About as much as keeping your hat on. HE! HE!"

New B.B.C. Governor.

THE King recently approved two important B.B.C. appointments. Mr. Harold Brown, formerly a governor, is to be vice-chairman of the board; and Caroline Viscountess Bridgeman (widow of Lord Bridgeman, a former governor) is to be a governor for the remaining term of the B.B.C. Charter.

There will now be two women on the board, the other being Mrs. Mary Hamilton, the authoress, and former Socialist M.P. for Blackburn.

The Radio Ruler.

UNTIL this year it was an inviolable law of the U.S.A. that either the President or the Vice-President should remain on American soil. Recently, however, radio has so altered the state of affairs, that a new precedent has been set by Mr. Roosevelt. Although his Vice-President, Mr. Garner, was on his way to the Philippines, Mr. Roosevelt enjoyed a fishing holiday in Atlantic waters.

By means of its wireless, the cruiser "Houston," on which the President travelled, kept in constant touch with Washington, and if necessary Mr. Roosevelt could have reached the capital in a few hours by aeroplane.

RADIO TOPICALITIES

Sir Hamilton Harty will conduct the London Philharmonic Orchestra on November 21st in a programme of varied appeal. An important musical event will be the first performance of Arnold Bax's recently completed Symphony No. 6. The programme will also include works by Handel and Berlioz, and Mozart's Concerto for two pianos, with Ethel Bartlett and Rae Robertson as soloists.

* * *

A young musical comedy actress had a dream in which she saw a tree which grew and grew until it attained quite frightening dimensions. Then into the dream came a waiter, and as soon as he touched the tree it shrank until she could reach the top. How this dream came true, as far as her professional advancement was concerned, is the theme of the romantic play "Top o' the Tree" which is to be produced by Martyn C. Webster in the Midland programme on November 21st.

* * *

The fifth of the "Northern Cockpit" talks symposiums, to be broadcast to northern listeners on November 16th, is entitled "The Rush Hour," and will consist of a series of statements by representative northerners on their preferences in the matter of transport to and from the office and the suburbs.

The speakers will include two prominent municipal transport managers, a policeman, a girl cashier, a journalist, and a waitress. The advantages and disadvantages of buses, trams, trains (electric and otherwise), motor-cars and bicycles will all come under review.

Wish it Were Yours?

THE Science Museum, South Kensington, has acquired a new wireless set. It is a fifteen-valve high-fidelity H.M.V. auto-radiogram, fitted with internal illumination so that visitors can see enough to make them gnash their teeth with envy.

Twice a day concerts are given in the museum; and sweet young things go there to revel openly in a Bach concerto, and to bite secretly into paper bags containing luncheon sandwiches.

The new set replaces the one installed in 1928, which has been worked regularly ever since, without having had one valve replacement.

America's Lapse.

THE radio scientists and astronomers who checked up the effect of the last eclipse of the sun on wireless signals are still puzzled about their results. In fact they have had to do a lot of hard thinking, and the unbusinesslike end of many a good pencil has been chewed to bits in the process.

The scientists have been timing the wireless signals from Rugby, Bordeaux and Annapolis (near Washington). And they find that sometimes the U.S. station gets slightly but measurably out of step with the two Europeans. So the theory has been put forward that North America is not always in exactly the same relative position to Europe—in fact, the continents don't stay put, but shift about a little, probably as a result of the pull of the moon! It sounds fantastic to you and me, but scientists don't care—they've simply got to have an explanation of that discrepancy in the stations' signals.

On the Ultra-Shorts.

THE ten-metre working with Australia that I mentioned last week continues to confound the sceptical. It has transpired that when G 6 K L hooked up with the Australian station V K 2 L Z, the power employed at his transmitter was less than that of the ordinary household electric lamp.

On that same day all the six continents were heard in this country—a testimonial to the universatility of interest in ten-metre work, as well as to the excellent conditions then prevailing.

By the way, the Australian station V K 2 L Z which has played such a notable part in these tests, is situated at Crow's Nest—an appropriate name, considering the high place V K 2 L Z attained in the experiments.

The Double Knock.

IN Germany the postman is supposed to act as a kind of radio detective, and report on new aerials which he sees on his rounds. He also collects the licence fees.

They are following this example in France, where listeners can now declare their sets and pay their dues while taking in the letters. In addition the French dealer has to declare all the sets he sells, giving names and addresses.

For the benefit of the unrighteous a month's grace has been given before payment is enforced, but after that period has expired the pirate must expect no mercy. The penalty for failing to pay the postman is two licence fees instead of one—the perfect double knock!

ARIEL.

PROGRAMME PROBLEMS PROBED - I

Listener-Rights in DANCE BAND BROADCASTS

by GARRY ALLIGHAN

AS the B.B.C. broadcast more hours of dance music than any other European country there may be some substantial ground for the belief that dance-band sessions are the broadcasts that have the largest listening public. That fact has at last been realised by the B.B.C., who have now appointed an official to attend to the internal organisation concerned with dance-band broadcasts. As he must, of necessity, have the B.B.C. mind on this matter, I will utilise this page to give him the benefit of the public point of view, prefacing my observations with the remark that, compared with the "consumer" point of view, the B.B.C. mind is of indiscernible importance.

Those Dance Music Sessions.

In the past the dance-band broadcasts have been, mainly, in two time sections: the 5.15 period and the "close of day" session. The timing of those two sessions induces the question: For whom do the B.B.C. broadcast dance music? Is it for those who want to dance or for those who do not? If for the former, has the B.B.C. got the quaint notion that listeners are dancing from 5.15 p.m. to 6 p.m., and that the carpets in seven million parlours are rolled back at midnight?

What is happening in the average home at from 5.15 p.m. to 6 p.m.? The children have come home from school and have just finished their tea. The wife is clearing the tea-table and busy in the kitchen preparing the evening meal. The husband is either on his way home from work or watching the clock ready to "knock off." That is the course of events in the home of the average set-owner.

I will admit that in the West End cafés women are to be seen drinking pink tea, eating éclairs, discussing dress and diseases, or scandalising each other. And that 'tween gulps of tea and gossip they jump up, risk indigestion, grab someone round the waist and prance around to "Smoke Gets in Your Eyes." But the West End isn't England; it isn't even London.

In the average home it cannot be said of 5.15 p.m. that "Now is the time for dancing." Neither wife nor husband is able to at that hour. And if the Children's Hour (on the other wavelength) is as extensively listened to by children as the B.B.C. claim, the set that is receiving

This is the first of a series of special articles on the B.B.C. programme service by a well-known radio journalist.

"Toytown Adventures" cannot be tuned-in to dance music at the same time. Maybe, the B.B.C. have never thought of that.

I will also admit that there are hundreds of West-Enders hailing taxis outside clubs and theatres at 11 p.m. and going home to dance into the next morning. But most of the nation is sane. They go to bed between 10 p.m. and 11 p.m. because they have to get up for some healthy, honest work the next day.

My contention, then, is that at neither 5.15 to 6 p.m. nor 10.30 to midnight are the majority of listeners dancing. A few may be—and that, of course, would be in keeping with traditional B.B.C. anxiety to cater for the minority and ignore the majority. To make the dance-band sessions of positive service to the majority of listeners they must have a different time scheduling. In my opinion, the ideal hour for dance music is from 8 or 8.30 p.m., as most sets are switched off at "tennish," after the last news bulletin.

Another point that Paul Askew, the B.B.C. dance-music chief, should bear in mind relates to the dance-bands used for broadcasting. There are six late dance-band sessions each week on each wavelength. Someone who is not aware of B.B.C. programme policy might be stupid enough to imagine that if there are six sessions available on each wavelength, and there are eleven wavelengths, listeners will be able to hear 66 different bands each week. He might also add to his foolishness by imagining that there would be a different set of 66 bands each week.

The B.B.C.'s Procedure.

That, of course, is infantile stupidity. The B.B.C. have a much simpler procedure. First of all they lump all the wavelengths together. Then they cut out the 5.15 session by giving it to one band always and for ever. That leaves them with the mentioned six dates per week to fill, so they decide to give the same night each week to the same band always and for ever. So, instead of the listener hearing different bands each week, he hears the same six bands always and for ever.

From the B.B.C. point of view I agree with this policy. It saves them a great deal of work and leaves their minds free to grapple with such problems as devising a new set of "Don'ts" for variety artists, planning anti-social rules for the staff, and inventing imposing titles for the hierarchy. Of course, from the point of view of the listener, there is nothing to be said for the policy, but, as I have hinted before, the listener has got a wrong notion of his rights: he has merely to pay up, take what's given him, and then shut up.

Under the present policy listeners are sure of getting the same band at the same hour, the same day every week. And

(*Continued on next page.*)

CHILDREN'S HOUR OR DANCE MUSIC?

"If the Children's Hour is as extensively listened to by children as the B.B.C. claim, the set cannot be tuned-in to dance music at the same time," says our contributor. Here is one family who are tuning to the Children's Hour programme on their H.M.V. receiver.

INTERFERENCE ON MAINS SETS

Unwanted noises in all-mains receivers are not always easy to trace. Here are a few hints as to where to look for the trouble.

THE modern mains superhet, which probably some two or three million people are now using in one form or another, is an extremely sensitive device. From the point of view of programme collecting, ultra-sensitivity plus single tuning is an admirable quality enabling the listener to tune-in practically any of the European stations with the greatest of ease. But on the other side of the balance-sheet this extreme sensitivity must be debited with an annoying tendency to pick up and magnify stray other disturbances.

And yet it is probable that a very large proportion of those who suffer from bad interfering noises do so to at least some extent quite unnecessarily. The trouble is that it is difficult, if not impossible, to distinguish between the various noises. One crackle on the radio sounds very much like another crackle, though its origin may be entirely different.

Thus one listener may say to another, and quite correctly, that he is experiencing considerable interference from atmospherics, meaning noises due to thunderstorms which may be hundreds if not thousands of miles away. The other listener perhaps agrees very feelingly that the ether is in a disturbed condition, for he can hardly hear some of the stations for crackles; whereas all the time his own noises are generated in the set itself.

A Common Cause of Crackles.

By far the most common cause of set crackles are, in the experience of the writer, due to faulty contacts between the valves and their holders. This is particularly so nowadays, when so many of the valves have seven and even nine pins—each of which must make a good contact with its appropriate socket in the valve holder.

When a set suffers a great deal from crackles, either continuously or in spasms, it is always worth while running round the valves to see that they are all snugly and effectively embedded in their holders. They should each be gently rocked from side to side before they are finally pressed right down.

Needless to say, the set should be disconnected from the mains before this is done.

Long rushing or sizzling sounds are most frequently due to electrical faults in the lighting and power equipment in the house. Switches can easily be tested for this. It is obviously only necessary to run round them all one by one, switching them off and then on. You quickly hear when you arrive at the culprit—if any.

Lamps often cause a similar kind of interference by not making good contact in their holders. Even a tiny arcing in a lamp holder can produce a loud hissing, rushing noise perhaps interspersed by crackles in a sensitive mains set. And the lamp does not have to be in the same room to do it. The interference can reach the set either by direct radiation to the aerial or by a feed-back through the mains circuit.

THE TWO "CADS"

Do you recognise them? They are the two Western Brothers, founders of the celebrated "Cads" Club, and great favourites on the microphone. They are here busy making a Columbia record.

The trouble can generally be detected by tapping each of the lamps which are switched on. The tap will either stop the interference or cause it to change in intensity or character if the lamp is to blame. But don't tap the bulb of a gas-filled lamp with the naked finger, for such lamps run at a pretty high temperature; unless you do it with a pretty snappy action you may make your finger smart.

You can always tell if there has been arcing by examining the two contacts of the lamp after removing it from the holder. There will be scorched patches where the metal has been burnt at the points of faulty contact.

A Good Tip.

And here is another good tip for all those whose sets employ either hand-controlled multi-mu volume-controlling or A.V.C. Do not conclude, because any interference you may experience is reduced when you are tuned-in to the local station, that it is therefore obviously due to disturbed conditions in the distant ether.

When A.V.C. comes into action on a powerful station, or when you apply manually a multi-mu type of volume-control, the sensitivity of the set is reduced perhaps to an enormous extent. Therefore, it is not so receptive of interfering disturbances of many kinds. For example, a faulty contact in an H.F. valve-holder, or a faulty lamp or switch in the house, will not create such loud noises when the set is on low gear, as it were.

Only a few causes of interference have been mentioned, and those are they which mainly badly affect mains sets. But they are so common, so troublesome, so easily overlooked, and yet so easily rectified, that it is to be hoped that the usefulness of the advice given will not be judged by the length of this short article!

LISTENER-RIGHTS IN DANCE BAND BROADCASTS

(Continued from previous page.)

often, playing the same tunes. This, unfortunately, has the effect of robbing the radio of the great virtue of surprise. Novelty has departed from the dance-band sessions. And when novelty goes, interest goes.

My advice to Paul Askew is: 1. Give no band a contract for more than three months. (2) Permit no band to broadcast regularly for longer than three months at one stretch—stand them off after that and bring them back again some months later. (3) Allow no band to broadcast the same tune on more than two consecutive occasions; not even if "by request"—unless the band-leader is able to produce the actual request, because if all the authors of "requests" were laid end to end they would stretch from Charing Cross Road to Tin Pan Alley in an invisible line.

Point number three relates to money. There are bands who broadcast regularly for the B.B.C. at fees which provide the members with 10s. per player. What sort of instrumentalist can be got for 10s. an hour? Some of the "ace" leaders, men whose names are internationally known, have told me that when they take their band into the studio for a broadcast, receiving a fee of £100, they are out of pocket to the extent, sometimes, of more than the fee. Bands that are broadcast from outside are lucky if they get £40 for a 90-minute session.

Such bands have these alternatives: Play the hackneyed "commercial" numbers exactly identical with the performances of all other bands and therefore of low entertainment value to listeners, or have special orchestrations written and so render a bright, sparkling performance.

On an average the orchestrations for a number cost £8, and during a 90-minute session a band plays no fewer, often more, than 20 numbers. Orchestrations, therefore, cannot fail to cost the leader more than £150, and I have already told you how much the B.B.C. pays him. It is obvious what he must do if he wishes to avoid a financial jam. Hence, the fact that you hear the same tune *ad nauseam*.

I conclude with these three constructive suggestions: (1) Dance-band sessions must be at times more convenient to listeners; (2) there must be a more general distribution of the sessions so that more bands get dates and, therefore, a greater variety of styles are broadcast; (3) bands must be paid in cash for their services by the B.B.C. with a level of payments no lower than that which permits the expenditure of £400 on a play and £1,000 on "Wozzeck," to neither of which 10 per cent of the listeners who want dance-music trouble to tune-in.

OPERATING THE S.T.700

How to get the last ounce out of this great set

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

The S.T.700 housed in a cabinet suggested for it by Messrs. Peto-Scott.

OPERATING simplicity has become such a fetish that even those of us who desire to cock a snook at it, doff our hats even though we do not bend the knee.

Where those of us who think we are enlightened differ from the benighted one-knob simpletons is in a matter not of principle but of practice. You, I, Aunt Matilda and all, want simplicity. You and I want "simplicity with honour"—in other words, we want simplicity but not at the expense of good performance. Aunt Matilda wants simplicity at all costs. Believe it or not, but at a recent Scottish demonstration a wife said to me: "What I would like, myself, would be a set which would give me the local station wherever the knobs were."

Choose Your Selectivity.

The S.T.700 has marched leagues towards the simpleton's dream of one glorious knob—but this ideal can probably never be reached because the moment you depart from it you can increase the performance so enormously. But the extra controls of the S.T.700—even more so than the S.T.600—do not affect tuning. This simplifies operation enormously and I confess I sometimes wonder how constructors of the S.T.300, S.T.400 and S.T.500 have "gone on." The S.T.700 is very much easier to work than any of these.

The S.T.700 operates—as regards selectivity—in the same way as all my national sets—*you choose your own degree of selectivity.* It is an odd thing but recently "variable selectivity" has become a new slogan, just as "band-pass tuning" once was. Having incorporated variable selectivity in the S.T.300 and every set since, the slogan will leave my readers frost-bitten.

In practice it means that you pick up the desired station with ease, and then proceed to improve it—giving it a wash and brush up. This is done by some or all of the controls affecting selectivity, to wit:

(a) Aerial coupler; turn towards left for selectivity.

(b) Volume control; turn towards left for selectivity.

(c) Anode reaction; turn towards right for selectivity. When the words "towards left" are used, it does not mean fully to left. Turning fully to left would weaken the station too much.

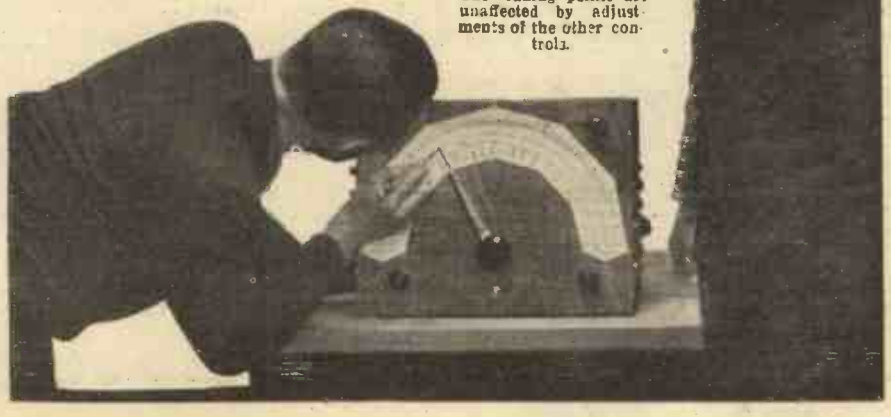
The novice must learn what are the normal positions of the controls. Well, the aerial coupler can be about half-way, the volume control half-way, anode reaction zero (full left), audio-reaction at zero (full left looking from that side of the set).

Setting the Triple Extractor.

The Triple Extractor knobs can be set to keep out your two locals and Droitwich. In the Midlands, it is best to set the two medium wave extractor knobs (the outside ones) to Midland Regional. It is easy enough to set one of them to cut out Midland Regional but a little ingenuity is necessary to tune the other also to Midland Regional, since that station will have been cut out. I suggest you very slightly mistune (noting the amount) the first extractor, so as to let through a bit of Midland Regional, which is then cut out by the second extractor. Then go back to the former position with the first extractor.

CALIBRATING THE DIAL

A member of the staff of "Popular Wireless" tries out the simplicity of marking in tuning positions on the dial, while the designer looks on. The tuning points are unaffected by adjustments of the other controls.



In some parts Droitwich is harmless and you then have to decide where to set the long-wave extractor knob (the middle one); you can set it to somewhere harmless, i.e. when it cuts out no desired station. Or you can actually boost some desired station. This is an unusual advantage of an extractor circuit. On either the long or medium waves, the extractors can be used either for cutting out or "boosting up" any particular station; it will be found that just to one side or the extractor knob adjustment when a station is cut out, the same station can be made considerably louder.

When in doubt, it is perhaps best to turn an extractor condenser fully clockwise (full right). Never set an extractor condenser fully to the left. *Remember also that wherever an extractor condenser is adjusted it will cut out the station on that wavelength.* I have been "caught out" myself once or twice worrying about the weakness or absence of a particular station, when all the time the extractor has unintentionally happened to be set to that very station.

Study the Notes Carefully.

The notes I am writing now are supplementary to the highly concentrated ones in the S.T.700 main issue of POPULAR WIRELESS, which should be carefully studied not just before you build the set, but after you have gained experience with it. If only readers would read articles after building and not just before—what vastly better results they would get! A novice especially cannot fully appreciate operating notes until he has acquired some superficial experience of the controls. He should then re-read the operating hints at intervals; each time he will appreciate them more.

I should like to interpose a suggestion here. Those who contemplate building the S.T.700 would be well advised to get one (or more, if you like) extra copy of the S.T.700 issue (dated November 2nd) of POPULAR WIRELESS, so as to have a spare

Auto-Dial card. These cards could not be supplied at 3d. by themselves—and you never know, you *might* spoil one. As soon as the probable requirements can be ascertained, a notice will appear in this journal regarding de luxe Dials, including, I expect, a white celluloid printed edition.

The only possible tuning trouble you could experience on the S.T.700 is that which is common to all two-dial sets, namely, that the aerial balancer is not correctly tuned to the station to which you are tuned on the main dial. Now do please listen very carefully: Do not just wander about with both tuning knobs. Right from the beginning pin down—or rather "dot" down—your two locals (if you have two) on the medium waves. Apply the dots and draw the junction lines *lightly* in pencil at first. Then add other B.B.C. stations which you can recognise.

Checking The Tuning.

Every station identified should have its main tuning checked as follows: Turn the main knob a little to either side of the tuning point; the station should get weaker to both sides. If the signal does not get weaker you are not properly tuned; do not therefore apply the dot. The fault is that the main tuning knob is not adjusted to its best position. It is no good putting down the dot unless the tuning on the main pointer is sharp, and you get it sharp by reducing the volume control and applying ordinary anode reaction.

Instead of picking up stations in a haphazard way it is best to get one station well and then tune a little *higher up* the Auto-Dial to the next station, increasing the reaction slightly and turning the aerial balancer knob a little more to the right. Always go *up* the dial for preference, increasing reaction a little as you go up; if you log stations going down the dial, the set will always be oscillating; this, like most of my remarks, applies to all straight sets.

The Aerial Balancer.

There is a possibility that the aerial balancer will be set to a different station than the one to which the main tuning condenser is tuned. This can be avoided by reducing the aerial coupler to give you aerial selectivity and using anode reaction. Also always see that the aerial balancer knob "points" the same way as the main long pointer.

An infallible process is as follows: Tune the main knob to a station. Make the set oscillate by increasing reaction. Then turn balancer until the whistle suddenly changes note. Leave the balancer at that position, reduce reaction to a suitable value, and the set is tuned to the station. This method will make a squeal in the room, but it causes no external interference to neighbours. The method is, of course, only necessary in case of weak signals and then only when first searching. Once you have "dotted down" a station your tuning problems are over.

A.C. MAINS UNIT CONNECTIONS FOR S.T.700

THE S.T.700 has been designed expressly for use with mains units as well as batteries; here are instructions for the connections: A.C. mains units (or "eliminators," as they are sometimes called) usually have the following sockets: Negative, S.G. (which has two tappings marked H and L or 60 and 80), a 50- to 80-volt socket (three positions), and a Maximum.

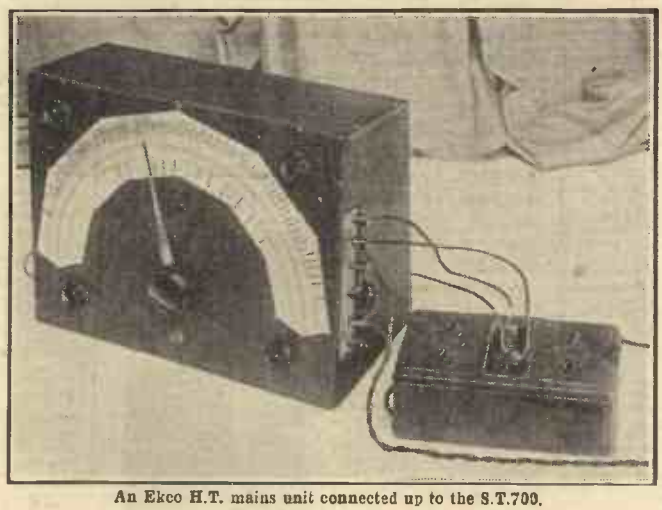
The following two examples will be a guide of how to connect an H.T. unit.

Ekco A.C.10/20. Earth terminal on set to unit socket marked NEG. Also connect earth terminal of set to earthing terminal on underside of unit. Make certain that mains tapping adjustment screw is in correct socket and "current screw" in 18/20 m.a. socket. H.T. + 1 terminal on set goes to S.G. socket marked H; H.T. + 2 terminal on set (*which is not now joined by any external wire to H.T.* + 3) goes to socket marked 50/80 and the variable tapping plugged in H. H.T. + 3 terminal on set goes to unit socket marked 120/150.

Using Another Make.

Atlas A.C.244. Earth terminal on set to unit socket marked NEG. and to metal case terminal (used for earthing unit). H.T. + 1 goes to + 60/80 socket marked MAX. H.T. + 2 goes to + 50/90 socket marked MAX. H.T. + 3 goes to socket marked + 120/150.

Note that H.T. + 2 is not connected by an external wire to H.T. + 3 as when an H.T. battery is used.



An Ekco H.T. mains unit connected up to the S.T.700.

VALVES FOR THE S.T.700

In response to many queries as to whether the valves specified are essential, Mr. Scott-Taggart replies: "The valves specified are not essential. Many constructors will already have at least three out of the four valves. But measurement tests showed that those specified gave the loudest signals."

MORE PRAISE FOR THE S.T.700

SEVENTY STATIONS IN FORTY MINUTES.

Dear Sir,—It being my pleasure and privilege to be present at a demonstration in the Manchester district of the S.T.700, arranged by yourself, I venture to express some little of the wonderment and admiration I feel at the recollection of that evening.

One's attention, on first viewing the set, was at once attracted to the dial, which, bearing station names, is for the first time a dial that gives all that a dial should do, viz., unfailing accuracy on all wavelengths, a truly great boon for easily and quickly tuning any station desired.

This tuning, as we had been led to expect, is by means of dual condensers, yet so ingeniously are they arranged that the ease and simplicity of one knob operation is combined with the advantages of two. These advantages were very apparent when the set was switched on; more than 70 long and medium wave stations were received and named in about 40 minutes.

Particularly interesting and instructive also was the demonstration of your new unit, the Triple Extractor—a natural offspring of your "700." It was certainly amazing to note how practically instantaneously and easily the two locals and Droitwich were completely tamed and, if need be, blotted out, giving the set selectivity of a very high order.

This, coupled with great volume and undistorted quality obtainable, definitely places the "700" high above its fellows. The sensitivity also was most illuminative and unquestionable, twenty stations being received with less than ten feet of aerial and no less than a dozen without aerial at all.

One was left with the feeling that most probably these might have been doubled, this test taking place at a time when many stations except the B.B.C. had closed down.

I now come to the undoubted titbit of the evening, the demonstration of "Audio-Reaction," this giving the "700" its final and lasting hall-mark as a real quality receiver. By its means one can obtain for signals deliberately toned down that same roundness of tone and bass response, hitherto only possible with receivers giving their highest output, and this without the muffled effect inseparable from tone controls. Definitely also there is great gain in output strength; in infallible test by meter, conclusively proving an increase in volume of not less than twenty-six times. A remarkable testimony.

I am very conscious that these disjointed remarks do not do justice, or exhaust the merits of this fine receiver which undoubtedly gives to the home constructor, not only a "new lease of life," but very definitely also "something the other fellow hasn't got."

R. DALE, 9, *Gordon Avenue, Levenshulme, Manchester.*

SIMPLICITY ITSELF TO OPERATE.

Dear Sir,—I thank you for the demonstration of the S.T.700, and my opinion is that once again Mr. Scott-Taggart has given us a fine set.

The Triple Extractor did its work perfectly, stations on either side of the locals being received quite clearly in the early evening. The introduction of Audio-Reaction in this set makes a wonderful difference in volume, but, best of all, I think, is the way it gives such a clear full rounded tone to speech and music alike.

The design of dial is the home constructor's ideal, and makes the operation of the set, once calibrated, child's play.

I was invited to try out the 700 and found it simplicity itself to operate. On my own personal test the set came through with flying colours.

C. J. THIMBLEBY, 13, *Cæsar's Walk, Mitcham, Surrey.*

CURING CABINET *Resonance*

Some practical hints on overcoming a common fault. All constructors who wish to obtain the best possible reproduction should read this article.

By R. C. RICKARD.

BOOMINESS, or cabinet resonance, is a very common fault. Often described by salesmen as "mellowness" and "soft tone," it may possibly sound quite attractive in the shop, but in daily use in the home the insistent irritating repetition of one monotonous sound soon sickens the listener, gradually intruding more and more upon his hearing comfort until it becomes almost unbearable.

That False Bass.

Yet there is a type of man who delights in demonstrating it to his friends; turning up the volume until the room is filled with a sound like a drum solo, he proudly declares "Listen to that bass!"

Actually these sounds are far from being pure bass notes and certainly do not, as he imagines, advertise the excellence of his set; rather the reverse, for their presence is due to a serious resonance, almost invariably in the cabinet, which has the effect of increasing the sound output enormously over a narrow band of frequencies.

A GOOD METHOD

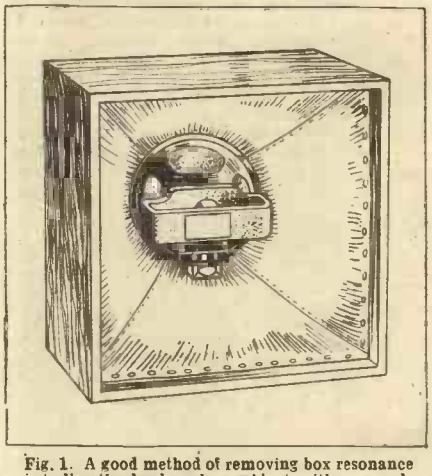


Fig. 1. A good method of removing box resonance is to line the loudspeaker cabinet with a sound-deadening material such as slag wool.

The phrase "cabinet resonance" really applies to the sum of two different kinds of resonance. One exists in the actual cabinet materials and may be called wood or wall resonance, while the other is due to the column of air enclosed within the cabinet and commonly called box resonance.

The latter will be dealt with first, since it is never entirely absent with any ordinary box-shaped cabinet, and can only be removed by lining the inside of the speaker compartment with a bell-shaped reflector stuffed with sound-deadening material (see Fig. 1).

The best substance for this purpose is slag-wool, although sand, Plaster of Paris, or kapok may be substituted with considerable success; if required, all the necessary materials for making one of these "boom-eliminators" can be obtained in kit form from various suppliers at prices from £1 upwards.

Carefully applied, they are a complete cure for all cabinet resonances, and may be purchased with confidence, as they improve most speakers to an extent that is almost unbelievable.

However, it is not everyone who wishes to go to so much trouble and expense, in which case the only other hope is to allow a better circulation of air inside the cabinet. The simplest way of doing this, and one that is effective more often than not, is to remove the back. Usually more harm than good (to the tone at least) is done by keeping the back on, and the little extra dust that gets in through removing it permanently will often be compensated for by the resulting general improvement in quality.

Preventing Wall Vibration.

An even greater improvement may sometimes be secured by also cutting a fairly large hole in the top or both sides, but this should only be done if the tone is exceptionally low-pitched and a certain loss of bass can be tolerated.

Wall resonance is caused by the thin sides vibrating at natural frequencies of their own. The average small cabinet, again for reasons of cost, is not sufficiently rigidly constructed, with the result that the walls "give" on certain frequencies; in fact one cabinet may have two or three resonant frequencies corresponding to different notes.

The most obvious cure is to stiffen the case somehow, which may be done by adding extra corner-pieces and cross-battens internally to strengthen and brace the structure, glueing and screwing them firmly in place, preferably at irregular intervals.

The following method is recommended in a particularly obstinate case which has not yielded to other treatment.

First remove the speaker, complete with its sub-baffle when fitted, from the cabinet, obtain a piece of thick plywood (7 or 9-ply) as large as will fit inside the cabinet but not exactly square, cut out the hole for the speaker, but not dead in the centre as before, have it slightly above or below and to one side of the centre (see Fig. 2). Then remount the speaker on this new baffle and fix it rigidly inside the cabinet, using plenty of screws dotted about in irregular places.

This unsymmetrical mounting, with its greater rigidity, has often cured a bad resonance which previously quite spoilt the reproduction of speech.

Finally, it is as well to remember that a cabinet can be overloaded with too much volume just the same as a loudspeaker or an output valve. So if it be found that quality sounds quite good up to a certain volume level, beyond which it begins to deteriorate, it is obviously up to the listeners to see that the volume is not allowed to exceed this level.

STIFFENING THE CABINET

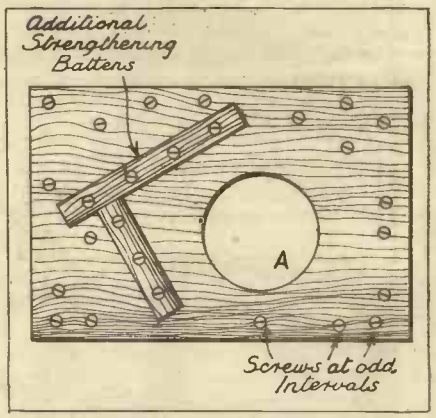


Fig. 2. Wall resonance, which is caused by the sides of the cabinet vibrating at natural frequencies of their own, can often be remedied by stiffening the sides with wooden battens.

MARCONI'S ACQUIRE ANOTHER "G.V.D." INVENTION

ONCE again "P.W.'s" inventive Technical Editor, Mr. G. V. Dowding, has achieved a triumph in the realm of radio invention. Marconi's Wireless Telegraph Co., Ltd., have purchased from him another patent, this time one covering an entirely new method of tuning. The patent is to be operated by the British Licensing Pool.

Owing to the originality of the invention the patent is able to incorporate unusually wide claims, and these have been admitted by the Patent Office.

It is probable that in due course it will be widely applied, and assume considerable importance in the radio industry. It would be premature to disclose a full description of the invention at this juncture, but readers can be sure that the first published details will appear in "Popular Wireless."

BUILDING THE S.T.700 BY THE CLOCK

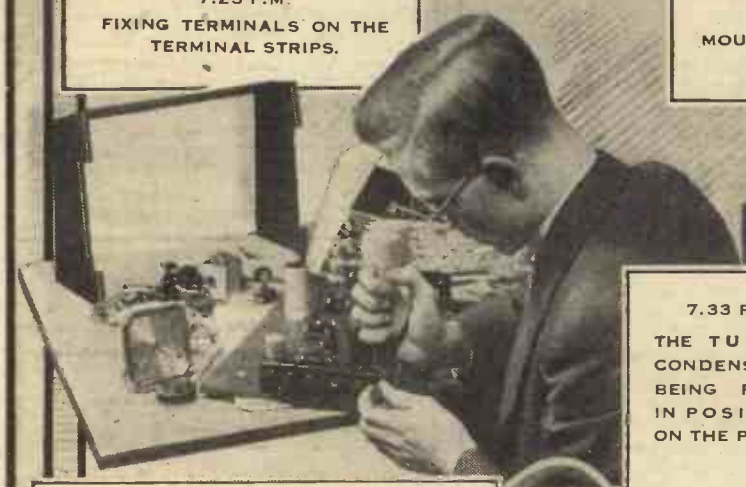
THE S.T.700 IS CONSTRUCTED IN JUST OVER TWO HOURS, IN ACCORDANCE WITH THE DETAILS GIVEN IN THE RAPID CONSTRUCTION GUIDE.

6.53 P.M.
ALL THE ITEMS LAID OUT FOR CHECKING PURPOSES.

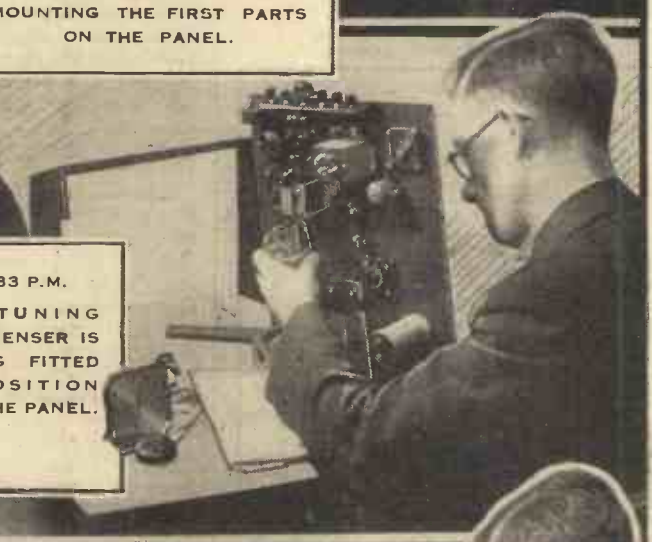
7.4 P.M.
THE EASY-CABINET IS BUILT, AND TERMINAL STRIPS ARE BEING MOUNTED ON THE READY-DRILLED PANEL.

7.14 P.M.
MOUNTING THE FIRST PARTS ON THE PANEL.

7.23 P.M.
FIXING TERMINALS ON THE TERMINAL STRIPS.



7.33 P.M.
THE TUNING CONDENSER IS BEING FITTED IN POSITION ON THE PANEL.



7.45 P.M.
WIRING HAS BEEN COMMENCED AND BLUE PRINT IS BEING FOLLOWED.

7.57 P.M.
A FURTHER STAGE IN WIRING HAS NOW BEEN REACHED, AND THE SET IS RAPIDLY TAKING SHAPE.


8.5 P.M.
MAKING A LOOP IN ONE OF THE WIRES FOR TERMINAL CONNECTION.
8.15 P.M.
THE LAST FEW LEADS ARE NOW GOING ON —THE SET IS NEARLY COMPLETED.
8.25 P.M.
A PAUSE FOR A CUP OF TEA AND A CHECK OVER BY BLUEPRINT AND WIRING CHECK.
8.35 P.M.
THE PANEL IS NOW READY TO GO INTO THE EASY-CABINET.
8.55 P.M.
THE AUTO-DIAL HAS BEEN PLACED IN POSITION, CENTRED AND PINNED.
8.46 P.M.
THE PANEL IS IN POSITION, THE BIAS BATTERY IS FIXED, AND THE GRID BIAS PLUGS ARE BEING INSERTED.
9.1 P.M.
THE S.T.700 IS NOW FINISHED. ONLY JUST OVER TWO HOURS' WORK AND PLENTY OF TIME LEFT TO LISTEN TO PROGRAMMES.

NOTES ON TELEVISION

How much will the forthcoming televiewers cost ? That is a question that none can answer at the moment, but in these notes L. H. Thomas "debunks" some of the fantastic stories that are often told about television receiver prices.

ALL sorts of weird statements about the probable size and cost of a television receiver seem to be in circulation. One, which I recently saw in a non-technical magazine, describes the television set of the future as an affair using anything up to 25 valves and costing £70 or more.

Of course, that phrase "up to 25 valves" is ingenious. It makes one think of something huge and unwieldly, but includes everything from the single-valver upwards ! (Not that any single-valver is going to be evolved for television.)

The future manufacturers of television receivers have already made a definite statement that it will be possible to market them at prices between £25 and £35, and the number of valves used is *their* concern. It is possible, however, for the home-constructor to-day to build a sound-and-vision receiver using not more than *ten* valves.

Not Worth Taking Seriously.

Anti-television articles have been rather frequent lately, and one cannot but think that they hail from "inspired" sources. They are not worth taking seriously, since the technical Press has an unbiased outlook and provides its readers with plain facts instead of half-witted fancies.

One can see many difficulties arising from the decision to use two television systems "side by side," so to speak. Apart from the extra complications at the receiving end, one imagines that there may possibly be a spot of bother when an important event is to be televised. Which system will be used ?

* * *

Television for the amateur transmitter is a subject that has already been discussed. He is in a queer position, chiefly owing to the complication and expense of the necessary apparatus. Before broadcasting started he was transmitting speech and music like a real pioneer. Before any commercial use was made of the short waves, he was chatting nightly with America on them.

Television is a branch of radio in which he will have to lag behind—but only superficially. The catch, of course, is that nearly all the amateur transmitters who *would* be putting out television if their pockets allowed them to do so are already on the staff of one of the firms interested in the commercial side of it !

When The History Is Written.

When the complete history of television is written up, in a century or so, the old 30-line transmissions will probably occupy about the same place as untuned spark transmissions, received on a coherer, fill in the history of radio-telegraphy. There has to be a primitive beginning to every new science, and the value of the first television transmissions, it must be admitted, was enormous.

The big snag in television, from the scientific point of view, has been that this crude variety of it was so simple and straightforward, while improvements in detail have entailed complications that are apparently out of all proportion to the improvement in results.

Could one progress from 30 lines to 240 just by punching eight times as many holes in a scanning disc—how like heaven that would be !

* * *

A friend recently started off on a train of thought that rather amused me. We might call it "Television and the English Landscape." Instead of strings of untidy aerials down the back of every road, he said, we shall now have a forest of small di-poles, standing, rather like gallows, on every chimney-pot ! Rather a striking thought !

OVER FROM HOLLYWOOD

Ramon Novarro making a record of his famous songs for H.M.V. during a recent visit to London.

ROUND THE RECORDS

News of the Gramophone Recordings.

I AGREE with the sentiments expressed in some official "dope" recently sent to me. It says, "The number of film stars who can really sing is small." That is true, unfortunately, as hordes of filmgoers realise. But there are some to whom the gift of voice has been vouchsafed—Grace Moore, Ramon Novarro, Tauber, to mention three. True, Grace Moore and Tauber took up filming after they had made their names on the opera stage, but they must be reckoned as film stars, none the less.

And two of them are recorded on some of the latest gramophone records—viz.; Ramon Novarro on H.M.V., and Richard Tauber on Parlophone.

A Medley of Popular Songs.

Novarro sings a medley of the most popular songs, including *Charming, The Night is Young*, and *Pagan Love Song*. This is issued on H.M.V. C2778, and is well worth getting. Tauber has sung four of his songs from the film "Heart's Desire," including the popular *Vienna, City of My Dreams*. The other songs are joint compositions of Tauber with Clifford Grey, and the numbers are RO20286–RO20287. A third record by Richard Tauber is RO20289; which contains two songs in German from "Gianditta." The items are *Stay With Me For Ever* and *Every Day Brings Pleasures New*.

* * *

The "record of the month for October" as given by H.M.V. was that of John McCormack. His consummate skill for ballad singing is as fine as ever, and the unique personality and artistry of the famous singer is well captured on DA1426. The titles of the songs are *Shannon River* and *I Met An Angel*. You should hear them.

* * *

Here are two recordings in which Paul Robeson sings with unusual feeling, *Swing Low, Sweet Chariot* and *On Ma Journey*, two negro spirituals that are world famous. They are on H.M.V. B8372, and large numbers of Robeson fans will want copies of that record.

Readers of "P.W." who enjoyed a recent broadcast of The Four Aces—a Decca discovery by the way—and who enjoyed their fine instrumental imitations, especially that of the cymbal, will want to hear their latest record. It is a medley of fascinating tunes of the day, and is called *Melody Trumps*. The Four Aces are Englishmen, and though they have inevitably been compared with the Mills Brothers, they have carved a niche of their own in the music-hall world, and earned a popularity that they thoroughly deserve. "Melody Trumps" is recorded on Decca F5690.

* * *

A loss to the entertainment world is that of Louis de Vries, the famous spectacular trumpet player who was killed recently in a motor accident. His last record, *Oh, You Sweet Thing*, has just been released by Decca, for whom it was played in Holland shortly before the fatal accident (F5688.)

* * *

Noel Coward, of the unusual singing voice, actor playwright, and composer, fresh from his Hollywood film triumphs, has made a new record for H.M.V. It contains *We Were So Young* from the film "Sweet Adeline" and *Mrs. Worthington*, one of his own compositions, in which he gives necessary advice to the stage-struck. The number is (B8369.)

Al Bowlly is recording again, in America, with Ray Noble, and they have just made some more H.M.V. records. I make no criticism of the numbers, but leave it for you to hear and judge for yourself. The numbers are *Basin Street Blues* and *Everything's Been Done Before*, from Jean Harlow's film "Reckless." (H.M.V. BD 226.)

Somehow the orchestra does not sound like Ray Noble's, judged by the orchestra which he conducted when in this country. Maybe he has progressed in the art of modern rhythm. Everyone says he has, and he is the leading dance-band leader in New York, but I for one prefer his old, simpler methods and orchestrations, which he exploited to such good purpose in the days of "Love is the Sweetest Thing."

I expect to be torn to bits by the real hot music fiends for such conservatism, but there it is. I used to like Ray Noble immensely. His present records disappoint me.

* * *

I am going to give you one or two biographies at the end of my notes in future. The life stories of the recording artists are always interesting and are not infrequently romantic. Here is the story of Count John McCormack, whose recent record I have already mentioned.

A Remarkable Career.

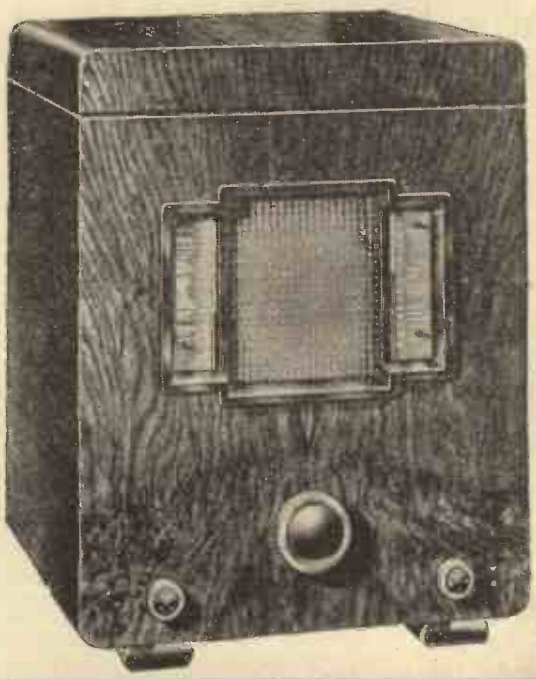
He was born in Athlone, years before the advent of the famous radio station, of course; in fact, in 1884. He had no intention of taking up music as a profession, though he was musically inclined and studied the subject.

But he went in for the National Irish Festival in 1902 and gained the Denza Gold Medal for singing. That did it. The next year he made his vocal debut as a public singer in Dublin. Then he made records for H.M.V.

In 1905 he began serious training under Sabatini in Milan and made rapid progress. And—no mean feat for a Briton—he first faced his operatic audiences in various Italian cities.

Two years later he came to London and created quite a furore by his remarkable singing. He appeared in the Covent Garden seasons before the War, and then later went to the States and became quite the idol of that continent. In 1918 John McCormack became an American citizen, and in April, 1932, he celebrated the twenty-fifth anniversary of his London debut. In all he has been recording for nearly thirty-three years, and is still going very strong indeed.

K. D. R.



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With Pentagrid Frequency Changer, H.F. Pen. I.F. Amplifier. Double Diode 2nd Det. Power Pen. output and heavy duty Rect. Anti-fading circuit. "Thermometer" tuning with twin scales in wavelengths and station names (replaceable). Single knob tuning. 8" energised M.C. speaker. Combined Radio/Gram. Volume Control. Silent Induction Motor. 12" turntable, Speed regulator, automatic stop and high-grade pick-up and arm. **16 GNS**

Hire Purchase Terms : 20/- deposit and 18 monthly payments of 20/-.

SUPER-FERRODYNE RADIOGRAM MODEL 536

(Illustrated on right)

With Variable-mu Screened H.F., H.F. Pen. Det., Pen. Output and Full Wave Rec. Mains Energised Concert Grand M.C. Speaker, single knob tuning, illuminated Scale in wavelengths, combined On/Off, wave-change and gramophone switch. Volume Control. Silent Induction Motor, 12" turntable, speed regulator, fully automatic stop, high grade pick-up and arm and separate Volume Control for gramophone. Sockets for extension speaker. **16 GNS**

Hire Purchase Terms : 20/- deposit and 18 monthly payments of 20/-.

Both models for A.C. Mains only, 200/250 v. (adjust.) 50-60 cycles.

Prices do not apply in I.F.S.

8004

THIS COUPON BRINGS FULL DETAILS

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Please send me free of charge, literature giving *full* details of the Cossor Radiogram — Model : .....

Please state model required.

NAME.....

ADDRESS.....

P.W. 16/11/35.

S.T.700: BRILLIANT RESULTS

THIS WEEK WE PUBLISH FURTHER STRIKING PROOFS OF THE WONDERFUL PERFORMANCE GIVEN BY JOHN SCOTT-TAGGART'S LATEST AND GREATEST MASTERPIECE

READ WHAT THESE ENTHUSIASTS SAY!

S.T.700: A GREAT STRIDE FORWARD IN RADIO.

Dear Sir,—I wish to thank you for the very interesting demonstration of the S.T.700.

Like its predecessors with S.T. prefixed to their number, it is certainly a great stride forward in radio. The new Triple Extractor is an amazing improvement, and something no doubt thousands have been looking for, like myself. The way in which it removes the locals individually is astonishing. The Auto-Dial proves a "spot on" control, which was shown by a faint foreigner being chosen with the set "off," and then just switched on, the station was tuned "dead-on." All S.T.'s have seemed to have an easy layout to me, but I must confess that this one beats them all for simplicity, and yet there is more obtained from the set in performance.

Above all I must congratulate you on the wonderful achievement of making Audio-Reaction practicable, something no doubt few, if any, thought possible. The value of this form of reaction is certainly a boon, for in addition to putting that mellowness in the tone, so hard to find in sets to-day, it greatly increases the volume, which is even more pronounced on weak foreigners, a point which greatly impressed me during the demonstration.

R. GRIFFIN, 149, *Langham Road, Tottenham, N.*15.

75 STATIONS IN 65 MINUTES.

Dear Sir,—I wish to thank you for being allowed to witness a demonstration of the S.T.700. I shall have no hesitation in recommending the S.T.700 to all constructors who want a set to build.

The Triple Extractor cut Droitwich and Midland Regional out altogether, so that reaction had to be used to bring them in. In fact, both these stations had to be treated like a good foreigner, after the Extractor had been used. Another pleasing feature about the Extractor is that once it has been set in the correct position, it need not be touched again.

The tuning seemed quite easy, helped as it was by a unique and novel tuning dial, which enables the operator to "see where he is going," also enabling him to tune with greater accuracy.

When you put the "700" through its paces you obtained 75 stations at full-entertainment value on a moving-coil speaker in 65 minutes. I timed you! You even obtained Turin No. 2 working on ·2 kw., a most remarkable performance in itself. But there was more to come.

This time you introduce low-frequency reaction, a thing never tried before. You proved conclusively by meters, etc., that you could increase volume 25 times.

But you kept the best (to my mind) until last—the Audio-Frequency control. By simply moving a knob it was possible actually to build up the bass response, without losing the top notes. A station which was coming through rather thinly, such as a weak foreigner, was made to sound much richer and "more solid" in tone.

Truly a real tone control at last.

GEOFFREY W. REYNOLDS, 19, *Wigorn Road, Warley Woods, Smethwick.*

AUDIO-REACTION MAKES A WEAK STATION A VERY POWERFUL ONE.

Dear Sir,—Having attended the demonstration of the S.T.700, I was struck by the Auto-Dial, which, I must say, makes it easy for any of the family to get local or Continental stations. As regards the selectivity of the set, it is remarkable how one station is cut from another.

Concerning the Triple Extractor, it is a wonderful job. At times it seemed impossible to cut out London Regional and London National owing to their power, but with a turn of the Extractor they were no longer on the dial. I must also say the Audio-Reaction makes a weak station a very powerful one, increasing its power about 25 times, by just the turn of a single knob.

With regard to the aerial, which was only 3 feet long, we received quite a number of stations, but when it was put on the outdoor aerial we received 76 stations, and I must say there were more, but I got tired of counting them, and threw the sponge in! I have not heard a factory set to tune in such a number of stations with the strength the S.T.700 has.

W. DAVIES, 11, *Ashurst Street, Park Road, Battersea, S.W.*11.

EXTREMELY GOOD SELECTIVITY.

Dear Sir,—The new "S.T." set has many advantages over the S.T.600; the main one I consider is the new Audio-Reaction, which makes a very pronounced difference to the output.

The "Uniplane Construction" not only gives the set a neat appearance, but renders the set easy for construction, which will be appreciated by all constructors.

The Auto-Dial also adds to the neat appearance of the job and will appeal to all.

The selectivity of the set is extremely good, and the stations are easy to find.

T. D. CROSLAND, 3, *Templeton Place, Earl's Court, S.W.*5.

A SUPER-SET AT AN AMAZINGLY LOW FIGURE.

Dear Sir,—I wish to thank you for giving me the opportunity of witnessing a demonstration of the S.T.700 and of operating same. I went there with the idea of hearing something above the average, and I certainly did.

The quality and volume on both English and foreign stations were all that could be desired, while the local stations could be absolutely isolated, thanks to a wonderful Extractor system. The new dial is a brilliant idea and very pleasing to the eye.

Operating the set is simplicity itself. A super-set at an amazingly low figure. J. S.-T. certainly studies the pockets of his hosts of followers.

W. ROWLANDS, 143, *Queens Road, Finsbury Park, N.*4.

CRYSTAL CLEARNESS OF DISTANT STATIONS

Sir,—Having just had the privilege of being present at a demonstration of the S.T.700, I have pleasure in making a few comments on same.

My first impression was the complete simplicity of layout.

Other points attracted me also, such as Audio-Reaction, Triple-Extractor and well-devised Auto-Dial, giving full and well-directed positions of stations at a glance.

JUDGING FOR THEMSELVES

A happy group of S.T. enthusiasts who were present at one of the demonstrations. They are Messrs. Bristow, Miller, Elford, Thimbleby, and Walmsley.

DEMONSTRATED TO READERS

The merits of the set were fully expounded and with crystal clearness distant stations were perfectly tuned-in with the Audio-Reaction control.

Mr. Scott-Taggart has once again achieved a marvellous piece of work in the S.T.700, and here's to its success!

J. A. PRIESTLEY, 83, *Blackheath Hill, S.E.*10.

A VERY FINE RECEIVER.

Dear Sir,—I had the pleasure to attend a demonstration of the S.T.700, the latest production by Mr. John Scott-Taggart.

May I convey my impressions of this very fine receiver, which leaves no doubt of the extraordinary fertility of original ideas that the inventor has incorporated.

The S.T.700 embraces all the characteristics of worth-while radio: Selectivity, tone and impressive volume, which really has to be heard to gather any conception of its fine properties.

The new Auto-Dial is a unique and serviceable refinement, and this, together with a pleasing cabinet design, completed a very successful effort.

*C. B. MILLER, College House, Sussex Place, Hammersmith, W.*6

WHAT A SET!

Dear Sir,—I must thank you for according me the privilege of attending your demonstration of your latest—and what a set!—the S.T.700. It certainly was a knock-out. At present I am running the "600", and I must say that the S.T.700 is a great improvement on it, and the "600" is good.

The first thing that attracts attention is the Auto-Dial—a decided step forward—for anybody to see just exactly what station they want and where it is on the dial. Simplicity itself to go to it with no overlapping of station names.

Again, as is usual with S.T. sets, the quality was there with a vengeance—could anyone doubt it? No. Quality was there on all types of music and speech. It certainly was good to listen to the output of the "700"; enough to suit anybody, from a whisper to suit a small room, or volume to suit a fair-sized hall. What more could anybody want than that?

The Triple Extractor which is used in the "700" is certainly a great consideration for getting the terrific spread of the locals cut down to reasonable limits, so that one can get the stations near them. Once the three Extractors are set for the Regional, National, and Droitwich it is a pleasure to work on either side of them.

Now as to the number of stations: it is something to say that one can get 65—viz., 55 on the medium and 10 on the long—without turning grey searching the ether for them. What a joy!

It will surprise many to know that one can apply reaction to the L.F. side of one's set. And what a difference it makes! It gives the necessary boost to give that fine smooth increase of strength and full reproduction which one looks for on the big-priced supers which are beyond the average listener's pocket.

It is a set that can do its stuff just as well on a small inside aerial as on the outside aerial.

WM. WHITTEN, 1107, *Maryhill Road, Glasgow, N.W.*

AMAZED AT THE SIMPLICITY.

Dear Sir,—I am very much obliged to you for letting me in with my friend to hear the S.T.700. I think it was very kind of you to let me handle the set, and I must say I was amazed at once by the simplicity with which station after station could be tuned-in.

When I first went in and heard the quality on London Regional, I thought that such word-clearness and musical fidelity were enough to make the set unique. But after handling it, I think that its station-getting, with certainty and simplicity, is even more wonderful. Congratulations on the best receiver I've ever heard.

A. P de le M. SINKINSON, 163, *Marlborough Road, Gillingham.*

FASCINATINGLY EASY TUNING.

Dear Sir,—Please accept my thanks for the opportunity of attending a demonstration of the S.T.700.

Stations were received, one after another, at good strength, without difficulty or overlapping.

Apart from the design being a very attractive one, the tuning is fascinatingly easy, tone excellent, reserve of power ample for all general purposes, and the facilities for "boosting" weak signals without distortion are remarkable.

The building of the set is well within the powers of the absolute beginner, and I was particularly impressed that results so efficient could be obtained from such simple wiring and small number of components, while the low cost of construction will—without doubt—make it even more popular than its celebrated predecessors.

Still, in spite of all these facts, I have a grouse! When I built my last S.T. set I was convinced it did all I wanted and that it should be my last. Now I'm afraid this will not be the case, and I am already making a list of the "untouched" friends from whom I hope to be able to borrow the "necessary" to commence construction!

May the S.T.700 have all the success it so richly deserves!

W. H. WALMSLEY, 44, *Pembroke Road, Seven Kings, Essex.*

JOHN SCOTT-TAGGART WILL WRITE ANOTHER SPECIAL ARTICLE ON THE

S.T.700

In Next Week's Issue

Don't Miss Your Copy.

ASTOUNDING PERFORMANCE.

Dear Sir,—On October 15th I had the privilege of attending a demonstration of your new set S.T.700.

To say the performance of the set was astounding is only a mild way of conveying my impressions.

I was particularly impressed by the working of the Triple Extractor, by which means London Regional, National and Droitwich are all cleared completely off the map, and are put in the position of foreign stations.

As soon as the condenser was moved to adjacent stations the locals might just as well have been closed down, for there was no indication that they were still radiating.

The supreme ease of accomplishing this is most remarkable, being nothing more than a slight adjustment of a knob at the expense of a few seconds, after which you were able to place the pointer of condenser to the station you wished to receive, add a little reaction and, perhaps, volume, and in they come. Truly you could say it's a self-tuning set.

Another remarkable feature of the Triple Extractor is that each one is absolutely independent of the other, and once set can be entirely forgotten. What a charm to suit all the various aerials in all parts of the country!

Another revolutionary feature of this set is low-frequency reaction. If anyone had suggested this to me, I think I should have doubted their sanity, but, however, it's on this set, and the way it operates is simply wonderful. Without depending on one's ear alone to detect the variations of tone and volume, it was clearly proved by the aid of a meter in circuit that the power of a weak signal could be increased to 20 times without affecting the tuning of the set in any way whatever.

The selectivity and sensitivity of the set are absolutely first-class, and stations come in with great volume. The quality of speech and music is excellent, and you can pick and choose your programme from any part of Europe.

In general appearance the set is attractive and pleasing, and compares favourably with any manufacturer's set at four times its cost.

I must congratulate you on giving to the constructing public such an ideal set.

W. H. MARSHALL, 64, *Shacklewell Lane, Dalston, E.*8.

AUDIO-REACTION REALLY UNCANNY.

Dear Sir,—I am writing this on October 10th on my return home from hearing your demonstration of the S.T.700.

Whilst the experience is still fresh in my mind I should like to pay tribute to the remarkable demonstration I heard. Selectivity, quality, power and sensitivity—all were there. **But what I found most surprising of all was the Audio-Reaction—it was really uncanny to hear the difference it makes, and I prophesy the day will come when every set fits this system as a matter of course.**

F. E. DEAN, Elm Cottage, Shirley.

AN EYE-OPENER.

Dear Sir,—Very many thanks for the demonstration of the S.T.700 last night. *Like everybody else who heard it, I was astounded.* The ease with which station after station could be heard, as and when desired, was an eye-opener to me. **And I must pay special compliments to that Triple Extractor. It muzzled the loudest programmes in a fashion that seemed unbelievable to one who has suffered long from interference.**

R. N. THOMPSON, 33, *Keswick Avenue, S.W.*19.

(*Continued on page* 317.)

AT TALLIS HOUSE

Messrs. Rowlands and Mayhew, two more "P.W." readers who tried the S.T.700. Note the meter on top of the loudspeaker which provided scientific proof of the amazing effect of Audio-Reaction in building up the strength of weak signals.

Our PRESENTATION BOOK OFFER Repeated

THE FIRST GREAT BOOK DEALING WITH TELEVISION

Written and prepared under the direction of

G. V. DOWDING

(Technical Editor of P.W.)

Have you applied for your copy of the BOOK OF PRACTICALTELEVISION yet ? Time is drawing short and if you want to take advantage of this further opportunity you must reserve your copy at once.

In this magnificent new volume the whole subject has been covered in a most thorough manner by experts. Special research has been undertaken for the purpose of obtaining up-to-the-minute information for the book, and every aspect of the fascinating science has been dealt with authoritatively.

But, though marvellously comprehensive, the book is not " heavy." Nor is it difficult to understand. The intricate mathematics that are usually employed in a modern science, especially one including optics and electronics, as does television, have been boiled down to simple terms, so that there is no reason why anyone should fail to understand any portion of the book.

Every reader of POPULAR WIRELESS should have a copy of this remarkable volume, for before long television will be occupying a most important position in the radio life of all of us.

CONTRIBUTORS TO THE BOOK OF PRACTICAL TELEVISION

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L. H. THOMAS

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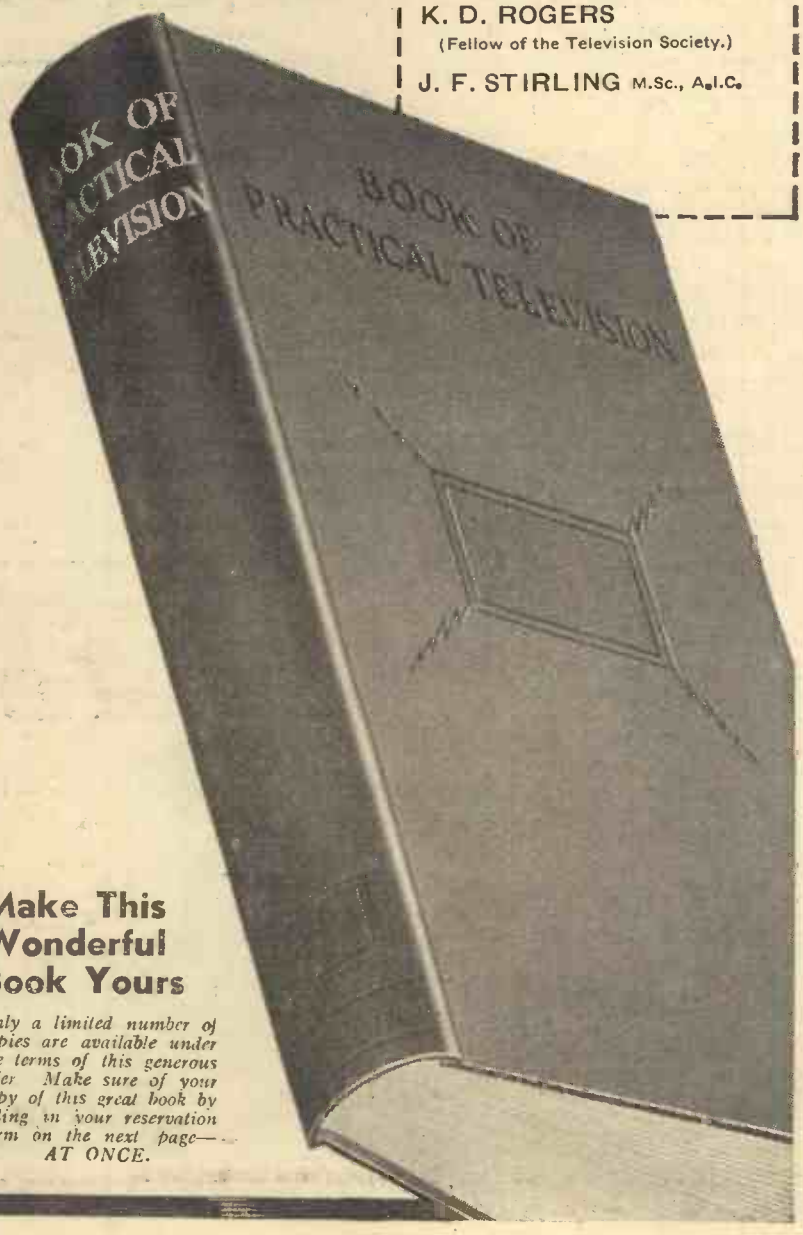
K. D. ROGERS (Fellow of the Television Society.)

J. F. STIRLING M.Sc., A.I.C.



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For Office Use

THE A.C. S.T.700

Further information about this fine receiver, with special emphasis on some component factors and other constructional items of importance.

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

A FEW technical design points in connection with the A.C. S.T.700 will no doubt be of interest to readers. These design features are distinct from the circuit development considerations—and are to a considerable extent applicable to other mains designs.

The reservoir condensers (there are two of them of 4 mfd. each in the voltage doubling rectifier circuit) are of the paper dielectric type, the reason being that they are able to withstand the large percentage of alternating current applied to them.

A Simple Safeguard.

The smoothing condensers, each of 8 mfd. capacity, are of the aqueous electrolytic type, which have the valuable property of momentarily breaking down without permanent injury to themselves, and in this way safeguarding other condensers which have no recuperative powers. This condition of danger to other condensers arises in sets with metal rectifiers, or valve rectifiers of the directly-heated type, when first switching on. The reason is that the radio valves—which are normally indirectly-heated—do not draw their full current from the high-tension supply until their cathodes have reached their working temperature. Since the H.T. current is therefore low at first, all points on the high-tension supply line will be nearly at the maximum output volts of the rectifier.

L.F. Choke.

You will notice that the resistance of the L.F. smoothing choke is low (250 ohms); it thus leaves the bulk of the volts to be dropped across the speaker field winding (1,500 ohms), where it will do good by strengthening the magnetic flux in the loudspeaker gap.

Apropos of using suitable condensers which will withstand alternating current fluctuations, you will notice that I have employed two 0·1 mfd. 600-volt D.C. working type for the mains filter arrangement. These condensers, which are of paper dielectric type, must be capable of being subjected to the mains alternating voltage, and less hardy types are not advised. It must be remembered when considering "working voltage" that alternating currents produce a much greater strain not only because their peak voltages are about 1·4 times the rated value, but the very fact of their alternating nature can cause great distress in the dielectric unless this is designed to withstand D.C. voltage of considerably higher value.

The receiver is fitted with a "gramophone" terminal to which the pick-up and its associated potentiometer is connected in the usual manner. The pick-up voltages are applied directly to the grid of the last valve. The A.C. S.T.700 is designed as an out-and-out radio receiver, and nothing has been done to minimise in any way the effectiveness of its performance as a radio set. Hence the simple arrangement of the pick-up terminal. The full 3½ watts is not obtained from the average gramophone pick-up, but the quality is exceedingly good, and the volume adequate for normal household entertainment.

The connections for the pick-up are as follows: The pick-up leads are connected across the outer terminals of the potentiometer which should have the value recommended by the makers of the pick-up. The middle terminal of the potentiometer, (*i.e.* the one connected to the slider,) is connected to the pick-up terminal on the set. The right-hand terminal on the potentiometer (viewing the potentiometer from the front—its knob's side—the three terminals being uppermost) is now connected to the earth terminal of the set.

As regards the construction of the set, there is little need to add to last week's instructions and diagrams. You will notice that three porcelain pillars are among the components. Their purpose is to act as anchoring points for wire-ended resistors.

Fitting the Panel.

The method of construction makes the interconnecting of the two parts of the set much simpler than in the case of previous A.C. sets, because the two parts now face each other instead of being separated by a shelf. You can make all the interconnections after the radio panel is in position; but it is better to prepare the twisted heater leads (which later go between the mains transformer and the detector valve holder), and to connect them to the mains transformer.

You should also prepare the wire which later runs between one field terminal on the loudspeaker and that porcelain pillar which is the anchoring point for several wire-ended resistors; this wire should be connected to this pillar before fitting the receiver panel.

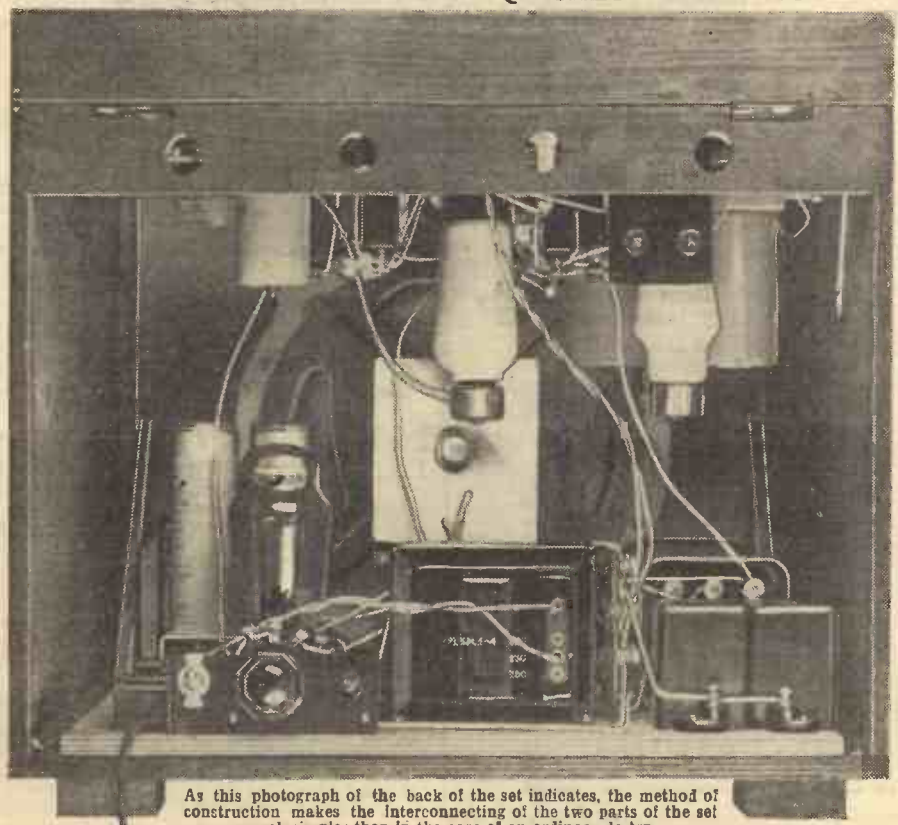
A word or two about fitting the panel will not be out of place. The hole for the wavechange switch spindle should, of course, first be drilled, and the extension piece fitted to the wavechange switch spindle so that the outer surface of the bush on the extension piece will fit close to the side of the cabinet when in position. Lift the lid of the cabinet and leave it propped open with the lid support.

Quite Easy.

Hold the radio panel with both hands, with control knobs uppermost and stand facing the front of the cabinet, with the wavechange switch spindle near your left hand. Keeping the end of the extension piece of the wavechange switch spindle just to the right of the left-hand side of the cabinet lower the back edge (farthest from you) of the panel and rest this edge along the fillet near the cabinet lid hinges.

(*Cont. on page* 317.)

THE TWO SECTIONS ARE QUICKLY JOINED UP



As this photograph of the back of the set indicates, the method of construction makes the interconnecting of the two parts of the set much simpler than in the case of an ordinary design.

ON THE SHORT WAVES

EXTRA EQUIPMENT

What goes to make up a "receiving station"? That is the question discussed this week by W. L. S.

THE average short-wave enthusiast seems, at some time or another, to feel a desperate urge to transform his simple short-wave receiver into an "experimental receiving station," or "short-wave listening post," or some other high-sounding phrase.

Who shall blame him? I don't! But I do feel that if you want to blossom out into something ambitious, you must have the gear to do it with. You can't call yourself the owner of an experimental receiving station if the only thing in it is a simple receiver. Were that the case, every broadcast listener could call himself an "official programme-checking station," or something of that kind.

A Noteworthy Fact.

Looking through a thick batch of photographs of my own station in its various stages, I came across the one reproduced on this page, which is noteworthy for the fact that there isn't a single piece of short-wave gear in it! It just set me off on the train of thought that the short-wave man *ought* to be an all-rounder. He should take an interest in occasional broadcast reception, gramophone reproduction, even home-recording, if he wants to get the maximum enjoyment out of his radio.

What does one need in the way of extra equipment before one can call oneself the Little Mudlark-on-Wallop official receiving post? Well, one must have a good short-wave receiver; and one must have a decent wavemeter and a means of keeping the receiver accurately calibrated.

For one's own amusement it is worth while to put in an ultra-short-wave receiver as well.

A Practical Suggestion.

If one is chiefly interested in short-wave broadcast reception, especially on the loudspeaker, then one cannot do better than install a nice broadcast receiver with one or more H.F. stages. All the legitimate short-wave gear you will want will then be an efficient little converter.

If you want to spend most of your time on short waves, then you will have a more ambitious short-wave receiver, but you can leave the L.F. out of it and feed its detector (when you're not using headphones) into a gramophone amplifier.

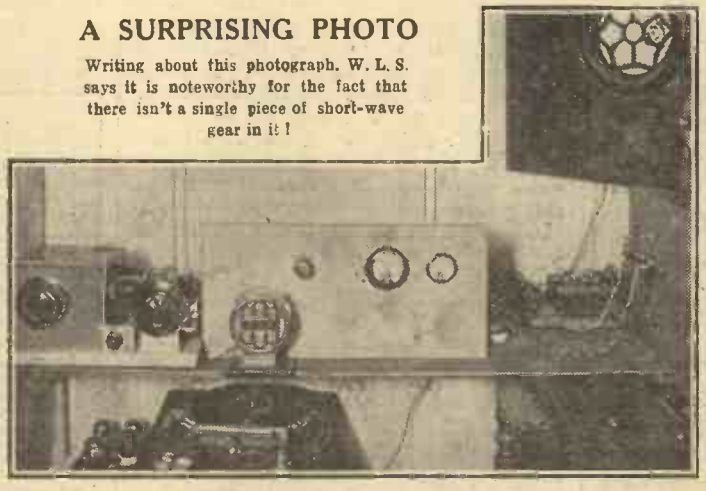
I did this for years. My short-waver was, first of all, the famous single-valver; then it became an H.F. and detector. But always, in the background, was that 3-watt amplifier, with a three-way switch—broadcast receiver, pick-up, or short-wave receiver.

As I have remarked before, a piece of gear like a big amplifier can be tucked away on top of a cupboard, or on a shelf out of sight, and it will serve for amplifying *anything* from gramophone pick-up to short-wave broadcast.

There's no point in building a broadcast receiver with L.F.; a short-waver with L.F.; and possibly an ultra-short-wave set, also with L.F. One good amplifier would do the job for all of them. That's why I'm rather in favour of cutting sets short at the detector. I am at the moment using a superhet which stops at the second detector. It gives me all I want on headphones, thank you! And with a 3-watt amplifier on the end. . . .

A SURPRISING PHOTO

Writing about this photograph, W. L. S. says it is noteworthy for the fact that there isn't a single piece of short-wave gear in it!



How many readers have a good wavemeter? And yet it is such an invaluable piece of equipment to have about the place. All that one wants is a single-valve receiver *without* a reaction control—one that will oscillate, and keep oscillating, over the whole swing of the condenser with a given coil.

No Need to Change the Coil.

There is no need to change the coil to cover all wavebands. If one uses one that gives a range of, say, 40–90 metres, then one gets 20–45 metres on the second harmonic, which is invariably quite strong enough to put a really decisive sort of signal into the receiver. The third harmonic will cover 13–30 metres. The only bother, of course, if you have a brand-new receiver, lies in making up your mind *which* harmonic you are listening to.

My present wavemeter is housed in an aluminium box 6 ins. by 6 ins.—contents one valve, one four-pin coil, one ·0001 variable condenser with a nice dial. Running with a 2-volt accumulator and 16 volts H.T. (from a grid-bias battery) this holds its calibration beautifully and helps me to identify all sorts of unknown stations.

Simple Calibration.

The initial calibration is simply a matter of tuning the thing to zero-beat with a well-known and reliable station, and then repeating the business on all the stations you can find. If your 40–90-metre curve is drawn in this way, you can check the harmonics on 31- and 19-metre stations, and really establish the fact that the calibration is accurate.

The laying-out of a lot of gear presents a bit of a problem, but people fortunate enough to have the said lot of gear usually don't mind that! I have my ordinary short-wave receiver in the most convenient place on the bench, with the 5-metre set on the left of it and the monitor-cum-wavemeter on a shelf just above. Underneath the bench is the all-A.C. amplifier and the front half of a broadcast receiver (S.G. and detector).

The Power Supply.

All the transmitting gear is on the other half of the bench—but that's another story!

Those people who are fortunate enough to possess two separate receivers—say, a superhet for broadcast reception and a "hot" two-valver for DX—need not bother to install two battery supplies or two mains units, although I often find this to be the case. What could be simpler than a nice L.T. and H.T. power-pack in a screened box with a simple change-over switch to throw it over on to either receiver?

The trouble when one has accumulated a lot of equipment is generally that one doesn't bother to lay it out nicely, and the untidiness and general atmosphere of "haywire" has a very depressing effect upon the efficiency of the gear.

Try to think commercially—lay out all leads tidily, and use neat switching arrangements wherever possible. You will then have a "station" that you can truly be proud of.

ON THE SHORT WAVES—*Page 2.*

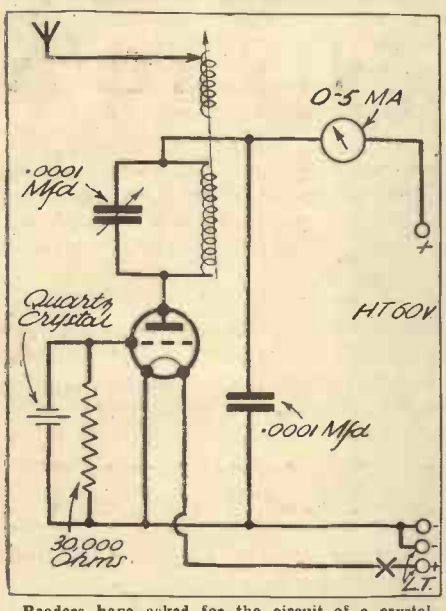
Points from the POST-BAG

A. D. B. (Sandgate) has a "Simplex" Two that he likes so much that he wants to use it for other wavelengths, and asks for particulars of a coil to cover 150–200 metres. There is, of course, an "Eddystone," similar to those used in the set, rated at 76–170 metres, and another going up still higher.

To cover the 150–200-metre band one wants about 30 turns in the grid coil and 15 or 20 for reaction. Even 40 turns in the grid coil would not be too much; but with 30 the 150–200 metre band is covered towards the top of the dial. 22-gauge wire seems altogether too heavy for the job, though. I suggest 32 enamelled.

F. K. (Newcastle), whose letter was picked out at random, asks practically the same question. He wants to cover higher wavelength ranges with valve-base coils. Just pile on the turns, F. K., and if you can't get them in a single layer don't worry too much about that. You can even cover the broadcast band with a ·0001 condenser if you wind on about 80 turns grid and 20 reaction.

A CRYSTAL OSCILLATOR



Readers have asked for the circuit of a crystal oscillator for calibration purposes. This simple scheme is all that is needed. The coupling coil is connected to a few feet of wire to form an "aerial," if signals are too weak without it.

Your arrangement for the reaction circuit is preferable to the alternative one that you show—at least, I always prefer series feed to parallel.

G. W. G. (Ipswich) mentions that a kind of "howl" that used to give him trouble has been traced to vibrating vanes of a variable condenser. He suggests that the only remedy is to use another condenser but I should think a judicious "wangle" with "Plasticine" would probably cure it. Anyway, it's worth trying.

Modern condensers are so rigidly built and have such small plates that I don't think many people are likely to come up against this trouble.

C. W. T. (Wimbledon) turned up an old copy of "P.W." with the description of a single-valve short-wave set using an S.G. detector. He built the thing up from all sorts of junk, and it works very well, "for some obscure reason," as he says. Some people seem to have reasonable luck with the junkiest of short-wavers, while others buy an expensive kit of parts and do nothing but grouse ever after. I wish I could fathom all this.

"Electron" Coupling.

G. A. A. (Romford) wants to rebuild his "B.C.L." Two with an "electron-coupled" detector circuit similar to the one I was recently discussing in these notes. Quite O.K., G. A. A. You can use your present S.G. valve for the job, but I'm fraid you'll have to convert to potentiometer reaction control.

H. H. H. (Camberley) points out that W 8 X K is far from inactive on his 13·9-metre wave. Curiously enough, I heard him just before the letter arrived, and was going to comment on same. He fades out at about 3 or 3.30 p.m. He also comments on good reception from the Japanese stations J V H and J V M.

L. J. F. (Wanstead) wants a set from me on the following lines: Tuned H.F. stage, triode-hexode mixer, two I.F. stages, diode second detector and two L.F. stages. The set that's on the board at present, and awaiting release as soon as the Powers That Be are ready, doesn't quite conform to that, but seems quite good enough on loud-speaker reception for *my* purposes.

It uses a triode-hexode, two I.F.'s, power-grid second detector and one L.F. Believe me, I'm unpopular in the neighbourhood if I let my hand slip on the volume-control. I very much prefer a superhet to have a tuned H.F. stage, but I am afraid the complications in ganging and/or tuning rather put such a set beyond the capabilities and patience of most home-constructors. (And now I am waiting for the shower of bricks!)

R. N. (Bombay) absolutely tears me limb from limb for holding up this big set for so long. He accuses me of neglecting the overseas reader and of taking far too long to keep my promise of nearly a year ago.

All Ready and Waiting.

To all this I bow my repentant head. I *have* been an awful time with this superhet. The trouble has simply been that I have so much to do that I can't do it all at once. But here it is, sitting on my bench as I write this, and I crave a little more patience until such time as it actually comes forth!

R. D. E. (now of Sandy, Beds) tells me that he is still collecting verifications to such purpose that his total is now 735—DX only, of course. I hope to publish a photo of his gear and some of the "veris" shortly.

W. G. M. (Southampton) sends in a very interesting list of DX stations heard on 10 metres, including nearly a score of North Americans, a South African, and a South American. He has also logged what I believe to be the first 5th district U.S.A. station (W 5 A F X) to be heard in this country. For further information about 10 metres, see "Short-Wave News."

SHORT-WAVE NEWS

OCTOBER, 1935, will always remain a red-letter month in the minds of the 10-metre enthusiasts. Since the last instalment of "Short-Wave News" was written, all *six* continents have been heard on "ten"; the first contacts between Australia and France, Belgium and Great Britain have been made; and rather more than fifty American amateurs have been heard in this country.

The record-breaking Australian stations were V K 2 L Z and V K 2 H Z; the Belgian was O N 4 A U; the French F 8 G S, and the British station G 6 L K.

By the time this appears in print there will doubtless have been many more contacts between Great Britain and Australia. When will the first New Zealand contact come to pass? Japan, Hong Kong and Argentina are all being heard regularly.

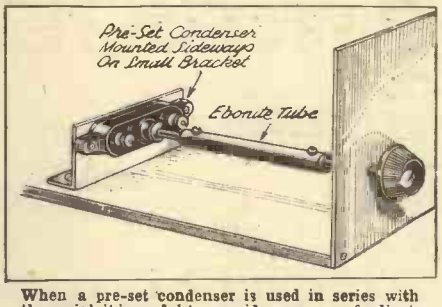
Reports on Stations.

Unusual stations that have been heard during the past fortnight include X E C R (Mexico) on 40·65 metres, C R 6 A A (Angola) on 41·8 metres, and Canadian C J R O (Winnipeg) on 48·85 metres.

Many readers report good reception of their first Bolivian station—in this case C P 7, La Paz, in the 19-metre band. This station has been coming in quite well between 5 and 7 p.m. Doubtless if it were earlier in the year he would improve as the evening went on, but "fade-out" is rather early nowadays.

A letter from a reader in Nigeria contains some interesting points about the best stations in that part of the world. Strangely enough, one of the most reliable appears to be Bombay (V U B) in the 31-metre band, which is very "patchy" in this country.

EXTENSION ADJUSTMENT



When a pre-set condenser is used in series with the aerial, it is useful to provide a means of adjusting it from the front panel. Here is a simple scheme for doing so.

Overseas readers, I find, are intensely tickled by the tactics of European short-wave stations. First one increases power, and then the others have to go one better. Then the original one goes better still, and so it goes on. But does the overseas listener mind? No, he does not! He'll soon have a better choice of good programmes than we do at home!

Stop Press News: Addis Ababa is being heard on a new wavelength of 25·1 metres. Call-sign E T A, input 2 kilowatts, transmission pretty weak and badly interfered with—but it *can* be heard.

Other items, just handed in by my roving correspondent. A station in Macao, with a call-sign beginning with C R 9, has been heard on about 23·5 metres relaying European short-wave programmes, with announcements in Portuguese and English in between.

Calcutta, V U C, has been heard in the 49-metre band early in the evening. He is on about 49·1 metres, just below Z T J, Johannesburg, but above Nairobi, V Q 7 L O. Native music is usually put out, and the transmission is weak.

The BOOK OF PRACTICAL TELEVISION

Some interesting details about the finest book offer ever made to the radio public, whether technical, constructor, or listener.

By G. V. DOWDING, Associate I.E.E.

TELEVISION is a most intensely interesting subject. I don't mean the crude television of the primitive disc and neon lamp variety, but the new television, the television which you and I and all our friends are eventually going to see in many homes. It is unfortunate that television was boosted so much before it was in anything but the most embryonic condition, for now that it has arrived many refuse to believe it; they justifiably suspect that there is a snag somewhere. There isn't.

There is no more cautious nor conservative concern in the whole country than the British Broadcasting Corporation. And the fact that they have actually started to build the first television station, and have begun to appoint a staff to run the programmes, should finally dissipate all doubts. Early next year, within a few months from this very moment, television will be "on the air" for all to enjoy who have eyes to see and sets with which to pick up the pictures.

"Living Pictures, Bright and Clear."

And what will these sets be like, and what sort of results will they give? Dim little "flickers" which you will have to use your imagination to interpret? No, something very different from that; something which will stagger the most hardened sceptic. Living pictures, bright and clear, and equal in entertainment value to the talkies. I know, I've seen it, lots of it, and I have attended demonstrations with the object of technical appraisement and criticism, and found myself lost in normal enjoyment just as with ordinary talking pictures.

And where are the roaring motors and numerous critical controls of yesterday's television? These have given way to silent, smooth working electrical processes which make television apparatus as consistent in its action and as easy to handle as the present-day radio receiver.

In the "Book of Practical Television" I have made a special effort to convey something of the intense domesticity of television, to show with a clearness which can leave no room for any doubts whatever that television is now something vastly more than either a scientific novelty or meat for the "Heath Robinson" school of technical caricature.

"It is Colossal."

I have included photographs of the latest television apparatus, and I think that at least some of you are going to be amazed at its fussless simplicity. There are also numerous very clear photographs which show the actual results obtainable.

One is apt to become somewhat case-hardened after a decade or so of close contact with the technical aspects of home entertainment, but I confess that television has set my blood racing. It is terrific! It is colossal! As the movie publicists say. And until you have actually sat in front of a television receiver in a quiet, comfortable room, and watched the living pictures of events happening at a distance perfectly synchronised with the accompanying sounds, you simply cannot appreciate the full wonder of it.

And I must repeat that it does not leave off there. After marvelling at the clearness and scope of the pictures, there will be the lasting thrill of having the talkies brought right into your own home; talkies of past

THE MAGNIFICENT AND IRREPLACEABLE VOLUME WHICH IS OFFERED TO READERS OF "POPULAR WIRELESS."

events in the form of plays and other such things, and talkies of the present in the form of vaudeville and occurrences which are happening at the very moment you are looking at their living representations.

Sooner or later you are all going to be thinking and talking television; it is bound to sweep the country. It will be too good not to do so. The far-seeing chiefs of the cinema industry realise this, and they are all endeavouring to obtain interests in it. The radio industry is prepared; there is no sizeable radio firm in this country which has no well-formulated plans for cashing-in on the new and intriguingly vital social amenity the very moment the B.B.C. service commences. And you will be amazed at the advancement that has been achieved in the design of apparatus.

Five years ago I stated in this journal that television could not attain a service value until some new principle other than that of the then crude methods of scanning had been developed. New principles were eventually forthcoming, and now television has in very truth arrived. And just as "P.W.," solitary and alone, raised its voice against the almost universal exaggerations of the early, primitive television, so we can now take pride in recalling that in later years we actively assisted in the technical development of the new processes.

"A Complete Guide."

But the "Book of Practical Television" is no mere survey of historic achievements, or a hash-up of already published material. It is a straightforward and complete guide to the new television, although everything of interest which has contributed to the perfection of the science is described.

However superficial your interest in the subject may be, I am firmly convinced that you will never regret taking advantage of our special offer, for you have the chance to acquire the most up-to-the-minute and the most comprehensive volume on the subject at an absurdly low price.

Just glance at the new books on any bookstall or in any bookshop and take note of what you can get for three shillings. You won't find one which is anything but the merest shadow of the "Book of Practical Television," with its 384 pages, hundreds of first-class illustrations, including no fewer than 63 pages of art photos. You will have to search among the books priced at a guinea and over for its equal. But then, to be quite frank, the Amalgamated Press have published this book for the sole purpose of giving you such a grand book bargain that you will support "P.W." in larger numbers than ever.

But there are *only four coupons* to collect; we believe that having managed to get new readers to take the journal regularly for that short period they will gladly continue to do so after that because of the contents of the journal.

Drawn From Practical Experience.

The "Book of Practical Television" does not, however, leave off at being an interesting volume and a great book bargain, it is also as widely informative as human endeavour could make it. The distinguished contributors to it were not merely commissioned to write so many words out of their heads, as it were, on various aspects of the subject—the whole being served up as a pot-pourri of articles. On the contrary, there are something exceeding eighty thousand words of well-knit information, much of which is drawn from personal practical experience.

Who could write so interestingly and authentically on the cathode-ray tube as Dr. Roberts, for instance? He has actually made the things with his own hands in the great and famous Cavendish Laboratory, and of late has been developing special apparatus for the new television. And then Mr. G. Parr, of the Ediswan Company (who

(*Continued on page* 315)

MY IDEAL STUDIO FOR BROADCAST VARIETY

Alan Hunter interviews Eric Maschwitz, B.B.C. Variety Director.

UP in the little control-room in one of the wings of the newly decorated St. George's Hall I discovered the B.B.C. Variety Director "clocking in" the rehearsal times for a Band Box broadcast. He looked through the observation window to the scene below, with those piercing dark eyes of his, humming the lilting Viennese melody in a spasm of *joie de vivre* I frankly envied. (Being myself at that moment a snivelling wreck of a man with incipient 'flu!)

It is a tonic to see Eric Maschwitz at work. He makes work look more like play than any other B.B.C. executive I know!

"St. George's is so Invigorating."

"My ideal studio? Why, my dear chap, *this!* St. George's Hall is so invigorating, you see. Especially after the stilted, stuffy atmosphere of a small studio. No, I don't mean the Broadcasting House studios aren't properly air conditioned. They are—at great expense, of course.

"No, what I mean is the feeling of freedom here, the general workmanlike feel of the place. It gets into one's blood. Shades of the magicians of old. I suppose it is because St. George's Hall is, after all is said and done, a real flesh and blood hall of entertainment, that we sense its atmosphere. Whatever the reason, it's real enough, I can assure you!

"The producers love it, and so do the artists. That is easily understandable. With everyone grouped in the one hall, instead of in perhaps four or five different studios, there is none of that utterly depressing business of waiting for the green light to flick. Believe me, artists react very spontaneously to company; they get along much better when they can all see each other.

"Of course, since we started up here in St. George's Hall we have done all kinds of things to make it more suitable for broadcasting. Quite recently, you know, we entirely redecorated the interior. This bright and cheerful green and cream scheme is a very striking contrast to the drab drapings and old-fashioned decorations we used to have.

Perfect for Acoustics.

"Now we've taken a seven-year lease of the place. No wonder, when it is so utterly suitable for variety broadcasts. Yet the fact that its acoustics are so perfect for broadcasting is, of course, an absolute—although I must say rather wonderful—fluke. Fancy, they built this place sixty years ago—before broadcasting was thought of—and yet to-day it is as good as any studio that has been specially designed for broadcasting, and better than a good many, perhaps.

"But there you are. Look at that old wine wharf down by Waterloo Bridge. Why should that make such a perfect studio for large orchestral concerts? Or the lounge of the Grand Hotel at Eastbourne—another wonderfully perfect place for acoustics? And so it is with St. George's Hall, which, in spite of its glass roof, is acoustically wonderful.

"Audiences? Well, yes, St. George's is ideal for them; but, as you know, we have decided to cut down the number of music-hall shows using an audience as part of the broadcast, as it were. But we still need small private audiences to help on the artists, of course.

"What about Maida Vale? Well, there again the tendency is for bigger studios to be used. They have put up some very fine new studios out there, and we shall make use of them for variety or music shows, and that kind of thing.

"Oh, yes, the bigger the studio the better—if the acoustics are satisfactory. Take, if you like, this very rehearsal you are watching. Five different bands all playing in the same programme; it would be almost impossible to work them in five different studios. We might have done it in the Concert Hall—but why bother when we have St. George's?

"In a Band Box broadcast of this type the players themselves react very strongly to the fact that they can hear and see each other. It puts much more life into the whole show, you see. Imagine what would happen in a multi-studio arrangement—each band sitting grimly waiting for the others to finish so that it might start!

"Well, yes, you might think I am obliquely having a dig at the Dramatic Control panel. Actually, I am doing nothing of the kind. The D.C. panel enables certain effects to be obtained that would be impossible in any other way. But I don't think that these synthetic effects belong, strictly speaking, to broadcast variety. The farther away from the real flesh and blood atmosphere we go the less punch there seems to be in the final effect heard at the loudspeaker end.

"Do you know it is rather a curious fact that some of the most complicated productions we think out, with all kinds of ingenious ideas, seem to be least successful? The real secret seems to be to discover the shape or form of show that appeals to the public—like the 'In Town To-Night' shows. I am now certain that quick, contrasting items go down much better than long-drawn-out programmes on one idea.

"Why does everyone like the gramophone record recitals so much? Because they offer the maximum of *contrast*. There's no time to get tired of any one theme, because the theme is changing all the time. That's why I think these Band Box and Variety of Music programmes are the coming thing, and for such productions we need a nice large studio like St. George's Hall.

Move towards Bigger Studios.

"Future studios? Well, I can't help feeling there is a move towards bigger and bigger ones. Productions are getting more ambitious, for one thing. Producers like to be able to see what they are doing. The engineers themselves may be reacting against the small, confined studios.

"The coming of the ribbon microphones has undoubtedly helped us along with our one-studio productions. With these wonderful 'mikes' we can place the band, the singers, the stars and everyone in such positions that each part will be picked up cleanly, without that 'fuzziness' we used to get with the older types of microphone picking up part of the sounds not intended for them.

"Anyway, the proof of the real usefulness of the one-studio idea for productions is shown by the ever-growing popularity of St. George's Hall. Now that we have decorated it up so brightly it is even more attractive.

"The dressing-rooms? Ah, that's where we keep on the tradition of the hall of magic! Right beneath your very eyes, dear sir, are not only dressing-rooms but band-rooms and everything for the artists' comfort. Yes, they are under the stage; there's plenty of room down there, you know!

"Now let me see, who's next? Oh, yes, Len Fillis! So-long!" and the Variety Director turned once more to his stop-watch.

DURING A REHEARSAL—

—AT ST. GEORGE'S HALL

Elsie Carlisle and Fred Duprez singing a comedy duet during a rehearsal at St. George's Hall. Note that the floor is marked out into numbers, so that the distance of the artist from the microphone can be accurately adjusted.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

A FAULTY COMPONENT SOMEWHERE.

T. T. (Westerham, Kent).—"This is the third set I have made up, and not one of them would work. **I am fed up with it.**

"I did not expect much from the two valves, Det. and L.F., but I ought to have got more than just a whisper of London National. That was the only station, and not worth listening to.

"When I put the other valve on, and made it Det. and 2 L.F., I ought to have been able to work a loudspeaker at this distance, but it never would. I could just hear two or three other stations, but not well enough to hear who they were, and it did not sound as good as a one-valve set I heard working in the same road.

"So then I tried what an S.G. valve would do, and it is now supposed to be an S.G., Det. and Power. If I sit right up close to the loudspeaker I can just hear what they are saying, at two or three stations. What is the good of that?

"It is nothing but a waste of money as it stands, and, as I said before, I am fed up with it."

We are not surprised that you are fed up, T. T. But why do you put up with this state of affairs?

There is no earthly need to go on, as you are going, building set after set, and getting no satisfaction from any of them.

If you do not know the cause of your trouble, we do; and we state it in capitals for the benefit of others with a similar list of "dud circuits" to their credit. YOU ARE USING A FAULTY COMPONENT, VALVE, OR ACCESSORY; and no matter what circuit you build it will be unsatisfactory until you have weeded out the dud.

We have so often explained how to test for such a fault that it is unnecessary to go into details. But we will remind you that a simple substitution test will almost certainly show up the offender quickly.

All you do is to borrow components similar to your own (not necessarily in make, but having similar electrical characteristics), and try them, one after another, in your set.

One of the new parts—perhaps a transformer, or a choke—will cause the set to leap into life, thus proving that the part replaced in that test was at fault.

If necessary you can test the valves by substitution, too; but failing that get them tested.

When you have found the dud, scrap it. To lay it aside, or put it in the junk-box for inspection later, is to ask for the trouble all over again.

"VOLTAGE OF MAINS UNIT SEEMS TO BE FALLING."

S. C. C. (Bristol).—"I have been having trouble with the output valve, and finally decided I needed a heftier valve to give the set a fair deal. So I changed over from an A.C./P to an A.C./P1.

"The latter requires exactly the same filament and H.T. voltage as the former, but different grid bias. And as this was obtained on the automatic system, by a resistance in the cathode lead, I thought it would be in order to get the new bias by altering the resistance.

"I was told I needed 1,200 ohms instead of the 800 I had been using, so I got this, and have since had the value checked. It is almost exactly 1,200. But the results are not right, so I got the voltages checked on a high resistance voltmeter, and then I found that the voltage of the mains unit seems to be falling.

"It used to give just a little more than 200 on the plate when the set was working, but now this has dropped badly, though nothing in the mains section of the set has been altered.

"Is this anything to do with the alteration to the resistance in the cathode lead for the grid bias?"

So far as it goes the alteration to the grid-bias circuit seems to have been in order, and the 1,200-ohms resistance should give satisfactory results *provided you are giving the valve enough H.T.*

From your statement that "nothing in the mains section of the set has been altered" we infer that you are expecting the mains unit that delivered 17 milliamps to the old valve to supply the new valve, which requires 24 milliamps—nearly half as much again!

Unlike a battery, the mains unit has a high internal resistance, and thus its voltage output is certain to drop if the current taken from it is greatly increased. This appears to be the cause of your trouble.

TAKING TWO BIAS LEADS TO THE SAME BATTERY SOCKET.

G. W. O. (Sunderland).—"And there is another point which a good many beginners like myself must have been in difficulties with—how to get two wander plugs into the same socket of the battery.

"It seems to be assumed that this can be done, without making one connection of the two leads by joining them permanently together. But *how?*

"At the moment I am giving one valve three volts bias instead of the one-and-a-half volts I should like to try, because I want the latter for the H.F. valve's bias. Please explain what I ought to do in a case like that."

To make a double connection in the one battery-socket, all you need to do is to spend one penny on a "Twin Tap."

This is a handy little gadget, made by Belling and Lee, and ingeniously designed to take two connections to the one socket. It does this by virtue of its T-shape, the upright plug being placed in the battery's socket, leaving the two "outers" for the flexible leads from the battery.

You should have no difficulty in getting one of these little accessories, and it would completely solve your difficulty.

POSITION OF CENTRE-TAP POTENTIOMETER FOR L.T. TRANSFORMER.

M. A. (Middlesbrough, Yorks.).—"I am going to run the L.S.6 A. from a 3½ amps. 3v.—0—3v. transformer, using a potentiometer for the earth lead, instead of the centre-tapping on the transformer.

"Is it better to have this potentiometer across the transformer terminals, or close up to the valve? (The lead will have to be rather long)."

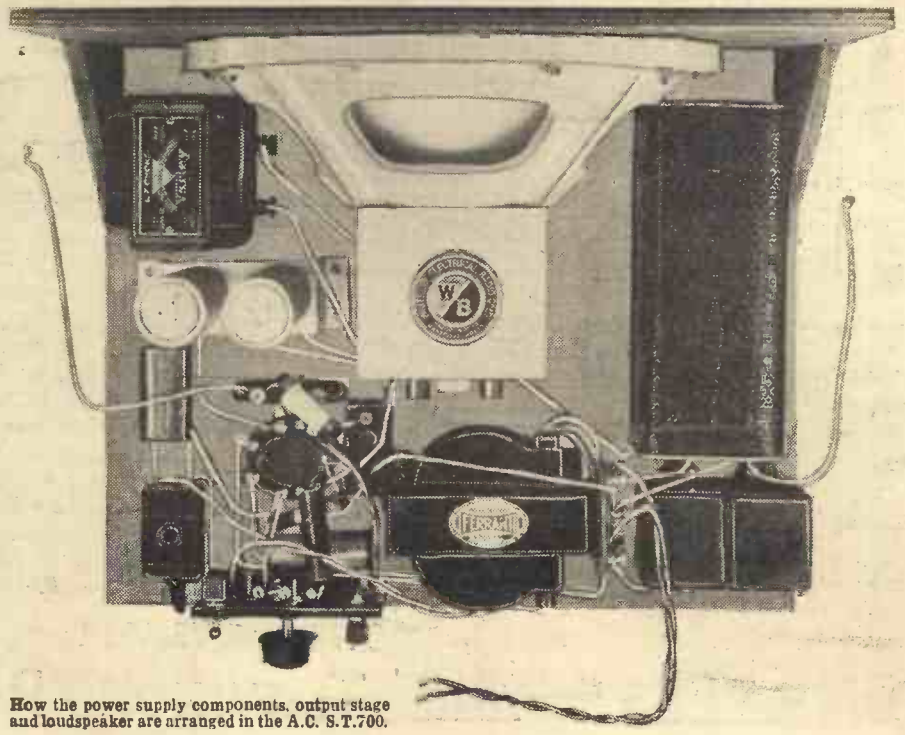
If the lead must be long, it is better to have the electrical centring device (potentiometer) at the valve terminals, than at the transformer end of the circuit. Use twisted flex, or, better still, a screened cable as used for house-wiring for the L.T. supply leads.

CONCERNING CONDENSER OPERATION.

G. P. (Ilfracombe, N. Devon).—"I have been a reader of POPULAR WIRELESS for a considerable time and was hoping to have seen a letter on the point with which I am in a little difficulty. Still it is no doubt a very

(*Continued on next page.*)

THE POWER SUPPLY AND OUTPUT STAGE



How the power supply components, output stage and loudspeaker are arranged in the A.C. S.T.700.

RADIOTORIAL QUESTIONS & ANSWERS

(Continued from previous page.)

simple matter, but at present it is a problem. It is this :

"I have read in Mr. Scott-Taggart's books that condensers allow the passage of alternating current, but act as a barrier to direct current. I have also read that alternating or oscillating current on passing through a valve becomes direct current, yet condensers are used to link up the anode of a valve to the grid of a succeeding one. Does this mean that condensers allow the passage of a direct current with a varying amplitude ?

"I am sorry to trouble you on such a minor point, but I am keen to understand wireless and it presents a stumbling-block."

This is not a minor point, but is of such importance that it can hardly be explained except in article form.

However, perhaps it will assist you if you remember that between the terminals of the condenser there is an *insulator* ; and if the insulation is not good, but permits the passage of direct current from terminal to terminal, the "condenser" is no condenser at all, but merely a dud.

Remember, also, that a voltage or charge on any conductor exerts a proportional effect on any closely adjacent conductor even though there is an insulator between them. (If there were no insulator between them, they would, of course, be sharing any voltage or charge.)

Now if you attempt to pass *direct* current through a condenser by connecting it to any source of voltage, the change of voltage on one set of condenser plates affects the other at once, and the condenser is said to be charged ; but apart from that initial and momentary effect there is no current across the intervening insulator—only a state of strain existing there.

If, instead of using a direct current you apply the continually-altering potentials (voltages) of alternating current to one side of a condenser, the effect will *not* be momentary. Every alteration of voltage on one set of plates will result in a corresponding alteration on the other set of plates ; and so the condenser can be said to allow the passage of alternating current, but to act as a barrier to direct current.

So remember the insulator, which is an essential part of every condenser ; remember that a direct current cannot pass through it ; and remember that the effect of voltage differences can be transferred across the insulation.

CARRYING THE CURRENT.

W. P. S. (Cardiff).—"I thought I would try shunt-feeding the transformer, instead of passing the detector plate current through the primary. But I had no 30,000-ohms resistance of the kind recommended.

"So I thought I would make sure there was nothing of the kind left over from the old sets, and in looking through the 'junk' I found an old volume control, 50,000 ohms. To see if it was in working order I tried it in place of the other volume control I was using, and it was just as good.

"So I wired it in the detector-plate circuit, adjusted it about three-quarters of the way round to get approximately 30,000 ohms, and connected up for shunt feed.

"It worked all right at first, but soon began to crackle, and the milliammeter showed all sorts of jumps, so I had to cut it out and go back to the old arrangement. Why should it refuse to work when it had proved O.K. as a volume control ?"

Because it was not suited to carrying a (comparatively large) current, and the attempt to pass current through it affected its resistive properties.

Many of the old-fashioned "composition" resistances had practically no current-carrying ability, as they were intended for use in grid circuits where there is no current to consider. The attempt to pass a milliamp or more through such a resistance would cause it to behave as you describe.

Generally speaking, the current-carrying property ("wattage") of a resistance in modern circuits is just as important as its ohmage.

TOO LITTLE ANODE CURRENT.

E. P. (Wareham).—"What is the reason when the anode current of a valve drops from nearly three milliamps. to about half that figure ?"

There are several reasons which might account for reduced anode current, the most common, of course, being loss of emission. But it would be a great mistake to suppose that this is necessarily the cause in any given instance. Wrong grid bias, wrong screen voltage, or even oscillation may cause big drops in the current, so these and similar possibilities must be borne in mind, as well as a possible loss of emission.

BARRY KENT CALLING

News and Views from the "Big House."

More Light Entertainment.

ERIC MASCHWITZ, the B.B.C. Director of Variety, tells me that his plans for development during the first quarter of 1936 have now been approved. There is to be a substantial increase in light entertainment, and a general raising of the standard of artists. An extra £10,000 has been found for Mr. Maschwitz for this opening quarter of 1936.

* * *

Search for Talent.

The B.B.C. "talent spotter," Mr. Bolton, who was appointed last summer, has just completed his first tour of the country in search of new artists for B.B.C. programmes. The result has not been satisfactory. In his report to Broadcasting House, Mr. Bolton says that he has come across only thirteen artists of adequate merit, and that most of these were already known. Despite the disappointing result of the first effort, Mr. Bolton is continuing, if only because of the keen interest manifested by provincial opinion.

* * *

Northern Proms.

The Music Programme Advisory Panel at Broadcasting House has been considering a proposal to revive the Northern Proms which the B.B.C. inaugurated in 1930 with great success. The idea now is that another season should be given next year, during April and May. Sir Hamilton Harty and the Hallé Orchestra would be engaged, and if the plan is approved by the Board would give a week of performances in each of the following places: Manchester, Liverpool, Leeds, Newcastle-on-Tyne, and Bristol.

* * *

The Empire Service.

The Ullswater Committee has taken special interest in the Empire short-wave services of the B.B.C. As a result, there is to be a big increase in the amount of money that is available for programmes for overseas. This is a good thing because the competition between British and foreign short-wave programmes gets keener and keener. One improvement will be a reduction in the proportion of recordings, and a corresponding increase in the proportion of "live" programmes, both night and day.

In this connection, it is recalled that at Paris in February there is to be a world wireless short-wave conference for the purpose of distributing wavelengths on some plan. The absence of a world plan so far has been a serious handicap to the development of short-wave services.

* * *

The King on Christmas Day.

Although the B.B.C. will make no official statement, it is generally understood that the King will broadcast again to the Empire between two and three o'clock on Christmas afternoon.

* * *

"La Bohéme" Relay.

The fourth and last act of Puccini's opera, "La Bohéme," as performed by the Royal Opera Covent Garden Company, will be broadcast to northern listeners from the Grand Theatre, Leeds, on November 19th. The cast includes Lisa Perli, Dina Borgioli, John Brownlee and Odette de Foras. The scene, it will be remembered, is played in a garret studio in Paris, and the principal event is the tragic death of Mimi.

* * *

St. Andrew's Day.

The National programme on November 30th annually relays from Scotland the radio commemoration of St. Andrew's Day. The celebration begins in Aberdeen. A fisherman's wife will be heard talking and singing in the northern granite city. Afterwards southerners will listen to a concert from the wilds of Buchan and the West Highlands. In place of Highland games, Glasgow has developed the more genteel battle of Soccer, and it is proposed to eavesdrop on the crowd at a Glasgow football match.

The ancient Kingdom of Fife will be represented in song and story, and the Border Scot will be melodiously reminded of his forefathers' courage in times of strife.

* * *

Midland Variety.

An attractive, varied programme on November 23rd includes a Black Country sketch, "Joe Gutteridge Again"; a relay of Leonard Henry's entertainment from the Central Hall, Walsall, and a song recital by Heddle Nash, the famous operatic tenor.

* * *

Hughie Green and His Gang.

Hughie Green and his Gang are appearing at the Royalty Theatre, Chester, on November 20th, and part of the show will be relayed to northern listeners on that date.

ON THE AIR

Candid comments by our broadcasting critic on recent programmes.

THE Election speeches have done much to add interest to listening. To those who take electioneering seriously there is much to stimulate thought, while those who are mainly interested in hearing "personalities" must be satisfied with the list of big politicians on the air.

It is fascinating to hear big people pulling other big people to pieces. We have listened to a variety of speeches, simple, bitter and scornful. One speech, though learned in substance, was just read. With another there was a suggestion of a sneer throughout. The sneer made one squirm.

* * *

The mention of thought stimulation reminds me of the series "The Dangers of Being Human," and especially No. 4 of the series. Here was food for thought in block capitals. The Scottish medical psychologist was sensational at times in his observations on "The Unconscious Causes of War." One thought of the Psalmist's query: "What is Man," with the accent on the "is."

Broadcasts to Schools.

I did a bit of listening to the broadcasts to schools. An afternoon can be spent very profitably when such a person as S. P. B. Mais, Rhoda Power or Vernon Bartlett is active. Whenever Mais speaks he makes an impression. He is so picturesque. He makes his scenes live. You feel you know Sussex intimately when he has been speaking about it.

* * *

One hears on all sides favourable reports of Dr. Tom Armstrong as a broadcaster of music to schools. I put him to the test this week. He is certainly good, and a worthy successor to Sir Walford Davies. How remarkably alike they are, by the way, in manner and speech! Dr. Armstrong is wise to carry on the Walford Davies tradition.

* * *

I have nothing but praise for the series "The Play." Mr. E. Martin Browne should be listened to, not only by the amateur actor, but by every public man. No. 5 of the series was a clever and helpful aid to reading. He called it "Analysing the Script," and it dealt with the effect of stress, and the use of pauses in consecutive words. Announcers might learn a thing or two from Mr. Browne. Only the other night I heard something like this: "Such and such a programme will be radiated on all the Regional programmes except the Midland *Regional*." Midland was the word that required the stress, and not Regional.

* * *

Mr. Martin Browne illustrated his points from "Macbeth" and "Candida." A company of actors and actresses gave a first reading of the two extracts. Then a second, and a third—each successive reading improving on its predecessor as a result of some suggestion by Mr. Browne. Here was theory and practice well combined and exemplified.

* * *

Each instalment so far of "I Knew a Man" has deserved a repeat hearing. Were it not for the second broadcast I would have missed A. C. Maclaren on "W. G. Grace." And I would have been sorry to miss this. A. C. Maclaren improved on the previous speakers in that he imitated his hero in mannerism and speech.

If such impersonation is good, then the reminiscences of these speakers will have a greater value and interest.

The Ideal Method.

Although I enjoyed Thelma Cazalet's "Mrs. Pankhurst," the fact that this famous lady was almost a contemporary (she died only seven years ago) did rob the talk of some of its interest. For these talks to be ideal I feel they should be given always by some G.O.M. who in his youth "knew his man." If ever the series assumes the title "I Know a Man," it will forfeit its best feature.

* * *

The Russian cabaret "Red Sarafan" succeeded mainly because of its atmosphere of good cheer. The music was characteristic and a welcome change from the more common English variety. The dialogue was never more than trivial, so it didn't matter much that a lot of it didn't get over. The foreign accent was very pronounced, and at times very difficult.

* * *

I feel somehow that listeners will score in the long run by this rationed Saturday Night Music Hall. It does seem a long time to wait each time—a month—but, after all, frequency and cheapness do go hand in hand.

Vic Oliver actually pleased me as much as anybody. He has good jokes and his style is impressive.

Will Hay is a remarkable broadcaster. Every bit of his act comes over, even those bits which would seem to have no aural appeal at all. It was outrageous that he was faded out.

C. B.

The BOOK OF PRACTICAL TELEVISION

(*Continued from page* 308.)

are already in production with cathode-ray tubes) has co-operated with our Research Staff for years in active television research and development. On this special occasion he carried out a vast amount of practical work in personal collaboration with other contributors to the volume in order to build up live material for the "Book of Practical Television."

And so I could go on, but I believe that the book speaks for itself through the detailed list of contents which appeared two weeks ago in "P.W." Publishing this was a rather original step, but I felt that if ever there were a case for laying all the cards on the table, this was number one in golden letters.

Preparing the "Book of Practical Television" has been a hard, expensive task, because so much new ground had to be covered if we were to achieve the ideal of the best and most complete book on the subject.

A Fine Production.

It is now finished, printed and luxuriously bound just in time for all to acquire on the extremely advantageous terms made possible by the nature of the offer and the dimensions of the printing arrangements. I believe you will like it—very much, and at the lowest estimate it will put you closer in contact with the new television than are all but a few men in the whole of the country.

I LISTEN TO THE S.T.700

By ALAN HUNTER

THEY took me into the "P.W." Research room, a room with a view—of the S.T.700. There lay the latest child of John Scott-Taggart's indefatigable brain, inside the metal-lined cabinet free from the baneful influence of "man-made" static.

So this was S.T.700, I thought. Well, it looks a good trier to me. Its huge Auto-Dial, which enables stations to be calibrated with uncanny and hitherto unheard-of accuracy, certainly hits one right in the eye.

Indeed, I don't think I have ever seen such a large tuning scale in all my chequered radio history. It is, I know, a common-enough complaint that the home-constructor set tends to lag behind the factory product in ease of control—but here, anyway, is a constructor set that has at least one control putting commercial efforts on their mettle.

Remarkable Volume.

But I was not invited to *look* at S.T.700. Merely to hear it. For a straight four-valver worked from batteries I can say at once that the output in terms of volume is head and shoulders above ordinary sets.

But then S.T.700 is obviously not ordinary. Successor to an almost ancient lineage of extraordinary designs, S.T.700 is—well, the TOP!

While they were still tinkering about with the connections, I managed to poke my nose into the "works." The Uniplane construction struck me as a bit of a brain-wave. But I am not allowed to rave about that, either!

"Just you listen to the results—and report on what you think of them." That was my instruction. Orders being orders, here goes. I thought the audio reaction well worth while.

Effect of Audio-Reaction.

Admittedly, when I first heard that John Scott-Taggart had had the temerity to exploit low-frequency instability—to harness it, in fact—I wondered what exactly the result would be. Well, the result is admirable.

When a weak station is tuned in and boosted up with reaction—high-frequency reaction, that is to say—we all know that sometimes there is a quality-affecting selective action of reaction.

But hear a weak station on the S.T.700! Hear it when the audio reaction has been given a gentle touch—and wonder accordingly why no one thought of the idea before Mr. Scott-Taggart!

The bass-note build-up of audio reaction has to be heard to be believed. I heard it on a weak station—and I believe it. This is undoubtedly one of the outstanding design features of the season. And that constructors should be able to take advantage of it in such an inexpensive set speaks volumes.

Worth Building on Tone Alone.

Tone is very good. I heard the S.T.700 under exactly the same conditions that anyone who builds it can hear it. I was not treated to a special audition. Batteries, valves and loudspeaker were "as per specification"—of that I can assure you.

I dare say the designer could advance dozens of perfectly valid reasons why you ought to build the S.T.700. I am prepared to say that even on tone alone the set should be built.

You simply must try this audio-reaction circuit. The wonderful quality of reproduction of weak foreigners is such a revelation that I was enchanted.

Delightful High and Low Note Balance.

And don't forget that this audio-reaction comes in just as useful on the strong locals. How often do you endure much louder reproduction than you really like simply because the tone goes "to pot" when you reduce volume? With S.T.700 the same delightful balance of high and low notes can be maintained on loud and soft volumes.

If I were a music critic I should be able, perhaps, to analyse the sensation of good tone allied to low volume. As it is I am only an ordinary listener where tonal values are concerned. But possibly that makes my joyous reaction to S.T.700's tone-and-volume performance all the more significant. For I take it that you, too, are an ordinary listener. Or aren't you?

THE "BOOK OF PRACTICAL TELEVISION"

The opinion of Mr. E. M. LEE, B.Sc. (Director of Messrs. Belling & Lee, Ltd.)

Dear Sir,—I have spent a very enjoyable time going through your new work, The "Book of Practical Television," and I can very heartily congratulate the Editor and all the contributors on this very interesting and comprehensive treatise.

We manufacturers have to watch technical developments several years in advance of the production stage, or even the public interest stage, and in the normal course of our work we often see confidential demonstrations of new developments long before it would be policy for any information to be published. Published work in our own particular fields of activity, therefore, does not interest us very much, since it has no "news value" to us, and it would be somewhat of a busman's holiday to read it.

There is something different about this book, however, and far from feeling that I was on a busman's holiday, I actually felt quite interested, particularly in the way in which the writers have made real public interest out of what I have been so used to encountering treated as a very mathematical subject.

It is difficult to foretell exactly how much entertainment value there will be in television, but I should think you have made a very reasonable forecast, and I should think this book must be exactly what thousands of people are waiting for to give them a thorough survey of the whole subject without drifting into mathematics.

I trust the book will achieve the success it deserves.

Yours sincerely, E. M. LEE.

THE A.C. S.T.700

(Continued from page 304.)

Lower the front edge of the panel until the extension piece of the wavechange switch spindle comes opposite the hole in the side of the cabinet. Now slide the panel to the left until it drops into position on the remaining fabric covered fillets. The wavechange knob can now be fitted.

Every builder of the A.C. S.T.700 should make absolutely certain that he gets exactly the same cabinet used by myself and illustrated in my article, as this particular model is the only one designed under my supervision. It is, moreover, important that the fillets should be covered with fabric or similar material, and that eight screws are used to hold down the radio panel on to these fillets; you should look for these features.

The operation of the A.C. version is exactly the same as that of the battery set. The Triple Extractor is also used, if necessary.

S.T.700: BRILLIANT RESULTS

(Continued from page 301.)

A MAGNIFICENT SET.

Dear Sir,—I was one of those lucky people who had the good fortune to be present at a demonstration of the S.T.700 here in Glasgow. Other readers would perhaps be interested to hear my opinion of this new S.T. set.

I have been a reader of POPULAR WIRELESS for some time now, and when the S.T.600 came out I read the many letters of appreciation from those who had heard the set in advance. I must admit, quite frankly, that I thought the writers' imaginations had got hold of them, and that they exaggerated a good deal. I have certainly changed my opinion now.

The first feature which one notices about the set, is of course, the dial. Tuning with this dial should be the easiest thing in the world when once the stations have been "spotted."

The selectivity of the set is remarkable, and the volume of output very good. In Glasgow we received 66 or so stations, of which 60 at least were sufficiently clear to be of programme value. Even a deaf person could hear the programme with ease.

The Triple Extractor was another useful feature. By using it, we were able to cut out completely Scottish Regional, Scottish National, and Droitwich, all at the same time. This must be a great improvement on the single Extractor on the S.T.600. Once set there should be no need to readjust the Extractor.

Audio-Reaction makes a marked improvement in the quality and trueness of the lower register. Besides this, it can be used to increase the signal strength by as much as thirty-six times.

The aerial on which the set was demonstrated here was, I believe, below the average, and this being so, the logging of sixty-six stations is indeed marvellous. On a short room aerial of about 15 ft. we got very good results.

Taken all round, I think the S.T.700 is a magnificent set.

I can safely recommend the S.T.700 to whoever is meditating on the construction of a set for the first time.

J. DICK DYKES.

8, Lilybank Gardens, Glasgow, W.2.

THE LINK BETWEEN

By G. T. KELSEY.

ISN'T it an amazing tribute to Mr. Scott-Taggart's skill and ingenuity as Britain's Number One Set Designer that he should succeed year after year in breaking his own record? Anyone who was in such close touch as I was with the sales figures of Mr. Scott-Taggart's S.T.600 last year would have said without hesitation that it was a sheer impossibility ever to beat those figures. And yet Mr. Scott-Taggart has done it again!

From the very day on which the S.T.700 was first published the manufacturers and retailers have been besieged with orders, and already the sales by comparison with the corresponding fortnight of last year *have broken all records.*

Now there can be only one reason for it, and that is the vast army of satisfied S.-T. followers have been quick to appreciate the immense advantages of the one and only set that is a year ahead of its time—the S.T.700. It is indeed a masterpiece of design, and the spontaneous way in which it has been acclaimed throughout the length and breadth of the British Isles as The Set of the Century is a striking tribute to S.-T.'s extraordinary ability as the designer of sets for the multitude.

Even were I not in such close touch with the trade I could have no possible doubt as to the enormous success of the S.T.700, for the number of applications for accessory literature under our postcard scheme has left me simply gasping. I never knew that such towns, villages and hamlets existed! At any rate, I am glad that the scheme is proving so helpful to readers.

As I announced in the great S.T.700 issue, the offer is open until December 2nd, but I do advise those of you who intend to apply and who have not yet sent off your postcards, to do so without further delay, for if the rush continues it is likely that some of the literature will go out of print, and that will mean waiting until supplies are replenished.

For your convenience, the complete list is repeated below, and all that you have to do to obtain any or all of the literature listed is to send a postcard to me at John Carpenter House, John Carpenter Street, London, E.C.4, giving the number or numbers of those in which you are interested, together with your name and address. I will then arrange for the required literature to be sent off to you:

VALVES.

Battery Model: Cossor 210 VPT met., 700/1; Cossor 210 R.C., 700/2; Mazda L.2 met., 700/3; Hivac P.X.230, 700/4; Hivac V.P.215 met. (alternative to H.F. pentode), 700/5.

Mains Version: Osram V.M.P.4G., 700/6; Marconi V.M.P.4G., 700/7; Osram M.S.P.4, 700/8; Marconi M.S.P.4, 700/9; Mazda A.C.2/Pen., 700/10.

SPEAKERS.

Battery Model: W.B., 700/11; Rola, 700/12; Blue Spot, 700/13; Amplion, 700/14; Wharfedale, 700/15.

Mains Version: W.B. type for S.T.700 (700/16).

BATTERIES.

H.T.: Drydex, 700/17; G.E.C., 700/18; Aerialite, 700/19; Milnes, 700/20; Lissen, 700/21; Fuller, 700/22.

G.B.: Drydex, 700/23; Lissen, 700/24.

L.T.: Exide, 700/25; Lissen, 700/26; Fuller, 700/27.

AERIAL AND EARTH EQUIPMENT.

Aerialite, 700/27; Electron, 700/28; Graham Farish, 700/29.

MAINS UNITS.

Ekco, 700/30; Atlas, 700/31.

Off The Beaten Track.

I am not often guilty of wandering from the path of duty, nor do I make a practice of showing favours to any particular section of "P.W.'s" national following. But for once I want a quiet word in the ears of our enthusiastic Essex fraternity, for there is something going on every fortnight down at Southend (apart from tidal affairs!) which calls for special mention.

The Southend and District Radio Society, which is one of the most active and old-established societies in the South of England, has a programme of meetings planned for the winter season which sounds to me exceptionally attractive, and which includes discussions by several of the country's leading technicians, including representatives of the B.B.C., of the G. E. C., and of E. K. Cole, Ltd.

Apart from its many other activities, this enterprising society, of which his worship the Mayor of Southend is president, has made itself responsible for the maintenance of all local hospital radio installations—indeed a noble thought.

An invitation is extended to "P.W." readers who are within reach of Southend to become members of the society, and full particulars can be obtained from the honorary secretary, Mr. F. S. Adams, at "Chippenham," Eastern Avenue, Southend-on-Sea.

On those occasions when I can get away from London I am hoping to run across some of you at the Southend meetings, for I, too, am a member of this society.

TECHNICAL JOTTINGS

Items of Interest to Every Enthusiast.

By Dr. J. H. T. ROBERTS, F.Inst.P.

Tone Correction.

I HAVE been many times asked whether a tone-correcting transformer should be used with leaky-grid detection, and whether it can be used just as well with anode-bend detection.

Since the tone-correcting type of transformer was first introduced it has gained a good deal of popularity, and undoubtedly, in the right conditions, it can be very useful indeed. With the anode-bend detector there is a certain amount of harmonic distortion, because the part of the valve curve which we call straight is not by any means straight in actual fact. There was a time when a great many people plumped for anode-bend detection, and the leaky-grid type of detection was very largely out of favour, but in this, as in so many things in radio, the pendulum swings first one way and then the other, and in due course leaky-grid came back into its own.

Improvements in Leaky-Grid.

Of course, this was largely due again to great improvements which were made in the leaky-grid style of detection, and nowadays it is fair to say that the leaky-grid detector can be made to give excellent quality, especially when the input to the detector is kept below the necessary limits. In this connection, if you want to use a large input at this stage you can go to power-grid detection.

However, to return to the question of the tone-correcting transformer, if this is used with anode-bend detection there is a tendency to increase the harmonic distortion. If used with a leaky-grid detector, however, it is possible to get excellent results, but for this I must mention again that the detector must be operated under the proper conditions.

A Long-Debated Principle.

It is rather curious that the tone-correcting transformer should work in this way with the leaky-grid type of detection, and it goes to show how the discovery of a new principle will often cause a swing over in popularity to some circuit feature which has previously been under a cloud. The old argument about the relative merits of leaky-grid and anode-bend detection dates back to the very early days of broadcast reception, and is one of the longest-standing of the many controversies which engage radio enthusiasts. Even to this day there is by no means unanimity on this point, and each principle has its section of supporters.

Earths and Stability.

I said something only the other day about the importance of the "earth" and how lots of people, although they go to endless trouble with other parts of the circuit, and especially with the aerial, seem to regard the earth as being of almost

(Continued on next page.)

TECHNICAL JOTTINGS

(Continued from previous page.)

negligible importance. This is a great mistake, and it is surprising how widespread the habit is. Quite apart altogether from the effect of the earth on the actual strength of signals (and even this is often a very important point), there is the still more important question of stability. If you have no earth connection, or a very poor one, you are liable to get the set unstable, whilst the reaction and tuning controls will also generally be affected.

You can easily prove all this for yourself by simply disconnecting the earth and seeing what happens to the controls of the set. The first thing you will probably find is that the tuning has all got shifted, the reaction has gone to pot, and various other things besides. When people ask me what is the matter with their set, I think of all the things which can *easily* be tried, and the one which I recommend first is attention to the earth connection.

Like a Sheet Anchor.

In nine cases out of ten it turns out that this has been sadly neglected, and in quite a large number of cases simple attention to this point is all that is needed to put the set on its feet again. It is a good plan to think of the earth as a kind of "anchor," a starting point of potentials from which to operate. If there is no earth (or almost, worse still, a bad one) the set is, in an electrical sense, "wandering" all over the place, and that is why it gets itself into so many troubles.

Now that the winter is with us and the ground is moist, there should be little or no difficulty with the various buried-plate types of earth, but in the summer, when the ground gets very dry, all kinds of troubles can be traced to the earth becoming inefficient.

Flat Tuning.

A set with "flat" tuning can be set off-tune to quite a bit on either side of the real tuning-point, without a great deal of effect on the volume or the quality. But if the set is very selective, naturally as soon as you go off the true tuning-point you will get distortion, quite apart from change in volume, and for this reason alone there is no difficulty in knowing when the set is accurately tuned to any particular station.

If the set uses automatic volume-control, however, the result which you get is rather between that given by a flat-tuned set and one very selectively tuned. The set behaves, in fact, in some ways as though it were a flat-tuned receiver, although at the same time the distortion effect mentioned above is noticeable; it may not, however, be so noticeable as with an ordinary receiver which has very sharp selectivity.

Off-tune Distortion.

The primary purpose of automatic volume control is to maintain the volume at a fairly constant level, notwithstanding changes in the strength of the incoming signals or, what amounts to the same thing, notwithstanding changes in the strength of the signals when they are applied to the detector. If the strength of the signals as they reach the detector is reduced, the variable-mu valve does its trick of increasing the amplification, and *vice versa*.

From this you can easily see how it comes about that with a receiver embodying automatic volume control it is possible sometimes to go quite off the true tuning-point without the volume changing very greatly; that is to say, the set behaves as if it were broadly tuned, whilst at the same time, although distortion occurs as you go off the tuning-point, this distortion is not of that violent type that you so often get with an ordinary set which is sharply selective.

Condenser Breakdown.

I had a case the other day of the breakdown of a radiogram owing to failure of the H.T. metal rectifier. I should say that this was through no fault of the rectifier itself; as a matter of fact, I have always

(Continued on next page.)

NEXT WEEK

ANOTHER FREE GIFT IN THE FORM OF

DATAGRAM No. 4

also

A FURTHER SPECIAL ARTICLE ON THE S.T.700

By John Scott-Taggart, M.I.E.E., F.Inst.P., Fel.I.R.E.

TECHNICAL JOTTINGS

(Continued from previous page.)

found these metal rectifiers to be eminently reliable components, and able to stand up to quite a lot of misuse. In this particular case, however, it was found that a condenser, one of a block, had broken down, and this threw an extremely heavy load on the rectifier, out of all proportion to what it was intended to stand. In addition to all this, there was a suspicion that a short-circuit had been taking place which had thrown one section of the rectifier out of action, leaving the other section to do all the work. In all these circumstances it would have been very surprising if any component had been able to stand up to its job.

Peak Voltages.

When you get a breakdown of this kind it is ten to one that the trouble will be traced eventually to the breakdown of a condenser. Often enough this is due to the constructor using a condenser which is not of sufficiently high voltage specification. It is always a good plan to err on the side of safety with condensers, because not only have you got peak voltages to contend with, but also you never know what surges of current will take place in particular circumstances.

Sometimes a condenser will be subject momentarily to a voltage several times the steady voltage to which it is ordinarily subject. It takes only one such high-voltage surge to puncture the paper insulation or start a breakdown, and you never know where the trouble is going to finish.

Watch Anode Potentials.

A point which is sometimes overlooked is that the voltage across the anode, when an H.T. unit is used, is very different when the filament is cold from what it is when the filament is hot. In the first case no current is flowing, whilst in the second case the full anode current flows. In home-constructed sets this effect is sometimes overlooked, and the rating of the condensers is chosen on the assumption that the anode voltages will be those which obtain under working conditions. Where a single on-off switch is used for the whole set, this throws on the H.T. voltage before the filaments have had time to heat up—in other words before the anode current starts to flow—and a much higher anode voltage is applied for the time being; this, of course, quickly falls to its normal value as the filament heats up and the anode current begins to flow. The condensers, however, have to stand the racket of all this, and this is a point which needs careful attention.

A Television Book You Should Read.

Everybody is wondering when television is really going to come along. It has been "around the corner" for a very long time now, and some people have almost begun to get tired of waiting for it. However, according to all the signs and portents, it seems that it cannot now be very long before a really practical and satisfactory television service will be provided by the B.B.C.

"P.W." has, of course, foreseen all the developments in television for a long time past, and the editorial staff have prepared a "Book of Practical Television" which is available to readers. The various chapters in this book have been written by a team of carefully selected experts, each with a special knowledge of the subject he writes about, and you can rest assured that it forms a really authentic and up-to-date compendium of television theory and practice.

SIMPLIFYING RADIO THEORY

VERY many attempts have been made to cloak the theory of radio with the sugar of entertainment, so that readers will be lured into the imbibing of facts. But so far no writer has managed to find the correct formula. Usually it seems that the best that can be done is to treat the subject facetiously, and to intersperse light-hearted treatment of fundamentals with clumsy attempts at humorous, and often misleading, similes.

Those who turn to such a work for straightforward instruction must be considerably annoyed by the often pathetically poor attempts at irrelevant humour, and anyone who may be so misguided as to purchase a book of this kind in the belief that it will provide diverting reading is liable to be even more disappointed.

The fact is that good humour and light reading generally (the only style applicable to "easy-reading" text books) represent the higher reaches of the author's craft, and those who can attain it have the world of popular literature at their feet. If P. G. Wodehouse, Ben Travers, or some other such star of literary humour could be induced to produce an easy-to-read radio book (although it is quite on the cards that he would have to study the subject for a fairly long period in order to gain the necessary technical knowledge), then the result might be satisfactory. When a technician, able perhaps quite adequately to express his radio knowledge on paper, attempts to go farther and be "funny," the result is almost invariably quite tragic.

An Interesting Publication.

However, radio theory can be made interesting, for those who are prepared to be interested, if the books are written in simple, straightforward language without the use of irrelevant embellishments.

In "How Wireless Came" (Routledge, 6s.), the author, John Langdon-Davies, endeavours to give the scientific history of wireless and a clear account of the basic facts about electricity "without writing in such a way as to insult the adult intelligence." His attempt is successful, and we can recommend his book to all who wish to acquire a superficial but quite accurate knowledge of electrical and wireless theory with the minimum of trouble.

Continued on Cover iii.

TELEVISION BOOK 3

Printed in Great Britain and published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.4. Advertisement Offices: John Carpenter House, John Carpenter Street, London, E.C.4. Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/4 per annum. Abroad (except Canada), 10/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd.—Saturday, November 16th, 1935

S.S.

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VAUXHALL.—Polar drives horizontal station named scales, specially made for above, 1/9.

VAUXHALL.—Benjamin Class "B" transformers, 1–1½ to 1, 6/6; volume controls, Radiophone, with switch, 5,000 to 500,000, 3/-.

VAUXHALL.—Set manufacturers' surplus, skeleton type Westinghouse rectifiers, H.T.8, 9/6; H.T.9, H.T.10, 10/-, complete with fixing brackets; Westectors, W.1, W.X.6, 5/9.

VAUXHALL.—Dubilier condensers, 4 or 8 mfd., dry electrolytic, 500v. working, 2/6; 50 mfd., 50v. working, 1/6; 50 mfd. 15v., 1/3; tubular non-inductive, 0·1, 6d., 0·05, 6d., 0·002, 0·0002, 0·001, 0·0001, 4d. each.

VAUXHALL.—T.C.C. mica, 0·002, 2,000-volt test, 10d.; 0·0001, 4d.; 0·001, 0·01, 1/-; 1 mfd. Mansbridge, 1/3.

VAUXHALL.—Resistances by well-known manufacturers, 1-watt, type, 6d. each; all values stocked.

VAUXHALL.—Clix valveholders, terminals, 7-pin, 9d.; 5-pin, 7d.; W.B. 5-pin, 4½ in., baseboard mounting, 6d.; post paid 2/6 or over, or C.O.D.

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INDEX TO ADVERTISERS

POPULAR WIRELESS, November 23rd, 1935. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

B.B.C. TELEVISION PLANS REVEALED

Popular Wireless & Television Times

"DATAGRAM" CARD
Free Inside

EVERY WEDNESDAY PRICE 3D

No. 703.
Vol. XXVIII.
Nov. 23rd, 1935.

SPECIAL FEATURES:

A REMARKABLE RADIO RELAY
By G. V. Dowding, Associate I.E.E.

\+ +

MUSIC OVER EUROPE
By Alan Hunter

\+ +

PROGRAMME PROBLEMS PROBED
By Garry Allighan

CROSS-EXAMINING

THE S.T.700

EXCLUSIVE CONTRIBUTION FROM

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

★

POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING, Associate I.E.E.

AT THE POLE
HALF A LICENCE
SILENT CARRIERS

RADIO NOTES & NEWS

RADIO "JERKS"
JAPAN CALLING
TIME TELLS

The "D" Layer.

TWO Indian scientists—Professor S. K. Mitra and Mr. P. Syam—are reported to have discovered a new electrified layer in the atmosphere, to be known as the "D" Layer.

Working in the University College of Science, Calcutta, they have come to the conclusion that this new layer absorbs medium wavelength transmissions, and accounts for a lot of bad reception.

The choice of its name, therefore, seems to be particularly happy. It acts as a delayer, and is referred to as a "D" Layer.

Chilly Prospect.

I SEE that the idea of setting up a permanent wireless station at the North Pole is being mooted again. The sponsors seem to think that any meteorological information obtained right on this ticklish spot will be of special value, but to me the idea does not seem so hot. Quite the contrary, in fact.

The wireless operator who undertook *that* job would deserve outsize condolences. Frostbound controls, icebound aerial and earth, the acid frozen in his accumulators, and no "P.W." on Wednesdays! 'Sno good!

Ma Conscience.

REMOVING his spectacles with a puzzled frown, polishing them with his silk hankie, and replacing them firmly, a bewildered B.B.C. official gazed recently at the letter somebody had sent him. It was wrapped around a "five-bob" postal order; it was short; and it was sweet, to all high-minded and financially-minded corporationists. For that letter from an anonymous correspondent read: "*Conscience money for six months' listening.*"

This was a brand-new one on the B.B.C. In all their dealings with pirates they had never before been treated with such Duvalesque punctilio.

Not knowing what to do with the money, they sent it on to the G.P.O. And now, I suppose, some poor acting assistant auxiliary auditor is lying awake at night, wondering how to enter on the books *half* a licence, name unknown, address withheld.

Station Information.

THE long-awaited new high-power station at Bucharest is now due to be working regular programmes.

* * *

"Radio-Midi," the apparently new station on 209·9 metres, is really our old friend "Radio-Beziers," with a clean collar on and a new name. He works from 7.30 to 10 p.m.

* * *

A new station, imported from England, is being erected in Bagdad.

Cleveland, Ohio, W T A M, is seeking to replace its aerial by one of a new design, claimed to be a far better radiator. It is 490 ft. high, and its use has been calculated to bring W T A M's programmes to an extra potential audience of two millions.

New Finnish Long-Waver.

THE Finns are delighted with the rate of progress of their new station at Lahti, and they say we need not be surprised to hear the new long-waver testing at any time now.

DRAMA DIRECTOR

VAL GIELGUD, the well-known B.B.C. Director of Drama. Joined the B.B.C. in 1928 and was appointed to his present post in 1929. Has written both stage and radio plays, three of the latter being published in a volume, "How to Write Radio Plays."

Kalundborg has been getting his feet wet. The station is situated so close to the water's edge—which partly explains its fine radiation—that winter gales and seas threaten to put it out of action at times, so protective banks are to be raised.

* * *

The wireless station at Akaki, five miles out of Addis Ababa, claims to be the busiest in the world at the moment. It works right round the clock on a seven-days-a-week basis.

* * *

One of the French newspapers sent a radio reporter out to Abyssinia, who succeeded in getting the Negus to say a few words into the microphone. The broadcast was relayed by the French State stations.

Receiving "Five Hours Back."

READERS who have wondered at the B.B.C.'s success in relaying the Saturday afternoon American programmes for the "Five Hours Back" feature may like to know that the stations picked up are usually W 3 X A L and W 2 X A D (on 16·87 m. and 19·56 m. respectively).

Two receivers are generally employed for each station's transmission, the aerials being widely separated; after detection the results are pooled, and the final output therefore is a mixture of several simultaneous receptions.

By this means the effect of fading is largely eliminated. An extension of the principle promises to make possible reception of almost any desired powerful programme in the world. Two new aerials for similar work are now being erected at Tatsfield.

Radio Remembrance.

THAT was a good idea of the French amateurs, to commemorate the fallen on Armistice Day. Last year some of their amateur stations marked the occasion by getting on to the air on full power before eleven o'clock, and radiating "silent carrier-waves."

This year the idea was copied widely not only in France, but in many other countries as well, including our own. And considering how many radio men laid down their lives in the Great War it seems fitting that once a year the chatter of the ether should be hushed while we remember them.

(*Continued on next page.*)

£1,000,000 SPENT BY ENTHUSIAST ON HIS HOBBY

The Diurnal Twelve.

IT is not, and never has been, my custom to leap from my virtuous couch at break of day, grab the humble dumb-bell, and do a daily dozen for the stomach's sake. But the morning exercise habit is one that grows and grows, largely aided by the jerks-minded radio station.

Several of the European countries seem to enjoy this touch-your-toes-again stuff, and it has an enthusiastic following in the U.S.A. South Africa, too, has its Johannesburg jerks at 6.45 and 7 a.m., I am told. And one life insurance company, with an eye to business, supplies free of charge nice little charts illustrating the various exercises broadcast. (The longer you live the longer they can hang on to the life insurance money! Good for them! Good for you!)

Oriental Romance.

WITHIN living memory Japan was a land of mystery, closed to foreigners, and with a strange and strict etiquette hedging its maidens from contact with all but their own narrow circle of acquaintances. But nowadays—well, meet Miss Chiyono Sugita.

Chiyono is one of Japan's best-known wireless amateurs and, from her station in Tokyo, is in constant communication with fellow fans the world over, on short waves. And when I say "fellow" fans, I mean regular fellows, with red blood in their veins and hearts that beat fast. No fewer than twenty of these huskies have already proposed to Chiyono, and most of them have popped the question by radio.

Chiyono, however, has left the matter in delightful uncertainty; for though she may not handle a paper fan as prettily as her predecessors, she surely knows how to handle those radio fans!

Radio Welcome at City Boundary.

THE New York citizenry has the hospitable instinct unusually well developed, and instead of welcoming you on the mat they now reach out and grab you vociferously at the city boundary, miles away, by radio. Here's how.

Visitors to the American Relay League's rally were told to equip their cars with short-wave transmitting and receiving gear, and tune on such and such a wave when approaching the city. Before they reached the city boundary a glad radio voice was heard extending greetings to them, asking where the car was now, and proffering assistance on choosing the best route to the headquarters where the rally was held.

So before the visitor arrived he had been chatting merrily to his hosts, and by the time the car rolled up the drive they had reached the jolly old pals stage—"Atta boy! How come?"

Other People's Programmes.

GERMANY recently bought a B.B.C. radio play for the first time in history. It was Val Gielgud's "Friday Morning" that was broadcast about two years ago, and tells of the thoughts of people in a London-Paris plane, just before a dangerous forced landing.

* * *

Rome has notified its hotels and bars that wireless sets used to entertain customers must not be tuned to foreign stations.

* * *

Russia, France, Spain, Germany and Italy all give regular programmes in English, including news bulletins. Britain is the only great European country that does not broadcast to the people of foreign countries.

* * *

Denmark recently banned from the air the new fox-trot "Black Sheba from Addis Ababa," in the interests of strict neutrality.

Thou Shalt Not Covet.

EARLY in the New Year the Nizam of Hyderabad, reputed to be the richest man in the world, will celebrate his jubilee. He is a keen radio enthusiast, and it has been stated that when he inaugurates the jubilee radio celebrations his hobby will have cost him about £1,000,000.

The rest of us cannot indulge on that scale, can we? However, if we cannot spend big money, let us be big-hearted about it, and wish him and his people full value for the outlay, and a jubilee whoopee that Hyderabad will never forget.

Topsy-Turvy Time.

THE new Empire Service Transmission which has been inaugurated for the special benefit of the listener in Western Canada, is a shining example of the intricacies of the time machine. For in order to put out a programme at 6 p.m. Western Canadian time, the London announcer on Empire service has to get up and speak at 3 a.m. the next morning—it takes the sunset-time five hours to cross the Atlantic, and then another four hours to roll west across Canada.

This may seem a little confusing until one has thought it out. But what emphasis the effect is that at the same moment (3 a.m. with us, 6 p.m. on the Pacific Coast) the Empire listener in India finds that he can tune-in the same transmission which reaches him just as he sits down to breakfast. So if our announcer yawns (as he must do sometimes, poor chap!), the answering yawns range from India's "Ought-to-have-been-up-long-ago," to Western Canada's "Let's-go-to-bed-early-to-night."

Ether Trespassing.

THE Geneva police have been getting home late these past few weeks, on account of a secret station which has been broadcasting from Geneva on a wave-length very close to that of Sottens. There have been songs and speeches—most arresting speeches, but apparently no arrests so far.

Closer home, apparatus described as a radio transmitter was seized in a house at Limerick, together with gramophone records, a microphone, batteries, and long and short wave coils. Limerick-like, the last word has not yet been said about this.

Never Tired.

AN Ipswich inventor, Mr. G. S. Mann, of 101, Rose Hill Road, has produced the very father and mother of a record-changer. On show at the recent Exhibition of Inventions, it secured a certificate of merit and maximum marks, together with the loud huzzas of the *cognoscente*.

The most remarkable feature of this record-changer is that if it is switched on at breakfast-time it will go on playing right through the day until tea-time. It regards one hundred records, one after the other, as a mere flash in the pan.

What a welcome it ought to get from some of those Continental stations!

RADIO TOPICALITIES

On November 28th there will be a variety bill from the Theatre Royal, Hanley—the second Midland broadcast from this centre of entertainment in the Potteries. The theatre's history goes back nearly a century. Part of the stage—which is an exceptionally large one—was at one time the site of an 18th century Methodist chapel. There is seating capacity for 1,700. The theatre, recently redecorated throughout, is independently controlled by a directorate of local people.

* * *

"Devonshire Cream," by Eden Phillpotts, will be produced by Cyril Wood from the Bristol studios in the Regional and Western programmes on November 28th and in the National programme on November 29th. As in the case of the production of "The Farmer's Wife" and "Yellow Sands" by Cyril Wood in the Western programme, all members of the cast will come from Devonshire.

"Devonshire Cream" resembles its predecessors in having as central figure a typically Devonshire farmer and as comic relief a typically Devonshire farmhand, and as in the other plays a party is used as a device to bring many of the characters together, but in "Devonshire Cream" listeners are not invited to the party itself but simply come in at the end of it.

* * *

A new northern feature entitled "Sports Edition" starts on November 29th. This will contain not so much special items of sporting news, but rather a retrospective survey of northern sport. The first number will include, for instance, brief talks on Rugby football, by Lance Todd, of the Salford Rugby League Club; on Association football by A. W. Ledbrooke, a Manchester journalist; and on indoor bowls by James Hartley, the well-known Preston expert. A novel item will be piano accordion music provided by Jack Casey, the well-known Sunderland boxer.

CROSS-EXAMINING THE S.T.700

Points Raised by Readers

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

The designer with his latest masterpiece.

HAVING presented the case for the S.T.700 in my opening "speech" followed by the evidence, I was ready for any cross-examination.

It has all been very friendly except for the few brick-bats which, like spent rockets, are so apt to fall in November. There is the man at Brighton who says "You ought to come down here and then you wouldn't try to ram Triple Extractors down our throats." Even a triple gag wouldn't keep this man quiet.

A Designer's Difficulties.

He is convinced that the ***** receiver gave him better results than one of my recent sets which—though he knows it not—was actually designed on the South Coast. Now the ***** set is years old; in fact, quite vermin-ridden, and about as much use these days as bows and arrows—or perhaps bladders and sticks—against tanks.

A designer of a new set is always up against this type of man who cannot or will not build the new receiver for some reason which has really nothing to do with its merits. You have probably met the type yourself. He feels on the defensive and is therefore offensive. Since he is not going to build the set he will explain—although no one asks him to—why the set is no earthly use. He doesn't like the terminals at the side, he doesn't like a knob at the side, he doesn't *want* to get all those stations, and so forth.

That Human Failing.

I suppose it is all very human and it applies all through life. If Jones is asked if he is going to buy the new model of the Lightning Sports-30 car how often does he say: "I'd like to, but I can't afford it." He says: "No, I don't care for their new streamline back; there's no room for your head. And six cylinders are always a nuisance. It's also hard to get at the timing gear on the new model." We've all done it!

The only radio critic who is really worth listening to without suspicion is the man who says: "I don't like the S.T.700. I am going to build the new Blank set" (mentioning another designer's product). The man who isn't going to build anything anyway is too often anxious to justify his inaction by inventing reasons which are not genuine.

He is really telling his friends that he is a much better judge and a much finer designer than this fellow who has produced the S.T.700. Well, if he is, he is certainly wasting his time in his present job! And if his friends believed him I should be keeping chickens in Cornwall.

Actually there are very few of these strident coxcombs who prefer to look ridiculous than to appear inactive. Most of my readers give me their goodwill. I do not *expect* everyone to build the S.T.700. Many of my former sets are still giving excellent service and their owners are under no compulsion to make a change at present.

But I am glad to say that 99 out of 100 will tell their friends to build the S.T.700. The goodwill of readers in general has been the backbone of such success as I have had. If every non-builder of a new set felt he had to "slate" the set to save his face—a stupid and unnecessary proceeding—very few people would ever build my new designs.

ALTERNATIVE CABINET

If you are one of those who object to the terminals being visible on the side of the cabinet, you can use the Peto-Scott design shown here.

But every criticism does come to me. If you wish to throw off your chest any venom generated at the sight of my sets, my photographs or my words, you may be sure it comes to me. The Editor of POPULAR WIRELESS passes it on with a delighted chuckle. He thinks it good for my soul. And when I get it, I sift it for some germ of truth. So do not imagine that because I hit back sometimes, I am impervious to criticism.

So sensitive to it am I that I am quite ready (a) to be good next time, or (b) tell readers why I am unrepentant. Let us therefore go into committee over the S.T.700.

The accusation of ramming the Triple Extractor down Brighton's throat is just ordinary common-or-garden wastepaper basket-worthy drivel. The S.T.700 is divided into the main set and the "magic box" for Brighton's especial benefit, and the benefit of all who *think* they do not need protection from the B.B.C. or other bugbears. It is a perfectly sound plan to build the S.T.700 itself and then—if you find you need it—the Triple Extractor.

Stiff-Necked Unbelief.

Of course, readers are a tough, cynical crowd. How many designers for the Press have survived their stiff-necked (and often justified) unbelief? Extremely few. I get quite a number of readers who lie in wait for me! If I demonstrate at Puddleton, a dozen ardent constructors at Lower Puddleton (only five miles away) know with astonishing clear-sightedness that I funked going there where conditions are notoriously bad! Why did I choose just that particular part of Manchester or Glasgow or Birmingham? Ah!

In the S.T.700 issue, no name or address appeared on a Birmingham letter. Ah, again! It was rather unfortunate that Mr. Perrins' letter should end at the bottom of the page, for the printer unceremoniously cut off the signature. However, the letter was repeated in the second issue so all's well.

At demonstrations, of course, lynx-eyed demonstratees have a lovely time baiting me. Demonstrations are such nerve-racking experiences unless you have a really first-rate set and are ready to face your "public." Have you noticed how rarely other designers give such demonstrations? Often a single remark by a demonstratee can ruin a demonstration. After a most successful demonstration in Central London, a most kindly old gentleman said, pointing to a connection to a waterpipe: "Of course, we know now why the results have been so good." Half those present would have put it all down to some magically efficient earth. I took off the earth wire and results were practically as good.

Two Aerials Used.

At Brookmans Park I had two aerials—a full-sized outdoor aerial and an indoor one of a few feet of wire. This again was to show that the S.T.700 relied on no special conditions.

The enthusiasm of readers like yourselves supports my own recommendation. It would not be unreasonable to ask you to support a judgment which has been forged during twenty-one years, but I have rarely

(Continued on next page.)

CROSS-EXAMINING THE S.T.700

(Continued from previous page.)

asked you to do that. You have the opportunity of relying solely on the opinions of scores of readers picked at random from hundreds of applications for demonstrations.

Perhaps only I know what a varied collection we constructors make. Almost every business and profession under the sun (or, in Manchester, the rain) was represented. Policemen to watch with suspicion, opticians to keep an eye on me, and bus conductors to see that the radio fare was satisfactory.

Readers' Letters.

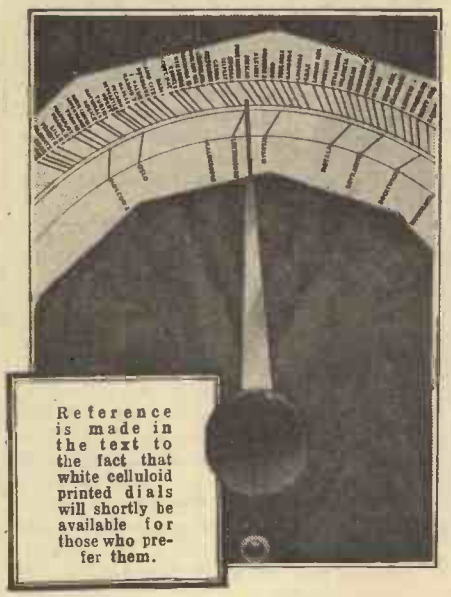
At each demonstration I described the set and its features. No secret was made of it and everyone looked behind the panel. All the letters are worth reading, although they inevitably resemble each other since a number of readers attended each demonstration.

Here and there a reader waxes lyrical, while another reader fumbles for his words. In fact, so lacking in literary originality was one demonstratee that he obviously borrowed the letter his friend had written and copied a whole paragraph word for word! But literary graces are no part of a wireless constructor's opinion and an idea of what took place at each demonstration is all that matters.

What about objections raised by readers in letters? Well, several say they do not like the terminals at the side. Technically this is undoubtedly the best place, and I am afraid that the whole Uni-plane construction would have been threatened by any other arrangement. There is the added advantage that you can see what is being connected to what. But any finicky objection here is met by the fact that the Peto-Scott people produce a cabinet (as cheap as any for any previous set of mine) into which the S.T.700 will slide, the terminals being then out of sight.

Some have said they do not like any controls at the side. Well, you don't need to *look* at a wavechange switch, and the Audio-Reaction, apart from the fact that it is not a "control" at all except at rare intervals, is adjusted almost better without looking at it. The common-sense place for knobs not used for tuning is away from the front.

A CLOSE-UP OF THE DIAL



Reference is made in the text to the fact that white celluloid printed dials will shortly be available for those who prefer them.

A Point Worth Noting.

Some readers do not like the Auto-Dial being printed on card. Well, white celluloid printed dials will be available shortly and an editorial announcement will be duly made; *these will be the only official dials* and will be approved by me first. This demolishes *that* particular criticism.

Some readers still want to do everything with one knob. Believe me, I am just as anxious, but it just cannot be done without sacrifice both of performance and certainty of results after building. Sets are designed both by manufacturers and the wireless papers using a minimum of knobs. Why not build one of those? Or better still, build the S.T.700 and leave the less important knobs at "normal"? You will not do that, though, because you would feel you were missing something! Well, you would, but you would miss that something just the same on other sets without the knobs.

Next week I propose to discuss Audio-Reaction more fully than I was able to in the S.T.700 issue. **J. S.-T.**

BOOK OF PRACTICAL TELEVISION

Further Tributes from the Radio Industry.

From **Mr. J. M. G. Rees**
(of Messrs. Varley)

Dear Sir,—I have examined your Book of Practical Television, and I should like at the outset to congratulate you upon your masterly treatment of a difficult subject.

Television to the ordinary listener is little more than a name at the moment, and this book should help tremendously to popularise the advent of the new and far-reaching era of "pictures by the fireside." It provides the reader with an excellent insight into the principles and practices of television generally, and it is a work that can be thoroughly recommended to all who are interested in broadcasting.

Yours faithfully,
(Signed) J. M. G. REES,
Director.

* * *

From **Mr. R. F. Collinson**
(Messrs. Colvern Limited)

Dear Sir,—The "P.W." Book of Practical Television, which I have now had an opportunity of examining in detail, is without doubt one of the most comprehensive expositions on television that has yet been published.

I congratulate you upon the way in which this book has been prepared and written, because I feel that with the commencement early next year of high-definition television broadcasting, it will serve to give the listening public an authentic insight into the many problems involved. I am particularly impressed with the generous and intriguing way in which this manual is illustrated. The pictures alone tell the story of television in a way which is both interesting and instructional.

In my opinion, it is a book that should be in the hands of every broadcast listener.

Yours faithfully,
(Signed) R. F. COLLINSON,
Director.

VOLUME CONTROL ON SHORT WAVES

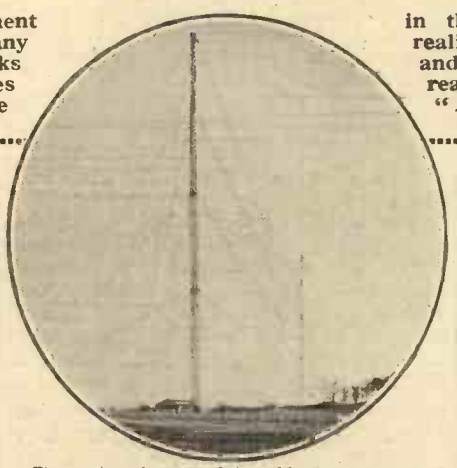
WITH a short-wave receiver of the single-stage tuned-H.F.-detector-reaction variety it is very useful to be able to adjust the response of the set when loud signals are being received without having to adjust the reaction control. This can be done by means of a suitable volume control in the high-frequency part of the circuit, preferably in the aerial circuit. Without an auxiliary control of this kind you will find that when the reaction is eased off the set is apt to lose selectivity and consequently you may get two or three stations crowding in on top of one another.

A Simple Scheme.

For the purposes of the H.F. volume control, as just mentioned, a simple arrangement is to use a potentiometer, with its end terminals connected to the primary of the aerial plug-in coil, the slider being connected to the aerial and one side of the primary being connected to earth. The maximum resistance of the potentiometer element, by the way, should be about 3,000 ohms. **J. H. T. R.**

TUNING-IN THE ANGLO-STATIONS

There is plenty of musical entertainment in the European ether every night Everybody knows that, but how many realise that quite a number of Continentals give good, interesting talks and news bulletins in English? In this article H. A. R. Baxter gives readers a rough guide to what he aptly terms these "Anglo-stations."



The masts and aerials of the Athlone broadcasting station.

THE owner of a powerful set in the United States has scores of alternative programmes from which to choose. We in this country are not so fortunate. There are plenty of stations right close at hand; in fact, there are probably just as many per hundred square miles as there are in the States. But only a mere handful broadcast in English. And the bigger proportion of that handful consists of the B.B.C. stations. These do certainly list alternative programmes, although they are merely what the one guiding body, the B.B.C. itself, devises as alternatives, so that they aren't really alternatives at all.

Nation-wide Duplication.

Thus one can switch on at, say, half-past ten at night, discover that one's local station is transmitting something uninteresting, and then turn hopefully to the other regional stations, only to find that all these are tied up in a nation-wide dance band duplication!

If one is a linguist, the Continent is wide-open all the time, but only a relatively few of us have got much farther than being able to recognise an "'allo" here and there. However, there is one language that is universal, and that is music. There's some jolly fine music to be heard from the Continental stations. That is, music which I, as a low-brow, a dyed-in-the-wool unrepentant low-brow at that, consider to be fine.

For example, I like a slab of that cinema organ music which Kootwijk (1,875 metres) puts out now and then. There is plenty of that tremulant "sugary" stop in it, which wavers its way right down my spine in a most sentimentally pleasant manner.

Strauss Waltzes.

Again Vienna (506·8 metres) fairly flogs the Strauss album of waltzes, and I often nip along the dial for a few minutes of it. Again Budapest (549·5 metres) frequently tickles the ether with mighty good tangoish, gipsy stuff. What appeals to me, too, now and then, is a saucy little morceau of mademoiselle singing from Radio Paris (1,648 metres) or one of the other French stations.

And then late in the evening, after eleven o'clock perhaps, it amuses me to run round the stations listening to snatches of dance music and noting the widely different standards of efficiency displayed. From some of the smaller stations you hear amateurish stuff executed on limited bands, while on some of the more important stations such as Stuttgart (522·6 metres) and Hamburg (331·9 metres) there are often really magnificent transmissions, top-grade bands impeccably put over. I can well imagine that crooning in German would give some folk a terrific pain under the third waistcoat button, but I've heard some which sounded pretty attractive to my ears.

Now all this compote of music has its points for filling up an odd few minutes now and then. But probably most listeners find that the B.B.C. can, at least, give them pretty nearly all they want in the way of solid musical entertainment.

It is when we come to talk stuff that the hundred or more Continental stations let us down with a bang.

However, there are items in English to be picked out of the ether now and then. It is surprising indeed what one will slide into if one makes a habit of roaming around the dial at intervals. One evening I hit the beginning of an interesting talk, by S. P. B. Mais, from Warsaw (1,339 metres). You remember the "In Search of England" series he gave in the National programme a year or two ago? Well, it was like that. He had searched for and found Warsaw, and he told Poland all about it in English. I hope the Poles didn't react like I do when the B.B.C. gives us a talk by a foreigner in a foreign language, though I must say that doesn't happen often.

And then one Sunday morning I heard the last part of a most exciting talk from Kalundborg, I think it was, by a war-time airman who described some of his exciting adventures, though exactly why he should have done so in English I don't know!

Those Sponsored Programmes.

Of course, all day Sunday, and during the majority of week-day evenings, you can hear the advertising programmes in English from Luxemburg, Radio Normandie, and so on. Well, I suppose many listeners like these, but I am afraid they don't appeal much to me. Their items are practically all records, and frequent advert. announcements are made. I much prefer to roam farther afield.

For example, I regularly call in at Moscow (1,724 metres) on Sundays, Mondays, Wednesdays or Fridays to hear the 10.5 p.m. English broadcasts. These are designed as propaganda for the U.S.S.R., but, nevertheless, there are some extremely interesting talks given. Now and then you get a dramatised reading from a Soviet novel, and the last five minutes of the hour are invariably devoted to a description of the day's weather in Moscow, given in the form of a jocular cross-talk by the two announcers.

Rome, Milan, Turin and Florence tie up practically every evening at 6.38 (Winter Time) to give news in English from an Italian point of view. There are also answers to questions, travel information and Italian language lessons to be gained from these mouthpieces of the Duce.

A SOURCE OF POPULAR PROGRAMMES

Athlone is one of the most popular of English-speaking broadcast stations not situated in this country. Here is the 60 kw. Marconi transmitter installed there, which works on a wavelength of 531 metres.

A Late News Bulletin.

And if you have happened to miss the News Bulletins from the B.B.C. stations it is worth remembering that Athlone (531 metres) has a fairly comprehensive News Bulletin every night at ten-thirty.

Later in the night still, if your set is a fairly sensitive one and the conditions are propitious, a Yank or two may steal over from the other side of the Atlantic on medium waves, and that to me is still a big thrill, even after twelve or more years of regular listening to broadcasting.

A Remarkable Radio Relay

Speakers in San Francisco, an air liner over California, the record-breaking Stratosphere balloon, and London, recently figured in an amazing radio relay which was heard by all America. It was also transmitted on the short waves for the benefit of overseas listeners. In this interesting article G. V. Dowding, Associate I.E.E., gives his first-hand impressions of the notable achievement.

IF the entertainment value of short-wave listening ever required vindicating, a recent relay put over by American stations would have done it once and for all. Those short-wave enthusiasts who were fortunate enough to tune-in W 2 X A F recently heard one of the most spectacular and intriguing radio relays ever attempted.

And not at some fantastic hour of the night for British listeners either, but at about nine o'clock in the evening. I heard it through W 2 X A F, the Schenectady short-wave station operating on 31·48 metres. It came over with the volume of a local station, loud and clear and with practically no fading at all. There had been one of those amusing conversations between "Lou and her friends" which are so intensely American that they sound like music-hall caricatures to British ears.

The Airplane is Linked Up.

Then came the surprise item. The announcer stated that the National Broadcasting Company's network, including W 2 X A F, would be switched over to the San Francisco studios for a two-way radio conversation between the China Clipper, which was en route between Miami and the West Coast, and the Stratosphere balloon which had just broken the world's altitude record.

The China Clipper, it was explained, is a giant four-engined aeroplane belonging to Pan-American Airways, and designed to operate on a new airway route to China. At the time of this historical broadcast it was completing a second trial transcontinental flight. During the trip in the opposite direction an attempt had been made to contact it for a radio relay and, indeed, they did manage to get it on to the line, but the distance and the atmospheric conditions militated against the complete success of the stunt.

Now for the Balloon.

However, this time there were no hitches. San Francisco called the China Clipper, and we at once heard it reply. The voice of a Mr. Bert Miller on board it was as clear as through a telephone. You could also hear the roar of the engines and the rushing wind, but only as a background; the speech rose above it very clearly, and it left it merely as a most impressive effect.

Bert Miller was then told to stand by while San Francisco called Capt. Stevens on the balloon Explorer II, which was even then over Nebraska and descending after having reached the record altitude of over fourteen miles.

The balloon was equipped with an 8-watt special R.C.A.-Victor short-wave installation, and at first the contact was rather weak. But after Capt. Stevens had been requested to speak closer to his microphone, his words became quite intelligible, though there was some fading now and then.

The announcer first asked him if he knew Bert Miller. "Oh, yes, I know Bert Miller very well," replied Capt. Stevens from the Explorer II. He was then told that he could have a chat with Mr. Miller, who was on board the China Clipper, and then this gentleman was called and told to "go ahead."

Whereat commenced a conversation carried out under the most extraordinary conditions. Bert Miller explained that the China Clipper was some ninety miles out from San Francisco, and inquired as to the position of Capt. Stevens and the highest-ever balloon. "We are coming down over Nebraska, now about thirty thousand feet." There was then a spot of fading, and the N.B.C. announcer interceded in order that "Bert Miller" should be able to discover exactly what it was that Capt. Stevens had which was "about fourteen feet long."

Eventually he was able to explain that this was a rip in the balloon. "What did you do with it?" Mr. Miller wanted to know. "Oh, we patched it; just patched it," said Capt. Stevens. "You patched it!" repeated Bert, with what I thought to be a trace of unnecessary surprise.

And all the time that this was going on the announcer at the San Francisco broadcasting studios acted as a kind of chairman prompting the speakers, and on occasion interpreting Capt. Stevens' remarks, when the transmission faded, for the benefit of the China Clipper. Then the skipper of this great air-liner had a few words to say, as also did Capt. Anderson, the other Stratosphere adventurer.

Finally, Capt. Stevens was told to stand by to receive a "Call from London," at which the broadcast was reverted to New York. It was then announced that Mr. Hugh Chevins, "Special Feature Writer of the London 'Daily Telegraph'" would speak to the Explorer II.

Well, I expect you read about this part of the astonishing radio relay in your daily papers, even if you did not actually hear the broadcast. Mr. Chevins made a perfect contact with the balloon and for several minutes conversed with Capt. Stevens, who by then had dropped to about 23,000 feet.

London Adds Her Voice.

He was speaking from the General Post Office studio in Faraday Building, London, whence his voice was taken by land-line to Baldock, Herts, sent by radio to New Jersey, carried by land-line to the R.C.A. station at Riverhead, Long Island, via the N.B.C. headquarters at Radio City, New York, and then relayed to the balloon by short waves.

Finally Mr. Chevins addressed a few words to American listeners and the relay concluded, the whole thing having taken only half an hour or so. It was a triumph of organisation; it went like clockwork, and was evidently timed almost to a split-second.

The N.B.C. described the affair as "the most extraordinary and unusual broadcast ever made." To which I say "Hear, hear!" But what was the B.B.C. doing not to let British listeners in on it via their ordinary sets. I believe the Regional programmes were pushing out a "Symphony No. 2 in C minor" while it was going on. What a contrast!

Almost Magical.

However, if one cannot enjoy such unusual items at home, the short waves enable one to go abroad for them. One of the reasons why I spend so much time on the short waves is because American broadcasting particularly seems so much more elastic than our own. If there is a good stunt possible they put it on the air, and don't seem so tied to schedule.

The Americans certainly have their schedules, but what schedules when they can be opened out to carry you way over to San Francisco, to an air-clipper above California, to a Stratosphere pioneer miles above Nebraska, to London, and back to New York all in the space of one magic half-hour!

And yet there are still quite a few people who say that the short waves have no entertainment value!

NEWS BULLETINS FROM BERLIN

Broadcasting news bulletins simultaneously to three different zones and in different languages from the German short-wave station in Berlin. The announcer in the background is broadcasting to South Asia, the one in the centre to North America, and the one in the foreground to East Asia. The three studios are inter-connected by sound-proof windows so that the announcers can make signs to each other.

ON THE SHORT WAVES

MORE NEW CIRCUITS

W. L. S. gives readers two fresh basic detector circuits with which to experiment in the production of new receivers.

EVERY week I receive well over a hundred letters from readers of these two pages, and they give me a pretty good idea of what the average short-wave enthusiast wants. Just lately there has been a marked indication of a desire to experiment with new circuits.

Readers seem to build a set, get good results from it, hear all that is going, and then—get fed up! They want to try out something different, something that will lead them up the garden and possibly give them lots of trouble before it works, but something *new!*

I don't believe in encouraging people to build freak sets that have only a slender chance of working at all; but I *am* all in favour of getting them to try something that they haven't tried before. Hence the two circuits shown on this page.

They probably are new to most of my readers, and, as such, are certainly worth playing with.

You will remember that a little while back I talked quite a bit about the "electron-coupled" detector circuit, which, I believe, is the invention of a Mr. E. P. Rudkin. Its chief characteristic was the use of an indirectly-heated valve in conjunction with a single coil and a "cathode tap."

The Anode is Earthed.

This same "cathode tap" circuit can be very conveniently used with an ordinary triode, and Fig. 1 shows the means of doing so. It is eminently suited to home-made coils, and is a very nice simple circuit to handle. Furthermore—it is almost unnecessary to say so—it gives very good results indeed.

In the usual oscillating circuit, whether we use one coil or two, it is conventional for the grid and anode of the valve to be connected to the two high-potential ends of the circuit, with the filament (or cathode) taken to the "dead" spot in the centre. In this cathode tap circuit, as in the "electron-coupled" variety, we shuffle things round. Our single coil has the grid connected to one end, and the anode, through a biggish fixed condenser, to the other. But this latter end is at earth potential.

THE "CATHODE TAP"

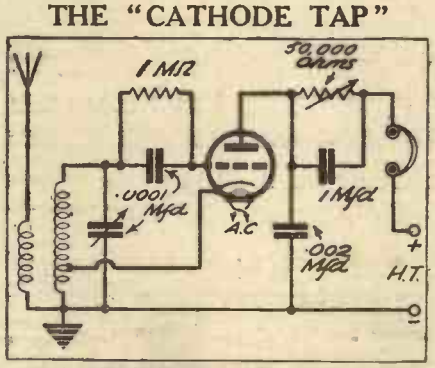


Fig. 1: The chief feature of this circuit, employing an indirectly heated valve, is the cathode tap on the coil.

About a third of the way up the coil we have our cathode tap, the cathode being at H.F. potential above the earth line. Virtually (always talking in terms of H.F. potentials), we have the anode of the valve earthed. This eliminates the need for using an H.F. choke of any kind, and wipes out all risk of losses in that direction.

The anode is earthed through a fixed condenser of ·002, and we therefore have to control reaction by means of a variable resistance in series with the H.T. This, however, is perfectly satisfactory, and most resistances of to-day are as silent in operation as the average reaction condenser.

The reaction control, of 50,000 ohms, is by-passed by a condenser of 1 mfd. capacity.

The tuning condenser, grid condenser and grid leak are of the usual sizes, although one must remember that the average indirectly heated valve likes a lower value of grid leak than the battery types. I have, therefore, suggested 1 megohm.

This little circuit gives beautifully quiet and stable operation, and if I were asked to perpetrate another single-valver I should certainly use it for the purpose.

Ultra-Shorts.

If the coil is not home made, it can be one of the ordinary four-pin types, the two windings being connected in series, and the tap taken to the junction between them.

The circuit is particularly suitable for ultra-short-wave receivers, and will oscillate strongly and smoothly with a five-turn coil, the cathode tap being taken about 1½ turns up from the "earthy" end. For such work you will naturally not use a tuning condenser of ·0001; something of the order of ·000025 or ·000015 should be used.

Fig. 2 shows our old friend the "Ultraudion" once more. This circuit has appeared in such a number of different forms that one doesn't always recognise it. I don't claim any particular advantages for this one, but it is an interesting arrangement that is well worth playing about with.

In this case the oscillatory circuit hasn't even a tapping to it. Just a plain coil is used, connected from grid to anode. This circuit is also particularly suitable for use on very short wavelengths, and can often be made to oscillate under conditions which would cause an ordinary circuit to pack up.

Useful Below 20 Metres.

The tuning condenser of ·0001, directly across the coil, has both ends "live," and must, therefore, be set back from the panel and controlled through an extension spindle. The ·0002 condenser from the grid end of the coil to earth has the effect of controlling reaction, but that has one side at "earth potential."

The "Ultraudion" was originally intended only as a transmitting circuit, and as such its chief merit was the ease with which it oscillated. I therefore recommend it to the attention of those readers who write and complain that their receivers cannot be made to oscillate below 20 metres!

WORTH "PLAYING" WITH

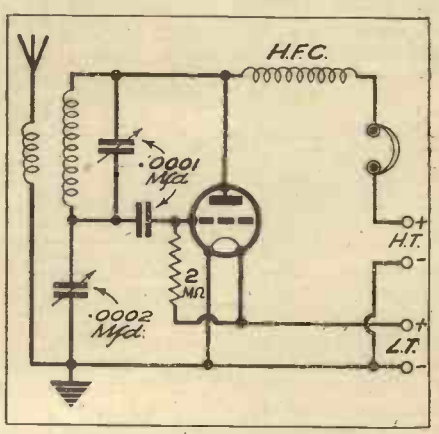


Fig. 2. The "Ultraudion" circuit which oscillates particularly easy on the shorter short-waves.

Those of you who have become thoroughly hardened to using the conventional series-fed reaction circuit will find that your ideas of layout have become thoroughly stereo-typed, and you may find a little difficulty in evolving the best lay-outs for circuits like these two.

Actually, that is all to the good. We shouldn't settle down to one thing for too long—not if we call ourselves experimenters—and it is rather a fascinating business to break away from familiar ideas and play with something else.

Actually the Fig. 1 circuit, in particular can be laid out with practically no wiring at all. Results in such a case will be correspondingly good. Fig. 2 is not so easy to get just right.

ON THE SHORT WAVES—*Page 2.*

WHAT READERS ARE SAYING

IN reply to a query from C. T. (Grimsby), concerning the regular broadcasting hours of La Paz, R. D. E. (Great Gransden) writes to say that C P 7, on the 19-metre band, only transmits in the case of some national event of importance. He has logged him (and received verification) between 6.30 and 7.30 p.m.

C. T. also asked about Australian amateurs on telephony, and R. D. E. says that he has heard V K 2 E P on the 20-metre band. He understands, however, from conversations heard, that there is no New Zealand phone at all on that band.

The rest of R. D. E.'s letter is an overwhelming list of D X heard—I can't possibly quote all of it—but I am filing it in the hope that it will gradually answer queries from other readers! Incidentally, a photo of his receiver and some of the "veri's" appears on this page.

Supers and Straights.

U. S. T. D., the operator of Z S 4 G, writes from South Africa to confirm my statement that superhets are best *for loudspeaker work.* He says that he has heard some marvellous performances from American superhets in South Africa, but they are invariably very noisy. He prefers his own S.G.-V-2 for all-purpose work.

G. A. B. (Hatch End) backs up my various remarks about the importance of short leads. Until recently he was one of those who couldn't get down low enough, but he moved the coil nearer to the tuning condenser and all was well at once. He reports V K 3 L R (Lyndhurst) as coming in "with a terrific punch" on week-day mornings, and also comments on the excellence of Rio de Janerio, P R F 5.

E. A. (Nottingham) asks for a circuit using a Class B valve as detector and R-C amplifier combined. It has already been arranged for next week's notes, E. A., so patience, please, for one more week.

Measuring the Signals.

J. S. T., a fifteen-year reader in Oxted, is using a six-valve short-waver made "mostly from old parts sent by friends." He believes in loudspeaker work, but listens mostly on the amateur bands. From his log he seems to make a pretty good job of it, too. One of the six valves, by the way, is connected across the output and serves as a valve voltmeter on which direct signal-strength readings can be taken.

W. G. M. comments on the way in which the shorter waves show up any little imperfections in the receiver. He mentions a variable condenser, which was perfect on 40 and 20 metres, but a positive nightmare on 10.

I haven't quite squeezed the hand-capacity out of my own receiver on 10 metres yet, but don't tell anybody that!

H. J. B. (Manchester) asks a question that has often puzzled me. Why are relatively low-powered American amateur phones coming in really well when W 8 X K and W 2 X A D are quite poor? I suppose it's just the difference in characteristics between 19 and 21 metres.

H. J. B. remarks that W 2 X A F is a huge signal nowadays—31 metres, 9 to 10 p.m. Many readers don't think of searching the 31-metre band as early as this, so I pass on the tip.

A Peculiar Effect.

T. F. (Bacup) switched on his short-waver and heard dance music all round the dial. Removed coil — still there. Removed detector valve—*still* there! Turned out to be direct pick-up, somehow or other, of North Regional on his L.F. stage. Ultimately found out to be caused by a burnt-out anode resistance! The set is the "Simplex" Two, by the way. *There's* another use you can put it to when you're bored with short waves.

S. A. K. (Westcott) reports that he has been sadly troubled by a transformer-coupled stage in his short-waver that would persist in hooting at him. He changed over to an R-C stage, as in the "Simplex" Two, and hasn't had a spot of bother since. He asks for identification of the station on about 49 metres that just announces, in English, "calling Africa."

This station closes down at 10.30 p.m. with the words, "Now, Africa, good-night. Good-night, all." I should imagine that it's Zeesen, but I'm not sure.

S. A. K. also reports the arrival of a newcomer—X 2 A H, of Mexico, on 1·25 metres, relaying the X E M O programme with a power of ·5 kw.

R. W. (Western Australia) encloses the circuit of his two-valve receiver, in which he uses an H.F. pentode in an "electron-coupled" circuit as detector. He bewails the complete absence of British components in W. A.

A SUCCESSFUL COMBINATION

M. R. D. Everard, the owner of the set above, does all his short-wave listening on a loudspeaker, using a converter with his broadcast superhet.

SHORT-WAVE NEWS

THERE are several letters this week from club secretaries, and from individual readers who wish to be put in touch with the nearest club or society.

Mr. R. E. M. Gemmell, Hon. Sec. of the Hoddesdon and District Radio Society, asks me to mention that there is room for more members. A full programme for the coming season has been arranged, and prospective members should get in touch with Mr. Gemmell, The Pollards, Keyser's Estate, Broxbourne, Herts.

"The Sphere D X Club" has been formed recently in Bradford, and already has over twenty members. A club room is available for the regular meetings. Full particulars from the secretary, at 14, Garibaldi Street, Thornbury, Bradford.

The Anglo-American Radio and Television Society, always to the fore with bright ideas, has now formed an "All-Electric Ensemble"—an orchestra in which every instrument is of the electrical or electronic type. The society hopes that it will be possible for this unique orchestra to broadcast from a Continental station one of these days.

Mr. W. R. Baldock, Park Farm, Woburn, Bletchley, would like to hear of a radio society within easy distance of Bedford; and Mr. P. Dalter, 73, Gordon Road, Ealing, would like to know of one in that part of the world.

The Ten-Metre Band.

Strange thing, but radio societies seem to be more flourishing nowadays than ever before—and they nearly always signify themselves with the addition of the words "Short-Wave and Television." I suppose there's a moral in this.

Real short-wave news is scarce. What there is mostly concerns the extraordinary happenings on the 10-metre amateur band. As we all know by now, Miss Corry of G 2 Y L gained a 10-metre "W A C" certificate by working all continents during one Sunday morning in October. She has also qualified for the "W B E" certificate by working with a British possession in each of the continents of the world.

Since then 10-metre D X work has become almost a commonplace. Every British transmitter with 50 watts or more (and many with less) has been able to make contact with stations outside Europe, and many of them have worked Australia. At the time of writing, no New Zealand contacts have been reported from this country, although I believe a Finnish station has been successful.

One effect of this spectacular work has been to arouse a great amount of "commercial" interest in the shorter wavelengths, especially as the contacts between Britain and South Africa on 10 metres have been more reliable than on the more frequently used wavelengths of 20 and 40.

Ships and the R.A.F.

A Canadian reader asks me to point out that the Bowmanville station B E 9 G W is now known as C R C X, and works regularly on 49·22 metres. Canadians are still fairly scarce, but C R C X is very easy to receive after 11 p.m. or thereabouts.

V P 1 A, Suva, Fiji, now calls himself V P D again, and created quite a stir by coming through nicely for several mornings early this month. His wavelength is 22·94 metres, and the best time for receiving him is about 7 a.m.

Readers whose sets will go up above 60 metres should also look round for ships on about 65 metres, and for R.A.F. transmissions between 65 and 80 metres.

The French liner Normandie, using the call-sign F N S K, may often be heard on 34 metres and 22.72 metres—the two recognised shipping waves—working ship-to-shore telephony with F Y A and other stations. These shipping bands, incidentally, are well worth watching, and many interesting transmissions may be heard.

Readers who are keen on finding something new to listen to should bear in mind the fact that many of the wavelengths in between the recognised broadcast bands are used for shipping, aircraft, police and other services. Many interesting transmissions may often be heard in these normally "blank spots."

W. L. S.

MUSIC OVER EUROPE

An interesting description of the land-line systems which are used in connection with the various B.B.C. foreign relays.

By ALAN HUNTER.

MUSIC lines—in terms of a European network—were only a pious hope eight years ago. Now they are an everyday reality. This rapid development is all the more remarkable when one realises the diversity of Post Office organisations of the nations of Europe.

Until each national system had developed its "S.B." network, on the lines of the pioneer British system, international link-ups were, of course, practically impossible. For there is all the difference in the world between ordinary speech trunks with limited frequency range and the lines needed for even moderately faithful handling of music.

A Special Committee.

After the Budapest land-line relays I had a chat with L. W. Hayes, the B.B.C.'s Foreign and Empire Service engineer. I am indebted to him for the survey contained in this article.

The co-ordinating authority, if you can call such a non-mandatory body an authority, is, of course, the C.C.I.T.—in other words, the Comité Consultatif International Téléphonique. It is made up of representatives from all the public and private telephone organisations of Europe; the G.P.O. in England, Reichspost in Germany, P.T.T. in France, and so on.

I think the C.C.I.T. is an excellent example of an international body that is really effective in getting things done. At the same time, it must be made quite clear that its function is co-ordination of individual responsibilities. It has, of itself, no overriding authority, you understand.

How the Relays Started.

As far as the B.B.C. is concerned, international relays by land-line date back to July, 1927. The B.B.C. by then had a pretty wide experience of land-lines. It had started its "S.B." system with overhead lines, suitably balanced and corrected to carry music signals. Then came the gradual spread of the buried cables. These had more inherent distortion than overheads—but that could be corrected. And there remained the great advantage of "staying put" once laid.

The B.B.C. sent a whole team of engineers over to Ostend for the Kursaal relay in 1927. For this early effort the route was from Ostend via La Panne on the Belgian coast and over the Anglo-Belgian cable to Dumpton Gap. The submarine cable had circuits in it that were capable of being made suitable for music transmission.

Next, the B.B.C. extended its activities to Brussels and Liége, its engineers installing repeaters every forty or fifty miles along the route, which went from La Panne, Ostend, Bruges and Ghent to Brussels, Tirlemont and Liége. Later on they got right to Germany through this route. In the meantime the Germans had put down a great many new music circuits, making it possible to link up with Scandinavia and the whole of Central Europe.

Nowadays the route is straight from La Panne to Ghent, Brussels, Aix-la-Chapelle, and so to Cologne. A new Belgian cable having music circuits was laid down about two years ago to make this route possible. For countries such as France, Spain, Switzerland and Italy the B.B.C. now goes via Boulogne to Paris.

If it wants Berlin it follows the route already mentioned to Cologne, and then on through Coblenz, Frankfort, Leipzig to Berlin. For Danish and Swedish relays it links up with Berlin and reaches Copenhagen and Stockholm through the intermediate point of Stralsund. Poland also comes via Berlin, the route being from Berlin to Breslau and a point near Katowice.

For Vienna the route branches off from Frankfort to Nuremberg and so through Linz to Vienna. Budapest is, of course, a continuation from Vienna. For the recent Budapest relays the Linz-Vienna music line had already been booked for Austrian "S.B." Because of this the B.B.C. had to take Budapest through Prague, and along this sector it seems probable that the noise heard during the second relay developed.

It must be remembered that there are a good many European calls on existing music lines linking up the main Continental cities, so that we in England cannot expect always to be able to book just what we like.

All the same, real progress is being made towards that end. In the past ten years it is possible to trace the development of European music lines from none at all to a wide network of single music lines. These are now being doubled, and in some parts trebled, as the demand grows.

Nearly all Countries Linked.

Here is a striking proof of the progress made to date. If we like, we can connect up by land-line on a good music-carrying basis with Hungary, Czecho-Slovakia, Austria, Poland, Germany, Denmark, Sweden, Holland, Belgium, France, Switzerland and Italy.

Under normal conditions it is possible to take musical programmes from any of these countries. The lines are properly tested by the Post Office as well as by the broadcasters before the broadcast. Unless something unforeseen turns up between test and broadcast there is no reason to worry. All the B.B.C. has to do is to book the circuit before the broadcast—and pay for it afterwards!

Those who still remember with irritation the second of the Budapest relays may like to be reminded of the land-line relaying record of the past nine months. Of a total of sixty-five incoming foreign relays, fifty-eight were entirely successful, four were partially successful, and only three were failures. I might add that these relays included eighteen from Geneva and others from Amsterdam, Brussels, Stuttgart, Berlin, Rome, Milan, Paris, Turin, Prague, Copenhagen and Salzburg.

Speech Lines Used Sometimes.

It is also interesting to note that some of the relays of talks—especially from Geneva—are done over the ordinary speech lines. Whenever possible, a music line is used, but there are occasions when we want a line at such short notice that we simply cannot get it except through ordinary speech channels. Although not nearly so good, these speech lines do enable the B.B.C. to bring over a talk intelligibly.

Reverting to those Budapest relays, there was absolutely no inherent technical reason why spurious noises should develop on any section of the line to England. It was just bad luck, apparently. Against the partial failure of the "Night Falls In Budapest" relays, one can quote the very

(*Continued on page* 348.)

FOREIGN-RELAY EXPERT

Mr. L. W. Hayes, the B.B.C.'s Foreign and Empire Service engineer.

STILL MORE READERS PRAISE THE S.T.700

Reports From Further Enthusiastic Constructors Who Attended Demonstrations of Mr. Scott-Taggart's Latest Masterpiece

THE S.T.700 HAS ASTOUNDED THE COUNTRY FROM THAMES TO CLYDE

SEVENTY-SIX STATIONS IN UNDER AN HOUR.

Dear Sir,—I was privileged to be present at a demonstration of your new S.T.700 receiver in Glasgow, and I wish to congratulate you on your latest triumph.

I was particularly impressed by the appearance of the set itself, which has the look of a scientific instrument and yet retains an unusually handsome and artistic appearance.

The "Auto-Dial" with its associated knob and pointer is the best method I have yet seen of providing simple and accurate tuning. The dial, however, with its artistic design and bearing so many station names would be useless, unless the set were capable of pulling in many stations free of interference. This the S.T.700 can most certainly do. **In something under an hour the S.T.700 pulled in about seventy-six stations all at full loudspeaker strength—free of interference and of excellent quality.**

The "Triple Extractor" is another interesting feature of the design, and should prove a boon in those districts where interference from the B.B.C. transmitters is very bad. With the Extractor it is possible to completely eliminate up to three stations simultaneously, and incidentally it is interesting to note that the large number of stations heard at the demonstration were received with the Extractor in circuit set to cut out Scottish Regional, Scottish National, and Droitwich transmitters, which is ample proof that the Extractor in no way impairs the performance of the set itself. The fact that Heilsberg and Bordeaux were received absolutely free of interference from the Scottish National programme will give some idea of the remarkable selectivity of the S.T.700 and also of the genuine utility of the Triple Extractor.

The sensitivity of the set is so great that even with an aerial consisting of a few feet of wire strung across the room, a reasonable selection of programmes from foreign stations could be picked up at full strength.

Perhaps the most interesting feature of the new set is the inclusion for the first time in any wireless set (I believe) of audio-frequency reaction.

This has the power of greatly increasing the power output of the set on weak stations. With the use of a local oscillator and a meter it was shown that a slight adjustment of the low-frequency reaction knob increased the power output by as much as twenty-five times its original strength on a weak station. This invention should appeal very strongly to constructors—the more so since it greatly increases the bass response, and that more effectively than many so-called tone controls which increase the relative amount of bass only at the cost of the higher, and as necessary frequencies. Truly a remarkable addition to an already remarkable set. The fact also that the amount of Audio-Reaction on the S.T.700 can be set by the knob and then brought into or cut out of circuit makes it easily manipulated and in no way detracts from the ease with which the set is operated.

In conclusion—the set is worthy of the initials S.T., and I am sure will amply satisfy the voracious appetites of hungry constructors.

J. D. BRIGHT, 124, *Barrachine Road, Baillieston, Lanarkshire.*

SELECTIVITY AMAZING!

Dear Sir,—Just a few words of praise for the S.T.700, which no doubt will prove the sensation of the year. The Auto-Dial is a decided improvement on anything else I have yet seen, the best money's worth of wireless apparatus on the market. I am looking forward to building S.T.700.

R. EDGE, 3, *Grange Avenue, Binley, Coventry.*

AUDIO-REACTION INCREASES STRENGTH 25 TIMES.

Dear Sir,—May I offer my sincere thanks for the opportunity of attending your demonstration 1 mile from Brookmans Park on Tuesday evening, October 15th.

The demonstration was so surprising that it is with great difficulty that I am able to do it justice.

The first feature, the Auto-Dial, is a very great advance. The angle of error to counteract the slight difference in coils and condensers is a really first-class effort, and that alone puts your set in the front rank.

Quality of reproduction on the speaker was all that could be desired through the whole of the audio range.

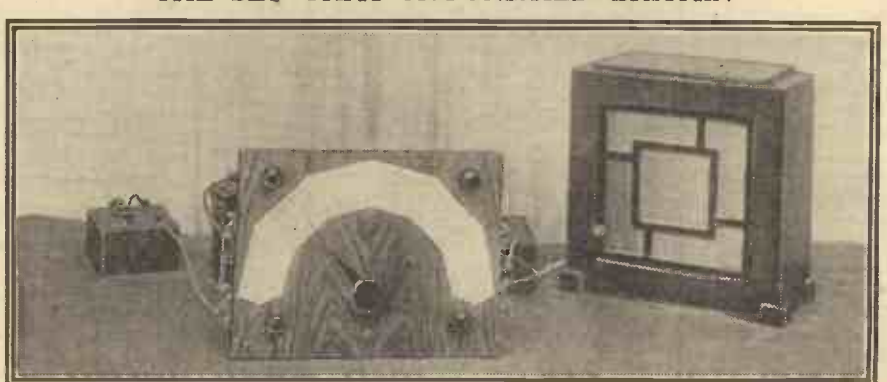
As far as selectivity goes I have yet to handle a set that would be able to rank alongside of your S.T.700, and the output volume was sufficient to fill a large hall on the majority of stations received.

Fifty-one stations were received, a few of which are as follows: Leipzig, West Regional, Milan, Cork (volume very good), Berlin, Strasbourg, Heilsberg, Fécamp, Hilversum, Rennes, Algiers, Radio Paris, Kootwijk, Luxembourg. Through the medium of your Triple Extractor all were entirely clear of the London stations; we had only to glance through the window to see the lights on the London station's mast less than a mile away. With the Extractors out of circuit the London stations covered the whole of the dial at a colossal volume.

To my mind, the Audio-Reaction feature is the best of all, as it increases volume 25 times, as measured by a meter across the speech coil, and also is the finest example of a tone control I have yet seen. Without Audio-Reaction reproduction was inclined to be thin, but with Audio-Reaction it was full and the bass response was nearly unbelievable—a really fine effort on your part.

Towards the end of the demonstration, about 10.30 p.m., with only about 12 feet of aerial 12 stations were received at really good strength, stations coming in dead on. The quality of reproduction was as near perfection as anything that I have yet heard. The selectivity was amazing; the stations rolled in with ease, quite separately and free from all interference. The Triple Extractor was a box of magic, and when set, the National and the local were difficult to find. I wouldn't have believed that so many stations could have been brought in on a small room aerial, the one used. This truly must be the

THE SET THAT ASTONISHED BRITAIN



Neat, easy to build and to operate, the S.T.700 opens up new possibilities in accurate tuning and interference-free reception.

(*Continued on page* 332.)

S.T.700 PILOT AUTHOR KITS

IMMEDIATE DELIVERY OF S.T.700 PILOT AUTHOR KITS. Miscellaneous Components, Parts, Kits, Finished Receivers or Accessories for Cash, C.O.D. or H.P. on our own system of Easy Payments. All S.T.700 recommended accessories can be supplied on attractive Easy Terms. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid (GREAT BRITAIN ONLY). Hire purchase terms are NOT available to Irish and Overseas customers. Efficient Overseas Order Dept.

● *See our 2-page Advertisement in "Popular Wireless," Nov. 2nd., or send coupon below for full details* ●

A.C. VERSION

KIT "A" CASH or C.O.D. *Carriage Paid* **£9:5:0**

● OR YOURS FOR Balance in 11 monthly payments of 17/- **17/-**

Comprises complete kit of components as FIRST SPECIFIED and used by Mr. J. Scott-Taggart, including Peto-Scott Ready Drilled and polished Walnut plywood panel, ready drilled terminal strips, aluminium brackets, mains lead, nuts and bolts, less valves, cabinet speaker and Extractor Kit.

1 Set of 3 First Specified Valves, £2/13/6.
W.B. Type RM/8 Speaker, £3/10/0, or 5/- down and 11 monthly payments of 6/6.
Peto-Scott A.C. S.T.700 Consolette CABINET. Exclusively specified. Cash or C.O.D., 37/6 (carriage and part packing 2/6 extra), or 5/- deposit and 6 monthly payments of 6/6.

Peto-Scott **1936** UNIVERSAL SHORT-WAVE
ADAPTER-CONVERTER

WELL SUITED FOR USE WITH S.T.700

SEND FOR FREE BLUEPRINT

COVERS 13-80 METRES Converts your existing battery or A.C. Receiver for operation on short-waves, *with no alterations*, bringing you **America direct**, programmes from all over the world. **Two hours to build . . . a lifetime of world-wide radio entertainment!**

2/6 DOWN.

KIT "A" CASH or C.O.D. *Carriage Paid.* **£1:19:6**

Or 2/6 down and 10 monthly payments of 4/3
Comprises all parts for building with **full-size blueprint, assembly and operating instructions,** less cabinet.
WITH CABINET. Casb or C.O.D. Carriage Paid, £2:10:0, or 12 monthly payments of 4/6.

Peto-Scott A.C./D.C. Short-Wave CONVERTER. For A.C. or D.C. Receivers. Tuning Range 13-80 metres.
KIT "A," comprising all components, less valves and cabinet. Cash or C.O.D. Carriage Paid, £3/10/0, or 12 monthly payments of 6/6.

LISSEN BAND SPREAD S.W.3

FREE BLUEPRINT WITH EVERY KIT

A new easy-to-build Band Spread tuning Short-Wave Receiver, Range 13 to 55 metres. Complete Kit of components, including ready-drilled chassis and condenser plate, 3 valves and full instructions. **Cash or C.O.D. Carriage Paid, £3/9/6.** **5/- DOWN**
Balance in 11 monthly payments of 6/6.

W.B. STENTORIAN SENIOR

AS RECOMMENDED FOR THE S.T.700.

Model 36S. New improved Microlode device, giving extended frequency range. Perfectly matches any output. Cash or C.O.D. Carriage Paid, **£2/2/0**, or 2/6 deposit and 11 monthly payments of 4/-.

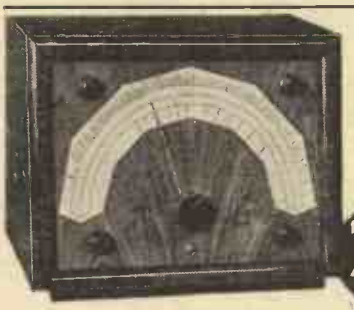
2/6 DOWN

W.B. Stentorian Junior Model 36J. Cash or C.O.D. Carriage Paid, £1/12/6, or 2/6 down and 11 monthly payments of 3/-.

B.T.H. NEEDLE ARMATURE PICK-UP AND TONE ARM, including pick-up rest, flexible lead and volume control. Cash or C.O.D. Carriage Paid, £2/0/0. Balance in 10 monthly payments of 4/3. Send only **2/6**

BATTERY VERSION

Peto-Scott S.T.700 CABINETS



Overall dimensions, W. 18½ in., H. 14½ in., D. 12 in.

2/6 DOWN

TABLE MODEL. Cash or C.O.D., 17/6 (Carr. and Pkg. 2/6 extra), or 2/6 down and 5 monthly payments of 4/-.

VERTICAL CONSOLETTE MODEL. Cash or C.O.D. Carriage Paid 35/- (Carr. and Pkg. 2/6 extra), or 5/- down and 6 monthly payments of 6/-.

TYPE "LL" CONSOLETTE MODEL. Cash or C.O.D. Carriage Paid, 37/6 (Carr. and Pkg. 2/6 extra), or 5/- down and 6 monthly payments of 6/6.

Peto-Scott S.T.700 FINISHED INSTRUMENTS

TABLE MODEL. Cash or C.O.D. Carriage Paid, £8/0/0, or 15/- down and 11 monthly payments of 14/9.

VERTICAL CONSOLETTE MODEL, with Peto-Scott S1 Speaker. Cash or C.O.D. Carriage Paid, £9/17/6, or 20/- down and 11 monthly payments of 18/-.

TYPE "LL" CONSOLETTE MODEL, with Peto-Scott S3 de Luxe Speaker. Cash or C.O.D. Carriage Paid £10/12/6, or 20/- down and 11 monthly payments of 19/6.

STRUCTAKIT

COMPRISES ● 2 **Peto-Scott** cabinet side-pieces, cabinet top and grid bias battery spar, **all ready drilled and French polished, and complete with necessary fixing screws.** ● **Ready drilled and polished walnut veneered panel, 16 ins. x 12 ins., with nickel-plated screws.** ● **2 Ready drilled ebonite terminal strips,** ● **4 aluminium brackets, and 4 nuts and bolts.** ● **30 ft. Maxamp. wire. Exactly as Specified by Mr. John Scott-Taggart.** *Total Value 9/7.*
Cash or C.O.D. 8/6.

8/6

Every Peto-Scott Structakit includes a FREE COPY OF S.T.700 ISSUE OF "POPULAR WIRELESS," with full size blueprint, dial card, etc. *Postage 9d. extra*

RECOMMENDED SPEAKERS

PETO-SCOTT S.T.700 High Fidelity Matched Speaker, specially produced for Mr. J. Scott-Taggart's latest set, 8-in. Cone, free from boom and resonance. **Type S.1.** Cash or C.O.D. Carriage Paid 19/6, or deposit 2/6 and 8 monthly payments of 2/6.

2/6 DOWN

PETO-SCOTT S.T.700 de luxe. Another specially designed speaker with 9½-in. oversize cone. **Type S.3.** Cash or C.O.D. Carriage Paid 32/6, or 2/6 deposit and 11 monthly payments of 3/-.

KIT "A" CASH or C.O.D. *Carriage Paid.* **79/6**

● OR YOURS FOR

Complete Kit of components exactly as FIRST specified and used by Mr. J. Scott-Taggart and shown in the detailed list in our advertisement on Nov. 2, '35, including FREE copy of S.T.700 issue of "Popular Wireless," but less valves, Extractor Kit and Peto-Scott Cabinet Cash or C.O.D. Carriage Paid £3 : 19 : 6, or Deposit 7/- and 11 monthly payments of 7/6.

7/- DOWN

KIT "B" CASH or C.O.D. *Carriage Paid.* **£5:11:6**

● OR YOURS FOR **10/-**

Balance in 11 monthly payments of 10/3.
As for Kit "A," but including set of 4 FIRST specified valves, less cabinet and speaker.

KIT "CT" CASH or C.O.D. *Carriage Paid.* **£6:9:0**

● OR YOURS FOR **12/-**

Balance in 11 monthly payments of 12/-.
As for Kit "A," but including FIRST SPECIFIED valves and **Peto-Scott S.T.700 table cabinet,** less speaker.

KIT "CC" CASH or C.O.D. *Carriage Paid.* **£7:6:6**

● OR YOURS FOR **13/6**

Balance in 11 monthly payments of 13/6.
As for Kit "A," but including FIRST SPECIFIED valves and **Peto-Scott S.T.700 Consolette cabinet, with speaker baffle,** and battery shelf, but less speaker.

KIT "CLL" CASH or C.O.D. *Carriage Paid.* **£7 9:0**

● OR YOURS FOR **13/9**

Balance in 11 monthly payments of 13/9.
As for Kit "A," but including FIRST SPECIFIED valves and Peto-Scott Consolette Cabinet type "LL," with speaker baffle. Less speaker.

If **Extractor Kit** is required with any of the above Kits, add **£1/4/0** to Cash or C.O.D. prices, or 2/3 to deposit and to each monthly payment.

S.T.600 to S.T.700 CONVERSION KIT

COMPLETE KIT of first specified components to convert the S.T.600 to the new S.T. triumph. **Comprises:** Peto-Scott **S.T. 700 Structakit,** as detailed in adjoining column, **Colvern** S.T.700 Coil Unit, **J.B.** Main tuning condenser with special knob and pointer, 2 **Graham Farish** potentiometers, **Bulgin** switch, 3 **Lissen** condensers, **Dubilier** condenser, **Dubilier** 500,000 ohm resistance, **Ferranti** 30,000 ohm resistance, **Belling Lee** G.B.-I wander plug, screws, flex, and FREE COPY OF S.T.700 ISSUE OF "POPULAR WIRELESS," with full-size blueprint, dial card, etc.

5/- DOWN

Cash or C.O.D. Carriage Paid, £2:2:0 or 5/- down and 7 monthly payments of 6/-

POST THIS COUPON NOW

PETO-SCOTT CO., LTD., 77 P.W.19, City Road, London, E.C.1. Tel.: Clerkenwell 9406/7.
Please send me full details of S.T.700 and/or your New Season's Catalogues:

Name.....

Address.....

..... P.W.19.

STILL MORE READERS PRAISE THE S.T.700

(*Continued from page* 330.)

so that a very small room aerial would be quite sufficient to give really good results.

The design and construction of the set merit a chapter to itself. The design is revolutionary, whilst construction is simple.

I am certainly going to build this set, as I think it is really worth while and deserves full praise; it is really a one-knob control set, as the other knobs around the centre one are mainly for polishing up the stations.

I could go on for hours as I am so enthusiastic about this set, but will thank you again for your wonderful demonstration.

B. DYER, 8, *Percy Road, Leytonstone, E.*11.

A REMARKABLE SUCCESS.

Dear Sir,—Allow me to pay my tribute to your latest set—S.T.700. The demonstration which I attended was, to say the least, a remarkable success.

The log of 66 stations, all clear of local station or adjacent channel interference speaks well of the sensitivity and selectivity of the set, and when this remarkable performance is combined with wonderfully good tone and volume it raises the S.T.700 from the standards of a scientific instrument to that of a musical instrument capable of an almost endless variety of entertainment.

Your new dial ends station searching. You know exactly where to find each station, and the separate aerial tuning condenser seems to be as easily worked as a volume control.

The new Triple Extractor is very effective, completely taming the locals, although in Scotland the long-wave section need not be used, as we are too far away from Droitwich.

Adjacent channels to Scottish Regional and National, such as Munich, Marseilles, Leipzig, Heilsberg and Bordeaux, came through clear of the locals and at very good volume.

The Audio-Reaction, with its new added bass response, brings a new realism to the programmes as well as a new technique to L.F. amplification. A meter test across the loudspeaker's speech coil showed an increase of over sixteen times, and I have no doubt that on a note of lower frequency the amplification would be considerably higher.

The S.T.700 is an ingenious set, it is simple to build and simple to tune, and represents remarkably good value.

I have no hesitation in recommending the set to all home constructors.

GEO. W. HOSIE, 23, *Main Street, Kilsyth, Scotland.*

VOLUME IS TREMENDOUS.

Dear Sir,—It gave me the greatest pleasure to attend a demonstration of your new receiver, the S.T.700, at Tallis House, E.C.4.

The most striking thing at first glance was the improvement on the Spot-on dial. The dial of the "700" is superior even to that masterpiece. Every station is marked clearly, with no possibility of confusion, and once calibrated a station could be obtained within a few seconds, as was demonstrated several times.

The new "Uni-plane" design, too, tends to make even this easy-to-build set even easier. For the first time the wiring of a set can be shown accurately on the blue print, the position and shape of each wire undistorted by the flattening-out of the panel.

In actual use the set has good volume without the use of "Audio-Reaction," but when using it the volume is tremendous. This was particularly noticeable on weak stations. These were tuned in normally, and then Audio-Reaction applied. From the merest whisper the volume rose to excellent loudspeaker strength.

The bogy of local station interference has also been overcome by the use of a Triple Extractor, which, working on the National, Regional and Droitwich wavelengths, succeeded in reducing them to long-distance stations, incapable of interfering with any transmission on either side of them.

For the DX listener the fact that in the early evening Barcelona was pulled in at extremely good strength and definitely identified by a gentleman present, will be sufficient recommendation.

I should like, in conclusion, to congratulate Mr. Scott-Taggart on the production of a set which, at an extremely moderate price, puts all Europe within reach of the ordinary listener.

S. BUDDEN, 124, *Morden Road, Merton, S.W.*19.

SCORES OF STATIONS

Dear Sir,—I was present at a demonstration of the S.T.700, given at 101, Sycamore Road, Aston. The selectivity and quality of the set were all that could be desired; a large number of stations were received at full loudspeaker strength, Droitwich being only 18 miles away. Deutschlandsender was heard with little interference and Hilversum with no interference whatsoever.

A test was made with an aerial of only a few feet of wire laid on the floor, and scores of stations were received at full loudspeaker strength.

The set seemed very easy to tune, and the Audio-Reaction improved matters considerably when receiving weak stations.

I shall most certainly build the set, as I think it is an improvement on S.T.600.

A. DEEMING, 75, *Sycamore Road, Aston, Birmingham.*

MOST UNCANNY

Dear Sir,—I am writing to thank you for the opportunity given me for the demonstration of the S.T.700 near Brookmans Park on the 15th inst. I thoroughly enjoyed listening to such a wonderful set, and what amazed me most was the selectivity produced, and to think that National, Regional, and Droitwich stations could be cut right out of the set when almost beneath the Brookmans Park aerials was most uncanny (thanks to the wonderful Triple Extractor. To tabulate over 50 stations in a very small space of time without interference was splendid. The Auto-Dial is a great improvement on the S.T.600. Sensitivity was perfect, working first with no aerial, then only a few feet of wire, and lastly with an outside aerial.

I noticed the set was very powerful, and would be sufficient to fill a dance-hall if necessary; also the tone was all that could be desired.

I shall strongly recommend the set to my friends as the set of the year. I am sure they will be looked upon with envy by other wireless enthusiasts, especially as the price is so low.

W. WIGG, 16, *Sanford Terrace, Stoke Newington, N.*16.

REMARKABLY FINE QUALITY.

Dear Sir,—I am writing to thank you for the opportunity of hearing your new set, S.T. 700, at a demonstration in Central London.

The first impressive point I noticed was the Auto-Dial, which, once calibrated, enables the user to tune any station with absolute certainty, the setting not being affected by any alteration of the extra controls. The selectivity of the set is certainly remarkable, as was proved by the reception of Turin, whose separation from London National is 9 kc., without a trace of the B.B.C. station.

The volume was surprising, and all of the sixty-three stations received during the test were sufficiently loud to provide good entertainment.

A great new development of this set is the Triple Extractor, a tremendous improvement on the very efficient Extractor of the S.T.600. Its effectiveness was obvious from the fact that the London stations and Droitwich could be entirely cut out within a degree of their dial readings, enabling adjoining foreigners to be received without the slightest background from the "local." A test demonstrated the Extractor's efficiency in silencing an oscillator working in an adjoining room.

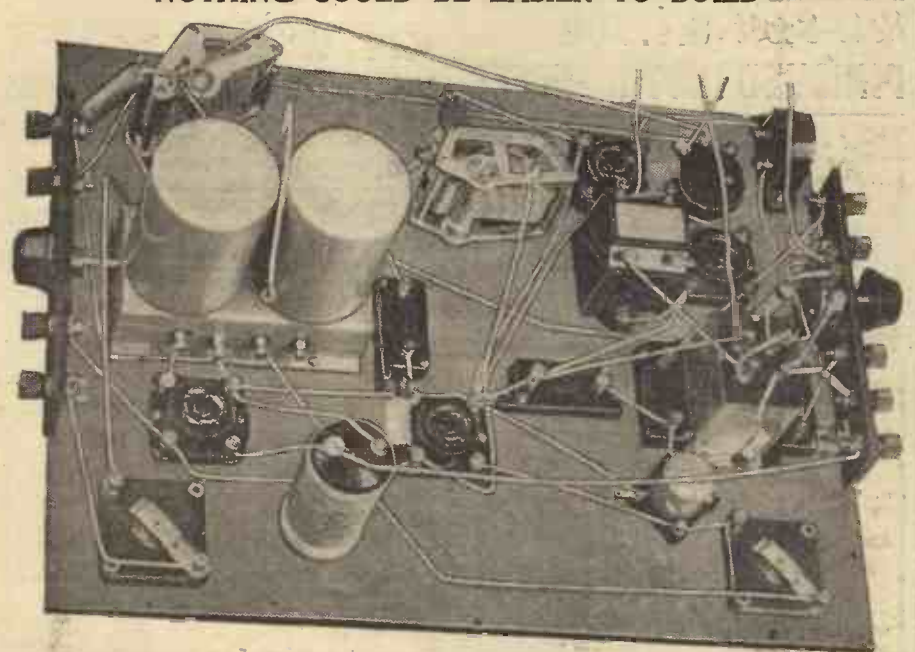
The S.T.700 provides remarkably fine quality, which is assisted by the Audio-Reaction circuit, the improvement when adjusting this control being very noticeable. The effect of this was demonstrated by measuring the current in the speech-coil of the loudspeaker. It showed that the increase in signal strength was twenty-five to thirty times that obtained without Audio-Reaction.

As a final and very convincing test it was tried without an earth and with a casually-hung wire about 10 ft. long as aerial. The set's sensitivity was amply proved by the volume at which even low-powered relay stations could be received. Even when the wire was laid on the floor little effect was noticed.

This demonstration proved one of the most interesting evenings I have spent, and certainly impressed me with the powers of the S.T.700. I would recommend anyone to build it, and would gladly give my opinion to anybody interested.

H. R. HAMILTON, 180, *Winns Avenue, Walthamstow, E.*17.

NOTHING COULD BE EASIER TO BUILD



The great simplicity of the Uni-Plane construction is clearly shown in this photograph. Just consider it for a moment and you cannot fail to be struck by the ease of construction that has been achieved in the design of the S.T.700.

"PEAK" RECEPTION

A "P.W." Reader's radio experiences during a tour of the Lake District.

ON THE TOP OF BOARDALE HAUSE.

AFTER a long ascent of one of the many Lake District mountains of about two or three thousand feet, the ordinary human being will want to sit down and have a breather. The author includes himself in that category, and it occurred to him that it might be rather a brainwave to have some form of light entertainment when that coveted summit was reached.

The Main Requirements.

The particular form of light entertainment was, rather obviously, a wireless set. In its design it was decided that the chief requirements of the set should be: (1) Lightness; (2) it must be completely self-contained with the exception of aerial, earth, and phones; (3) long- and medium-wave coverage; and (4) sufficient volume on a 16-ft. aerial to work phones on local Regional and National, or Droitwich.

As daytime reception in the Lake District is extremely poor, it was considered best to take a two-valve set, which eventually turned out to be a detector, low-frequency arrangement. Compactness was not essential, as there was plenty of room in the rucsack. The actual set measured 3 in. × 6 in. × 7 in., and weighed just over 3½ lb. This may seem heavy, but was not noticed at all. Even if it had been, the results were well worth taking it out.

The detector was an HL2/K battery Catkin, transformer-coupled to an ordinary small L.F. valve; the high-tension was supplied by a Drydex midget 35-volt battery, and the low-tension from a 3-volt cycle lamp battery, which, in series with a variable resistance, will last for several weeks, or even months if it is not used for more than an hour a day. All the joints were, of course, soldered, as the set had to withstand considerable knocking and jolting. A baseboard and panel were made, over which a removable cover was fitted; the whole was then stained and french polished.

The two photographs, taken while on holiday at Ullswater, show the set in action with the author at the controls. The photo which shows the set without its cover was on the summit of Place Fell at about 2,000 ft., overlooking Lake Ullswater. The other photograph was taken at the top of Boardale Hause on the way to Place Fell at 1,000 ft. The Cairn, which marks the top of the pass, made a useful mast for the aerial; incidentally, this appears shorter than it actually is (about 16 ft.), due to the foreshortening effect of the camera.

Our contributor is here seen at the summit of Place Fell, 2,000 feet up.

A Good Earth Essential.

The earth consisted of a metal skewer pushed into the ground with the lead from the set soldered to the top. The earth on a small set such as this should be as efficient as possible.

The aerial in the second photo is round the corner of the rock on the extreme right, and cannot be seen in the photograph. Reception in the daytime in the Lake District is about the worst imaginable, as one is almost entirely surrounded by mountains (the one exception being when one is on their summits!). Droitwich is the only worth-while signal. At night, however, the two-valve set brought in about thirty stations or more at good entertainment value.

N. H. D. W.

FOR S.W. ENTHUSIASTS.

THERE is no doubt at all about the increasing popularity of short-wave reception. For many years it was almost the exclusive province of the radio experimenter and home-constructor, but gradually it is becoming as popular as the electric reproduction of gramophone records—if not more so.

The Italo-Abyssinian dispute has probably given short waves a big fillip, for the ether in these days is humming with short-wave Morse and telephony news and propaganda.

And then there is America with full programmes every night, and such is the power that is being used for these short-wave stations and those in other quarters of the globe, and such is the penetrating quality of the higher frequencies, that one can listen regularly to transmissions originating thousands of miles away on quite modest apparatus.

This Utility short-wave condenser is solidly constructed of brass with Frequentite insulation.

Modest, that is, in so far as its price or the ease with which it can be home-assembled is concerned. A very high order of efficiency is, however, quite essential if good reception is consistently to be obtained.

An excellent example of the high grade achieved in modern short-wave component design and manufacture is to be found in the new Utility ganged short-wave condenser made by Messrs Wilkins & Wright, Ltd., of Utility Works, Birmingham.

The general form of the design can be seen from the accompanying photo. The metal employed is brass throughout, and the vanes are well bonded. The insulating material is Frequentite, and this is a ceramic material having very low losses.

Great rigidity has been achieved in the framework, and as Messrs Wilkins & Wright point out, it is so arranged that there is no closed loop of metal around the vanes to cause any absorption effects.

The matching is extremely close—actually to within one half of one per cent. The maximum capacity of each section is ·00015 mfd. and the minimum is five noughts 6 mfd. This is, as will be appreciated, very low, and to ensure that there can be no slip in printing the value we have used words to indicate this figure.

The condenser is a fine piece of work, and is so efficient that it can be employed, where suitable, for ultra-short-wave circuits.

ON THE TEST BENCH

Two components of interest to constructors.

A FINE LOUDSPEAKER.

THE fact that the W.B. mains-energised loudspeaker has been employed in John Scott-Taggart's A.C. S.T.700 is evidence that it is an outstanding production. That it was also included in the new "Ferro-Power" set provides even further evidence, if that were required, for the "Ferro-Powers," designed by K. D. Rogers, have come to be regarded as peak achievements in mains set design, not only by constructors but also by radio engineers.

The E.M./W. is a substantially constructed instrument and it weighs 13 lb., although it is sufficiently compact to be included in sets of quite modest proportions; its metal chassis measures 10 in. in diameter.

The speech coil has a D.C. resistance of twelve and three-quarter ohms, and for calculating matching the impedance is taken as seventeen ohms. The field of the original model is twelve hundred and fifty ohms in resistance, and therefore takes approximately one hundred milliamperes at the recommended 120 volts. But other fields can be supplied to order. Mr. Scott-Taggart required the field to have a special resistance suited to his A.C. S.T.700 design, and so the speaker is available with this requirement fulfilled. In this style it is known as the EM/S.

The transformer has ratios of fourteen and a half, seventeen and twenty to one for optimum loads of three thousand eight hundred ohms, five thousand two hundred ohms and seven thousand two hundred ohms, and is suitable for inputs up to sixty-three milliamperes. But here, again, there is an adaptability in supply, for there are other transformers which can be supplied to suit special conditions.

One of the latest W.B. speakers—a mains energised moving-coil—retailing at seventy shillings.

This fine W.B. mains speaker, which costs seventy shillings, will accommodate outputs up to eight watts. It is a sensitive speaker, too, and the results it gives are most impressive. Similarly to all W.B. speakers, the high notes come away crisp and clear and the bass is extremely good.

But in view of the facts with which we commenced this short article, it will be quite unnecessary to make any further comments regarding its performance. It is a speaker which will obviously appeal to all discriminating constructors.

PROGRAMME PROBLEMS PROBED - 2

ART MANGLED *in the* MUSIC MACHINE

AS more than 60 per cent of the B.B.C. air-time is devoted to musical broadcasts it may be deduced that the B.B.C. regard music as of highest importance. That being so, listeners are justified in expecting the musical activities to be on the highest plane from the technical, artistic and entertainment points of view. To a great extent it is true to say that the B.B.C. have asserted themselves with a supreme distinction in their musical operations, but their very success may become a weakness—in attempting to give listeners plenty of good music they may fall into the error of giving too much.

£500,000 Per Annum!

The musical activities of the B.B.C. make the biggest hole in B.B.C. funds. They maintain in London alone a Symphony Orchestra of 119 players, a Theatre Orchestra of 27, Variety Orchestra of 16, Military Band of 36, an Empire Orchestra of 16, in addition to Wireless Singers, quartets and a professional chorus of 40 voices. They have orchestras of 35 instrumentalists attached to four of the Regional stations. The salary bill alone for the staff musicians totals well over £200,000 per year.

In addition they pay considerable sums to broadcast concerts by the big independent symphony orchestras of London and provincial centres as well as for foreign relays. Additional to all these the B.B.C. last year gave 4,751 contracts to individual soloists and small combinations such as string quartets. I am understating the facts when I declare that more than 70 per cent of the money spent on programme material is paid for the 60 per cent of programme time devoted to musical broadcasts. In other words, music is costing the B.B.C. quite £500,000 yearly.

Orchestras Overworked.

That is a colossal sum. To spend £500,000 each year on music should be sufficient to ensure that musical broadcasts reach as near perfection as humanly possible. But do they? I should say that, generally speaking, musical broadcasts are superior to any other class of entertainment the B.B.C. provides. That does not mean to say that they are as high in quality as they might and should be.

One of the chief reasons for this has a psychological basis: the B.B.C. broadcasts too much music. Sixty per cent of programme time is too much to devote to music.

The number of listeners who want music is not 60 per cent of the total. And those who do want music cannot digest so much. The contempt that familiarity breeds will be the fate of broadcast music if the B.B.C. insists on devoting 60 per cent of time to it.

"Reduce the quantity of musical broadcasts and increase the quality," says Mr. Garry Allighan, in this, the second of his special series on B.B.C. programmes.

Nor is it fair to the orchestras. Especially does the Symphony Orchestra suffer from this overproduction of music. There is a long season of nightly "Prom" concerts followed by a season of symphony concerts. These are performed by what the B.B.C. advertise as "The B.B.C. Symphony Orchestra," and I declare here and now that the best work cannot be expected from any orchestra that has to render so many concerts.

During the "Prom" season the orchestra has sounded obviously under-rehearsed. No wonder. What chance have they or Sir Henry Wood to produce new works, or even perform the standard works, at utmost efficiency when they have to broadcast a four-starred concert, with different artists, night after night? Tired out, physically and emotionally, by an incessant string of "Proms," they have to recommence with the Symphony season under different conductors, rehearsing new works and with strange artists. And this season will comprise 15 concerts as against 12 last year.

Not At Full Strength.

Then there is the mystery of the orchestra itself. All the "Proms," as all the concerts in the Symphony season are announced are by "The B.B.C. Symphony Orchestra." According to the B.B.C. the Symphony Orchestra is composed of 119 instrumentalists, and those who pay to hear the concert (either at Queen's Hall or on their radio set) are justified in expecting to hear the full orchestra. That, of course, is ordinary conventional business morality.

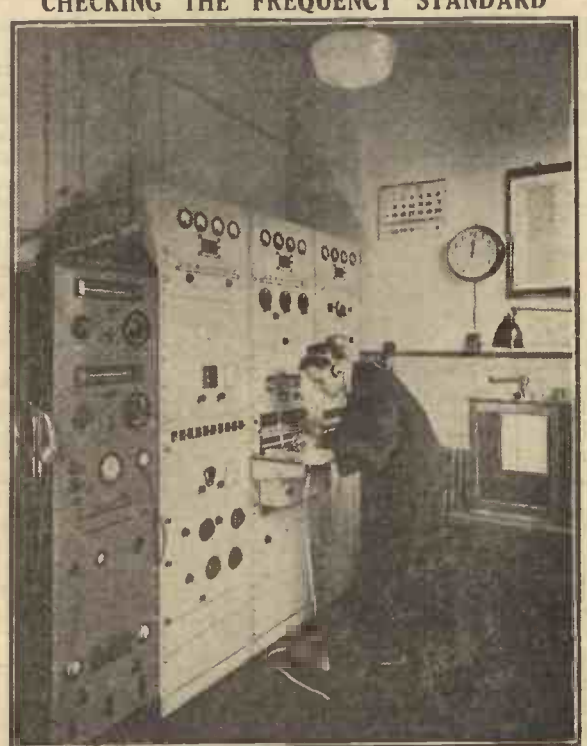
Instead, they do not hear "The B.B.C. Symphony Orchestra" they were told they were to hear. They hear an orchestra of only 80 performers, and not even the genius of Sir Henry Wood is capable of securing an adequate rendition of some of the big symphonic works that were broadcast by a decimated orchestra. I am inclined to think that those who paid to hear an orchestra of 119 performers can claim their money back when they are given a concert by only 80 players.

Only "Section A."

Where are the other 39 players? Do not run away with the idea that they are off having a good time, or resting by some kind of "roster." They are "doubling" up. That "Section D" or "C" or "E" orchestra that is playing in the studio at the same time that the "B.B.C. Symphony Orchestra" is broadcasting from Queen's Hall is merely some of the instrumentalists of whose services the "Prom" concert have been robbed. Truth is that "The B.B.C. Symphony Orchestra" does not play at the "Proms" at all. It is "Section A" orchestra, and only the B.B.C. can manage to

(*Continued on page* 346.)

CHECKING THE FREQUENCY STANDARD



The frequency measurement room at the B.B.C. checking station at Tatsfield. The engineer is checking the rate of the crystal frequency standard against Rugby time signals.

B.B.C. TELEVISION PLANS REVEALED

Mr. Gerald Cock, Television Director of the B.B.C., tells Alan Hunter his programme plans for the forthcoming television service.

IN his first statement to the Press since he took office as Director of Television, Mr. Gerald Cock told me of his plans for the first programmes from Alexandra Palace. He showed me the actual plans of the new layout at the Palace, with the two rival transmitters on the ground floor and the studios on floors being erected above. The Baird and E.M.I. gear are separated by a film studio and the common sound transmitter.

First test transmissions will be possible, at the present rate of progress, about the middle of February. It is thought that the only practicable idea is to send out the Baird system one week and the E.M.I. the next, giving each system alternate weeks. The change-over of the gear is too complicated for nightly alternations.

Subject to the Television Advisory Committee's agreement, Mr. Cock proposes three one-hour programmes per day, the first in the afternoon for demonstrations, the second around 6.15 p.m. for a special purpose, and the third to be given in the middle of the evening.

Special Looking-In Hall.

The 6.15 p.m. programmes will be designed to give listeners going home from work the chance to "look-in" at the B.B.C.'s special "looking-in" hall, which it proposes to erect at a convenient point in the West End. It is hoped that eventually a whole chain of such halls will be fitted up.

As far as programmes are concerned, Mr. Cock has some very definite ideas. He insists that each programme shall be very short, placing a time limit of 20 minutes as the maximum endurable without boredom. "There will be no 'background looking' as there is 'background listening' to sound programmes," he reminded me. Concentration in two dimensions—and upon the 8 in. by 6 in. screen of the home television set, will be very considerable, he thinks. Hence the insistence on breaking up the programmes into very short items.

A clock face will fill the whole of the screen during intervals, as being the most restful and least annoying of all stop-gaps.

Films will also play a part in the early programmes, although it is emphasised that a great number of films do not lend themselves to television technique. Even Mickey Mouse, thinks Mr. Cock, is much less appealing seen on a small scale than on a full-size cinema screen.

A special orchestra of about 20 players will be formed for the television service. Another innovation will be the employment of a lady announcer, who will work in conjunction with a man announcer. Mr. Cock is looking for a suitable "announcerine" to play this important part. She will have to possess exceptional charm, to have a "photo-genic" face and a very fine memory—for announcing from scripts will be taboo before the television scanner. In addition, Mr. Cock thinks that a mezzo voice will be required.

Sponsored programmes are definitely envisaged. By this, Mr. Cock emphasises, the B.B.C. does *not* mean selling time on the air. Various manufacturers and firms with interesting products to show will have the chance to parade them in Alexandra Palace—or rather outside it. Fashion parades will also give the B.B.C. a chance to exploit the sponsorship idea, without in any way lowering itself to the level of Continental time selling.

PUBLIC DEMONSTRATIONS

Demonstration halls will be equipped and special programmes transmitted so that the public will be able to form its opinion about the new service.

Long Musical Programmes Unsuitable.

"The whole basis of my programmes will centre around the idea of *intimate personality turns*," said Mr. Cock. "Long musical programmes will be quite unsuitable, as will symphony concerts, chamber music—and, yes, the Foundations of Music!"

He is going to recommend that the service should be on a six-days-a-week basis, leaving out Sunday because that would entail a very big increase in staff. At first, only a skeleton staff will be employed, although that will of necessity embrace quite a large number of people.

Mr. D. H. Munro will be productions manager, and under him will come a group of producers. Then there will be a special man on film work, an engineer in charge, and engineers under him.

Heavy structural changes are now in hand at Alexandra Palace, where only the shell of that part of the building taken over by the B.B.C. now remains. When this has been fully equipped the first transmissions will take place. For some time to come only the Alexandra Palace will be used as the source of the televised programmes, but Mr. Cock hinted at all kinds of future developments.

Micro-Wave Relay Points.

A complete "S.B." system of television stations, on the lines of the present sound system, will only be possible when the Post Office has laid the necessary co-axial cables—at an estimated cost of £1,000 per mile. Outside broadcasts will probably be done by means of micro-wave relay points, but that is looking ahead, rather.

Mr. Cock, referring to his immediate plans, says he is very conscious of the danger of running too long a programme. He aims at short ten-minute items as the ideal—and expects that many artists will develop special personalities for his programmes. He hopes to be able to give artists whole-week contracts to appear for six successive nights, thereby encouraging many who now hesitate or are unable, owing to other contracts, to accept odd dates on the sound system. Dancing and such-like acts are considered very suitable for these weekly feature appearances—anything where a varied repertoire can be exploited.

He has no intention of competing with existing forms of entertainment and hopes that very soon a working arrangement will have been reached with the film interests. He aims to give *via* television items of entertainment that would be impossible to enjoy by any other means. *That is the acid test of his programmes.*

Direct events will figure largely in the vision items. "Half the emotional value of television will come from knowing that the entertainment is instantaneous," he urged.

Televising Mechanical Inventions.

Out on the terrace of Alexandra Palace, Mr. Cock aims to televise miniature motor shows, to give onlookers a close-up of aeroplane construction, to deal in every possible way with mechanical inventions and developments. He also has in mind curiosity broadcasts, such as the exhibiting of a heart beat by X-ray photographing.

The news magazine feature idea will be specially developed for television.

"There will be plenty of mistakes at first," Mr. Cock admitted, "but we ask everyone to realise that we are exploring an entirely new technique. Ideas and suggestions are welcomed, the only danger being that most people do not realise the special limitations of the television apparatus to interpret their ideas into visual entertainment."

A Quest For Ideal Reception

The story of some interesting experiments on quality reproduction.

By A. E. BAWTREE, F.R.P.S.

The set referred to by the author.

IN a lecture before the Radio Society of Great Britain in 1924 P. P. Eckersley said that, to judge from manufacturers' catalogues, ultimate perfection of reception was an accomplished fact. One could say the same thing about present-day lists, and, in addition would feel that the ultimate limit of beauty of design had been achieved. Doubtless the listener of 1945 will regard our apparatus of to-day with the same indulgent smile as that with which we regard the instruments in use in the early days of broadcasting.

Having had some twenty years' experience in recording on the phonograph and gramophone, and, having invented and publicly exhibited the Audiometer about twelve years before its adoption in the laboratories of the B.B.C. and the gramophone companies, the writer, at the date of P. P. Eckersley's lecture, was able to form a fairly accurate estimate of the shortcomings of reception at that time, and he set about devising improvements.

A Special Receiver.

The quest was to be solely in the field of acoustics. To eliminate faulty wireless reception the B.B.C. were consulted, and their chief engineer very kindly devised a distortionless receiver. It used much current, some 4 amps of L.T., and 200 volts of H.T., through three stages of resistance-capacity coupling, but it certainly gave a fair start for the acoustic research. This centred round two components, the diaphragm and the sound passage or horn.

The former called for little attention. Contrary to general opinion, a small diaphragm will respond to all frequencies, from the lowest to the highest, and will impart very little of its own period of resonance, provided that it is properly held.

The general practice was to clamp the diaphragm between flat rings of soft material, or rigidly between flat metallic surfaces; thus the edges of the diaphragm were anchored, and the diaphragm gave out harsh noises of its own.

The proper way to mount the diaphragm is between two circular knife edges, slightly smaller than the diameter of the disc. In order to prevent a fluttering noise from the free outer rim of the metal sheet, or chattering on account of imperfect fitting between its surface and the knife edges, the margin of the diaphragm must be liberally coated with petroleum jelly, that product which achieved so much for the success of the early moving-coil microphone.

The horn consists of two parts, the channel and the mouth. The former must be free from self-resonance. Many attempts have been made to achieve this; a large horn constructed of lead one inch thick was less successful than was hoped, while a thick-walled one composed of plaster of paris reinforced with wire netting was little better—witness the echoes obtainable in an empty plastered room.

A Non-Resonant Horn.

The horn, which was designed to go with the properly fixed diaphragm and operated from the distortionless receiver, was composed of thin glazed cardboard, and measured five feet in length, with no bell mouth. From end to end it was covered on the outside with thick, but soft, string, attached with glue. Thus the inner glazed layer was separated from the outer soft and non-resonant layer by a continuous spiral triangular air channel, which so broke up the character of the wall as to make it totally non-resonant.

The horn was placed vertically, mouth downwards, in a cabinet some six and a half feet high. The sound emerged from a prismatic chamber at the bottom, and the construction of this was important. When composed of wood, it imparted marked box resonance, but this was entirely eliminated by forming the sloping back reflector of slate one inch thick, and the triangular sides of slate fully half an inch thick.

Re-designed for Modern Developments.

For seven years this instrument marked the utmost perfection achieved in wireless reception. One after another of the principal manufacturers of loudspeakers brought their best instruments, and often their own receivers, to the writer's laboratory, and carried out direct tests, and in every case they themselves admitted the superiority of the cabinet instrument which they had come to test.

The advent of the cone, and then of the moving-coil speakers, gave a new robustness to reception which the diaphragm-operated speaker could not supply, and a new line of research was undertaken. Every available form of instrument was examined, in private homes, in stores, and at radio exhibitions; also in the laboratories of the B.B.C. Three facts emerged from these tests.

First, that nearly all instruments suffered badly from box resonance, for it must be remembered that an open back may be no preventive of this defect: a mere wooden frame will echo badly.

Secondly, that there was a distinct

(*Continued on page* 344.)

"TUNING WITHOUT TEARS"

THERE are about 140 pages in this 2s. 6d. book, and the publishers—Sir Isaac Pitman and Sons, Ltd.—describe it as an entertaining explanation of the things all listeners should know about their sets, particularly listeners who "have no time" for technical terms.

It is notoriously difficult to explain wireless entertainingly, and though it has often been tried it has seldom succeeded. Whether the author (Frank Boyce) has succeeded in this instance can be judged from a typical extract, taken haphazard from the middle of the book.

The chapter on A.V.C. begins:

"A.V.C. means 'automatic volume control'—just that and nothing else. It is somewhat similar to your sitting in front of your wireless set with the volume control knob in your hand and, when a programme fades, turning *up* the control or, when it comes in strongly, turning the control *down*. Many are under the impression that A.V.C. *cures* fading, but it does that no more than the monthly inspection of my pass-book increases or diminishes my income, and that is about the best analogy I know.

"This A.V.C. business always reminds me of that stupid comparative 'fuller.' You know the sort of thing: 'Dear Sir, If you will send us —— (this, that, or the other thing, or money) we will send you *fuller* details.' How can anything be fuller than it is? If it's *full* it's full, and that is all there is to it, and it cannot be *fuller*.

"Consider the facts for a moment. . . Before the days of this ill-described A.V.C. the maximum performance of a wireless receiver could be obtained by turning up the volume control to its maximum position. If this adjustment caused too great a volume of sound the control was turned down a little to suit the item or the room. Sometimes the station was not so strong as usual, or perhaps, owing to atmospheric conditions, it faded, and so the volume control was turned *up* a little, as I said before, to increase the sensitivity of the receiver . . ."

Readers of this journal will be able to judge from this extract how much light "Tuning Without Tears" will throw on their radio problems.

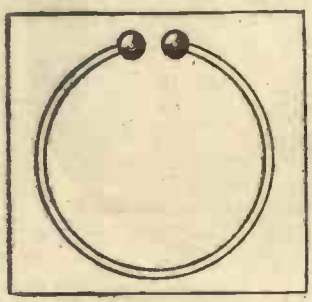
BEFORE MARCONI

Some interesting facts concerning the knowledge attained about magnetism and electricity prior to the wireless telegraphy experiments and achievements of Marconi.

By L. A. HODGES

MOST listeners will know and realise what a lot we have to thank Marconi for, his name always being associated with the beginning of wireless. Many, too, will be familiar with his early pioneering work and will gather by the reference made to such names as Maxwell, Hertz, Lodge, and others, that Marconi did not introduce wireless telegraphy without having some foundations laid by earlier scientists to work upon.

In 1895 Marconi, commencing his experiments, arranged a Hertzian wave apparatus which could be interrupted so as to send out trains of waves representing the dots and dashes of the Morse code. At another point, a few feet distant, he placed an



The first "detector" was a loop of wire with the ends just separated. It was used by Hertz in 1888.

improved form of filings coherer in which a small pile of filings was made to pass or refuse to pass a local electric current.

Marconi found that when he "shunted" this across a local relay circuit the Morse signals sent out by his transmitter were correctly reproduced by the electric current passed locally through the coherer.

This experiment of communicating electrically across space without the use of wires is generally accepted as the starting point of wireless as we know it to-day—the basis of present-day broadcasting.

The Hertz Loop.

The behaviour of loose metal filings, alluded to in this experiment, was discovered by Branley in 1890, and investigated more thoroughly by Popoff, a Russian, and Lodge, the term "coherer" being due to the latter. So here we see that Marconi had a type of detector to base his experiments on right away.

Just before this, in 1888, a German scientist, Hertz, used a loop of wire with the ends just separated to detect electromagnetic waves, this being what we might call the first detector. What a step from this 1888 Hertz ring to the double diode and H.F. pentode valve detectors employed in modern receiving sets!

Previous to this Maxwell, an eminent scientist of his day, evolved a theory in 1864 that, as a result of extensive tests with light and electricity, there was a certain connection between these phenomena, and that electro-magnetic waves would be one of the connecting links. This theory subsequently turned out to be correct as developed by Hertz, although Maxwell himself did not discover how to produce the electromagnetic waves.

It must be observed that early experiments in frictional electricity played a great part in the foundation of wireless telegraphy and telephony.

It is with frictional electricity that scientists first came into contact with the very important electric spark and the oscillatory character of the discharge of electrified objects.

Dufay (round about 1730) proved that there were two kinds of electricity, that the electricity excited by rubbing glass with silk was different from that produced by rubbing sealing wax with flannel.

Frictional Electricity.

That amber acquires by friction the power of attracting light bodies, such as bits of straw, was described by Thales 600 years B.C. In 1671, Von Guericke discovered the property of electric repulsion associated with frictional or static electricity. He also constructed the first electrical machine, by means of which he was able to produce electricity in far greater quantities than had hitherto been possible from the friction of glass or sulphur rods. This machine consisted of a globe of sulphur mounted on a rotating axis, and excited by the friction of a cloth held in the hand.

In 1729 Gray discovered the properties of electric conduction and insulation, following which came in 1745 the invention of the Leyden jar (a form of condenser) used so much by our early wireless telegraphy pioneers.

Battery history is founded on Volta, who in 1799 gave to the world his epoch-making discovery of the voltaic battery or pile. Piling up a column of discs of copper, moist cloth and zinc, he constructed the pile which ever since has borne his name. Oerstèd, in 1820, continuing these various investigations found that the space round the wire joining the ends of a voltaic pile possessed properties similar to those of the region round the lodestone—i.e. a magnetic field.

Concerning magnetism, Dr. Gilbert had, before this time, laid the foundation of magnetic science strong and sure, but had not connected it with the properties of electrified amber or glass. It might be mentioned here that the property of a magnet taking up north and south position when freely suspended was known to the Chinese at a very early period, and in the 4th century Chinese navigators employed the magnet to direct their courses across the open seas.

After Volta's battery the next few discoveries were relatively of more importance. Following the introduction of the galvanometer in 1820 came the important invention of the electro-magnet in 1825 by William Sturgeon. This instrument, in one form or another, is at the basis of all our electrical industries.

This brings us to 1831, to Michael Faraday—the Father of Electrical Engineering, who discovered the relation between magnetism and electricity. He found that an electric current could be created in a closed loop of wire by merely moving a magnet to or from it. Hence a magnet produces Volta's electric current in conducting wires merely by being moved rapidly in their neighbourhood.

The First Dynamo.

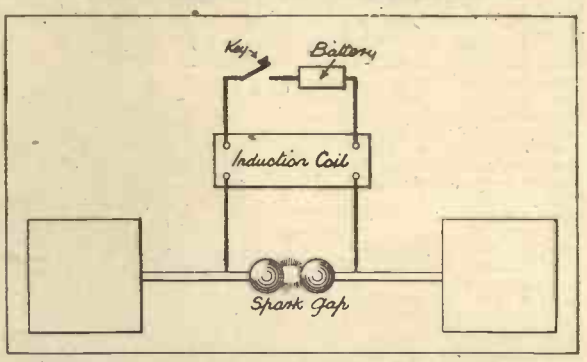
Faraday then gave us electro-magnetic induction. To him we are indebted for the first dynamo. His discovery is the root of the induction coil and the transformer. Practical applications now began to manifest themselves, the most important of which was the electric telegraph in 1837, the first application of the electro-magnet. There is no doubt that a lot of ground covered in the development of telegraphy and its associated apparatus was of assistance in the origin of wireless telegraphy. Mention of telegraphy brings to mind the names of Morse and Wheatstone.

Just as important is the invention of the telephone in 1876 by Bell. We all know the subsequent developments and applications of this discovery.

In the history of electrical science outlined above it is impossible in so short a space to give details as to how inventors were led to their discoveries, and equally impossible to mention the work of all the other scientists. These latter men who have left their names in history include Arago, Ampére, Ohm, Galvani, Thomson, and Kelvin, followed by the comparatively more recent works of Lodge, Marconi, Fleming, and De Forrest.

However, sufficient landmarks have been indicated to show what a vast amount of basic work and principles were accomplished and laid during a long stretch of years, without much practical application but nevertheless useful and necessary when applied by later scientists who have made rapid progress during the past forty years.

AN EARLY TRANSMITTER



The arrangement of the original Hertz oscillator—virtually a crude spark transmitter. Square metal plates formed the aerial, and the oscillations sent out appeared as a spark at the gap of the Hertz "detector" loop.

A Fine Variety

1936 Receivers of Renown.

A splendid eight-page photogravure section dealing with the latest commercial sets.

The Spirit Signal.

A radio story of the occult by J. D. Strange.

Looking Inside.

Three special articles describing the layout, valves and power supplies of modern commercial receivers.

Wireless and Warfare in Abyssinia
How I Became "Stainless," by Stephen
The Roberts Four
British Broadcasting News and Views
Short-Wave Developments
We Are Cleaning Up This Radio!
It All Depends on Lisburn
Germany's Tower of Babel
The "Super-Regen"
The B.B.C.'s Television Transmissions
From My Armchair
Favourites of the Microphone
The "Spanspace"
"Plug-In" Economy
This Death Ray Business
Italia on the Air
Television To-Day
Question and Answers
Your Station Guide
Quality Radio

They're All In

THE NOVEMBER

WIRELESS AND TELEVISION REVIEW — PRICE 1/-

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

MAINS L.T. FOR OUTPUT VALVE.

A. W. (Sheffield 2).—"I recently made up your 'Northern Four' (Sept., 1934 issue), and instead of the specified 2-volt power valve in the last stage I should like to substitute a 4-volt valve to run from a mains transformer. The valve is a P.X.4.

"Will you kindly let me know the necessary alterations?"

The best way is to use a five-pin valveholder for the mains-fed output valve. There is one extra terminal on this (the "cathode," in the centre), and this type of valveholder enables the new connections to be made very easily, whether the valve itself has four or five pins.

To use a four-pin valve such as the P.X.4 in the new five-pin valveholder you should re-wire as shown in the sketch, also taking the lead marked "X" (the one from the centre of the potentiometer) to the centre terminal of the new valveholder.

At some future date you may want to replace your four-pin valve (P.X.4) by one of the equivalent *five-pin* (indirectly-heated) output valves; you could then do so without changing the valveholder, and the only alteration then necessary would be a slight one to this lead "X."

To suit a five-pin valve, the end of the lead "X" would have to be removed from the centre terminal on the valveholder, and wired instead to the metal baseboard. That would be the only wiring alteration required for changing from the mains-driven P.X. (four-pin) type of valve, to a five-pin (indirectly-heated) mains valve.

The necessary re-wiring to suit either type of valve is easily carried out, as indicated in the sketch.

The chief difference is that the old filament wiring of V.4 is removed, and the new connections are made by twisted flex to the potentiometer and 4-volt terminals of the L.T. transformer.

This transformer must be placed fairly near the set (to keep its L.T. leads as short as possible), but there must be no magnetic interaction between the L.T. transformer and the rest of the set. So do not mount the transformer on the baseboard, but keep it well away from all components—otherwise it may cause humming trouble.

Note also how the low-resistance potentiometer is arranged across the leads to the four-volt terminal of the transformer. (Instead of using the centre-tap terminal on this latter component, the slider terminal of the potentiometer is used.) Any tendency to hum that may show itself can then be removed by slight readjustment of the slider—which is an electrical centre-tap, superior to the tap made by means of a terminal.

Instead of using a separate grid bias tapping from the L.F. transformer for the last valve grid bias, it is better to use automatic bias when a mains-fed valve is employed. This method needs a fixed resistance and condenser in the "cathode" lead, as shown. For the P.X.4, the value of the bias resistance should be 750 ohms. (If ever you change over to a different output valve, with anode currents or grid bias requirements different from the P.X.4's, you will need a different value of resistance—the correct value for any valve can be ascertained from the valve-makers.

It will be seen that the wiring to the "G" and to the "A" (or "P") terminals of the valveholder are unchanged; but note the alteration to the wiring of the L.F. transformer G.B. terminal.

CURE FOR TOO MUCH BASS RESPONSE.

A. E. (Worthing, Sussex).—"Can you tell me a simple method of tone control to cut down bass on the lines of the 'P.W.' method brought out some years ago when an L.F. choke was employed in the anode circuit?

"I particularly want this method, as I tried it at the time and found it very satisfactory. Also, the set on which it is to be used is a special one, on which I have been working some time, and I do not wish to alter its grid circuits.

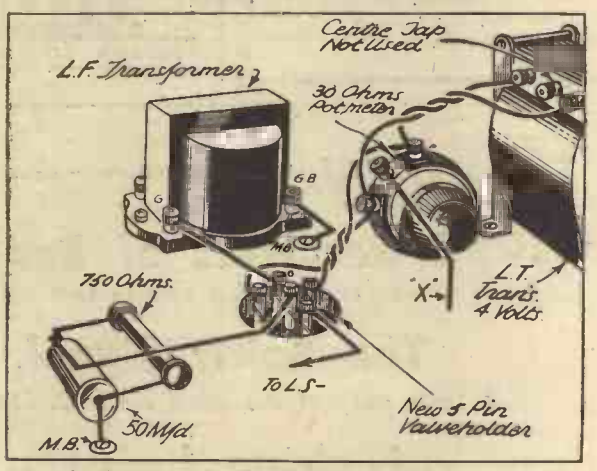
"The tone control I used before from 'P.W.' had a variable resistance and a choke across the L.F. transformer primary, but I do not remember the values now. Can you suggest figures for these, and explain the wiring to *reduce* bass, which is definitely too pronounced owing to the very high selectivity of the circuits I have worked out?"

If the over-emphasis of the bass is caused by unusually sharp tuning it should be possible to correct for this across the L.F. transformer primary, as you suggest. And as the method we have in mind is simply applied there should be no disturbance of the rest of the set's characteristics.

You need a fairly high variable resistance—30,000 ohms or more—and an L.F. choke of about ·3 or ·4 henry. The choke and resistance should be joined in series, across the transformer primary.

With the resistance "all in" there should be little if any noticeable alteration to the tone; but with the resistance moved towards the "all out" position, the by-pass arrangement becomes increasingly effective, tending to shunt away more and more of the low-note response.

REWIRING FOR A P.X.4



This pictorial diagram shows the alterations suggested in the reply to A. W. (Sheffield 2).

ACCIDENTALLY LEFT OFF THE G.B. NEG. LEADS.

J. F. C. (Corbridge).—"After changing H.T. battery one night recently I switched on, and it just dawned on me that I had forgotten to connect up the G.B. battery. To be exact, I had the G.B. + plug inserted, but I had forgotten the grid bias negative plugs.

"I am now suffering from poor quality, although there is ample volume and selectivity.

"Now which valve would be most likely to have suffered most? Could I have them tested as regards efficiency, as they are all new."

Generally speaking the output valve is the one that suffers most when such an accident occurs; but this is only a general rule, and there are exceptions, when other valves may be found to have come off worse than the output valve.

The best thing to do is to get them checked up for correct anode current—what is called an emission test. This is easily done by a dealer, who has a special tester for the purpose. Failing that it can be done with a milliammeter in the plate circuit of each valve in turn, the object being to see if, when the recommended voltages are applied to filament, grid, and plate, the anode current is up to the rating for those voltages.

Failing testing instruments to check up the emission, it is often possible to check a valve's loss of emission by substitution. That is to say, try another valve of the same type, in the suspected valve's holder. If the poor quality immediately disappears you can safely infer that the replaced valve was the one that lost its emission, and that the remaining valves will carry on, at least, for a time.

HOW TUNING INDICATOR SHOWS UP EFFICIENCY.

H. W. E. (Rotherham).—"There are two ways of earthing the set which are open to me. One is to a water-pipe, rather a long way from where the set is placed. The other way is to a direct earth-pin.

"As the latter is closer to the set I should have no hesitation in using it if it were not for the fact that the point of entry into the earth itself is a small bed or edging along the side of a paved yard. And being close up to the wall it is always rather dry there.

"I have tried them both, but cannot decide if one is better than the other. What is noticeable, however, is that when the waterpipe earth is tried the light in the tuning indicator goes nearly to the top of the slot, but whereas when the other earth is used it never does so. Does that mean anything?"

Certainly it does. The height of the column of light in a tuning indicator is proportional—within limits—to the set's performance at the detector. And if one earth enables you to get a greater indication than the other will give, you can be confident that the former is the better arrangement.

Apparently yours is a very sensitive tuning indicator, and the listener who possesses one of these should not forget that it may be used in much the same way as a valve voltmeter to make comparisons. If, when tuning has been accurately adjusted and readjusted, it is found that one aerial, or one earthing arrangement, or one H.T. setting, etc., gives a greater tuning indication, it can usually be assumed that this is because it is visually demonstrating an improvement that cannot be shown up by loudspeaker and ear.

THE PRACTICAL SIDE OF ELECTRICAL SCANNING.

E. P. (Clapham Common).—"It is a good many years since I wrote to your Query Department, but remembering past help I should like some assistance with television circuits. Can you tell me if you have dealt with electrical scanning, the reasons for condenser values, etc.? I hesitate to get the expensive books on the subject, but I should like to know the whys and wherefores of this type of scanning,

You will now have seen the announcements about "The Book of Practical Television," which has been made available to all our readers for a nominal sum. This is exactly what you are looking for, since it is the up-to-date angle, and the practical applications that are dealt with extensively, the usual textbook histories of development, etc., being mentioned only when they are relative to present day practice.

One word of advice, however—get your application in quickly.

TELEVISION'S RAPID GROWTH

By CARDEN SHEILS

MARCONI'S early experiments are separated from the first public broadcast service by a gap of nearly thirty years, and of course the interval can be stretched still farther by dating the discovery of wireless back to Hertz in 1888. This only goes to show that most really big inventions take a long time to mature, and wireless is no exception to the general rule.

Even the valve took nearly twenty years to win its way to the front, whilst the so-called "modern" superhet circuit is by no means a chicken in years. One finds exactly the same story in other directions. Aviation, for instance, is still far behind radio as a popular institution; whilst the manufacture of artificial silk took half a century to reach its present stage of perfection.

Yet people are complaining that television—which has barely ten years to its credit—is taking too long to reach perfection. One can, of course, sympathise with this point of view, but those who are behind the scenes and know what is being done in the laboratories at the present moment are actually congratulating themselves on the progress made. Within the last year or so they have definitely got to the stage where they can televise a standard cinema film in sufficient detail to enable each figure on the screen to be identified. The reproduction, it is true, is still on a reduced scale, but the picture shown is beautifully clear and free from flicker.

A GREAT BOOK OFFER

Full details appeared last week of the simple and inexpensive way in which you can secure a copy of the most comprehensive and luxuriously prepared work on Television yet produced. The "Book of Practical Television" is the great achievement of a team of famous scientists and engineers, and forms the subject of a very special offer to our readers. This is a rare opportunity such as may never be repeated.

SEE ALSO PAGE 341.

No one who is in the know will admit that there is the slightest ground for complaint, at least on the technical side. For those who have not yet had time to dip into the subject, the "Book of Practical Television" will come as an eye opener. It points out exactly what is involved in this business of seeing at a distance, and explains clearly and simply how the various problems have been tackled and overcome. In fact, it seems that the experts have sufficient margin in hand to be able to show television pictures not only on an ordinary screen, but also in relief (stereoscopic) and in colour.

Like any other pioneer invention, television has its commercial side, and those responsible are waiting to be convinced that it will pay its way—and show a profit—before launching it on a large scale. The high-definition picture service from Alexandra Park which is scheduled to start early next year will provide the crucial test. If the public really want to look-in as eagerly as they wanted to listen-in to the B.B.C.'s first broadcast programmes years ago, there can be no doubt of the future of television. It will go ahead like a house on fire.

THE LINK BETWEEN

By G. T. KELSEY.

THIS is your last chance to obtain S.T.700 accessory literature through the medium of our postcard service. As I promised in the original S.T.700 number of "P.W." this offer would remain open for one month, and this is the fourth week.

Judging from the deluge of cards that has already been received, there cannot be so many of you who have not yet applied. But will the late-comers kindly note that their cards must be received by the first post on Saturday, November 30th, for I am afraid that after that date no further applications can be considered.

I should like to keep the offer open indefinitely, but that would lead to a temporary cessation of our usual postcard literature service, and already catalogues are beginning to accumulate on my desk. Next week, therefore, I must make a start on them, and then you will be able to obtain them in time for your Christmas shopping.

For your convenience, I am once more repeating the list of accessory literature that is available, and for the benefit of new readers, may I explain that any or all of this literature can be obtained quite free of charge by sending a postcard to me at John Carpenter House, John Carpenter Street, London, E.C.4, giving the number or numbers of those in which you are interested, together with your name and address.

Just one further point. Several of the cards that have already been received have had queries on them relative to the S.T.700. Will readers kindly note that all queries should be written on a separate sheet of paper, which should be addressed to the Query Department at Tallis House, Tallis Street, London, E.C.4, to avoid confusion and delay.

VALVES.

Battery Model: Cossor 210 VPT met., 700/1; Cossor 210 R.C., 700/2; Mazda L.2 met., 700/3; Hivac P.X.230, 700/4; Hivac V.P. 215 met. (alternative to H.F. pentode), 700/5.
Mains Version: Osram V.M.P.4G., 700/6; Marconi V.M.P.4G., 700/7; Osram M.S.P.4, 700/8; Marconi M.S.P.4, 700/9; Mazda A.C.2/Pen., 700/10.

SPEAKERS.

Battery Model: W.B., 700/11; Rola, 700/12; Blue Spot, 700/13; Amplion, 700/14; Wharfedale, 700/15.
Mains Version: W.B. type for S.T.700 (700/16).

BATTERIES.

H.T.: Drydex, 700/17; G.E.C., 700/18; Aerialite, 700/19; Milnes, 700/20; Lissen, 700/21; Fuller, 700/22.
G.B.: Drydex, 700/23; Lissen, 700/24.
L.T.: Exide, 700/25; Lissen, 700/26; Fuller, 700/27.

AERIAL AND EARTH EQUIPMENT.

Aerialite, 700/27; Electron, 700/28; Graham-Farish, 700/29

MAINS UNITS.

Ekco 700/30; Atlas, 700/31.

Luxury Listening.

With a climate like ours it doesn't do to take too much for granted concerning the weather. As I write these notes it is cold—icily cold—and an attack of the shivers in moving from one room to another has reminded me of a particularly appropriate topic for Link Between. The chances are that by the time these notes find their way into print, the long overdue "Indian Summer" will have turned up and my observations will no longer be quite so appropriate. However, I'm going to stake a chance on the prospect of an even colder spell, and ask you what you are going to do about it?

Are you one of those listeners who struggles from one room to another with the set in order to listen-in in the warmth, or do you boast a portable fire? It is not so good this weather if you are forced to sit in a cold room because the wife has put the fire in the non-radio room! But why worry, anyway? What is the matter with an extension speaker?

Because of its tremendous convenience, I should have thought that everybody with a wireless set would have gone in for an extension speaker. And yet, if my experience may be taken as criterion, that is far from being the case—indeed, I am convinced that there are a number of listeners who do not even know what an extension speaker is!

Only the other evening I had some friends in who were most intrigued because I had my set in one room and an extension speaker in another, and they promptly wanted to know the make of set that enabled this to be done. When I told them that it could be done with practically any set, and that ninety-nine to one their own set at home was fitted with the necessary terminals for the extension to be made, they were amazed.

As a matter of fact, several of the prominent speaker manufacturers have properly got to grips with the extension speaker problem of late, and it is now possible to obtain speakers that are ideal for extension purposes at most reasonable prices. W. B., Celestion, and Rola provide typical examples, and the amount of work involved in fitting one is negligible. All that is required is a length of twin wire from the set extension speaker terminals to the speaker itself, and the job is done.

Why not go into your local dealer's for a demonstration the next time you are passing? You will find an extension speaker a great boon, and it easily justifies the cost, for it is almost as good as having two sets in the home.

A QUEST FOR IDEAL RECEPTION

(*Continued from page* 338.)

sound produced by the fabric of the cone, similar to the flapping of a flag in the wind.

And thirdly, that the record of the audiometer, even when made with the utmost accuracy, with the aid of the quartz oscillograph, is no true test of audible values.

A test may show a speaker to give perfect response over the whole range of audible frequency, and yet the resulting tone may be definitely defective. The reason for this is that sounds above audible frequency penetrate the brain and impose their quality upon the effect, although not audible.

It is these inaudible upper tones which impart the "rosin" sound to the violin, which is usually missing in moving-coil reproductions, and the same tones impart the personality of a speaker, and they are sadly missed, particularly in radio drama.

The series of experiments following the discovery of the above defects produced an instrument which is probably superior to anything else to-day. It is seen in the photograph.

In front of the heavy sloping slate slab in the base has been fitted a modification of a well-known commercial speaker. A stout mahogany basin was turned, a foot in diameter at its mouth, and with a hole four inches in diameter in its bottom.

Two Separate Speakers.

A membrane was stretched across the mouth of the basin, and another across the hole in the back. A bolt pulled the two membranes tightly together, and to the rear of this bolt was attached the reed of the cone speaker chassis.

The speaker was tightly embedded in crumpled blanket, the top of the space covered with a board, and the front filled in with an ordinary fret. This speaker renders perfectly the inaudible upper tones, but fails in the lower pitches, giving them as a mere mush. It is totally free from box resonance and fabric flapping.

In a cavity of about fourteen inches cube above this speaker is situated the best obtainable modern moving-coil speaker. Like the lower one, it is packed round with blanket, covered above with a board, and in front with a fret. Used alone, this speaker gives magnificent bass, free from box resonance, and with only a moderate amount of fabric flapping, but it fails in the upper and super upper tones.

In the space above this speaker is provided a three-way switch. In one position the lower speaker alone is in operation, in a second position the upper speaker alone operates, while in a third the two speakers work together. The upper speaker is never required alone. For most purposes the two speakers are used together, but for radio drama the lower one alone is best, owing to its superior power of bringing out the super higher frequencies.

BARRY KENT CALLING

News and Views from the "Big House."

Mr. Salt for Malaya.

FURTHER to my exclusive advance news about the B.B.C. being asked to find a general manager for the new Broadcasting Corporation in the Malay States, it is now interesting to hear that Mr. S. Salt of the Talks Department of the B.B.C. has been appointed to the vacant post. Mr. Salt was one of the most vigorous and adventurous of the talks officials. His departure, taken in conjunction with that of Mr. Fielden, now in India, Mr. Felix Greene, going to America for the B.B.C., and Mr. Charles Siepmann, now Controller of the Regions, means a fundamental change in the staffing of the Talks Department.

* * *

Radio Drama in 1936.

Mr. Val Gielgud has an interesting programme of plays planned for the first quarter of the New Year. The series will open with "Queen of Baltimore," by Mr. Norman Edwards, which Mr. Gielgud himself will produce. In the middle of January, "Twelfth Night" will be given. Other projected plays are as follow: "Mary at Loch Leven," by Horton Giddy; "The High Road," by F. Lonsdale; "Ding and Co.," by C. K. Munro; "Twenty Years After," by Dumas and Riddell; "King Henry VIII"; and the "Voysey Inheritance," by Granville Barker.

* * *

Newfoundland and Sir Walford Davies.

Enthusiastic appreciations of Sir Walford Davies' broadcasting from Newfoundland have done a lot to advance the prestige of this popular broadcaster with the management at Broadcasting House. Plans are being framed to bring Sir Walford more into the general programmes than he has been for some years.

* * *

Christmas Day.

The special programme including the King's message will be given from 2.30 to 3 in the afternoon. In the morning at 10.45 there will be a general relay of a religious service in Leicester Cathedral. At lunch time "The Mikado," Act I, will be given on gramophone records in the National programme, the Regional alternative being Troise and His Mandoliers and the Northern Ireland Orchestra.

* * *

Music Festival, May, 1936.

The B.B.C. has decided to embark on another London Music Festival in May. There will be six special public concerts all of which will be broadcast. Toscanini will be invited to be one of the guest conductors.

* * *

B.B.C. as Model.

An influential committee of public men has been for some time quietly exploring the possibilities of remodelling the Post Office on B.B.C. lines. The idea is to denationalise the Post Office to the extent of enabling its work to be managed on business lines, without Parliamentary interference. There is a growing feeling that more use should be made of the B.B.C. as a model organisation, and that not only the Post Office but also the railways might be suitably reorganised under the direction of Sir John Reith.

* * *

Broadcast Opera.

The future of broadcast opera is again under serious discussion. There is a movement to bring back the "potted" studio opera that was so successful in the early days of the B.B.C. Interest in opera is not confined to the Music Department of the B.B.C. Both the Drama and Variety Departments are keenly interested. Mr. Stanford Robinson, conductor for Mr. Maschwitz in variety work, regards studio opera as a special hobby, and is likely to have a good deal of say about it in future.

Money Anxiety.

I hear that the most optimistic expectations of increased revenue, as the result of Government action on the Ullswater Report, will not satisfy the appetite of the B.B.C. The snag is television, for which an enormous sum will be required in the next few years. I fear it will be a long time before the B.B.C. will have recovered from the mistakes of its building policy which imposed a serious drain on limited resources.

ON THE AIR

Candid comments by Our Broadcasting Critic on recent programmes

TWO talks that stick most in my memory this week are by Professor Eileen Power on Mosques and James Agate on Mosquitoes. The one was serious and the other amusing. Eileen Power was talking to the schools, and James Agate to the whole country in general, and to theatre-goers and schoolmasters in particular. If schoolmasters were listening en masse then I wager that conversation in common-rooms hasn't been lacking lately.

* * *

European history isn't interesting to every child. But Eileen Power has a way with her that compels good listening. Her talk was styled an illustrated talk. She began by describing a mosque. She places in it a lonely figure. The lonely figure speaks. It is a wailing voice that we hear, calling all good Mohammedans to prayer. An extremely impressive introduction this. It captures the imagination which is held throughout the talk.

Effects of this sort are ideal for children. I think the Effects Department might do still more in broadcasts to schools than they do already. Their efforts might be better appreciated by children than by adult audiences.

Very Impressive Effects Again.

In S. P. B. Mais' talk on The Downs and Chanctonbury Ring the effects were again very impressive. He finished in grand style to the song of the lark and the tinkling of sheep bells.

I was rather disappointed with the variety bill from Morecambe. One of the turns, "The Rag-Bag of Vanity," was an old favourite of mine. I remember him of old. He is still singing the same song: "I Wonder What It Feels Like To Be Poor." But you must see him and his make-up to appreciate his song. These were not described, and you forgot he was announced as a rag-bag. So the point of the song is missed. This was the case of a comedian using the wrong medium. Or, to be more accurate, he should not have been one of the four turns of the bill to be broadcast.

* * *

He was followed by a fifteen-year-old, clad in surplice and cassock, singing about some abbey ruins. Then came a Mother song, and as a finale "Just A Song At Twilight." Who is it who encourages these children to sing songs of this sort? It isn't often we hear boy sopranos on the air. Whenever we do it is to hear some eerie songs of Eventide. Surely there are better songs for boys?

The last item came as a tonic pill. There were a couple of fiddlers who sang their own introduction. They raised our drooping spirits. They played with gusto. But I would have preferred a little more singing, for the occasion demanded it.

* * *

I heard you calling, Tyneside. Only by a lucky chance however. Four p.m. isn't a good time for listening, you know, and I'm afraid that most of the South (for whom you said you were performing) were otherwise employed. Anyhow, I can tell the South how good you were, especially your compère (who, I'm afraid, sounded dreadfully southern), Esther McCracken and her marvellous song on two notes about a lost child (I can't say I got all the words; Tyneside sounds a foreign tongue in the South), and J. R. Lowson on pigeons and the "saw" (what tone, boys!).

Indeed, I liked the whole show so much that I hope the B.B.C. will put you on during an evening sometime.

* * *

Lovers of the fistic art must have enjoyed Lionel Seccombe in the Saturday evening Sport talk. They may have felt a little despondent over the state of British boxing at the present time, but although Mr. Seccombe didn't try to gloss this over he didn't speak hopelessly of the future.

Do We Think Too Little?

There is yet another talk that calls for comment. It is Maurice Healy's in the "Men Talking" series. Mr. Healy doesn't hold a very high opinion of his fellows as thinkers. People to-day, he said, are so spoon-fed by the Press that they have lost the habit of thinking for themselves. They are just as slovenly in expression. They mutilate their language, they listen carelessly, and they repeat carelessly. He was prepared to except the Irishmen and Scotsmen in this respect.

As an instance of careless speech he gave us the history of the "'m" in the housemaid's "Yes'm." Starting originally as a word of several syllables (I can't quote it because I couldn't quite catch it) it has been so clipped and curtailed that it cannot be further shortened now without disappearing altogether.

He urged listeners always to listen and to think well. "For a good talk there must be a good listener," he said. Mr. Healy was inclined to preach. He promised once that he wouldn't. But he didn't keep his word, as is evident from his last sentence: "Believe in something or somebody that is really worth dying for. If you can't do that it means you are really dead already."

C. B.

Programme Problems Probed—No. 2.

ART MANGLED IN THE MUSIC MACHINE

(*Continued from page 335.*)

delude its customers and get away with it. Let it not be imagined that I am critical of the B.B.C. musical operations in principle. On the contrary, it is my belief that the B.B.C. stand between this country and the devastation of jazz; I believe that the B.B.C. have saved Britain from being a musically backward nation; that the B.B.C. have brought Britain into the front rank of orchestral nations for the first time in its history. During the past few years the B.B.C. have performed a great and glorious work for music. But my contention is that they have not done their best job yet.

In my opinion this way lies salvation: Reduce the public work of the B.B.C. Symphony Orchestra (both as a whole and as sectionised units); give them more time for rehearsal and for private study; supplement the broadcasting activities of the B.B.C. staff musicians by more broadcasts from "outside" professional orchestras. There is a moral responsibility resting on the B.B.C. in this last-named respect.

The Mechanised Music.

There is no question that mechanised music has caused terrible damage to exponential music. Orchestras have gone under by the score and hundreds of professional musicians have become the victims of the radio and record craze. It is the moral duty of the B.B.C.—a heavily State subsidised public utility body existing on public subscriptions—to make use of existing independent orchestras as much as possible. Listeners would prefer this also, because they would be certain of more style-variety and more individualistic interpretations in orchestral broadcasts.

Let the B.B.C. accept this as a constructive suggestion: Reduce the quantity of musical broadcasts and increase the quality. There is no real reason why music should occupy more air-time than all other classes of radio entertainment, education and religion put together. If the amount of time is cut down to 40 per cent, the B.B.C. Orchestra would have more time for improving the quality of broadcasts, and the money saved could be employed in utilising the services of "independent" combinations who would augment the official orchestra in supplying the 40 per cent of musical broadcasts.

From Studio To Desk.

There is a serious danger of the B.B.C. creating a huge musical machine, a bureaucracy that will be more concerned with the mechanics of concert-organising than artistic creation. There is already a nucleus of this in existence. Good musicians on the B.B.C. staff are being turned into "organisers" and "administrators," their minds diverted from artistic activities to desk work, the filing of returns, the indexing of auditioned artists, the dictating of memoranda and the countersigning of other memoranda. In this vast machine—highly organised, smoothly revolving—the art of music and the soul of the musician may be mangled. Let the B.B.C. beware!

TECHNICAL JOTTINGS

Items of Interest to Every Enthusiast.

By Dr. J. H. T. ROBERTS, F.Inst.P.

Cost of Juice.

YOU may remember I said something in these Notes the other week about the question of the cost of the "juice" for your set when using H.T. dry batteries. It is a simple matter to estimate the total number of ampere-hours, or milliampere-hours if you like, used in the course of a year, and the total amount of money you spend on high-tension batteries and the re-charging of low-tension accumulators. In this way you can easily calculate how much the juice is costing you per ampere hour or, if you work on voltages for the H.T., how much it costs you per *unit*, and compare this with the cost of the juice for an all-electric set.

Economy.

Anyway, just now I want to say something about the kind of H.T. batteries to use and the question of economy. You have read many times that it is cheaper in the long run to use good quality British made batteries instead of yielding to the temptation to buy low-priced foreign batteries on the theory in this, as in so many other things, that to be low-priced is not necessarily to be economical.

Batches of batteries are from time to time submitted to the National Physical Laboratory for comparative tests, and in one of these tests recently the slogan "buy British" was thoroughly vindicated, as you will see from the following figures. Several batteries were tried, all rated nominally at 60 volts; some of these were well-known British standard batteries, whilst the others were of various foreign makes.

Some Interesting Tests.

Tests consisted briefly in discharging the batteries, at about the same rate of discharge as they would get in use with an average radio receiver, until the voltage had dropped from the rated 60 to 36 volts. It was found that with the British batteries the life in this sense, that is, the number of hours discharged before the voltage fell to 36, came out at considerably over 200 hours. With the foreign batteries, however, the drop to 36 volts was reached in one case in about 120 hours and in another in about 170 hours.

A further important point is that with the British batteries the drop was fairly gradual throughout, whilst with the others it was comparatively rapid in the early stages; if we took a higher figure than 36 volts, say 48 volts, the comparative showing would have been still worse. After about 150 hours working, when the British batteries were showing about 40 volts, some of the others had fallen so low that they were useless, whilst only one of them was standing up to a respectable voltage, about 37 volts.

How the Battery "Wears Out."

You must remember also that it is not merely the drop in voltage which you have to consider—that is bad enough—but the increase in internal resistance which generally occurs at the same time. This increase in internal resistance has the same effect as falling voltage because the voltage which is left has to drive the current through an additional resistance. Furthermore, any appreciable resistance in the high-tension battery is very apt to cause the building up of alternating voltages at the terminals of the battery and so to produce unwanted coupling effects which may render the whole set unstable.

The little extra that it costs to buy a good battery is well worth while, and "cheap" batteries are not cheap at any price. To buy a cheap battery is only to buy yourself a lot of trouble.

Impedance-Matching.

Several readers have asked me for particulars of the aerial-impedance-matching transformer which I mentioned some time back. This is a dodge for cutting out static and interference of various kinds, and it employs the above-mentioned transformer at the aerial end of the aerial lead-in, together with a receiver-impedance-matching transformer at the other end, that is, lower end of the aerial lead-in.

This latter transformer has a number of special connections, which it would take some little time to describe here, and has also a connection to earth. The aerial down-lead consists of a shielded (metal sheathed) cable. If you want more particulars or details of the above-mentioned receiver-impedance-matching transformer I can let you have them, but I don't want to go into all that at the moment, owing to lack of space.

Radio Reconditioning.

I was talking to a man who runs a business of repairing and reconditioning radio sets, and he told me many interesting things, one of which was that quite an appreciable percentage of the sets have nothing more the matter with them than *dirt*, in plain language, and all they need to put them into action again is a good clean-up. Of course, any respectable workman setting to work on reconditioning a set would give it a good clean out, as part of his job, if he found that it required it, just as a watchmaker, if called upon to replace

(Continued on next page.)

INDEX TO ADVERTISERS.

TECHNICAL JOTTINGS

(*Continued from previous page.*)

a spring, for instance, will give the watch a clean-up if he thinks the dirt has got in (at any rate he will always tell you it wants cleaning and charge you for it).

Examine the "Works."

It is surprising how some people neglect their sets, and I have many times seen radio receivers with dust at least an eighth of an inch thick on the tuning condensers and other high-frequency parts. I think some people imagine that because a radio receiver does not involve all sorts of gear wheels and "working parts," in the ordinary sense, in other words shall we say because it does not require oiling like a machine, therefore it does not matter if dust and dirt get inside. This is quite a wrong view, and in point of fact dust getting on to condensers, whether fixed or variable, especially the latter, and on to different insulating parts, will cause all kinds of trouble. Remember that not only is dust often quite a fairish conductor, but it has the property of absorbing some degree of moisture, and this latter can play havoc with the high-frequency part of the circuit.

Watch Connections.

It is a good plan first of all to have the set so properly enclosed that dust and dirt do not easily get in, and secondly to go over the "works" thoroughly about every two or three months and clean them out. When doing this you want to have all battery and mains connections removed. Use a nice soft paint brush or something of the kind. Take great care not to break or disconnect any of the wire or busbar conductors in the set, and pay particular attention to variable condensers.

Isolating the Speaker.

When you are using a mains-operated set or amplifier, whether direct mains-operated or by means of a mains unit, it is often a good plan to put a fixed condenser into each of the loudspeaker leads. At first sight you might think that two condensers were unnecessary and that the loudspeaker would be effectively separated from the set by means of a condenser in only one lead. The argument for a condenser in *each* lead is somewhat the same as that for a two-pole switch with ordinary electric lighting. A single-pole switch breaks the current, but does not disconnect the electric light or instrument, or whatever it may be, from the mains, because there is always the other terminal permanently connected. A double-pole switch, however, like a two-point plug, gives you complete disconnection from the mains. In the same way the fixed condenser in *each* lead completely separates the loudspeaker from the set.

Single-Pole and Double-Pole.

If the amplifier or radio set is operated with H.T. batteries it is quite sufficient to use a condenser in only one lead, corresponding to a single-pole switch, but for proper isolation of the loudspeaker two condensers should be used when the mains is employed as a source of power. These condensers, by the way, should be of a fairly large capacity, 2 microfarads each or more.

MUSIC OVER EUROPE

(*Continued from page* 329.)

successful relay of a European concert from the same city a few weeks before. And, of course, many of the Salzburg relays were admirable.

In this country we are dependent upon the submarine cables for our line communication with the Continent. The Post Office is increasing the number of these precious links. A new submarine music-carrying cable has just been put down from St. Margaret's Bay, for example.

On the Continent itself the future seems wrapped up in the doubling or trebling of the now widespread networks of single music-carrying channels. When the work has been done it will be perfectly simple to link up widely separated countries in Europe by land-lines, without in any way interfering with the special needs of each participating country's own simultaneous broadcast networks.

Meanwhile, I have said enough to show that the work already accomplished is a gratifying proof that international co-operation is possible when a common interest is at stake. Without the loyal co-ordinative effects of all member countries of the C.C.I.T., it is very doubtful whether we should have enjoyed so many locally radiated programmes, originating in sometimes far distant foreign broadcasting studios.

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HAS anyone an S.T.600 for sale? No callers. J. D., 16, Manor Close, Worcester Park, Surrey.

POPULAR WIRELESS, November 30th 1935 REGISTERED AT THE G.P.O. AS A NEWSPAPER.

ENTHUSIASTIC LONDONERS ACCLAIM S.T.700

Popular Wireless & Television Times

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EVERY WEDNESDAY PRICE 3D

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Vol. XXVIII.
Nov. 30th, 1935.

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POPULAR WIRELESS AND TELEVISION TIMES

MANAGING EDITOR: N. F. EDWARDS. TECHNICAL EDITOR: G. V. DOWDING, Associate I.E.E.

POWER IN U.S.A.
MAST FACTS
NOT FICTION

RADIO NOTES & NEWS

FRENCH LICENCES
CAR RADIO
SONGS AS NEWS

The Organ Stops.

FOR a long time I have noticed that Poste Parisien has been fighting shy of those broadcasts on the electric organ, which were once a feature of its Saturday night programmes.

Now it transpires that the organ-isms have all been removed, the whole thing dismantled, and "there's weeds round the ranch-house door" so far as Poste Parisien's electric organ is concerned.

The large-scale experiment with this type of organ was, I believe, quite unprecedented, and I am sorry that we shall hear it no more. They say the tone was "too dry," but when I heard the instrument it always whetted my appetite for more of its unique oscillatory melody.

Adding Noughts.

THE first American radio station to broadcast on high power in 1922 was W L W (Cincinnati), which came on with the then unheard-of figure of 500 watts. Other stations followed suit, so W L W let them push up to equal power, and then, in 1924, added a nought, and worked on 5,000 watts.

This staggered the folks and blokes for a time; but in 1928, just to show 'em, W L W calmly added *another* nought and set a fashion for 50,000-watters.

Then, of course, attention became riveted on the famous W L W "cigar-shaped" mast, and people forgot about the noughts for a time, till the engineers reminded them by calmly adding yet another! The present power is thus 500 kw., so you need never be surprised to hear W L W on 428·6 metres, when Stockholm and Paris P T T have gone to bed.

The Surprising '80's.

I WONDER how many of my readers remember the thrill we amateurs got in 1922 when the radio tests of that season disclosed that amateurs could talk across the Atlantic on ridiculously low power by using wavelengths round about 80 metres? Those successes were the biggest cracks on the nut ever delivered to theorists and know-alls in the radio game, and, like the Fifth of November, *should never be forgotten.*

What brought them to my mind now was the announcement that British and American amateurs are having another smack at transatlantic results on the 80-metre band, for comparative purposes.

The week chosen for the comparisons is December 15th to December 22nd, and if you can get down to 80 during that period you should be well rewarded.

Continental Progress.

HAVE you noticed how Belgium has blossomed out recently—longer hours and snappier programmes? This is the effect of the new Broadcasting House in Brussels now in use.

Sweden also is having a clean-up, a sum of £75,000 having been asked for to smarten up reception in the south. A new station of 100 kw. is planned for the Horby area.

In Poland they are fed-up with housing the Warsaw broadcasting authorities at six different addresses in the city, so a new headquarters is projected. It is going to cost quite a bit, the provisional estimate being £40,000, but it is hoped to raise this amount by Christmas twelvemonth, when the new building should be ready for service.

Radio in India.

THE conversational powers of hard cash are proverbial; and we may safely assume that now the Government of India has voted some £150,000 for the extension of broadcasting to the inhabitants of the peninsula, that money will soon be talking.

Mr. Lionel Fielden, ex-B.B.C. and now Controller of Broadcasting in India, is looking for a site for the new Madras station. Delhi is supposed to be hearing her new 20-kilowatter this month (November), and Calcutta and Bombay are getting similar transmitters, so everything in the Shalimar is lovely.

Droitwich Data.

SIR NOEL ASHBRIDGE, Chief Engineer of the B.B.C., gave some interesting figures about Droitwich in a paper he read to the North Midland Centre of the Institution of Electrical Engineers at Leeds recently.

The two stayed steel lattice masts are 600 ft. apart, and each is 700 ft. high. Each mast weighs 100 tons, but the load on its base insulator was increased by the stay tension to 150 tons, and the weight of the concrete base foundation was 90 tons.

The correct site for the station would have been half-way between the two coasts—somewhere in Yorkshire—if the reduction of fading had been the only factor concerned.

Anyhow, we can now see why the B.B.C. is reluctant to shift the station to another locality; they have weighty reasons for preferring Droitwich!

The Station That Stopped Broadcasting.

YOU remember those schoolboy thrillers you used to read about the hidden wireless station that defied the authorities by broadcasting sedition? And how the Secret Service men were told to get their man or perish in the attempt?

Well, you may not have noticed the prosaic newspaper report, but these things do happen, it appears. Somewhere in Czechoslovakia a mystery station was recently run by a political refugee, but one day—"says an Exchange message from Prague"—the

(*Continued on next page.*)

HEARD OVER THE AIR

Mr. Bayco, organist of the Dominion Theatre, London, who recently joined the select band of cinema organists whose recitals are relayed by the B.B.C.

"GONGING" THE RADIO-BROADCAST LEARNERS

messages stopped. The director of the hidden station had been murdered.

Even the number of the car used for the get-away has been reported in the newspapers, so scoffers at Bulldog Drummond will do well to remember that more things go on in this wicked world than are dreamt of in their philosophy.

Unlucky French Guys.

"PLEASE to remember the Fifth of November" is so typically English that it comes as a surprise to know that the slogan applies also in France this year.

Piratically-minded French law-breakers were warned that all wireless sets must be declared, or the owner would be doubly taxed. Unlike previous round-ups this one was known to be no bluff, and declarations began to pour in at the rate of 20,000 a day. So to enable the officials to cope with it, and to give everybody the utmost possible grace, the original date of closing was extended to November 5th.

R.A.F. Reunion.

ONE-TIME wearers of wings will be interested to hear that the R.A.F. Electrical and Wireless School (Farnborough, Flowerdown, and Cranwell) officers' reunion dinner will be held on Saturday, January 11th, at the Royal Air Force Club, 128, Piccadilly, London, W.1, at 7 for 7.30 p.m.

Many addresses of members have gone astray, due to the sad death of Mr. J. F. Herd, so don't rely upon another notification.

Full details will gladly be supplied by Flight-Lieutenant F. S. Wainscot, The Electrical and Wireless School, Royal Air Force, Cranwell, Lincs.

The North-East Regional.

THE news that Harlow Hill, ten miles west of Newcastle, has been selected as the site for a new Regional transmitter, is more than welcome. Though Newcastle is on the Tyne, it was not at all gone on "Tiny," the old station, with its niggling range of only 15 to 20 miles. The newcomer will be a full-powered Regional, reaching out to Berwick in the north, Carlisle to the west, and Whitby to the south.

The new site almost overlooks Hadrian's Wall and the Roman road. Strange, is it not, to think of a radio mast towering up from where, nearly two thousand years ago, the legionaries kept sentry go, and wondered if they would ever see good old Rome again.

Talking to Himself.

CHAPS who like changing down on corners to music will be intrigued to hear of a programme picked up recently in Durban. It consisted of two-way tests on ultra-short waves, between New York and Buenos Aires, and the tests were staged for the purpose of enabling a man to hear himself talk—over a distance of 6,000 miles and back. The man in question was Mr. Edsel Ford, son of Henry Ford, multi-millionaire motor manufacturer.

Apparently Mr. Edsel Ford wanted to hear his own words come back to him on a portable set from the other hemisphere when travelling in a car doing fifty miles an hour. 'Tis a long way; but he got his way.

RADIO TOPICALITIES

Turner Layton, the coloured artist, will broadcast in the Regional programme on December 5th. He has labelled his broadcast feature "My Piano and I," and in his inimitable music-hall style he will sit at the piano and sing to his own accompaniment.

* * *

Cora Goffin, the famous musical comedy actress and principal boy in pantomime, has the leading part in a new musical comedy which Francis Durbridge, of Birmingham, has written for broadcasting (Midland programme, December 2nd).

The plot centres on a band of gipsies who have for many years camped on an island, and when it is bought by a millionaire, who seeks to evict them, they employ Mariella, whom they had adopted as a child, to plead with him.

Aubrey Standing, of Cheltenham, brother of Sir Guy Standing, the film actor, plays the millionaire. Reginald Burston conducts the B.B.C. Midland Orchestra and Revue Chorus. "Mariella" will be repeated in the afternoon "pool" on December 5th.

* * *

An excerpt from the variety bill will be relayed to Northern listeners from the Argyle Theatre, Birkenhead on December 4th.

* * *

Carlyon de Lyle (pianoforte) will broadcast with the Clifton Light Orchestra, conducted by J. L. Bridgmont, in the Western programme, on December 3rd., in the first of a new series entitled "West Country Composers of Light Music." She has come to be known as a West Country composer because she has written her best work in the West Country, but she was born in Scotland. She is the daughter of an antiquarian noted for his classic work on the coinage of Scotland.

Extraneous Exclamation.

IN answer to the several kindly inquiries as to whether I heard the swear-word that slipped out over the London Regional some time ago—alas, no!

The B.B.C. admit to "a few extraneous words" being broadcast during the gramophone recital, and my sleuths tell me that following a burst of crackles somebody let out a good old English "Damnation!" Officially this is regarded as quaite fraightful behaviah—but John Listener doesn't mind. Likes it, in fact; makes the announcer seem more like a member of the Listener family.

Tea-time Station.

ALTHOUGH it is a long, long way to the South Pacific, I think we ought to wave a cheery how-do-y'-do to Port Moresby station, the first in that part of the world. Designed, manufactured, and operated by Amalgamated Wireless (Australasia), Limited, the newcomer is of the latest type, and operates on a wavelength of 221 metres.

The call sign is "4 P M," which somehow suggests that the tea-time programmes should be better than average.

Crooning the War News.

HAVE you noticed how apt some of our dance-band numbers are to the news from Abyssinia? Nobody else seems to have called attention to this, so I give it to you as a brand-new stunt, to surprise your pals with.

All you have to do is to compare the newspaper headlines with the song titles of the same day; this is the kind of thing you get: "ITALY'S TRANSPORT DIFFICULTY"—*The Wheel of the Wagon is Broken.*

"NO FURTHER ADVANCE FROM THE SOUTH"—*The General's Fast Asleep.*

"NEW PEACE ATTITUDE"—*I'm in the Mood for Love.*

Stratospherewards.

THE New Zealand habit of grabbing records does not necessarily mean she can hold them, for her claim to have the tallest structure in the Southern Hemisphere looks like getting eclipsed. The 500-ft. mast of I Y A (Auckland, N.Z.) is to have a lofty rival at Minding, near Wagin, in Western Australia, where the new National (6 W A) is taking shape.

6 W A is to have a wavelength of 536 metres and a mast 700 *ft. high.* So now, if Australians talk of tall structures, it is useless for the New Zealander to say "Y A."

"Kicking the Gong Around?"

DO you remember that I told you, a long time ago, of an American stunt for trying out amateur broadcast turns with a gong? The mike was thrown open to Tom, Dick, and Harry, who sang, played, or otherwise tried to entertain an audience, safeguarded by this gong. The safeguard lay in the fact that if a turn was too awful to bear, the chap in charge banged the gong, which cut short the item in the middle of a word, and brought on the next would-be star. Great fun!

Well, this scheme has become so popular, and has revealed so much talent, that it is now creating a minor economic problem. Lured by the chance of success, hundreds of aspirants have left their old home towns, and turned up in New York to broadcast, with the result that many destitute cases are having to be fed by relief committees. It's got so that warnings against over-optimism are now being given by the stations concerned!

ARIEL.

ALL S.T.700's ARE EQUALLY GOOD

THE EXTREME SUITABILITY FOR DUPLICATION POSSESSED BY THIS REMARKABLE SET, AND SOME FURTHER POINTS ABOUT AUDIO-REACTION ARE DISCUSSED

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

IT is doubtful if any set prior to the S.T.700 has ever been so thoroughly put through its paces in the presence of and *by* a critical public. And as I have come across—extremely rarely I am glad to say—minds that find no suggeston too mean or contemptible to make, demonstrations are completely informal, with groups of readers chosen at random examining the set—or sets—inside and outside, operating the controls themselves when they wish, taking notes, making measurements.

In other words, the demonstrations are conducted so as to satisfy even a malicious-minded half-wit who might risk ridicule and contempt by suggesting I was about to perform the Indian rope trick.

Every Feature was Explained.

Needless to say, all the demonstratees were very keen to examine the components, the lay-out and the "internals" generally. The circuit, types of valves and all the technical features were explained and each control was demonstrated separately to show its effect.

The nature of the demonstrations is evidenced by the letters of demonstratees. Many of them mention how they operated the set themselves with ease; others tell of the simple lay-out and internal wiring; others testify to the measured amplification when audio-reaction was applied. Practically all relate how quite insignificant aerials—often bits of wire thrown on the floor—were tried as alternatives to the aerials that happened to be in readers' homes.

The opinions are therefore of eye-witnesses and ear-witnesses who were only too enthusiastic to report to other readers what they saw and heard. When a designer introduces features which have never appeared in a radio set before, such opinions are very valuable, although I flatter myself that my designs have proved so successful that over the last twenty-one years I have gained a sufficiency of the public confidence to dispense with the need for demonstrations.

As, however, I am just as anxious to show what a new set can do as readers seem anxious to hear it, I shall probably go on demonstrating sets. It is my practice to demonstrate these sets before and after publication. For example, the S.T.600 was demonstrated last year in Wales *after* the set was published, and all the Welsh letters—enthusiastic to a man—were the result of comparing the claimed published results with the set in front of them. Although they were led by other readers' letters to expect great things, they declared in their own letters their delight and confirmation.

This year, letters are published from two groups: those who attended at the offices of POPULAR WIRELESS in London, and those who came to my own demonstrations in Central London, Brookmans Park, Birmingham, Manchester and Glasgow. Two duplicate sets were used, one by the technical staff of POPULAR WIRELESS and one by myself. **The performance of the two sets was the same, the merit of the S.T.700 design being that you can duplicate the set with absolute certainty. It is impossible—absolutely impossible—to produce one S.T.700 better than another. Anyone who might suggest such a thing is revealing his technical incompetence.** All the components are standardised—and there are no matching or other critical adjustments. For example, there might be differences in coils or condensers, but these would only make slight changes in the tuning control positions, not in the signal strength or selectivity.

You can have a hotted-up racing car, but if anyone can show me how to hot-up a standard inductance, or hot-up a condenser or ginger-up a resistance, I should be eternally grateful. And a fortune—or Bedlam—awaits him.

The very fact that you cannot "hot-up" the S.T.700 is the basis of its design. The proof of the success of my sets lies not in successful demonstrations but in having tens of thousands of successful duplicate receivers all over the country. That is why I have fought shy of ganged sets I have on several occasions published "ganged" designs, both "straight" and "superhet," but difficulties of duplication make such sets unsuitable, to my mind, for the constructor. One such set might be much "hotter" than another because the coils were better matched or the oscillator vanes of a ganged superhet condenser "tracked" better. One is completely at the mercy of the components, and even if the components were absolutely perfect and alike, sets would vary because the various trimmers and other pre-set condensers were not adjusted exactly.

Safest Type for Reproduction.

With the S.T.700 there are no such risks. Two simple circuits are separately tuned, and slight differences in values of components would alter the tuning point, but would make no alteration to the set's performance. The worst calamity would be to use the wrong valves, or the bad luck to have a dud specimen of the right valve. This is not likely, and, if valves vary, a low efficiency of one valve is probably compensated for by a more-than-normal efficiency in one of the remaining three.

The S.T.700 design, therefore, represents what I regard as the safest type from the point of view of reproducing the designer's results. Two sets were used for demonstrations, but two thousand could just as easily have been produced giving the identical results. The S.T.700 has, from the start, been designed with this duplication idea always before me, because in many people's minds 100 per cent certainty of success is far more important than 100 per cent efficiency. In the S.T.700 I believe I have combined the two. I have certainly taken full advantage of the experiences of others and of myself who have found ganging too risky for public consumption.

An important point to the minds of some may be that all the demonstrations I gave—I cannot say what the POPULAR WIRELESS staff did—were without the use of audio-reaction, which was demonstrated as a separate proposition. In other words, the number of stations received, the quality of reproduction, the sensitivity—and, of course, the selectivity—owed nothing to the audio-reaction.

Demonstrations of the S.T.700 were given by the technical staff of "Popular Wireless" on a duplicate set besides those given by Mr. Scott-Taggart. Here is a group of readers present at one of the former demonstrations, and one of these enthusiasts can be seen trying the controls for himself.

ALL S.T.700's ARE EQUALLY GOOD

(*Continued from previous page.*)

This is important because it shows the very high performance of the set *before* even the great merits of audio-reaction are utilised. These merits are two-fold; first, quality of reproduction is enhanced and, secondly, signal strength is greatly increased.

Obviously, if signal strength is already very great—and readers' letters tell you about this better than I can—there is no need to take advantage of this second benefit of audio-reaction. If the quality is already good there is no need to gild the lily. Hence the straightforward main demonstration did not call for the use of audio-reaction.

Valuable "Boost."

But sometimes the lily might lose colour and sometimes conditions might be so bad that a boost in signal strength would be appreciated. I had to create these conditions by using, for example, a short indoor aerial or by weakening signals with the aerial coupler or volume control.

The improved quality resulting from audio-reaction is noticed less on loud signals than on medium or weak strengths, but it is there. But when you deliberately turn down the volume to medium room-strength, or if the signal itself is not *capable* of giving greater strength (due, perhaps, to a very poor aerial), then the amazing improvement in quality becomes immediately audible as you "turn up" the audio-reaction.

My special demonstration—usually given at the end of the main demonstration—was therefore of a luxury device not absolutely essential to the success of the set, but adding greatly to its attractiveness as a musical instrument.

Prove it for Yourself.

Owners of the S.T.700—and there were 2,100 within three days of publication date who had commenced construction, so manufacturers have told me, and the number is rapidly rising—can prove out the audio-reaction by reducing the volume of their local and then applying audio-reaction gradually up to the point just before the growl occurs. The knob must be turned cautiously, as the growl—or "low-frequency oscillation," to use a more scientific term—occurs when you have turned the knob about one-eighth of a turn. Those accustomed to swing on their control knobs must therefore curb their enthusiasm.

The improvement in quality (and also signal strength) will be at once apparent, although the human ear does not "think" the change is as great as measuring instruments actually prove. It is a good plan to listen to the music or speech and then as *quickly* as you can, turn the audio-reaction knob to zero (full left). The nearer you are to the "growl point" (without actually growling, of course), and the more sudden the change to zero, the more startling the change. Without audio-reaction music and speech will sound comparatively thin after you have been listening with audio-reaction "on."

WITHOUT AUDIO-REACTION

The improvement in volume due to audio-reaction is even more noticeable on a meter than it is to the ear, as the photos on this page show.

Instead of doing the test with your "local" reduced, you can try the scheme with a signal which is already weak—if you can find one on the S.T.700!

You will note that some kinds of music benefit more than other sorts. Speech is always greatly improved and dance music with drums is always better.

You have only to listen to the drums with and without the audio-reaction to hear the vast improvement given by that knob at the side which is capable of producing a growl from the set but never from the user.

J.S.-T.

WHAT THEY SAY ABOUT THE S.T.700

FORTY-SEVEN STATIONS AT GOOD STRENGTH.

Dear Sir,—I want to thank you for giving me the opportunity of being present at the demonstration of the S.T.700 in Central London.

It is the best set, commercial or otherwise, that I have ever had the privilege of hearing—and I am using the S.T.600, so that is saying a lot.

We received forty-seven stations all at good strength, and this log is by no means a comprehensive one, for, given good conditions, with more time to spare twice that number could be received.

The Auto-Dial makes it extremely simple, once a station has been marked, to go back to it at any time it is working. And a given station can only be found at one point of the dial, as no controls but the condensers have any effect on the tuning.

Selectivity has been carried to a degree where any station but the locals can be confined to a microscopic spread, using the Aerial Coupler, which efficiently varies the selectivity.

The locals are silenced in less time than it takes to tell, using the marvellous Triple Extractor, and, once set, the Extractor condensers need never be touched again.

I agree that two tuning condensers are better than a ganged set, as it is too much to expect a gang condenser to keep exactly in trim all round the dial. However, tuning is not made difficult, as only the condenser in the anode circuit is provided with a dial, the aerial condenser being adjusted when the dial reading is correct.

The Anode Reaction is particularly smooth; and the volume control is no ornament, as practically every signal received has to be reduced to a comfortable level.

But the most astounding feature in this truly amazing set is a completely new and revolutionary innovation, namely, Audio-Reaction, which consists of applying reaction to the low or audio-frequency part of the set. This has the effect of bringing out the lower notes to a degree never before found possible. With this out of circuit, the tone would be called natural, but with Audio-Reaction in circuit you realise that natural tone has hitherto been an empty statement for, with the turn of a knob, the music or voices tuned to are brought right into the room.

Please accept my congratulations on a set which every true constructor will be building.

ROBERT L. WOOTLEY, 102, *Bridge Road West, Battersea, London, S.W.*11.

A GREAT LITTLE SET.

Dear Sir,—My wife and I were highly pleased and very interested at the demonstation of the S.T.700. Now, taking the Audio-Reaction, that in itself is a very novel and neat idea, as it practically gives the volume of another valve.

The Triple Extractor is absolutely the finest I have seen. I have used so-called wave-traps, but have never come across one that could command absolute silence from the London Regionals until you demonstrated with your Triple Extractor; and if I had not been present and seen it demonstrated I should have been very sceptical about it.

Now that dial idea is what might be termed almost foolproof, as it were, because, as you say, after a little care in finding the stations, and then putting the dot on the circle, any one of the family should be able to get the station wanted easily—well, as you might say, blindfold. Also the idea of mounting everything back and front of the panel, and doing away with the baseboard, is really worth while, as it does away with quite a number of long wires, which should be a great asset to the set to be able to keep all wires from straggling all over the set, as some do.

GEO. STILWELL, 21, *Queen Elizabeth Road, Walthamstow, E.*17.

NOTE THE DIFFERENCE

In the top photo a steady note is being received; it is just audible without audio-reaction. In this photo a reader is seen holding the meter after audio-reaction has been applied. Note the new position of the needle.

So BROADCASTING HOUSE Was Too Small! Says ALAN HUNTER

AFTER eating more than one excellent crab sandwich—prepared no doubt by the inimitable Mr. Mason himself—I should hate you to imagine that I am now going to crab the B.B.C.'s extension of studios at Maida Vale.

It is very easy in these days to criticise the pioneers for lack of foresight. No one could have foreseen how enormously broadcasting would develop in such a relatively short time.

Plans Now Seven Years Old.

Broadcasting House, that oddly shipshape erection at Portland Place, is obviously too small to encompass the whole of the vast activities of present-day broadcasting. Satellite establishments are therefore springing up all over the place. Not merely in houses adjoining the main building, but as far afield as Maida Vale.

In 1935 we may easily feel slightly supercilious about the B.B.C.'s meagre allowance for expansion. But it must be remembered that the original plans for Broadcasting House were prepared as far back as the middle of 1928. Seven years is a long time in broadcasting history.

No, I cannot find it necessary to castigate the B.B.C. for failing to be clairvoyant. Compared with Savoy Hill, the premises that arose at Portland Place seemed very grand indeed. After all, most of the engineers responsible for the new headquarters must have been mentally conditioned to some extent by the memory of their very small beginnings. I dare say they thought they were being pretty big minded about the whole thing!

But progress has been inexorable. Hours of broadcasting have been extended, a whole Empire programme service has come into being, and every type of home programme has tended to become more elaborate—in the sense of needing more studio accommodation.

Variety, chafing under the stuffy limitations of a suite of small studios in the central tower of the "Big House," removed lock, stock and barrel to the spacious freedom of St. George's Hall. Music, unable to accommodate itself and audience even in the Concert Studio, depended more and more on the nearby Queen's Hall.

The Largest B.B.C. Studio.

Then, a year ago, the Ecclesiastical Commissioners gave the B.B.C. permission to metamorphose a disused roller-skating rink in Delaware Road, Maida Vale. Within the shell of this gaunt relic arose the largest broadcasting studio yet constructed in this country—a studio having a volume of 230,000 cubic feet, with an average reverberation period of only a little over two seconds.

Yet, in spite of the vastness of this studio, only about half the available space of the premises had been utilised. It was explained at the time that other orchestral studios would be built there in due course.

And the other day, in company with the engineering elect and a goodly gathering of fellow radio correspondents, I saw the fruits of this promise. I saw four new studios built within the remainder of that sad old shell.

OUR CONTRIBUTOR DISCUSSES THE RECENT B.B.C. EXTENSIONS WHICH HAVE BEEN RENDERED NECESSARY BY THE CONSTANT EXPANSION AND PROGRESS OF BROADCASTING.

Even a cursory look around the Maida Vale premises is enough to impress one with the extensive studio facilities now available. Indeed, with its fully equipped control-room, restaurant and recording studios, the place takes on the importance of a miniature Broadcasting House.

Designed on Different Lines.

No. 1 studio is the large affair that has been in action for nearly a year. Nos. 2 and 3 are also large orchestral studios, though not as large as No. 1, of course. Another pair consists of Nos. 4 and 5, smaller still and intended for general purposes—although I believe Henry Hall has now taken one completely unto himself.

It will be most interesting to see—or rather to hear—what difference there may be between the acoustic effects of Nos. 2 and 3. For, although they are practically identical in size, their acoustical treatment differs very greatly. Here we have two equal-sized studios with an approximate volume of about 60,000 cubic feet each, but with entirely different wall and ceiling treatments.

No. 3 is of the normal type, with unbroken surfaces of building board, entirely devoid of any intentional decorative treatment, but beautifully lighted.

No. 2 studio is bizarre in the extreme, with its walls and ceiling zig-zagged to cut up the reflection of sounds. As the building board surfaces are so cut up it was not convenient to fit the flush type of lighting as in No. 3, so a system of hanging oblong lights has been adopted—with, I must admit, a markedly pleasurable effect.

A Matter of Experiment.

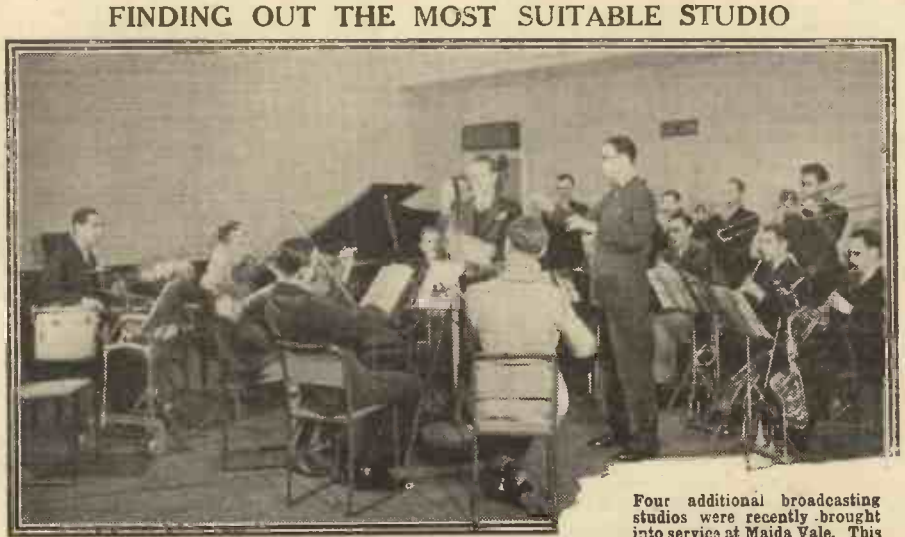
When I asked Sir Noel Ashbridge what the idea was he smilingly admitted that it was an experiment. Time—and usage—alone could prove whether all this trouble was justified in terms of improved acoustic effect. I noticed a distinct difference in the general "feel" of Nos. 2 and 3 studios, and I really believe that the zig-zagged one will sound better than the normal one.

With the smaller pair of studios another chance has been taken to try an experiment. Whereas No. 4 has much the same volume as No. 5, it differs in having non-parallel walls. No two walls are parallel, only the ceiling and floor being normal in this respect.

Again only time and usage can show what the precise difference between the acoustics of this pair of studios will be. Henry Hall seemed fairly well entrenched

(*Continued on page* 370.)

FINDING OUT THE MOST SUITABLE STUDIO



Four additional broadcasting studios were recently brought into service at Maida Vale. This photograph shows the B.B.C. Dance Orchestra taking part in one of the balance and acoustic tests which had to be carried out in order to determine the most suitable studio for this particular combination.

THE ELECTRICITY SUPPLY CHAOS

The question of compensation when mains are changed from D.C. to A.C. and the need for strict standardisation of voltages is discussed.

By "NEUTRON."

THE electricity supply industry is in a state of chaos quite unprecedented in the history of utility services in this country, and consumers in many areas are agitating for a complete reorganisation of the supply systems.

Complaints continue to be tendered, concerning the nature of the current supplied in some districts, multiplicity of voltages, pressure variations, and tariffs, and in the majority of cases these are only too well founded. That this is so is emphasised by the existence of a Government committee under the chairmanship of Sir Harry McGowan, and it is expected that this committee will bring about the legislation apparently necessary to bring the majority of systems up to the level of the few really economic ones. In a number of areas radio set owners, in particular, have suffered the most as the result of the changeover of systems from direct to alternating current.

Like certain other electrical appliances, radio sets designed specifically for direct current have been rendered absolutely useless by the change to A.C., yet only in comparatively few cases has any compensation been awarded to consumers affected in this way. As justification for their refusal to grant the claims or, alternatively, replace the redundant sets, a number of supply undertakings have pointed out that they did not give permission for radio apparatus to be connected to their systems.

In fairness to both parties, in many districts consumers did not bother to apply for permission, and thus, since it is really necessary to receive the sanction of the supply undertaking prior to connecting any apparatus to the system, failure to do so provides a loop-hole for a "no-claim" action on the part of the undertaking.

Radio Sets Excluded.

The question arises, apart from any legal aspects, "Is it reasonable to exclude radio set users from the consideration which has been granted to other consumers?" The whole position seems to boil down to one point, namely, the small amount of energy consumed by the average radio set, as opposed to the consumption of other electrical appliances.

Indeed, so much so is this the case, that some undertakings contend that energy consumed for radio purposes should be charged for at special rates. In other words, since a radio set is not considered to be either a lighting or a power unit, the energy consumed by it should be charged for at any price above the minimum rate of the undertaking supplying it. Here, again, the unfortunate radio set users are asked to pay "through the nose," whereas, if it were possible to pick-up broadcasts on a vacuum cleaner or an electric iron, energy would be available at the cheapest rate.

Furthermore, if a consumer takes his radio set from one area to another—maybe only across a street—he may find that his set will not function, simply because the voltage of the new supply system is too high or too low. This applies to all users of electrical devices; and there exist about 25 different supply voltages ranging from 100 to 550, which necessitate the existence of eight distinctly different ranges of electrical equipment.

Variety of Mains.

Incidentally, this is one of the main reasons why manufacturers cannot offer their appliances at more equitable prices, because their plants have to cater for so many voltages. Standardization of supply voltage would enable manufacturers to produce their commodities more economically, and thus their prices could be considerably reduced.

Of the 655 supply systems in this country, 284 have alternating current only, 92 are entirely direct current, and 279 have both supplies. It is apparent, therefore, consumers in some 376 areas are absolutely confined to one supply or the other, irrespective of which supply they may want. This, of course, is in addition to the glorious variety of voltages previously mentioned.

The tendency of some engineers to change over their systems to A.C., in an attempt to cut down operation costs, has made its appearance like an epidemic, but, it seems, some who have made the change are finding the cure worse than the disease. They hoped to cut down costs, by means of transformers and A.C. distribution in place of rotary machines and D.C. distribution, yet, in some densely populated areas, the inherent troubles of the former are causing much worry and expense.

The supply voltage rises appallingly during periods when the demand for energy is least, and falls as much when the demand is greatest—surely a ridiculous state of affairs. These fluctuations are causing a variety of troubles, and those consumers sufficiently well informed have lodged very emphatic complaints.

What Voltage Drop Means.

This is not to be wondered at, considering that, previously, direct current enabled them to have constant voltage at any and every time of the day. A matter of ten volts below normal may mean a loss of something like 150 heat units per kilowatt hour to some users of heating appliances; motors may deliver about one-24th less power per h.p. hour, and electric lamps may emit some 6 candlepower less every hour.

These figures, though somewhat empirical, serve to show the extent of the relationship between steady normal voltage and one which is inconstant. In other respects, the disadvantages of alternating current supply are numerous, and it remains to be seen whether these cannot be overcome. Figures indicate that some 4½ million consumers need only a direct current supply, whereas, only about 800,000 need alternating current, as a matter of preference.

It is apparent, therefore, that although there is a need for both supplies in the majority of areas direct current is as necessary to-day as ever. Indeed, in many areas it will remain, and some systems at present supplying A.C. may, in time, be changed over to direct current.

Linking Essential.

Whatever the finding of the Government committee may be, it is certain that many individual supply systems will have to be linked together, and the entire undertakings arranged in groups. These economic conditions cannot be arranged so long as different voltages and currents exist, and thus, nothing is surer than a standardization of both within the next few years.

Already a standard pressure of 230 volts has been suggested, but, whatever the ultimate decision may be, those affected by it will have definite grounds for compensation. It is hoped, also, that the committee will make the tariffs in all areas consistent with the demand, whatever its nature may be.

A SUPERB A.C. RECEIVER

Examining the inside of a Cossor high-fidelity automatic radiogramophone.

ON THE SHORT WAVES

A TWO-STAGE SINGLE-VALVER.

Details of a circuit employing a Class B valve as detector and L.F. amplifier in one.

THE set that is physically small seems to possess an untold fascination for the short-wave enthusiast. I suppose a psychologist would tell us why this is; it's probably something to do with the pride one experiences in pulling in all corners of the earth with a little box about "four by two."

At all events, no set I have ever designed has been half so popular, or brought in a quarter of the correspondence that the notorious "single-valver" did. That was described in 1932, and I still receive letters from readers who have recently made it and are astounded to find what they can do with it.

Compact and Efficient.

If I designed another straight single-valver now, I can't think of any points in which it would differ materially from the original article; so there is no conceivable reason for doing so. It struck me, however, that a description of a little general purpose set that I am using would be interesting.

In one corner of my den is a tiny aluminium screening box. On the front face of the cube is a slow-motion dial; on one side is a small knob and a phone jack. Every now and then your humble servant may be seen to steal across the room, plug my phones into this particular hole, and twiddle one or both knobs.

Sometimes a seraphic smile will spread over my benign countenance; at others I will register one of the expressions beloved of the film villain. This particular little box contains a fully-fledged short-waver which has not failed, as yet, to pick up one single station that has been logged on a big superhet. Only one valve is used, but it is a Class B type. One set of elements serves as the detector, and the other as a resistance-coupled L.F. stage.

So efficiently does this double valve perform its two functions that it makes quite a noisy little set. By that I mean that some of the habitually-stronger stations are definitely apt to prove uncomfortable to the wearer of headphones.

Ideal for a Portable.

Fig. 1 shows the circuit diagram, complete in every detail. I didn't think it necessary to draw up a full wiring diagram, although I shall probably make another set of the same type for publication later on.

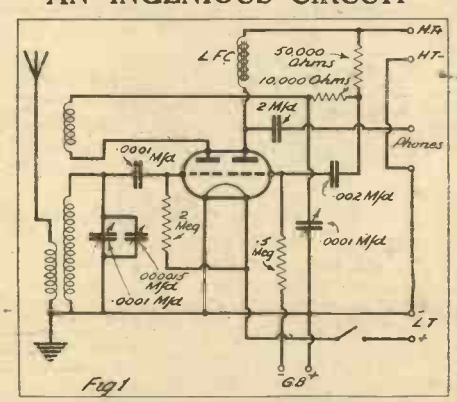
A standard six-pin coil is used, as various different aerials are hitched on to this little "check receiver," and capacity coupling rather leads one up the garden (literally, in my case, to shorten the aerial!)

I have shown a ·000015 band-spread condenser across the main ·0001 tuning control, although I don't use a band-spreader on account of lack of space. In any case, twelve years of short-wave tuning have given me a steady enough hand to hold things on a ·0001 that some novices can't find on something a tenth of the size!

The values of grid condenser and leak are quite conventional. So are the values of the coupling components to the second half of the valve. The anode resistance is of 50,000 ohms; the grid condenser ·002, and the grid leak ·5 megohm. Note that instead of an H.F. choke in the detector anode circuit I use a resistance of 10,000 ohms. I have already enlarged on the merits of this little change, and I expect most readers are using it by now.

Choke filter output is used, but this is not strictly necessary if you want to economise

AN INGENIOUS CIRCUIT



As explained in the text, remarkably strong signals can be obtained on this circuit when used for short-wave reception.

and make a really minute set. Incidentally, if the weather were a little more summery I would certainly rig this up as a short-wave portable. The whole thing, with batteries, could be got down to an extremely compact size. (Mental note. Must have one ready in good time for next summer!)

I have tried several different valves in this little job, and although I haven't come across one that won't work satisfactorily, I must say that I find the type that is designed to operate without grid-bias is preferable.

Collect the components together for yourself, and you will see what a tiny space it is possible to crowd them into. As I am not suggesting the construction of this little set for use as one's main short-wave receiver, I don't think one need be too particular about the layout. Short leads are essential, of course—they always are—but the components may perhaps be crowded together a little more than usual in the effort to produce something really Lilliputian in size.

I think that's all I need say about this particular little job, but I am wondering whether it has occurred to readers that modern valves may be made to do quite a lot of interesting jobs like this?

One ingenious friend of mine has evolved a circuit with the X41 triode-hexode (intended, of course, for use as a frequency-changer), which utilises the double valve as a screened-grid H.F. stage and detector. Furthermore, I have heard the set, and it works extremely well.

Try these "Tricks."

It is also quite worth one's while to make a single-valver with a heptode, using it just as one would in a superhet, but simply putting a pair of phones where the first I.F. transformer primary would normally be.

The advantages of this arrangement are, roughly, those of a "separate reactor" set using two valves, or of a two-valver comprising a detector and a separate oscillator. I won't go into the theory of the thing here, but any "ham" will tell you that signals that are unreadable with a reacting detector may be copied quite comfortably by stopping the detector from oscillating and switching on a "beat" from a heterodyne wavemeter or a separate oscillator specially built for the purpose.

Background noises are practically reduced to zero, and a heptode single-valver is the ideal set for the man with good ears who wants something as quiet as it is possible to make it.

A Powerful Midget.

I don't know whether some ingenious person can invoke the aid of the double-diode-triode, the double-diode pentode, or the octode. Doubtless they can all be used in some highly unconventional manner that was not intended by the manufacturers!

And just think of the midget four-valver that could be built with two Class B valves—one as buffer and detector, and the other as two separate stages of L.F.!

Generally speaking, one does not save money by using one multiple valve in place of a more conventional arrangement of triodes; but when the portable aspect is considered, there is often a saving in filament current, which is a point well worth attention.

Even when the set is not to be used as a portable, there may be reasons why it should be kept as small as possible, particularly when it is "a second set" that has to be housed in a small corner.

ON THE SHORT WAVES.—*Page 2.*

Points from the POST-BAG

W. H. (Plaistow) asks me to mention that he would be very glad to give anyone in that neighbourhood some Morse instruction in exchange for a few unwanted short-wave components. His full address is Mr. W. Hare, 1, St. Mary's Road, Plaistow, E.13.

R. C. (Belfast) has a "Simplex" Two that doesn't seem to be going too well. He doesn't get anything at all on it unless he removes the grid-bias plugs. That looks to me like a faulty L.F. valve, run-down H.T., or a poor connection in the filament wiring. Am I right?

A. M. (Nottingham) reports good reception of Addis Ababa, E T A, on 25 metres. The station was heard calling New York from midnight until 12.20 a.m. Sorry, A. M., but I can't find any trace of your previous letter on the subject.

If L. M. B. (Hankow), who recently appealed for information, cares to write to Mr. C. E. Murray, 28, Somers Road, Reigate, Surrey, the latter gentleman has kindly promised to send him some radio books and prints of circuits that will interest him.

D. X. (Derby) mentions that W 2 X E, on the 19-metre band has been received at extremely good strength lately. W 2 X E was heard announcing a series of concerts by the New York Philharmonic Orchestra, to be broadcast on Sundays at 8 p.m., G.M.T. Unfortunately, that will be too late for us to hear him during the winter, unless they are put out on one of his other wavelengths as well.

W. G. C. (St. Austell) wonders whether the old "Empire Super" would be greatly improved by the use of 465-kc. transformers instead of the 110-kc. variety originally specified. Candidly, I don't think the conversion would be worth while. The set is horribly out of date as supers go nowadays, and the autodyne frequency-changer would be worse off with 465 kc. than 110 kc. I.F.'s.

Is It Overlooked?

C. H. M. (Marazion) has "boosted" the "Simplex" Two by using a screened-grid detector and adding another L.F. stage. He is now going to add H.F. to it and make it a really big set! He mentions extremely good reception from Warsaw on 22 metres between 4 and 6 p.m. No one else seems to have commented on this station—possibly it has been overlooked.

C. G. writes from the Bishop Rock Lighthouse to ask me to continue my policy of describing sets that readers can build up from their old parts. He has been running a single-valver and a two-valver made up from my old "standard baseboard" layouts, and wants some more to play with. All right, C. G., you shall have them shortly.

He wants to know whether it is too much to hope for results from short-wave coils wound on Paxolin formers instead of the modern ribbed variety. Certainly it isn't, C. G.—you just try them and see! But you mustn't expect Rolls-Royce results from Ford parts.

A Peculiar Fault.

A. B. (S.S. Marthara) writes to tell me that he has a "B.C.L." Two going very well on Atlantic crossings, and that he is trying to forecast my "big set" and build it before I publish the details. He finds that the "B.C.L." Two is all the better for the addition of an H.F. stage, but is puzzled by the fact that the coupling condenser seems to work the wrong way round. When it is at minimum, reaction ceases! Can't explain that, A. B.—I've never met it.

Mr. J. J. Platt (2 A G K), of "Purlea," Ferncliffe Drive, Keighley, Yorks., asks me to say that he would like to hear from anybody interested in 5-metre work.

D. C. (S.W.12), wants to use coils of a different make from those originally specified in the "Simplex" Two. It's too late to give a diagram this week, but I will include one on this page *next* week, showing the connections for B.T.S. coils.

The two sketches on this page are meant to emphasise the importance of screening anode leads in H.F. stages or superhet I.F.'s. Looking after this point carefully may make all the difference between stability and instability. If you have an unmetallised valve, use a cylindrical screen and a connection covered with copper braid. (Fig. 2.) If you have a metallised valve, you may use one of the excellent hoods with flexible connectors which are now on the market, and make a really professional job of it. (Fig. 3.)

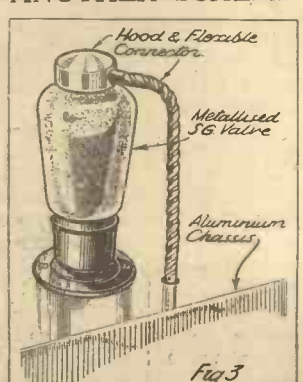
QUITE SIMPLE

A good method of screening when a non-metallised valve is used.

At last I have received a favourable opinion of the "sideways T aerial" I described in the Sept. 28th issue. Two readers tried this out and told me that it was perfectly hopeless compared with their original aerials. Now comes a letter from "D.C." (Aberdeen), who moved into a new house and put this up as a temporary aerial.

The top was 30 feet long and had a slant of 45 degrees, and the lead-in was 15 feet long. Since then, he has put up a "permanent" aerial—100 feet inverted L—but doesn't get half the results that he did on the other affair. On that he could get V K 2 M E every Sunday, but the station hasn't been heard yet on the new one.

ANOTHER SCHEME



The special hooded connectors are ideal for metallised valves.

SHORT-WAVE NEWS

MR. A. E. BEAR, European representative of the International Short-Wave Club, once more sends me full particulars of the club's activities. Any readers who are interested in joining are asked to get into touch with him at 10, St. Mary's Place, Rotherhithe, S.E.16.

The annual subscription is 5s., and a monthly publication called "International Short-Wave Radio" is circulated to members. Chapters are open in London, Manchester and Leicester, in which towns members can attend regular meetings. London meetings are held at the R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8.

Please Send Details.

Several other clubs were mentioned last week, and readers are constantly asking me for information of the nearest organisations to them. Will secretaries of any short-wave clubs, small or large, please help me to keep a really complete register by telling me all about themselves? Thank you.

In a recent publication the B.B.C. mentions that it is constantly receiving complaints from listeners overseas that they cannot receive the Empire station on 19 metres. On investigation, most of these malcontents are found to have sets that will not tune below about 25 metres! They therefore warn Empire listeners against buying a short-wave receiver which does not cover the full range of 13 to 50 metres, which will include *all* the B.B.C. wavelengths.

During the week December 8th to 14th, the Empire programmes will include performances by a number of well-known Empire artists. Other transmissions during the same week will include commentaries on the inter-Varsity football matches—Rugger on December 10th, and Soccer on December 11th.

I have heard, at first hand, of the extraordinary thrill that football commentaries bring to overseas listeners who are far from the "playing-fields of Eton," and commend these two broadcasts to their attention!

Erratic Conditions.

Conditions seem to have become wildly erratic during the few days before writing this. All the 19-metre stations, in particular, have been suffering from tremendous fading of the "night-distortion" variety, and the 49-metre band seems to have been all at sea, with the locals much too strong for comfort.

The only short-wave band that continues to be really reliable is 5 metres! Here, of course, we are not dealing with reflected waves as yet.

W. L. S.

SOME S.T.700 INSTALLATION HINTS

PRACTICAL ADVICE FOR THE CONSTRUCTOR

By A. JOHNSON-RANDALL

LIKE many thousands of other listeners, I am a battery-set user, and when Mr. Scott-Taggart revealed the details of his latest set, the S.T.700, I was keenly interested. Later, when I was privileged to hear a demonstration at Mr. Scott-Taggart's own hands, I became wildly enthusiastic.

Simplicity is the keynote of the S.T.700. It is amazingly simple to build and to operate.

Here was a battery receiver which would give results far surpassing those which I have heard given by any other set using the same number of valves.

It is unnecessary for me to speak of the selectivity, sensitivity or quality, since these have already received well-merited praise in the various letters written by readers who have attended demonstrations.

It has, however, occurred to me that S.T.700 builders may be interested to read some hints concerning the installation of this fine receiver, based upon my practical experiences.

Actually, the S.T.700 that I have got such excellent results with—and these results can be duplicated by any other constructor with any other S.T.700—was one built in Tallis House from the published description given by Mr. Scott-Taggart in the November 2nd issue. That is to say, we took the blueprint and used this in conjunction with the wiring check. The set is, therefore, an exact copy of the original, thus giving identical results.

Built in Two Hours.

Those who have not yet built the S.T.700 will be amazed at the extraordinary simplicity of construction given by the Uniplane system, when they actually come to tackle the job. It is incredible to think that the results which the set will give can be obtained so easily.

The particular model I have used was built in just over two hours. This means one can go home in the evening, after the day's work, and completely build the set, as well as test it out and receive stations before going to bed.

Some readers may wonder whether they will be able to get first-rate results with the S.T.700 when it is connected up to their existing aerials. I would say, here and now, that the S.T.700 will give amazingly good reception on a short length of wire slung across the room, although, naturally, to get the full benefits of the design, it is desirable to use a reasonably efficient aerial system. For instance, a good outdoor aerial is ideal, or, alternatively, an efficient loft or other type of indoor aerial can be employed when it is not possible to erect an outdoor aerial.

Constructors often fail to take full advantage of their aerial facilities. For example, I have seen aerials with lead-ins which are partially earthed—the bare wire touching some semi-conducting material and so causing a very marked loss of efficiency.

Importance of the Aerial.

It is grossly unfair to blame a set for mediocre results when it is so badly handicapped by carelessness on the part of the constructor. With an outdoor aerial the lead-in wire should be joined to the main span by a really efficient twisted and soldered joint, or, alternatively, the main aerial span and lead-in should be in one continuous piece. Moreover, the lead-in must be kept well away from all earthed objects, such as guttering, stack-pipes, etc., and taken to the set through a proper insulating tube.

Then, again, it is best to use a good earth. A stout length of copper wire terminating in a clip, clamped to a well-cleaned main water-pipe is excellent, providing it *is* the main water-pipe, and not a supply pipe which runs round the house before it goes into the ground. Other very efficient earths are a copper tube or plate making contact with damp soil.

FOLLOWING THE BLUEPRINT

Here is a member of the "P.W." staff constructing an S.T.700 from the blueprint and wiring check.

It is only fair to give a design like the S.T.700 a good start-off by paying attention to this part of the receiving system

Then, again, it is essential to see that the batteries are in tip-top order before joining them up to the set. The 2-volt L.T. accumulator should be fully charged; and, moreover, it should be completely free from sulphation or other troubles which will cause a charge to leak away in a very short time.

The H.T. battery should give its full 120 volts when connected on load—that is, when it is actually delivering current, and after it has been delivering current for a period. It is as well to remember that a partly run-down H.T. battery can give a fictitious voltage reading on open circuit, i.e. when it is not delivering current to the set, which may lead the constructor to believe that his battery is quite O.K. Actually, of course, in these cases, directly the battery is joined to the set and called upon to deliver current to the valves, its voltage drops and, therefore, the valves cannot work at their highest efficiency.

Start With Good H.T.

This is a frequent cause of poor selectivity and sensitivity, as well as distortion.

In the days when I used to deal with queries sent in by readers I was constantly meeting with cases of this type, the constructors in question blaming the set for the poor results they obtained, when all the time the real fault lay in the power supply.

H.T. batteries don't last for ever! And the S.T.700 certainly deserves a brand-new battery to commence with.

The S.T.700 is particularly easy to connect up. A pictorial wiring diagram was given in the November 2nd issue showing the Extractor, L.T. accumulator, H.T. battery and loudspeaker, all joined to their respective terminals.

Looking at the front of the set, the top terminal on the left is aerial; next below it is L.T. +; then L.T.—; and, lastly, earth. On the right-hand side are: top, H.T. + 1; next below it, H.T.+2, L.S.—, H.T. + 3 and, lastly, pick-up.

When the Triple Extractor is used, the aerial is joined to A_1 on the Extractor, the A_2 terminal being connected by a length of wire to the aerial terminal on the S.T.700.

L.T. + and L.T. — terminals are joined to + and —, respectively, on the accumulator. The + terminal on the accumulator is always very clearly marked, often with

(*Continued on next page.*)

SOME S.T.700 INSTALLATION HINTS

(Continued from previous page.)

the + sign, as well as being coloured red. Don't get these leads reversed.

The earth terminal on the set is joined by a length of flexible wire to the H.T. — socket on the H.T. battery, and also to the earth connection. On the other side of the set we have the top terminal H.T. + 1 going, via a length of flexible wire, to the 72 volts tapping on the H.T. battery.

H.T. + 2 and H.T. + 3 terminals are joined together by a short length of insulated wire, H.T. + 2 also being joined to the maximum H.T. + tapping on the battery, which is 120 volts.

The two leads from the loudspeaker are joined to L.S. — and H.T. + 3 on the terminal strip. The other two ends of these loudspeaker leads—that is, the two joined to the loudspeaker itself—must go to the correct terminal connections on the loudspeaker input transformer.

These days it is usual for the input transformer to be part and parcel of the loudspeaker assembly, and usually it is bolted on to the metal chassis. On some there is a switch on the back of the speaker, the position of the switch being determined by the type of valve in the last stage of the set. In the S.T.700 the output valve specified by Mr. Scott-Taggart is a Hivac PX230.

Now the PX230 is what is called a battery super-power valve, and on some loudspeaker input transformers there will be special terminals marked "super power." In such a case the two leads to the transformer must be joined to these two terminals.

It will be found, however, that the loudspeaker manufacturers normally give very definite instructions on the leaflet accompanying the loudspeaker.

The pick-up terminal—that is, the terminal marked P.U. on the pictorial diagram—is not joined up at all external to the set, except in cases where a gramophone pick-up is to be employed.

The S.T.700 requires a 16½ volt grid-bias battery, and here again this battery should be in new condition when connected up in the set. Although the life of a grid-bias battery is considerable, nevertheless it is always a wise plan in the absence of a good high-resistance voltmeter to change the battery for a new one every eight or nine months. Grid-bias batteries are inexpensive, but a faulty one can cause a whole heap of trouble, including ruination of the valves in the set.

You must be careful to see that your grid-bias plugs make good contact with the sockets of the battery. In some cases they may need opening up a little.

There is no excuse for anybody to go wrong in so far as grid-bias voltages are concerned: G.B.+ goes into the G.B.+ socket; G.B.—1 into the —1½ volts socket; G.B— 2 into the 9-volt socket, and G.B.—3 into the —16½ volt socket.

All these details have been given before, but I merely mention them to remind constructors of their importance in the proper working of the set.

Using the Aerial Coupler.

My own preliminary experience with the S.T.700 was without the Extractor in use. That is to say, it was not connected in circuit at all. In this case the aerial lead was joined direct to the aerial terminal on the set.

I placed the aerial coupler about a quarter of the way in. This, with the particular aerial that I have in use (fairly large outdoor one) gave me adequate selectivity for my needs. Constructors will find that they will have to adjust the aerial-coupler to suit their own particular requirements.

When it is fully to the left, that is, anti-clockwise, the selectivity is at its maximum ; as the aerial coupler knob is rotated clockwise so the selectivity is gradually decreased.

"In Step" Tuning.

Another point that I found very important in getting best results on distant stations was that of rotating the main tuning condenser and the aerial balancing condenser in step. Both should be used simultaneously, although, of course, when the set has been fully calibrated one can swing the pointer of the main tuning condenser to the desired station and then rotate the aerial balancer until the station is received at its maximum volume, and free from any interference.

The particular form of anode reaction used in the S.T.700 does not upset the tuning, which is a great advantage. I should have mentioned that the anode reaction knob is the one on the top right-hand side looking at the front of the panel.

On the bottom right-hand side, looking at the front, is the volume control. This gives a perfectly smooth variation of volume and is turned anti-clockwise to reduce the volume and clockwise to increase volume.

One of the features of the S.T.700 which I, in common with hundreds of other constructors who have actually heard the set in action, feel particularly enthusiastic about is the Audio-Reaction control on the right-hand side of the set. The effect on weak signals is amazing, and in addition it gives a definite improvement in the quality.

The Triple Extractor is also wonderfully efficient. Those who have hitherto suffered from local station interference need suffer no longer. It can be joined in circuit in a jiffy. The aerial is connected to A_1 on the Extractor box and the aerial terminal on the set to A_2 on the Extractor. There are three knobs on the top of the box and I used the two outside ones for eliminating the National and Regional medium wave transmission and the centre knob for cutting out Droitwich.

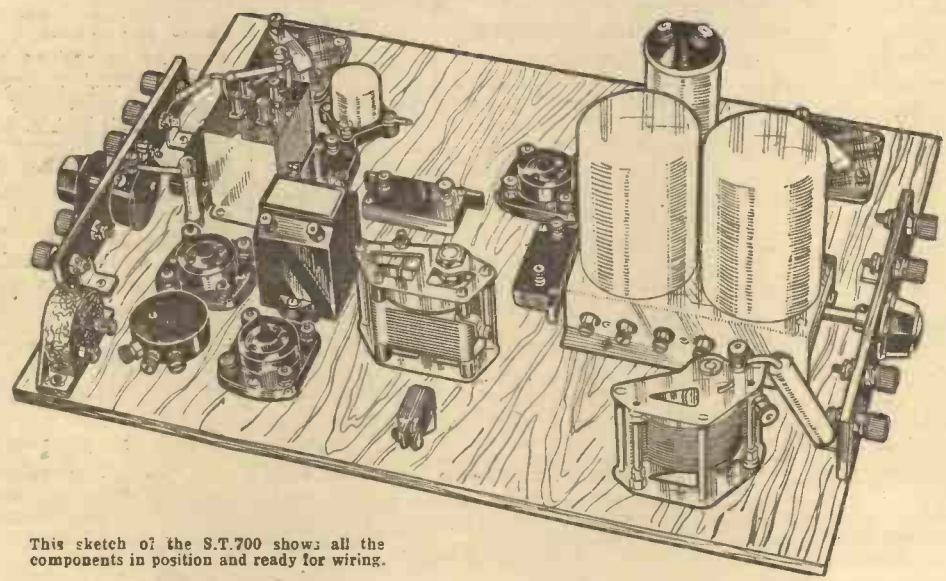
The Extractor is particularly simple to use, the main point being to take special care to rotate the knobs very slowly; otherwise you will pass right through the silent point and wonder why the station has not disappeared as it should.

But you can take it from me that if you turn the knobs really slowly you will not be troubled with interference any longer.

Incidentally those who wish to fit a fuse in the H.T. circuit may do this quite easily. The most satisfactory position is in series with the H.T. negative lead and all that you have to do is to replace the H.T. negative wander plug with one of the special wander fuses.

I hope constructors will find these hints of value in helping them to get the best results. Some further articles concerning the installation of the S.T.700 will appear shortly.

UNI-PLANE SYSTEM MEANS SIMPLICITY



This sketch of the S.T.700 shows all the components in position and ready for wiring.

HENRY HALL'S NEW TRUMPETER

The B.B.C. announces that Billy Smith, a twenty-one years old trumpeter, has been chosen by Henry Hall from hundreds of applicants for the vacancy in the B.B.C. Dance Orchestra. He joins the band on December 2nd and will lead the trumpet section jointly with Charles Price. Billy Smith started to play the trumpet when he was twelve and first broadcast at the age of fifteen. He has had experience with many first class bands.

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OR YOURS FOR 13/6

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If Extractor Kit is required with any of the above Kits, add £1/4/0 to Cash or C.O.D. prices, or 2/3 to deposit and to each monthly payment.

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COMPRISES ● 2 Peto-Scott cabinet side pieces, cabinet top and battery spar, all drilled and polished, with screws. ● Drilled and polished walnut veneered panel, with nickel-plated screws. ● 2 drilled ebonite terminal strips. ● 4 brackets and 4 nuts and bolts. ● 30 ft. Maxamp wire. Exactly as Specified by Mr. John Scott-Taggart. *Total Value* 9/7. Cash or C.O.D., 8/6.

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The Peto-Scott Kit of essential S.T.700 components comprising:

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Built exactly to Mr. J. Scott-Taggart's specification. Complete with FIRST SPECIFIED valves and Peto-Scott Walnut table cabinet, illustrated above, less batteries. Overall dimensions of Cabinet: W. 18½ in., H. 14½ in., D. 12 in.

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CONSOLETTE CABINET ONLY. Another beautiful model built from the finest woods. Australian walnut veneered front and wings, attractive corded silk fret backing and complete with speaker baffle board and battery shelf. Cash or C.O.D., 35/-. (Carriage and packing 2/6 extra.) Or 5/- down, balance in 6 monthly payments of 6/-.

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Exact to Specification. Complete with FIRST SPECIFIED valves Peto-Scott S.3 de luxe matched speaker and walnut consolette cabinet (illustrated above), less batteries. Overall dimensions of cabinet: W. 20½ in., H. 15½ in., D. 14½ in.

Cash or C.O.D. Carr. Paid, £10.12.6.

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TYPE "LL" CABINET ONLY. Australian walnut veneered front. Hand French polished macassar fret with corded silk backing. Speaker baffle board. Lift-up lid. Cash or C.O.D., 37/6 (Carriage and part packing 2/6 ex.), or 5/- down, balance in 6 monthly payments of 6/6.

Overall Dimensions: W. 20 in. H. 24 in. D. 12½ in.

A.C. S.T.700 FINISHED INSTRUMENT

Exact to specification. Complete with valves and specified W.B. speaker in Peto-Scott first specified A.C. S.T.700 Consolette Cabinet. Cash or C.O.D. Carriage Paid, £19.19.0. Balance in 11 monthly payments of 30/-.

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S.T.600 to S.T.700 CONVERSION KIT

COMPLETE KIT of first specified components to convert the S.T.600 to the new S.T. triumph. Comprises: Peto-Scott S.T. 700 Structakit, as detailed in adjoining column, Colvern S.T.700 Coil Unit, J.B. Main tuning condenser with special knob and pointer, 2 Graham Farish potentiometers, Bulgin switch, 3 Lissen condensers, Dubilier condenser, Dubilier 500,000 ohm resistance, Ferranti 30,000 ohm resistance, Belling Lee G.B.-1 wander plug, screws, flex, and FREE COPY OF S.T.700 ISSUE OF "POPULAR WIRELESS," with full-size blueprint, dial card etc.

5/- DOWN

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A.C. VERSION

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Comprises complete kit of components as FIRST SPECIFIED and used by Mr. J. Scott-Taggart, including Peto-Scott drilled and polished walnut plywood panel, drilled terminal strips, aluminium brackets, less valves, cabinet and speaker.

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Model 36S P.M. Speaker. Suitable for any output and incorporating improved Microlode device. Cash or C.O.D. Carriage Paid, £2.2.0, or yours for 2/6 down, balance in 11 monthly payments of 4/-.

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Astonishing Results Demonstrated Within One Mile from Brookmans Park and in London Itself

A WONDERFUL FEAT.

Dear Sir,—I wish to thank you for the opportunity you gave me of attending demonstration of your new set, S.T.700. I am sure that all those present must have been astonished at the remarkable results obtained by the set in the black-out area right under the shadow of Brookmans Park aerial.

Over 50 stations at good strength, no background, and of good quality, is surely a wonderful feat for such a spot (Brookmans Park). The special features of this new triumph of yours that struck me most were the extra large dial, making it very easy to calibrate stations, the small external case that contains the three units for cutting out so definitely the unwanted stations; and the audio-frequency control, giving that boost to the lower register so necessary when working set at minimum capacity.

I cannot conclude without a note on the unique lay-out of the set. With the components placed as they are on the back of the panel, thus simplifying wiring, surely the most unskilful of constructors cannot fail to get results.

S. M. PETTET, 2, *Norfolk Avenue, Palmers Green, N.*13.

A FINE DESIGN.

Dear Sir,—I take this opportunity of expressing my gratitude on having the pleasure of being present at your remarkable demonstration of your latest wonder, the S.T.700.

Naturally, you are well acquainted with the splendid results obtained with this remarkable, ingenious design, but I feel sure that many of your less fortunate readers would appreciate my impression of the demonstration, which took place in sight of London Regional and the National transmitters.

The enlarged dial first drew my attention, which Mr. Scott-Taggart explained was a great improvement on the really efficient S.T.600 dial.

I will not discuss the set in detail, as by the time this letter is printed (if at all) the blue print will be before your enthusiastic readers, and they will be contemplating the results obtainable when the set is assembled. I attach a list of stations, 42 of which were received at real entertainment value without whistle or background noise, which was marvellous in the confined space of time taken, and especially under the trying circumstances of the giant aerials grinning you in the face less than a mile away.

Given more time I have no doubt that the set would have been capable of receiving 80 or 90 stations without any difficulty.

Besides other stations I would mention that Berlin on 356.6 metres was received irrespective of the Regional on 342.1, and Toulouse came in on the other side at fine tone and volume. Cork on a 1-kilowatt transmitter came in at tremendous strength, and Warsaw was received in spite of Droitwich on the long waves. I was surprised that Fécamp was received without any form of interference whatever, and all through the performance the volume control was not used to its full extent.

The audio-reaction control attracted my attention and showed a vast improvement in the bass response of the output, and should prove to be a great asset.

It certainly gave me a clear idea of what the local inhabitants had to put up with when you disconnected the Extractor circuit; the result was perfect Bedlam.

You are to be congratulated on producing such a fine design at small cost, without sacrificing any of the important features.

R. L. ERBE, 8, *Sunnyside Road North, Lower Edmonton, N.*9.

AMAZING NUMBER OF STATIONS.

Dear Sir,—To me one of the most salient features of this set was the Audio-Reaction, an entirely new idea in wireless, which—as was visibly demonstrated—increased the signal strength 25 times and also introduced the low-frequency notes without impairing in any way the high-frequency notes.

Another striking point at the commencement of the demonstration was the Triple Extractor, which, after the few minutes necessary to set it.

NEXT WEEK.

A Concise Construction Guide to the **S.T.700** will be found in our Special Xmas Number, on Sale next Wednesday.

was left untouched throughout the demonstration. This Extractor reduced the London and Droitwich stations in power until they were equal only to medium strength foreign stations.

Another very great improvement is the Auto-Dial, which shows each station very clearly and makes tuning very simple indeed; the fact that this dial is adjusted by the user to suit his own set and conditions is the greatest factor in its favour.

During the demonstration the set was run on an aerial which consisted only of approximately 9 feet of wire, and the earth was taken off. Even so the set still received an amazing number of stations, all absolutely clear and at full loudspeaker strength.

During the demonstration 67 stations were received, each perfectly tuned-in and at full strength.

I have yet to see the set that will beat the S.T.700 for selectivity, volume of output and sensitivity.

JOHN A. WATKINS, 207, *Bollo Bridge Road, Acton, London, W.*3.

1 MILE FROM BROOKMANS PARK.

Dear Sir,—I wish to thank you for the opportunity you gave me of hearing a demonstration of your new set, the S.T.700, which took place less than one mile from the National and Regional aerials at Brookmans Park.

My expectations of something exceptional and original were fully realised, and I was more than surprised to see how easy it was to bring in station after station on both medium and long waves at full volume without interference. Also, the quality on so many stations was all one could desire.

Your arrangement for dealing with the National, Regional and Droitwich is most effective.

Many of your old readers are no doubt expecting something good, and I personally am convinced they will not be disappointed.

E. G. POLLINGTON, 45, *Holtwhites Hill, Enfield, Middlesex.*

REMARKABLE SELECTIVITY.

Dear Sir,—In thanking you for the demonstration of the S.T.700 I should like to add how greatly I appreciated the several really practical features therein incorporated.

I consider the set excellent for the average user.

The tuning, for example, resolves itself into setting the pointer of the Auto-Dial (which in itself is a great feature, in that at last a dial with readable names of stations well spaced apart has been evolved) to the station required, and turning one knob till that station is heard, increasing the volume in the usual way. Then watch the effect of putting the Audio-Reaction into operation!

The selectivity is quite remarkable, over forty stations M.W. clear of each other were logged in about an hour and many L.W. as well.

The sensitivity is definitely excellent. With an outdoor aerial and good earth the stations romped in. When this aerial was replaced by some 30 ft. of ordinary bell wire slung across the room, this romping-in was not affected. The aerial across the room was then cut down to about 10 ft. and excellent results were received. Finally, the earth was removed and still the signals continued good and strong. From the results obtained under these conditions, I feel sure that had time permitted the whole lot would have been logged.

I would mention particularly that these changes in the aerial and earth systems made not the slightest difference to the readings on the Auto-Dial.

A very useful novelty "The Triple Extractor," is 100 per cent efficient. It enables any troublesome stations to be, not so much cut out, though it will do this, as to reduce their strength sufficiently to prevent them interfering. Equally efficient on the M. and L.W. this will have many users.

And a something that must be heard to be believed—"Audio-Reaction." The operation of this device is twofold: (1) gives a wonderful life to the reproduction and (2) increases the volume of sound. Actual measurements taken on an A.C. meter proved the increase to be adjustable up to 25 times the original! This addition alone makes the set worth building.

I must compliment you on your achievement. A straight circuit doing what a superhet will do and without all the disadvantages.

I was astonished that such varied and really excellent results were being placed at the disposal of the home constructor, who now can build a set which will do infinitely more than any mass-produced set can possibly do for anything like the same money.

(*Continued on page* 370.)

Programme Problems Probed 3

BROADCAST VARIETY

By GARRY ALLIGHAN

EVERY "popularity" contest that has been held in this country has placed variety at the head of the list and yet variety is the poorest of the B.B.C. programme offerings. That is not a paradox; it is merely a confirmation of the reputation the British have for putting up with anything. It does not, however, excuse the B.B.C. for its shortcomings or relieve them of the responsibility for bringing variety up to the level that consumer-demand infers. It is the obvious duty of the B.B.C. to ensure that the quality of any kind of broadcast should be as high as public demand for that kind of broadcast. If variety is the listeners' favourite it should be the B.B.C.'s best broadcast.

"The Root of the Evil."

Let me constructively analyse the facts of the variety situation. At the root of the evil is the root of all evil—money. Not that the B.B.C. are short of money but they stand on their head to spend it. They gleefully squander £1,000 or so on a modernistic opera, intelligible to only 10 per cent of even high-brow musicians, and eke out a miserable £150 for a variety show which, they admit, is entertainment for the overwhelming majority of listeners.

Imagine the problem that John Sharman has to face. He has an hour or 90 minutes to fill, and that means a minimum of eight acts. When the listener hears the show he groans and moans at the quality —"seven ordinary artists and one star," he splutters. The star probably demanded a £50 fee, which left John Sharman no more than £100 with which to tempt seven other artists, or an average of less than £15 an act. How many first-rate artists can afford to break into a big theatrical engagement, sacrificing much in order to pick up £15 at Broadcasting House? Hence the mediocrities.

Stars are Necessary.

If the listener wants a variety show equal in quality to that of the Palladium or even the local music-hall he can resign himself to the fact that he won't get it until the B.B.C. spend as much on their show as the Palladium or the local music-hall does on theirs. In building a music-hall "bill" there must always be at least three big star turns, otherwise the show is thrown out of balance. Three stars would cost John Sharman at least £150 and five good second-rankers would cost another £150, which simply means that the B.B.C. have to double their expenditure on variety.

They have also to double the supply of variety. If they quadrupled it they would still be giving too little of that type of entertainment. There should be a variety show at least twice a week—not once a month as now is the rule. If it is true—and I am sure it is—that more listeners prefer variety than any other type of entertainment, then the B.B.C. are failing in their primary duty of catering for the majority of their subscribers when they spend £150 on a variety show once a month.

WHAT THE BROADCAST VARIETY PROGRAMMES BADLY NEED IS FLEXIBILITY, SAYS OUR CONTRIBUTOR.

Another difficulty about B.B.C. variety is that the quality is as low as the quantity and not only because of the tight money-bags. Truth is that the B.B.C. have not yet devised a formula; they have not studied the mechanics of broadcast variety.

They stupidly feature a ventriloquist, entirely forgetting that, so far as listeners are concerned, there may be two artists on the stage; broadcasting does not reveal that one man is speaking with two voices. They engage a comedian who gets most of his laughs by making funny faces, using grotesque make-up and quaint "props." He will be acceptable to the invisible audience when television comes and not before.

Microphone humour is a vastly different art from stage humour. George Robey was not a noticeable success in his first broadcast because the suggestive up-raising of the famous eye-brows or the eloquent tongue-plugged cheek or the saucy twirl of the walking stick were the chief expressions in his vocabulary of humour. The perfect radio comedians are those who make the listener see funny pictures by the use of words only. They secure "action" by words; they create a "scene" with words; they paint a picture with words as the only pigments.

The "Atmosphere" is Lacking.

The technique of presenting broadcast variety has not been perfected. The methods employed on the stage have been transferred to the microphone and are not suitable. In the music-hall an artist goes off the stage to applause and we occupy our mind and thoughts by joining in the hand-clapping the while we watch the gyrations of the conductor and the motions of the musicians. Our mind is also attracted from the empty stage by the falling of the curtain, the raising of the lights and the general "atmosphere." We do not notice the time lag between the acts.

The same technique has been employed in B.B.C. variety and is most unsatisfying. We sit in our homes and see nothing. We hear the concluding joke of a comic and then there is silence. In such circumstances time becomes elongated like shadows. The dozen seconds lengthen out into the effect of as many minutes. Then after the jollity of the jokester comes the acid, artic tones of the announcer: "And now Flossie Flutterflop will sing to you." Ugh!

Linking the Acts.

John Sharman has to devise some aural proceedings that will take the place of the missing curtain-fall, house lights and theatre "atmosphere." Acts should not be put on, one after the other, cold. It is too much like a Band of Hope entertainment where different juveniles follow one another, without much reason, to "do a little piece." A technique has to be evolved, a formula devised. There has to be an "atmospheric" connection between all the acts, a kind of genial linking-up that makes broadcast variety the same kind of intimate show that its music-hall counterpart is.

The other point I wish to make is that there should be more variety in variety.

(*Continued on page* 369.)

CROYDON AIRPORT CALLING

Schoolchildren recently heard a special broadcast from Croydon Airport. Our photograph shows Mr. Shelley, the B.B.C. commentator, who is himself a pilot, at the microphone in the control tower. With him is Mr. James Jeff, the control officer.

"INTERLACED" SCANNING

What It Means

An explanation of the differences between the two B.B.C. television systems.

By CARDEN SHEILS

THE Baird Company intend to use ordinary "straight" scanning when transmitting television programmes from Alexandra Park, whilst the Marconi-E.M.I. engineers prefer to rely upon a somewhat more complicated method, known as "skip-line" or interlaced scanning. From information now to hand of the exact form of signal which each company will radiate when in charge of operations, it becomes possible for the first time to form an estimate of the differences involved. At first sight they appear to be considerable, though it can be taken for granted that they are not such as will necessitate the use of separate receivers.

One Set for Both Systems.

When the Television Committee agreed to allow the two companies to "share" the transmissions, they made it a condition that both programmes must be receivable on the same type of set. This does not, of course, exclude the possibility of some slight readjustment being necessary, but it must be of a simple and inexpensive nature.

We now know that the Baird Company are going to use 240 lines "straight" scanning at 25 frames per second, and that they will radiate a total frequency band of one million cycles. On the other hand, Marconi-E.M.I. Company will transmit 405 lines and 50 interlaced frames per second, representing a total frequency band of two million cycles.

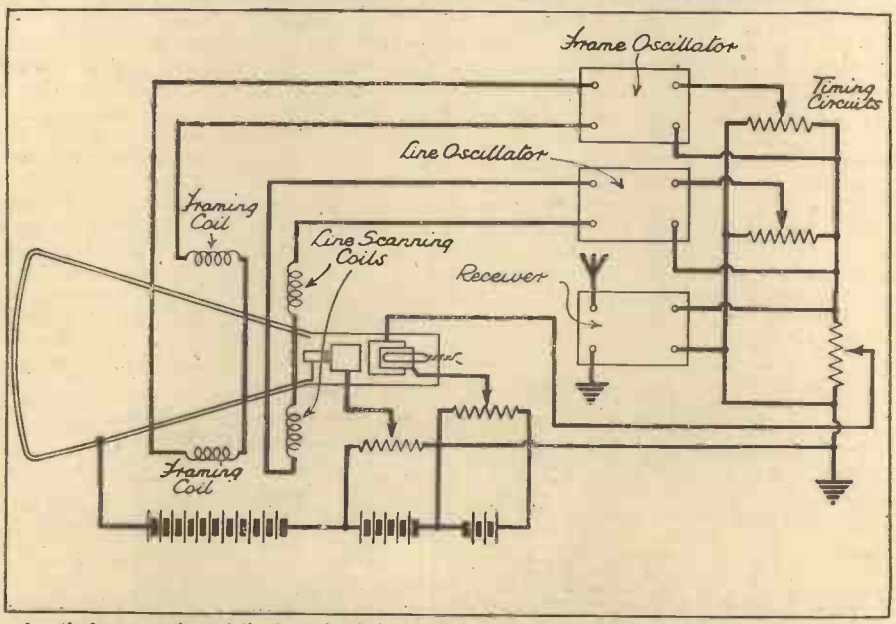
That Half Line.

But when the E.M.I. Company state that they use 405 lines and 50 frames, they actually mean that 405 lines are taken up in scanning the same picture twice in succession. That is to say the first 202½ lines are used up in making one frame of the picture. Then the same process is gone through again with the remaining 202½ lines to make a second frame of the same picture. Actually the two frames are not quite identical, because the second set of scanning lines are slightly displaced from the first set, owing to the presence of the odd half-line.

When the two frames are superposed, one on the other, the second set of scanning lines fit into the gaps between the first set, as you have seen in a recent article in "P.W." by K. D. Rogers. This is what is meant by interlaced scanning, and although it certainly produces high-grade pictures, the gain in detail cannot be taken as the numerical difference between 405 lines and the 240 used by Baird.

In the first place, the actual number of scanning lines used to build up each of the interlaced pictures is only 202½, which is fewer—although not very far removed—than Baird's 240. In the next place, although the eye is intended to receive the effect of two 202½-line pictures, one superposed on the other, the two frames are not in fact thrown on to the viewing-screen exactly at the same moment. One frame is projected first, and is completed, before the interlacing of the second frame begins. Although the frames are repeated at intervals of only one-fiftieth of a second, yet even in that small fraction of time the first half-picture is beginning to lose some of its original brilliance, before the second half-picture comes along to complete it.

SUITABLE FOR BAIRD OR E.M.I. TRANSMISSIONS



A cathode-ray receiver of the type shown here will reproduce both forms of programmes which are to be sent out from Alexandra Palace. The synchronising pulses transmitted should swing the oscillator circuits into step for either form of picture.

It is therefore necessary to qualify one's first impression that the Marconi system uses 405-line scanning, as compared with Baird's 240. Whilst it is difficult to calculate what is the exact effect of interlacing on the brilliance of the completed picture, it is safe to say that it will be a good deal better than the 202½-line scanning used for each half-picture—but something less than the full 405-line figure mentioned.

The real advantage secured by interlaced scanning is the entire absence of "flicker." The number of picture-repetitions per second used in the Baird system is 25, which corresponds with modern cinema practice, and from that point of view is entirely satisfactory. But the fluorescent screen in a cathode-ray tube is a very different proposition from the projection screen used in a cinema theatre, and what will pass for the one is not necessarily good enough for the other. Marconi accordingly prefers to throw fifty frames a second on to the screen—or twice the number used by Baird. In spite of the fact that each frame is not fully complete until it has been interlaced with its "opposite number," yet it serves as an effective "repetition" in the sense of preventing any trace of flicker.

Reduction of Flicker.

The use of interlaced scanning was first suggested at a time when television programmes were being transmitted on the medium waves, where it is essential to make the best use possible of the limited amount of ether-room available. The method was then claimed to allow of a higher rate of picture-repetition for a given side-band spread of the radiated frequencies. Although the claim to freedom from flicker still holds good, the advantage of reducing side-band spread hardly carries much weight under present conditions. The Alexandra Park programmes are to be radiated on a 7-metre carrier, and in this region of the ether there is still plenty of room to spare.

Summarizing the position, it will be seen that as against Baird's 240-line "straight" scanning with 25 pictures per second, Marconi will send out 25 "pairs" of interlaced pictures per second, with 405 scanning-lines divided between each pair. The first type of programme will cover a total frequency band of one million cycles, and the second two million cycles a second. Both make use of synchronizing signals transmitted in opposite phase to the picture signals, i.e. in the "blacker than black" direction.

Switching Over.

A cathode-ray receiver of the type shown in the diagram will reproduce both forms of programme, under the effective control of the synchronizing impulses sent out from the transmitter, which are intended to swing the oscillator circuits of the receiver into step for straight or interlaced scanning as the case may be. Owing to the different line and frame scanning frequencies used in the two cases, some readjustment will be required in the timing circuits as the programme is altered from one type of transmission to the other. In practice, this will no doubt be affected by a suitable change-over switch as simple to work as a wave-change switch.

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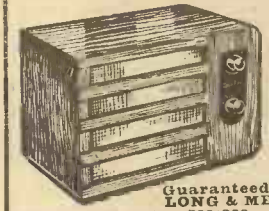

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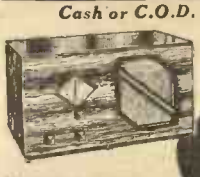

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A testing outfit that is easily made with a few component parts, enabling one to locate faults in a methodical manner, and which provides for the taking of voltages and currents in all valve circuits without grovelling about inside the set with clips, will be appreciated by the constructor, set-owner, and service-man.

The components required are:

1 Dual-range milliammeter.
1 Dual-range voltmeter.
1 Five-pin valve holder.
1 Min. D.P.D.T. and off-switch.
1 "Avo Dapter" plug.
1 Pilot lamp with holder.
5 Terminals or sockets.
2 Spade terminals or plugs, connecting wire, nuts, bolts, screws, etc.
1 Panel and instrument box.

The panel must be of a size to take all the components without crowding, depending on the meters that you have available, or intend purchasing; dual-range meters of good make are recommended for accurate testing.

Mounting the Meters.

Begin by marking off the centres of the circular openings on the *reverse* side of the panel; these should have just clearance for the body of the meters to slip through, thus allowing enough panel for the fixing bolts to grip.

To overcome the problem of cutting out the circular openings, use a compass (with radius required to suit your meters), describe a circle, then reduce the radius by ⅛ in. and make another circle.

THE PANEL LAYOUT

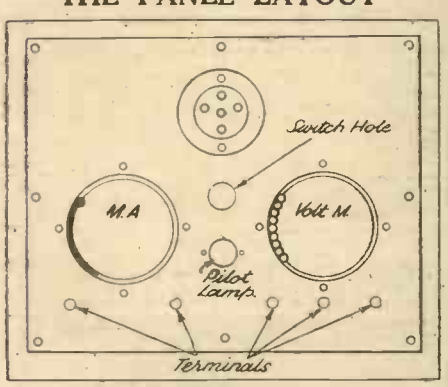
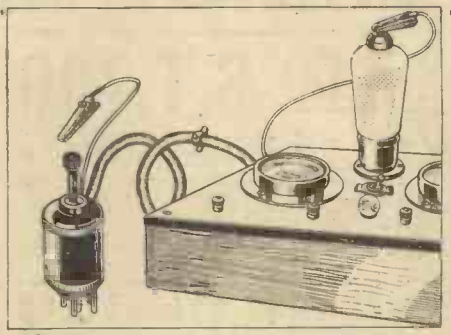


Fig. 1: Two methods of cutting out the meter holes are illustrated in this diagram of the panel.

On this inner circle make a "centre-pop" with a centre punch, and drill a ¼-in. hole. Insert a fretsaw through the hole and saw between the two circles, finishing off the hole with a half-round file.

If preferred, make a series of "centre-pops" round the circle ¼ in. apart, and drill out the centre-piece; finish off with a file as before, then complete all the drilling and countersinking required for the valve holder, pilot lamp, terminals, etc., as per diagram Fig. 1.



This sketch shows the testing unit which is described on this page by T. J. PHILLIPS.

Mount all the components securely on the panel, using small nuts and bolts with countersunk heads; the valve holder may be mounted above or below the panel.

The only advantage gained by mounting on top is that the terminals of the valve holder are more accessible when making anode to cathode, anode to earth tests.

With all the components in place, it is a simple matter to wire them, if the wiring diagram Fig. 2 is followed. The leads from the "Avo Dapter" plug are connected to the valve holder as follows:

Grid to grid, cathode to cathode, filaments to filaments; note that the lead from the plate of plug goes to the centre connection of switch, the remaining one is connected to a "crocodile" clip for clipping on the anode of S.G. valves, side terminal of pentodes, etc.

When using the adapter plug for testing 4-pin valves, the centre-pin can be taken out of operation by lifting the small knurled knob. The "crocodiles," when not in use, are clipped on to the cable out of the way.

The Testing Prods.

With all the wiring completed, but before securing the panel to the instrument box, cut a slot at the back of the box to take the cable if you have mounted the valve holder underneath the panel.

Now there remain only the "testing prods" to be made (if you have not decided to buy them). Obtain two propelling pencils—if possible, one red and one black—made of vulcanite compound with no metal tops on where the lead projects, from the popular sixpenny stores. Remove the propelling arrangement inside, and drill, or burn with a hot wire, a hole right from one end to the other. Solder a length of flex or rubber insulated wire, 18 in. to 2 ft. long, to a piece of stiff copper wire slightly longer than the pencil, and insert into the hole from the top till the soldered joint is inside the vulcanite.

Cut away the surplus at the point end, leaving about ¼ in. protruding, which should be sharpened to a point: to the other end affix a spade terminal or plug with appropriate colouring; do the same with the other pencil. The instrument is then ready for use.

To check the plate current of a valve in milliamps., remove the valve from the set and place in the valve holder of "testing outfit," plug the adapter into the valve holder of the radio set, turn switch to M/A, and switch on the set, when the pilot lamp should light up, indicating that the filament circuit is correct. If a reading is obtained in m/a., it shows that the H.T. circuit plate is not broken, and the emission can be checked by maker's data.

Plate voltage can be checked while the valve is still in its place by switching over to volts, and taking the *negative* prod (one end of which should be connected to the negative terminal of voltmeter) and touching the chassis or earth, which will give a reading, if the H.T. circuit is all right.

If the valve under test is an indirectly-heated mains valve having automatic grid bias, taking the *negative* "prod" as before, and touching the cathode, a slightly lower reading in volts should be obtained here if the bias resistance is in working order. No reading will indicate if bias resistance is broken down or disconnected.

S.G. Measurements.

Note that when testing an S.G. valve, the crocodile clip at the adapter end is clipped to the pig-tail that normally goes to the anode, and the clip at the other end is connected to the anode of the S.G. valve on the "testing outfit."

In this case the milliammeter will be giving the screen current. To test for anode current place the switch in the "off" position, connect the two testing prods to their respective terminals of the milliammeter, disconnect the clip from the S.G. anode, and connect to the *positive* prod, then touch the S.G. anode with the negative prod.

HOW IT IS WIRED

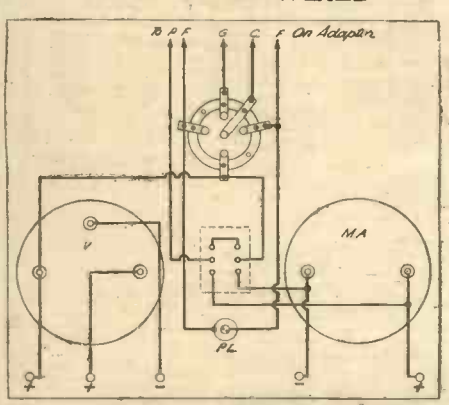


Fig. 2: The complete wiring is seen in this diagram, which serves to emphasise the simplicity of the outfit.

Obviously the lead with the clips on at each end is used to carry the H.T. potential from the priming grid lead on set to priming grid terminal on a four-pin pentode with side terminal for priming grid.

With the switch off the meters can be used independently. Grid volts, accumulators, H.T. circuits and batteries can be tested with the "prods."

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped, addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialties described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

AN IDEA WORTH PATENTING.

E. W. F. (Ramsgate).—"Having several ideas which I think would be worth patenting, I thought perhaps you would be able to give me the names of some firms who would be willing to develop, put the finishing touches to, and patent these ideas."

There is only one way in which to sell an idea, and that is to *patent it first.* Unless this is done the inventor discloses his idea at his own risk, and somebody else may reap the benefit of it.

To aid inventors to patent their ideas sufficiently to protect themselves while selling, a special form of patent is obtainable. This is known as a *provisional patent,* and its cost is only £1.

The inventor may not realise all the implications of his own idea, so his best plan is to get a qualified patent agent to draw up the provisional patent for him; the agent's fee is not high, and this and the provisional patent fee itself will cost only a few pounds all told.

For this small sum—it may be well under £5—the inventor gets professional aid in drawing up his claim, and complete protection against its being "lifted" by someone to whom he discloses it in the course of business.

With this simple and inexpensive method of approach available to him, no inventor who believes in his idea should attempt to sell it before a provisional patent has been obtained: in fact, most large firms refuse to deal with an idea which is not patented in this way. So our advice is to get into touch with a patent agent who specialises in wireless patents, and get his opinion and, if necessary, his assistance in obtaining a provisional patent.

ALTERING BIAS RESISTANCE WHEN VALVE IS ALTERED.

E. J. E. P. (Grimsby).—"I am writing this on Sunday evening, after a day without wireless, during which I have been made to look a fool. If I tell you what happened, you will see where I was wrong.

"Some relatives of mine—farmers—have recently had the mains extended to their village, and I told them that I would fix them up with a mains set if they would fetch me in the car. I had a set ready, S.G., Det. and L.F., and we packed this, with spares, etc., and got over to the farm at dinner-time.

"I fixed the aerial and earth by 3.30, and then got out the valves and said, 'Now for the programme.' But when plugging in the output valve (a 41M.P., requiring a 320-ohms bias resistance), I found that its bias resistance was missing. The car had gone off with it, and I knew I had not got another resistance of that value, so it meant a different resistance or a different output valve.

"As the set had worked well at my place, I had put in only one spare output valve, an M.L.4. This requires a bias resistance of 400 ohms, and in case I had to use that valve, I had got a variable resistance up to 50 ohms, thinking I could add this to the 41M.P.'s resistance and get near enough to the right figure. But without the other resistance the 50 was no good!

"The only spare resistances I had were two 1,000's and a 2,500, so I tried one of the 1,000's, and it sounded as though the set was being strangled. I was afraid to try the 50, for fear such a low value would pass too much current and damage the valve.

"In the end I had to leave the 41P.M. valve in position, and show them where to put its resistance when this turned up. I did not hear the set, as I had hoped, and they did not get the war news on which they were very keen, so it was disappointing all round. Could I have combined those resistances to have given me a usable resistance? If so, please explain how, as it is a fix anybody might get into."

AT MAIDA VALE

The cylindrical steel ducts supplying air to the four recently opened additional studios at Maida Vale. Half a mile of ducts are used, varying in diameter from 5 feet to a mere 6 inches.

You were right not to try the 50 ohms, as it would certainly have done the valve no good. But you might have tried the effect of parallelling the two 1,000's quite easily, and though the quality would have suffered the valve would not have been hurt by that value—500 ohms.

All that was needed was to remember the simple old rule—two equal resistances, when in parallel, have a value of half that of one of the resistances. So the two 1,000's, placed across one another, would have represented 500 ohms.

You could, however, have done better than that if you had known the full rule for resistances in parallel. The formula is $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ etc., where R is the resistance of the combination, and R_1, R_2, etc., the values of the separate resistances.

Working this out for your own instance, you would have known R_1, R_2 and R_3, the respective values being 1,000, 1,000 and 2,500. So the formula would have read:

$$\frac{1}{R} = \frac{1}{1{,}000} + \frac{1}{1{,}000} + \frac{1}{2{,}500}$$

$$= \frac{5}{5{,}000} + \frac{5}{5{,}000} + \frac{2}{5{,}000}$$

$$= \frac{12}{5{,}000}$$

Having found that $\frac{1}{R} = \frac{12}{5{,}000}$ we can obviously find R, the resistance of the combination, by dividing $\frac{12}{5{,}000}$ into 1. This gives an answer of (approximately) 417—only 17 ohms more than you required, so quite near enough for your purpose.

THE 1936 "FERRO-POWER" AND TELEVISION.

C. M. (near Alexandra Palace, London, N.).—"I have been looking over the diagrams of the P.W. 'Ferro-Power,' and I should like to have a go at this set if you can enlighten me about the television position.

"As you will no doubt see from my address, the set will have to be used quite near to the new B.B.C. television station at Alexandra Palace. So any new set that I build will have to be considered from the point of view of working close to this station.

"Is the 'Ferro-Power' suitable to withstand any interference created by the new station?"

Yes, you can be quite confident about that. The new station will be working on a very low wavelength, and its input to your aerial is not likely to be comparable with that from an ordinary-wavelength station. The set has, in fact, already proved itself capable of dealing effectively with the much more difficult type of interference that is experienced from stations working on wavelengths adjacent to its own: this is a much stiffer proposition than coping with interference from stations geographically near but widely separated in wavelength.

Although much attention has already been paid to the probable effect of the new station on broadcast receivers in the immediate vicinity of the Alexandra Palace, the exact extent of the problem involved cannot be gauged until the new station begins transmitting. Its tendency to create disturbance with ordinary broadcast reception will then be known, and the appropriate remedial measures can be taken on the few aerials so close to the transmitter that noticeable interference occurs.

But it is not expected that this will be a widespread or difficult problem, and it should be possible to remedy it even when rather old-fashioned sets are concerned. With an ultra-modern design, like the "Ferro-Power," no difficulty at all is expected.

A PUSH-PULL PUZZLE.

A. M. B. (Bognor Regis).—"What is wrong with a push-pull amplifier when it seems to work fairly well with only one of the push-pull valves in its valveholder?

"I find that quality, with both valves inserted, is excellent, and there is no trace of harshness at all. If I pull out one of the valves there is little difference to the strength, but there is some harshness in the reproduction.

"If I pull out the other valve there is definite instability; but it is not due to the particular valve, because I can change the two over, and still get the same effects at the respective valveholders. What does this indicate?"

The indications are that there is nothing wrong at all, since the results you describe are very much what would be expected. When you pull out one valve, and listen to the other working, you are not—as you apparently imagine—testing one section of the amplifier's normal performance. Nor can you, by pulling out the other valve, then test the other side, and so gain information as to how the respective sides are working when both valves are inserted, in the normal manner.

So far as the static conditions are concerned this half-at-a-time test may be of service; it enables you to check such fundamentals as the continuity of grid and plate circuit, for example. But it cannot correctly represent what either half is doing when combined with the other half of the amplifier, because the presence or absence of the one-valve affects the other's performance by varying the conditions under which it works.

You must consider the two valves working together as one stage, and on this basis you say there is nothing wrong. The fact that either half, tested separately, behaves in such and such a manner, is nothing to be disturbed over.

BARRY KENT CALLING

News and Views from the "Big House."

Programme Try-outs.

THE B.B.C. has decided on an important development in endorsing the suggestion that there should be financial and organisational provision for programme try-outs. This is really an extension of the rehearsal system. In the United States, where advertisers create most of the programmes, there is naturally a good deal of this trying-out, but the idea is new to Broadcasting House.

* * *

A Henry Hall "Party."

There is not to be any elaborate "Review of the Year" at the end of December or beginning of January. The B.B.C. has wisely decided to get away from precedent and to replace the customary chronology with a programme of appropriate verse and music, with a Henry Hall "Party" as the alternative.

* * *

"Murder in the Cathedral."

"Murder in the Cathedral," by T. S. Eliot, will be given as a special production in the Regional programme on Sunday, January 5th, at 9.15 p.m. This is a further sign of the gradual development of entertainment on Sundays.

* * *

New Variety Theme Song.

The B.B.C. Variety Department has adopted the new theme song of the Variety Artistes' Federation. The title is "Oh, Don't Miss Miss Variety." This is another of Eric Maschwitz's bright ideas.

* * *

Felix Greene in New York.

Felix Greene, the new B.B.C. representative in North America, has now been a week in New York. He received a very warm reception. There is, of course, special significance in this appointment. Not only will Mr. Greene act as liaison between B.B.C. and the American broadcasters : he will be a centre of interest in public service broadcasting which is a very live subject in America now. People there are awakening to the indisputable fact that the B.B.C. system is miles ahead of any other broadcasting system in the world.

* * *

Overhauling the Regions.

Mr. Charles Siepmann, the Director of the Regions, is making his first reports on conditions that he has been studying during the past three months. The policy of the B.B.C. is to bring the Regions up to London standards both in programme quality and in staffing. More money will be made available. There will have to be some reshuffling of staff. In fact, the general reorganisation which took place at Broadcasting House in September will have its counterpart at all Regional headquarters during 1936.

* * *

Mrs. Hamilton Active.

Mrs. Mary Agnes Hamilton, of the Board of Governors of the B.B.C., having resisted the temptation of returning to politics, is throwing herself with redoubled vigour into the work of broadcasting. Mrs. Hamilton is getting to know a lot of the staff personally ; particularly those of the more remote junior grades.

Conditions of work in the B.B.C. have been improved lately but there is still a feeling that the governors are not interested in the lower grades. This is the feeling which Mrs. Hamilton is now trying to dispel.

* * *

B.B.C. and Politics.

They tell me round at the "Big House" that the recent General Election was the first occasion of the kind to yield no criticism of partisanship or unfairness in the handling of Election results. All parties seem satisfied that the B.B.C. did its job exceptionally well. Many letters of warm commendation have been received.

* * *

More British Music.

Through the activity of the Music Advisory Committee of the B.B.C. which is presided over by Sir Hugh Allen, there is to be an increase in the proportion of British music in the general programmes and in the public concerts of the Corporation. This process will be attended by a new "drive" to advance the cause of British music both on the Continent and in the Empire overseas. It is thought that the United States should not be attempted until Mr. Greene gets settled into his job in New York.

ON THE AIR

Candid Comments by Our Broadcasting Critic on recent programmes

NOW that the excitement of the General Election has died down, it is interesting to reflect on the part broadcasting played in it. There is no denying the fact that the broadcasts of the select leaders were the biggest and best features of the programmes during the fortnight preceding the 14th.

* * *

Each of the speakers seemed to make a very good case for his Party and its principles. Listeners who set aside their prejudices to listen to everything with an open mind became more and more bewildered as the evenings passed. Facts were given one evening, in a way which carried conviction. The next night more facts (the very opposite of the previous evening's) were broadcast, and just as convincingly. It was the same thing night after night.

* * *

The result of this was that these broadcast speeches achieved only a certain success. Bewildered listeners (and I have heard of many) were, in their bewilderment, faced with two alternatives: Either they were compelled to abstain from voting at all, or to vote as they had always voted, and for no other reason. How could listeners have been spared this bewilderment ?

(Continued on next page.)

ON THE AIR

(Continued from previous page.)

I think their difficulties would have been minimised if opposing leaders had appeared before the microphone in pairs. We certainly would have had a first-class debate each evening. Questions would have been argued out, and no facts, or alleged facts, stated without the opposition being given the opportunity to protest. The statement and the protest, if listened to intelligently, would have left the listener free to draw his own conclusions.

Why Not Parliamentary Broadcasts?

You will remember how I from time to time deplore ranting by actors. The best effects are got by a quieter dialogue. Broadcasting has its own peculiar technique. The politicians will have to learn this technique. True, some already have it, as discerning listeners were quick to see during this election campaign. As these speeches were so much enjoyed it is not surprising that listeners are eager for more.

Well, there should be a spate of interesting debates shortly in the House. Why shouldn't we be allowed to listen to some of them? Why shouldn't we be allowed to hear our own member (if he or she ever speaks)? Broadcasting makes this quite possible, and I hope the B.B.C. will take the hint and install a mike in the House straightaway, in readiness for the coming session.

* * *

And now of the broadcasting of the election results. No one will deny that to sit comfortably at home waiting for these is an improvement on the old experience of being jostled about in an excited crowd outside the local newspaper office, sometimes in the rain and fog, waiting for results to be posted. The service the B.B.C. rendered in this respect was great. Yet one hears complaints. To make waiting for results less tedious the B.B.C. dispensed hours of music. Three popular combinations were engaged for this. So far so good.

* * *

The mistake the B.B.C. made was that it provided music only. It should have aimed at giving more variety. A good entertainer, I thought, would have been very welcome. In fact, several entertainers should have been engaged for this occasion. But what a marvellous opportunity for the Mobile Unit! I have great faith in this Mobile Unit service. When it functions it never fails to succeed.

On this election night, in every quarter of Great Britain, results were being declared, each with its own local characteristics and spirit, by every possible assortment of city mayors, etc. What an array of gorgeous sound-pictures went begging here, only because the Mobile Unit chose rather to go home to bed! Election nights don't happen every week, and the B.B.C. missed a golden opportunity in this 1935 election to demonstrate the value of the Mobile Unit. It may have to wait a long time for another.

A Conspicuously Good Play.

"Eden End"—J. B. Priestley's play—was, to me, the only other conspicuous thing of the week. It is a good Yorkshire story of full Yorkshire flavour, true to life (or to some lives, shall we say?) and happening at a time one cannot recall unfeelingly. The broadcast was excellent. The story came to a somewhat surprising end, I thought, and though I would praise all the cast without exception, I found the female voices a little trying towards the end.

I have never felt quite the same over the female voice before. The "drunks" were first-rate. In a word, "Eden End" is a good play—it's a Priestley—and a good play is always a certain winner.

* * *

"Songs From The Shows" is enjoying a very long run. I don't see why it should stop either—yet. It succeeds because of the way it is presented. The idea of contrasting styles is good. Fashions change, but in songs, at any rate, the underlying theme seems unalterable. It was a disappointment when W. H. Berry was announced absent. I think the time has come now when the B.B.C. should announce as early as possible any alteration in its advertised casts. Many listeners would listen to a broadcast only because W. H. Berry was billed to appear in it. I would, for one.

The theatre always broadcasts the indisposition, etc., of its stars. Nor does it wait until its patrons have passed the box-office. The B.B.C. waits until listeners are in their chairs, and alternative appointments put off. Bad arrangement, that!

C. B.

BROADCAST VARIETY

(Continued from page 361.)

In the average studio show there are usually at least three acts that are almost identical in character. I know all John Sharman's difficulties—the fact that contrasting acts may be in different parts of the country when required, or that, having to plot his "bill" six weeks ahead, he has to book what he can get. But listeners are not interested in the domestic circumstances of Broadcasting House—they pay their money and expect what they expect.

There is also too much of a sameness in the names that are seen in the variety bills. That gives rise to accusations of favouritism—accusations which I personally know to be entirely without foundation. But, after all, even B.B.C. producers are only human and it is natural to take the line of least resistance. Having to plot a show six weeks ahead is a task full of difficulties, and often artists who thought they would be free suddenly find, almost at the last minute, that they will be unable to broadcast. In that dilemma the producer may be excused if he evades the trouble of testing out some new material but 'phones up one of the tried and experienced veterans.

Which brings me to my concluding point: the foolishness of having to complete programme plans six weeks previous to the broadcast. That is the besetting sin of B.B.C. programmes. It causes rigidity—the death of the "Surprise Item" policy. It makes it necessary to standardise programmes and puts artists on a "roster." What the B.B.C. programmes badly need—especially in respect to studio variety—is flexibility.

(Continued on next page.)

HYVOLTSTAR RECEIVERS

(Continued from previous page.)

The chef d'œuvre of the range is the Hyvoltstar All-wave Superhet Ten. This has a simply magnificent specification, and includes a tuning indicator, A.V.C., an H.F. stage, completely automatic silent tuning by means of a relay, and many other advanced technical refinements. Its output is 5½ watts and it will tune down to 13 metres and up to 2,200 metres.

There are various models of this set, including a de luxe radiogram having an automatic record changer.

Universal High-voltage Radio also list amplifiers, short-wave converters, public address apparatus, and a full range of artistically designed cabinets.

We would strongly urge readers to send for the appropriate literature, for these few words are inadequate to convey anything but a bare indication of the interest and merits of the ranges of complete sets, kits and other lines manufactured by Universal High-voltage Radio Ltd., 28-29, Southampton Street, London, W.C.2.

SO BROADCASTING HOUSE WAS TOO SMALL!

(Continued from page 353.)

in the irregularly shaped studio, so perhaps he will be able to tell us in a few months' time.

Quite apart from the building board one can see on the walls and ceilings, there is a similar material laid underneath the expensive-looking carpet on each floor. The B.B.C. Acoustic Research Section means business. It has done somebody a bit of good, too, with its lavish use of 20,000 square feet of acoustic building board!

Perhaps the most interesting general aspect of the new studio group is the way in which each studio is really an entirely separate structure. A heavy brickwork wall is carried right up to the old roof, and it extends down into the foundations of the clay subsoil.

Walking round the exterior of the brick buildings forming the studios, one meets a very concrete reminder that a studio is not just a room with a view, but a highly developed enclosure with artificial ventilation. As in the big studio at Maida Vale, the latest plant has been installed to enable the artists to breathe pure West London air, even though they are sequestered within the confines of stout brick walls.

Force-Feed Ventilation.

Air is forced into the studio from slotted ducts, which one can see high up on the end walls, and is extracted again from vents fitted behind projecting baffle plates about half way up the walls. This is air ventilating, not air conditioning, for there is no freezing apparatus as at Broadcasting House. Of course, before the air is forced through the ducts it has been nicely warmed —so there should be no teeth chattering during the winter months.

A tour of Maida Vale—such as I undertook with the help of Mr. L. W. Hayes, the Empire and Foreign Service Engineer—gives one an impression of happy spaciousness, especially after being shot up and down in the lifts of that somewhat depressing tower at Broadcasting House.

Symptomatic of the "room-to-spare" aspect of Maida Vale is the ample size of the listening rooms adjoining the studios. Sound-insulated double windows divide each studio from its adjoining listening room. And, of course, each room is acoustically treated so that the control man or producer may hear loudspeaker reproduction such as not one in a million listeners ever hears it. But that's by the way.

An Impressive Control-Room.

Finally, there is the impressive control-room, where engineers have full facilities for handing on to Broadcasting House the outputs of four studios simultaneously, as well as enabling the recording rooms at Maida Vale to be linked with B.H.

Evidently the B.B.C. means to make a great deal of use of Maida Vale. I think it would be an exaggeration to suggest that all the orchestral and band concerts will in future emanate from there; but certainly there will be a great deal more elbow-room for drama and Children's Hours at the Big House.

One 'bus an hour will run from "B.H." to Maida Vale. The phrase "missing the 'bus" will take on a new meaning to artists, won't it?

MORE ENTHUSIASTIC LONDONERS ACCLAIM THE S.T.700

(Continued from page 369.)

And the simplicity of the construction, which is perfectly straightforward, without snags, makes it ideal for home construction.

The ease with which the set can be worked will appeal to every average user, while the constructor can pass many happy hours working on the refinements.

Wishing the S.T.700 the success it deserves, and thanking you for a very instructive evening.

WILLIAM MARRIOTT, 32, Leybourne Park, Kew, Surrey.

A REAL GOOD JOB.

Dear Sir,—October 13th will remain in my mind for a long while. After working S.T.400–500, and at present 1.5, had pleasure of hearing demonstration of S.T.700, the performance passing even my wildest expectations.

The new dial will supply a long-felt want and satisfy even the most ardent wireless fans. Over a hundred station names so placed that once set is calibrated—an easy job with this dial—one can set pointer to whatever station is desired and receive that particular programme.

Testing on 50 ft. aerial, selectivity was amazing. Hamburg and Turin clear of locals—no mean performance.

Quality of reproduction is all anyone could wish for, and volume terrific. Using 120 volts H.T. battery dance-hall volume on practically all the sixty-odd stations received and identified during two-hour test. Two notable features are the Triple Extractor—apparatus that cuts out Droitwich, London Regional and London National with such ease and efficiency that it appeared as if they had closed down—and Audio-Reaction, a luxury device. A measured demonstration proved it capable of improving incoming signals twenty-five times without impairing quality.

The sensitivity of the S.T.700 was put to a severe test when a piece of wire about 10 ft. long left dangling from set to floor was used as an aerial. Stations still bowled in at splendid loudspeaker strength on medium and long waves. The S.T.700 is a real good job, and I am positive that all constructors will have a set to be proud of for many years to come.

E. J. BOWEN, 36, Lansdowne Road, Leytonstone, E.11.

TECHNICAL JOTTINGS

Items of Interest to Every Enthusiast.

By Dr. J. H. T. ROBERTS, F.Inst.P.

Bandpass Filters.

WHEN using a bandpass circuit it is very important to take particular care with the wiring and to see, amongst other things, that the wires do not run too close together. A bad arrangement of the wiring will produce stray capacity effects, with the result that, instead of the proper bandpass effect, you will get a curve which is either too sharp—that is, peaked—or too broad. Many constructors do not realise how important the effect of the wiring of the circuit can be upon its characteristics, especially in the case of bandpass filters. As regards the running of the wires too close together, this may happen, for example, with the connections to the tuning condenser, causing a capacity or coupling effect which will completely upset the tuning.

ANOTHER "DATAGRAM" FREE NEXT WEEK

"Datagram" No. 6, which will be given away with our December 7th issue, contains valuable information concerning fault-finding, modern radio definitions, frequency ranges of the piano and other musical instruments, outstanding events in radio history, and the common 7-pin valve connections are given in diagrammatic form.

DON'T MISS YOUR COPY!

Sensitivity and Selectivity.

With a set which employs a bandpass filter, the sensitivity and also the selectivity of the set may be affected quite appreciably by the way in which the wiring is arranged, especially the wiring of the filter itself. All this has been mentioned in letters to me from readers at various times. One reader mentions that he has tried several sets employing bandpass filter arrangements, more or less identical with one another, and has found that the sensitivity and the selectivity vary quite considerably, which he puts down to the inefficiency brought in by differences in the wiring arrangements.

Of course, the arrangement of the wiring of a set is *always* important, on the general theory that unwanted couplings and capacity effects are to be avoided as far as possible. It is quite impossible to prevent some slight effects of this kind, with sets arranged as compactly as they are to-day, but nevertheless these effects should be kept to the very minimum. The importance of correct wiring is especially to be emphasised in the case of bandpass filters.

How Electrolytic Condensers Work.

The electrolytic condenser still appears to be something of a mystery to newcomers to radio, many of whom do not appear to realise that this very useful component is first cousin to an ordinary cell of a dry battery. The pre-eminent characteristic of the electrolytic condenser is its enormous electrostatic capacity compared to that of an ordinary laminated condenser of similar size. This is due to the fact that the "plates" of the electrolytic condenser (one of which is the electrolyte itself) are in extremely close proximity, much closer than we can ever attain by the placing of layers mechanically together; as you know, the capacity of a condenser increases as the distance between the plates decreases, other things being equal.

The Question of Polarity.

The action which takes place in an electrolytic condenser is very similar to that taking place in an ordinary simple battery. When the current tries to pass through in one direction it builds up a layer of gas against one of the electrodes, and this, prevents the actual flow of current. If the voltage is applied the opposite way, this gas layer breaks down and current starts to flow; thus the electrolytic condenser is polarised—that is, it is intended to work with the voltage applied only one way, and consequently has positive and negative poles. It follows that it is not suitable for alternating current. An ordinary laminated condenser can be used for alternating current, and we commonly say that alternating current is able to pass *through* such a condenser.

This is not perhaps true in the ordinary sense, because the plates of the condenser are separated by an insulating material, but, inasmuch as the alternating current builds up a voltage at the terminals of the

(*Continued on next page.*)

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TECHNICAL JOTTINGS

(*Continued from previous page.*)

condenser, first one way, then the other way, the effect is the same as though the current actually passed through the condenser. There is, however, the very important characteristic that the "conductivity" of the condenser, as we may call it (I am speaking now of ordinary laminated condensers), depends upon the frequency of the applied alternating voltage, being greater the higher the frequency.

For Smoothing Purposes.

Since an electrolytic condenser is polarised and must be used only one way round, its use in a radio set is limited generally to that of a smoothing condenser for current which has already been rectified. In using a condenser of this kind it is very important to see that it is connected the right way round, otherwise it will pass current, and chemical action will take place inside the condenser which will soon render it useless.

An electrolytic condenser may contain a liquid electrolyte, or the electrolyte may be "jellified" in the same manner as the electrolyte of a so-called "dry" battery. It is only "dry," however, in the sense that it can be placed in any position without the electrolyte running out.

Radio on Taxis.

Those of you who have been on the Continent lately will have noticed how popular wireless in taxicabs is becoming. On my visits to Paris lately I have noticed that the number of taxicabs advertising "T.S.F." on the windows is greatly increasing. The use of the radio set in the taxi is free—or rather included in the fare, I should say—and the operation is extremely simple. The on-and-off switch and tuning are very conveniently placed to the right hand of the passenger and the music comes out of a loudspeaker concealed behind the upholstery of the back seat.

Any of those that I tried gave excellent reproduction and certainly seemed to me to be quite an attraction. At any rate, all those drivers with the magic letters "T.S.F." plastered over all available windows of their cabs evidently considered they were one up on the other fellows with their unadorned windows.

Amazing Valve Developments.

The other day I was examining a set about seven or eight years old and I fell to reflecting what amazing changes have taken place, not only in set design, but even more in *valve design* in that period. The set in question was one of which I was very proud at that time and it put up a performance which was the joy of the owner and the envy of all others. Now, of course, it is a thing of the past and the valves are hopelessly out of date.

Increases in Magnification.

When you come to think of the magnification which you can get from some of the present-day valves, as compared with those of a few years back, it is astonishing that so much improvement can have been made in what is, in principle, such an extremely simple little component. I venture to say that nobody could have predicted, a few years back, that the thermionic valve was capable of such tremendous improvements—in fact, they can hardly be called *improvements* because the valve has been improved out of all recognition.

The H.F. Pentode.

A magnification factor of 10, for example, was regarded as pretty good for an ordinary three-electrode valve. Compare this with the present-day high-frequency pentode which (theoretically, at any rate) is capable of a magnification of some 5,000 times! The introduction of the screen-grid principle was one of the landmarks in valve development, and quite early on this type of valve gave us an amplification of 30 times per stage. Further developments very rapidly followed upon the introduction of this particular principle and soon we had the pentode or L.F. amplifier leading on to the high-frequency pentode, the enormous magnifying power of which I have just mentioned.

Used as a Detector.

Talking about the high-frequency pentode, by the way, this can frequently be employed instead of a screen-grid valve and also may be used as a power detector. Some people consider that in the detector position the H.F pentode shows its true worth more than in any other. Like the screen-grid valve, the H.F. pentode is made in the ordinary type and also the multi-mu.

TELEVISION BOOK 5

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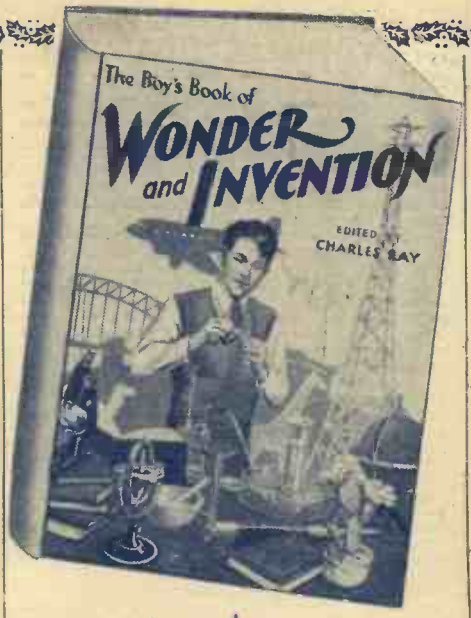

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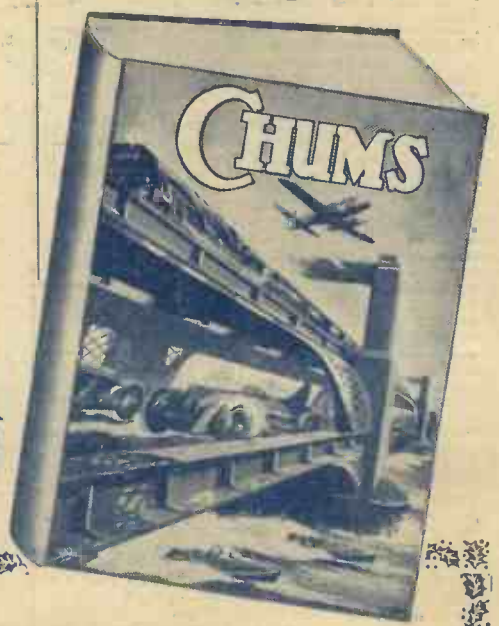

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