

# MUSICAL OSCILLATIONS (See Page 915.)

# Popular Wireless

Every Thursday

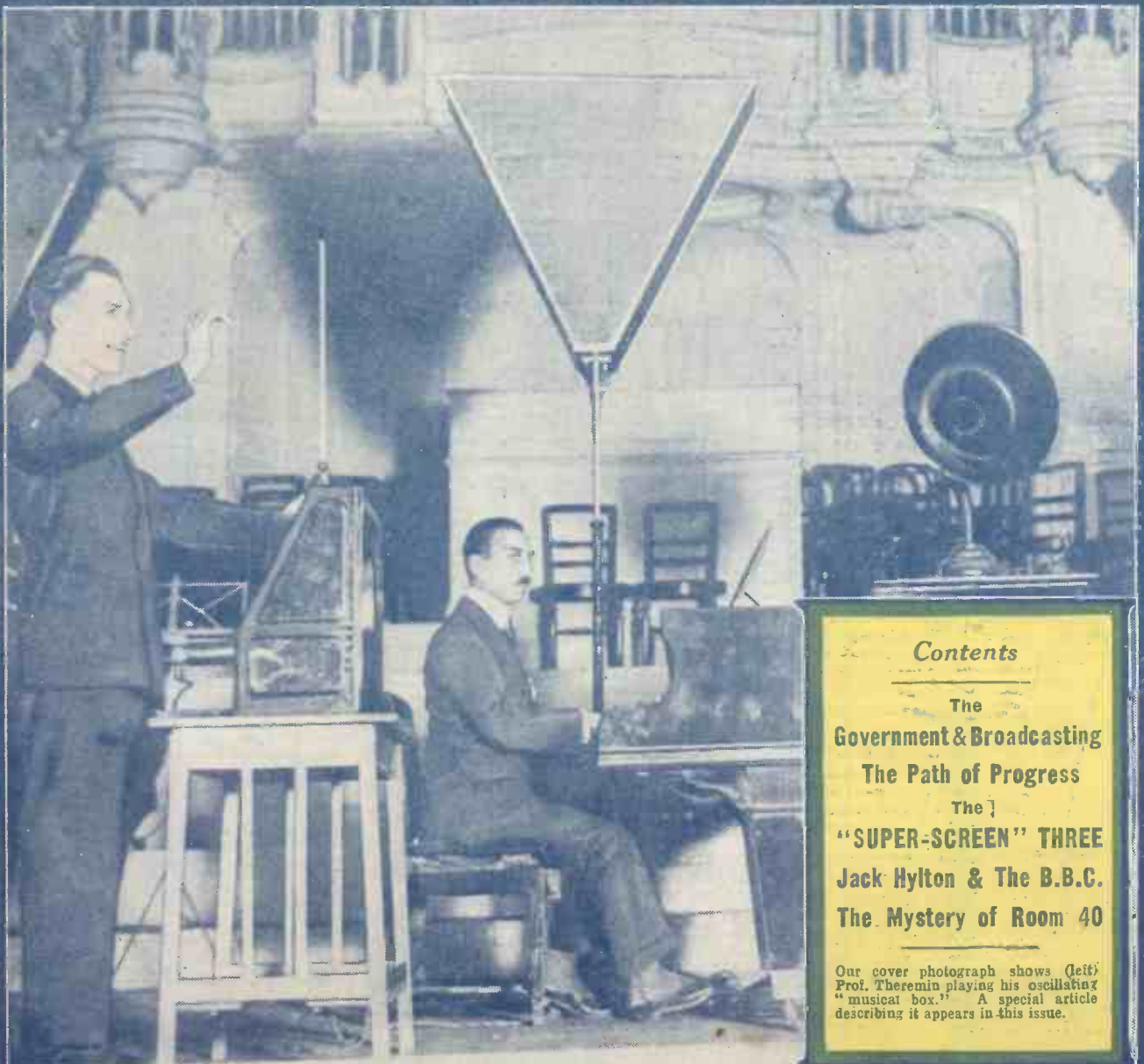
PRICE

3d.

No. 291. Vol. XII.

INCORPORATING "WIRELESS"

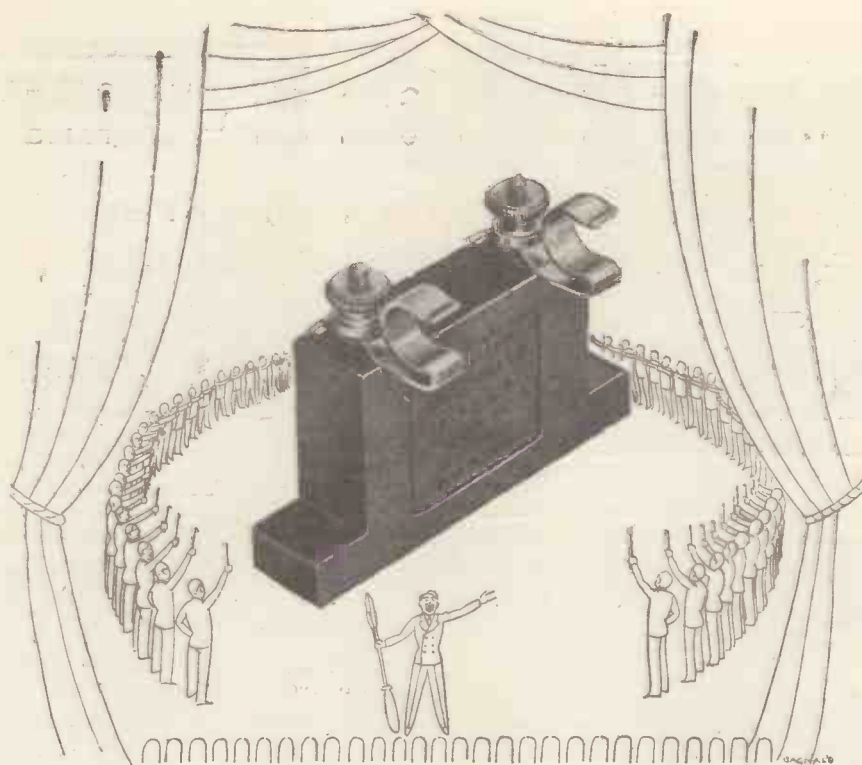
December 31st, 1927.



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Government & Broadcasting  
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"SUPER-SCREEN" THREE  
Jack Hylton & The B.B.C.  
The Mystery of Room 40

Our cover photograph shows (left) Prof. Theremin playing his oscillating "musical box." A special article describing it appears in this issue.



## The Solderers' Chorus

**T**HE vast army of constructors, expert and amateur alike, hail Dubilier as "the perfect condenser."

They have done so for years past:

They know that Dubilier Condensers are old and trusted friends worthy of their implicit confidence because made of very high class materials by craftsmen who understand what they are about.

They know that no reduction of price has been sought by the skimping of details.

They are themselves painstaking and jealous over the sets they build and they rightly expect that the manufacturer has been so over the components he makes.

That is why Dubilier Condensers are demanded wherever wireless sets are constructed.

How else to account for the fact that there are more Dubilier Condensers sold than there are of all other makes put together?

All Dubilier Products are fully described in the catalogue shown here. In addition there is a lot of information which you may find interesting. If your dealer has run out of copies we will forward you one free.



Dubilier Mica Condensers.  
Types 610 and 611 (vertical):  
0.0005 to 0.0009 mfd., 2/6  
0.001 to 0.006 mfd., 3/-  
0.007 to 0.009 mfd., 4/6  
0.01 mfd., 4/-  
0.015 mfd., 4/6

## DUBILIER DICTA



No. 5.

Many years ago there dwelt on the outskirts of a far-off city an honest merchant. Daily would he sit by the wayside offering for sale unto those entering the city small singing birds.

"Take this bird," he would say, "treat it with kindness, and it will make melody to gladden your city home."

Now it so happened that the fame of this honest merchant spread abroad throughout that land, for the exquisite melody of his singing birds was it not a joy unto all that heard? Moreover, as he charged a fair and reasonable price for his birds he waxed prosperous.

Then there arose (as there usually does in such cases) a cunning merchant whose name was Haak. He made much study of the honest merchant's ways, and, being envious of his prosperity, he sought means whereby he might divert into his own coffers the shekels that fell to the lot of the honest one.

And he caught many sparrows of the city and did colour them to resemble the song birds. And he said that the Alchemists would give much to discover the secret of his dye. And he did take up his stand with his coloured birds farther down the highway, so those entering the city came to him first.

"Who'll buy? Who'll buy?" he piped from the wayside. "Are not my birds cheaper by far?" And many bought who, being deceived by the outward appearance, and attracted by the small cost, believed they were receiving true makers of melody at knock down prices.

And, as they passed on down the dusty road that led to the city, a wry smile played about the lips of the cunning merchant who was named Haak.



# A Home-made Met-Vick Four

## THE MET-VICK 4-VALVE A.N.P. CONSTRUCTOR SET

**T**HIS booklet tells you how to make a really superb four-valve wireless set in a few hours at a moderate cost.

It is a set giving **GREAT SELECTIVITY**, and capable of receiving from a **WIDE RANGE** of transmitting stations on the Continent as well as from the B.B.C. stations.

It is **SIMPLE TO TUNE** and the resistance-coupled L.F. stages ensure the **HIGHEST QUALITY OF REPRODUCTION**.

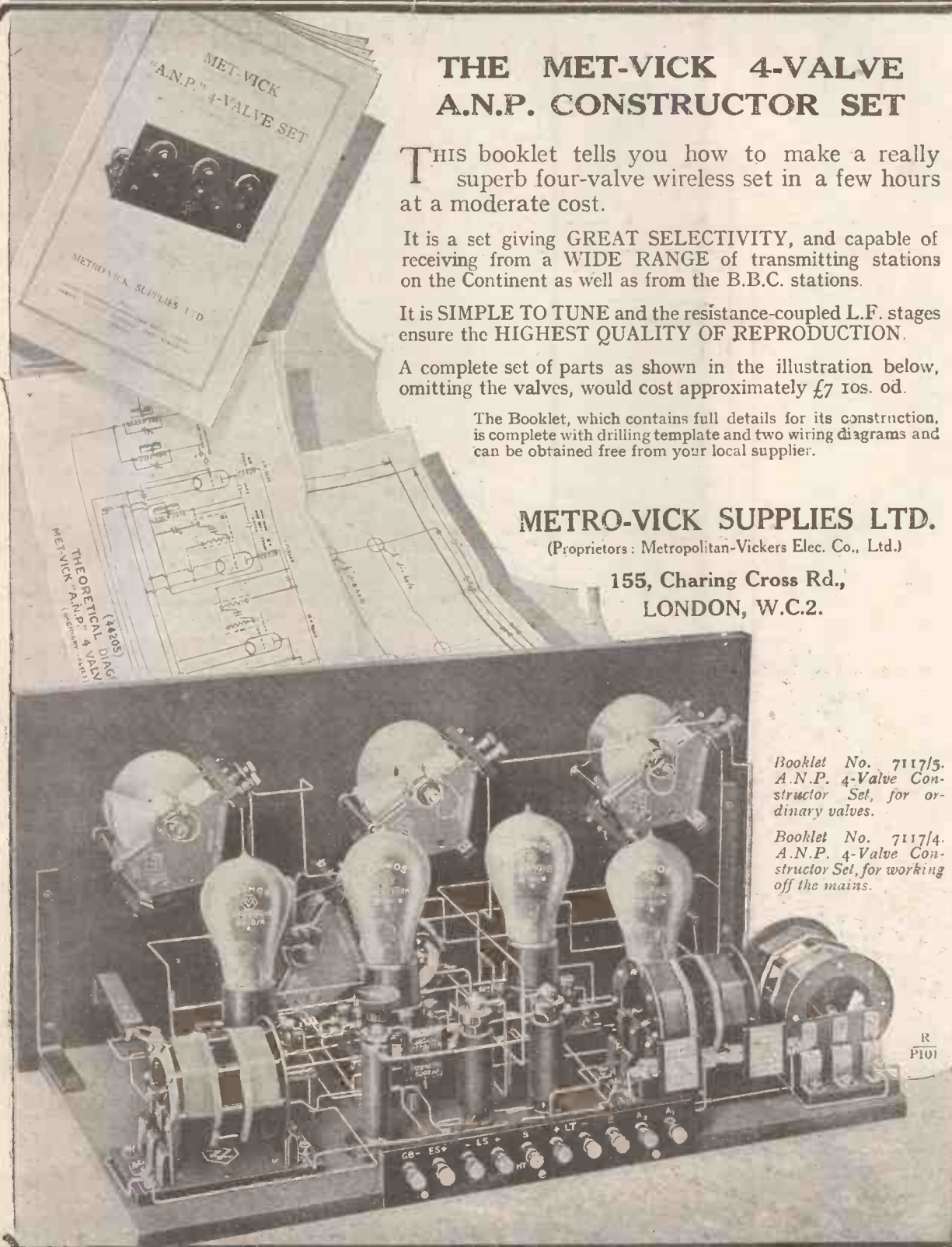
A complete set of parts as shown in the illustration below, omitting the valves, would cost approximately £7 10s. od.

The Booklet, which contains full details for its construction, is complete with drilling template and two wiring diagrams and can be obtained free from your local supplier.

### METRO-VICK SUPPLIES LTD.

(Proprietors: Metropolitan-Vickers Elec. Co., Ltd.)

155, Charing Cross Rd.,  
LONDON, W.C.2.



Booklet No. 7117/5.  
A.N.P. 4-Valve Constructor Set, for ordinary valves.

Booklet No. 7117/4.  
A.N.P. 4-Valve Constructor Set, for working off the mains.

R  
P101

AS SIMPLE AS MECCANO

THE SET

OF THE

SEASON!

GETS RADIO FROM 7 COUNTRIES



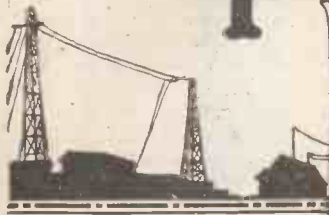
**J**UST think of it! Concerts from seven countries, one after the other, on a Set you have made yourself! That's what you'll get with the wonderful Cossor "Melody Maker"—the Set that has brought Radio to the masses. You need not know the first thing about Radio to be able to build this amazing Set. Thousands who know less than you do have already built it. It's as easy to build as Meccano. If you follow the simple instructions in the full-size chart, which your Dealer will supply you free, you can't go wrong. In an evening you'll build a Set that, at the turn of a dial, will bring you the broadcasting of Europe. There's no blue print to puzzle you. No soldering to thwart you. As easy as A. B. C. ! Remember, too, that you'll save money—the Cossor "Melody Maker" will give you better performance than many factory-built Sets costing twice the price. Ask your Dealer for "How to build the Cossor 'Melody Maker'", or send a P.C. to A. C. Cossor Ltd., Highbury Grove, London, N.5.

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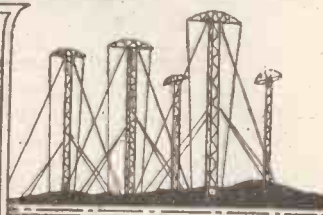
**COSSOR**  
*Melody Maker*



# Popular Wireless



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## RADIO NOTES AND NEWS.

Conjuring by Radio—Short-Wave Stations—Sparks!—Our New Scientists—Broadcasts to Note—Do You Applaud?—A Last Word.

### Another Milestone.

AT the last breath of the Old Year we salute the new, and tender to all readers our hearty wishes for a happy and prosperous 1928, with the luck evenly mixed, but not the weather—let that be strictly according to season. It's not been a bad old year, anyway, so let us pat him on the back before he expires.

### A Retrospect.

NO, taking it in the lump, 1927 has been an outstanding year for radio, I think. A year ago, to ordinary sight, there were no signs of direct reception of broadcasting from Australia; no transatlantic telephony, no Beam stations working, no 5 GB, no 5 SW, no influenza, no taxes—hullo! I've overshot the mark in my enthusiasm. But have the programmes improved? Yes? No? Don't ask me. Write and tell us what you think.

### Vision.

AS to the coming year, in radio affairs I anticipate that it will be a "humdinger."

By this time next year you will have grown used to broadcasts relayed from the Continent, Canada, America, Australia and perhaps India and South Africa; you will be able to telephone by wireless to some of the Dominions; a new system of telegraphy will have been put into operation across the Atlantic, namely, facsimile picture-telegraphy under the Wright system, and as to wireless telegraphy in general there will have been constant expansion: (Listen to Old Moore!—Ed. "P.W."). And as for the prices of valves and sets, and as to television—well, I'm no prophet, as you see.

### Conjuring by Radio.

I SEE that the B.B.C. is giving lessons in conjuring to children, parents being asked to leave the room during the broadcasts. I foresee ruined watches and top-hats by the score, besides escaped rabbits, and goldfish gasping on the carpet. But, bless us, who could teach conjuring to a small boy? It would puzzle Maske-lyne and Cook to counterfeit the skill my small son shows in filling his pockets with ironmongery and oddments of every conceivable kind.

### Radio Overdone.

FATHERS and "fans," take warning from the fate of little Eric Palmer, aged fifteen, son of a radio editor of Brooklyn, New York. This kid has undermined his health, made his mother a nervous wreck, had his apparatus smashed by his father and his licence suspended, all because of his addiction to radio. Writing to the Federal Radio Commission, his father said: "I believe the boy will die of under-nourishment and lack of sleep. I do not believe he has seen sunlight in three months." Some "fan"! Trying to get Rugby, I expect!

### Our Wireless Encyclopedia.

AERIAL: So called because it is situated underground or a foot above the ground, or wound round a small frame and placed on the table, or hidden behind the picture-rail, or not used at all. Transformer: Like a Sunday School, the transformer has a primary and a secondary and often makes a lot of noise. It often has an "outing," too—for the good of the primary or secondary. High Tension: State existing in society when broadcasting station breaks down and society is ignorant of the fact. More dial-twiddling done then than when society is trying to tune in Sydney, N.S.W.

### Short-Wave Stations.

A FURTHER selection, recently compiled—S.S. Derbyshire, G L Y X, 37; Telegraph Administration, Oslo, LCHO, 33; Dakar, OCDA, 35; Rufisque, OCRU, 39; Sebastopol, RCT, 64; Leningrad, RDRL, 28.5; Karlskrona, SAA, 44; S.S. Masisia, SIC, 42, 51.5; Motorship Suecia, SGT, 42, 50; German aeroplane, XEK 4AP, 42.5; Reno, Nevada, KDEK, 70, 55; Radio Club of Zurich, EH9XD, 85, 32; Bizerta, FUA, 42.5, 56, 73; Toulon, FUT, 36.5; Royal Air Force, Henlow, GFY 76; Coltano, ICC, 18; Tripoli, ICK, 45; Norddeich, KAV, 36, 68.

### Odds and Ends.

THE Chicago Federation of Labour is planning a chain of co-operative farmer-labour owned  
 (Continued on next page)



A section of the elaborate earthing system being installed at the new Air Ministry radio station at Mitcham.

## NOTES AND NEWS.

(Continued from previous page.)

and operated stations. The first of these is WCFL. The Radio Corporation of America has applied for two exclusive short wave-lengths for use in exchanging programmes with Britain.

### More Short Wavers.

THE Mackay Radio Telegraph Company, a subsidiary of a large cable combine, controls a chain of short-wave telegraph stations, comprised of Guam, K T A, 18, 21.8, 22, 23.5, 36, 43.6, 44, 47; Honolulu, K N N, 17.2, 23, 23.7, 28, 34.4, 46, 47.4, 56; Midway Island, K T F, 21.6, 33.2, 43.2, 66.4; Palo Alto (Cal.) K N W, 16.7, 17, 24, 33.4, 34, 48, 51. All far, far away, and fair game for any man who thinks he is the snake's hips when it comes to manipulating a receiver.

### Oh, Mong Jew!

AND what is the matter with fair France, really an Al radio country, that her broadcasting system is in need of such drastic overhauling? There is more than a strong indication that they are to begin *de novo* with three national stations working in conjunction with eighteen district stations. Money seems to be at the bottom of their trouble, for I learn, too, that they contemplate raising the tax on receiving sets from one franc to ten; only a 900 per cent increase! Just as Britain is ripe for a 50 per cent cut in the licence fee! (Another "vision."—Ed. "P.W.").

### Sparks!

THE Washington Conference agreed that by 1940 all spark sets shall have been removed from ships. That will be a boon indeed—to those who are now just beginning school. Apropos, the Post Office has recently emitted a self-satisfied toot because its new station at Mablethorpe, Lines, is not to have a spark transmitter. For this we are grateful, in proportion to the amount of Morse interference which will thereby be prevented, but we still beg for an acceleration—in the right direction—of the purifying process. We don't all live in Lines!

### Our New Scientists.

IF the B.B.C. really wish to do some good work in the educational line I recommend them to organise lectures for the benefit of newspaper radio experts, some of whom need tuition in elementary physics before they will be qualified to mislead their readers amongst the tortuous paths of radio. I see that our friend who recently advised the public to wear rubber gloves (no, Archibald! not goggles) to avoid "hand-capacity" effects, has since told us that when we see 0.1 amps—why the plural?—on a valve it means that the valve consumes one-tenth of an amp. per hour.

### Clear Thinking.

I HATE to contradict, but I hereby declare that no valve ever made can possibly consume amperes. Bless me! Does the dear fellow think they are made of petrol? You can no more consume an ampere than you can steam a ship at 5

knots per hour. I would not be thought over-nice, but there is so much loose thinking on these subjects, due to "experts," that it is well to pull up sometimes and get straight on our definitions. An ampere is a rate, not a definite quantity, such as a pint or ounce. Moreover, strictly speaking, you cannot consume a watt, which is also a rate. But I grow academic. Think it over.

### What is Sound?

THOSE who like these little excursions into the realm of accurate science may cherish the memory of a flutter I had some weeks ago with a writer who stated that no one knows what sound is. I in-

## SHORT WAVES.

It is said that since the installation of wireless in hospitals, the average length of time of a patient's stay in hospital has decreased by one week.

Commenting on this, an unkind critic of the programmes said: "No wonder."—"News of the World."

A magistrate points out that the law entitles a man to swear in his own house. Radio constructors, please note.

### NOT THE ORIGINAL COST, BUT THE UP-KEEP.

Radio Dealer: "Well, sir, how do you like your new radio?"

Amateur: "Not much."

Radio Dealer: "Why, what's the matter?"

Amateur: "Well, last night my wife and I were listening in to a sermon, and when they passed round the plate for the collection I forgot, and handed my wife a shilling."

"... The broadcasting manager, when he chooses his company, will have a comparatively simple task. He need not trouble about height, length of eyelash or shape of nose."—"Time and Tide."

Length of tongue and wind capacity will no doubt be important qualifications.

### TOOT! TOOT!

Billy: "Say, Ernie, I just got a radio set." Ernest: "Is that so? What kind of a set is it?"

Billy: "I dunno; but I call it a railroad receiver."

Ernest: "Why is that?"

Billy: "Because it whistles at every station."—"Radio News."

The following is an extract from MSS. received for the Editor's consideration:

"One of the essential features of a low-loss condenser is to keep all di-electric materials out of the consecrated field."

We hope this isn't a forecast of more religious talks over the radio.

It is said that wireless has added hundreds of words to the language. Some of them are quite printable.—"London Opinion."

Wireless Dealer: "Yes, this is a wonderful set—a child can manage it."

Dabious Dad: "H'm! That's what I don't like about it."—"Answers."

There was a young fan of Centralia  
Who fished every night for Australia;  
He got some good practice,  
But, sad as the fact is,  
His efforts so far are a falia.

tended to recommend him to visit a boiler-factory, but forgot. Aha! here is a nice letter from A. N. (Oslo) who says he is inclined to agree with what our "scientist" wrote, and solemnly warns me that "it is wrong to state that sound is waves of air or of other substances." A Norwegian Quixote, forsooth! tilting at imaginary giants, for, of course, no one says or believes that. Sound is not a thing, it is only a sensation, like light and heat. To a stone-deaf man sound is truly non-existent; it can exist only for beings which can hear.

### Broadcasts to Note.

THOSE who like to rob their systems of sleep on the night of Dec. 31st—Jan. 1st, will enjoy the Watch-night service from York Minster, which is to be broadcast from 2 L O, the Daventry brothers and other stations. On Jan. 5th, 5 G B will relay from Birmingham a comic opera, "Hearts' Desire," by Mabel Constanduros. Our Mabel's name is sufficient guarantee that the goods are first-class. Oh, by the way, I missed mentioning "Memories of 1927," Manchester, New Year's Eve, and "Wireless Favourites of 1927," 5 G B, on the same date. Aberdeen comes out with a "Hogmanay" programme relayed to all Scottish stations on Dec. 31st. Perhaps Sir John Reith will oblige the Southron public with a definition of Hogmanay.

### Do You Applaud?

CRYSTAL users and others who feel the desire to applaud B.B.C. items in ink, will be interested to learn that the maker of the "Russell Oscillating Detector" has adopted the suggestion, which has received some support in the Press, that something might be done to facilitate the expression by listeners of their appreciation of items broadcast. Mr. L. G. Russell is supplying his dealers with "Applause Cards," for distribution to any listener who cares to ask for them.

### S.O.S. Unlimited.

THE excellent results obtained by the B.B.C.'s S.O.S. calls during the past year certainly justify the Corporation's action in approaching the Union Internationale de Radiophonie with a view to the repetition by Continental broadcasting stations of its future distress calls; no doubt a general interchange of S.O.S. calls amongst European stations will be the outcome, the very beneficial outcome. I do not feel quite so happy about the expansion of the B.B.C.'s "charitable causes" activity. Already an advisory committee has been set up. Committees have killed more than one good cause; besides, I think the "charities" get a very fair show as things are.

### Beating the Air.

M. THEREMIN'S novel adaptation of "howling" to musical purposes seems to me to be more than a nine-days' scientific wonder, and I believe it will evolve into a new musical instrument which, maybe will have its Paganinis and/or Kreislers. According to the reports of ear-witnesses the sounds he produces have a charm for the ear, and may be made to imitate the timbre of other instruments. After all, I expect the first bow and fiddle seemed a fairly comical outfit to the casual observer, but now—

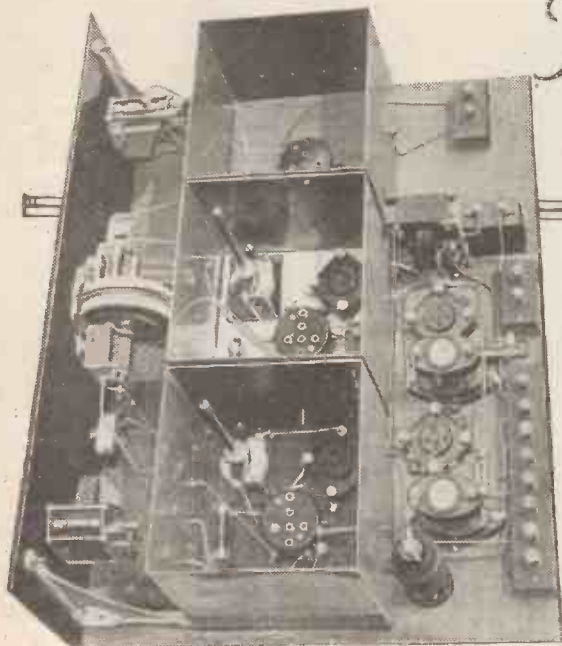
### A Last Word.

AND now I come to my last 1927 note. It has been a great lark to colloquy with all you chaps on almost every radio topic under the sun, and when I have spotted you reading "P.W." on the 'bus I have been tempted to make your acquaintance. But "Ariel" is just the spirit of "P.W." He is, officially, impersonal. As impersonal as Santa Claus. He means well; sometimes he pleases, and sometimes he earns a kick. That's life. Cheerio! Tomorrow is a new day and a new year, but "Ariel" is for ever. Yours very faithfully,

ARIEL.



# The PATH OF PROGRESS



Improvements in Radio Receivers.  
New H.F. Valves of High Efficiency. H.T. Eliminators.  
By SEXTON O'CONNOR.

THE past year has seen a noticeable change in the general attitude of the listener and home constructor towards the merits of high-frequency amplification. Not so very long ago it was the fashion to decry the use of high frequency, partly on the ground that it unduly complicated tuning control, and partly because it was considered that the H.F. stage did not pull its full weight, and that one got better value from an extra valve on the low-frequency side.

Such arguments no longer hold good. In the first place, of course, valves are cheaper both to buy and to run, and one extra stage is neither here nor there. In the second place, the general use of power valves has made more than two stages of low-frequency amplification an unnecessary luxury, so that the centre of gravity has naturally shifted towards the high-frequency side.

## Selectivity and Stability.

Another point is that there is a wider appreciation of the advantages of using one or more stages of high frequency as a practical way of increasing selectivity. Each tuned valve interposed between the aerial and the detector acts as a filter to cut out interfering frequencies, and a number of such filters acting one after the other affords a very high degree of selectivity, quite apart from the natural increase in the range of reception.

Objection as regards difficulty in tuning control automatically disappears as soon as true stability is ensured. In this connection the neutrodyne method of stabilising or balancing the internal capacity of the electrodes has been supplemented by various alternative arrangements, both as regards the external circuits and also as regards the construction of the valves themselves.

As regards new circuit arrangements, the Loftin-White system of combined electro-magnetic and electrostatic coupling is worthy of notice. Here successive high-frequency stages are linked together, partly by capacity coupling and partly by mag-

netic linkage, in such a way that inter-electrode reaction is automatically balanced out over a wide range of frequencies. At the same time the overall reactance of each amplifying stage is kept low, so that an efficient transfer of energy is ensured from one valve to the next.

This system overcomes the main objection to the original method of "neutralising" by means of a small condenser connected from a tapping in the output coil to the grid of the same valve. In such cases the "balance" cannot effectively be maintained over a wide range of tuning without making corresponding readjustments of the neutrodyne condenser. In the Loftin-White circuit, on the other hand, the balance is automatically preserved throughout.

The same advantage applies to the recently introduced "screened-grid" valve as used for high-frequency amplification. In this case a fourth electrode or shielding grid is inserted between the plate and the control grid, and is so constructed as to shield the latter from the electrostatic field of force emanating from the plate. As the two electrodes are in this manner effectively insulated from each other, no undesirable coupling effect can take place between them.

Another type of valve for securing an automatic "balancing out" of plate and grid coupling has been devised by Dr. Robinson, and is known as the Interdyne. Here, a double set of electrodes are mounted inside the same bulb and co-operate with a common filament to ensure stability.

Together with these improvements in circuit arrangements and valve design, inventors have been busy in devising new methods of linking together the necessary tuning adjustments into one central control. Prior to the introduction of automatically-balanced

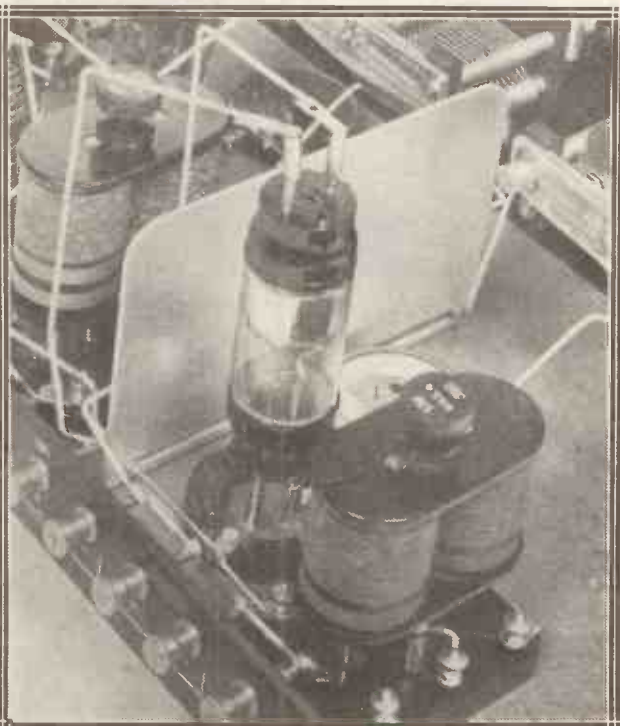
H.F. amplification, the ideal of "uni-control" was practically unattainable except in the case of sets comprising detector and L.F. stages only.

At the present time, however, the problem is comparatively simple. Given a perfectly stabilised H.F. system, a number of "ganged" or geared condensers can be operated from a common knob in such a way as to preserve correct synchronism between the various circuits concerned. Designers have gone even further than this by producing sets capable of being accurately tuned to as many as eight or ten different transmitting stations by the mere operation of two pairs of tumbler switches.

## H.T. Eliminators.

Another outstanding feature of the year is the increasing popularity of eliminator and rectifier units designed for energising valve sets directly from the house-supply mains. At first sight it would appear as though the accumulator and the high-tension battery are both doomed to early extinction. At the same time, it is early days to make so definite a prophecy.

(Continued on next page.)



A screened-grid valve in use. The introduction of the screened-grid valve was one of the outstanding events of the year.

## THE PATH OF PROGRESS.

(Continued from previous page.)

In the first place, mains units have not yet reached perfection for all purposes, particularly where high-frequency amplification is concerned, whilst on the other hand the resources of the makers of primary and secondary batteries are by no means exhausted. It may be that some genius will discover an entirely new means of storing up electricity by chemical means. Welsbach, it will be remembered, invented the incandescent mantle just in time to save the gas industry from extinction by electric lighting. In the same way, it is quite on the cards that we shall see a long, drawn-out battle between battery and eliminator in the radio industry.

For the moment the need for an efficient supply of high-tension current is the more pressing. This is largely due to the increasing popularity of power valves requiring from 10 to 20 or more milliamps of current at a pressure of 100-200 volts. The capacity of the ordinary type of dry-cell battery to stand up to this demand is soon exhausted and constant renewal becomes expensive.

### A.C. Units.

The wet-cell or accumulator type of high-tension battery offers a possible alternative, though here the initial outlay is high and the facilities for recharging are generally inconvenient unless an expensive home-charging unit is available.

For this reason the H.T. mains supply unit is most in demand. These devices fall into two classes according as they are designed to work off A.C. or D.C. mains. The former type is by far the more expensive to purchase, owing to the fact that special thermionic or other rectifying devices must be incorporated in the unit.

At the same time, A.C. units are, generally speaking, more satisfactory in operation than the less expensive D.C. type. This is partly due to the fact that A.C.

rectifiers are isolated by means of a transformer from the mains proper, and are therefore cut off from intermittent disturbances caused by the switching in and out of other "loads," such as carpet-sweepers, electro-medical vibrators, etc., on the supply. It is also, however, due in part to the fact that the A.C. frequency note is a more or less well-defined and constant quantity, which the filter circuit can be designed to deal with and effectively subdue.

With a D.C. unit, on the other hand, the receiving set is not cut off or isolated by a transformer coupling, but is only separated from the mains by the filter circuit. The latter can certainly be designed to cut out the "hum" caused by the commutator where this is a more or less steady note.

Unfortunately, however, commutator noise tends to vary with the care and super-



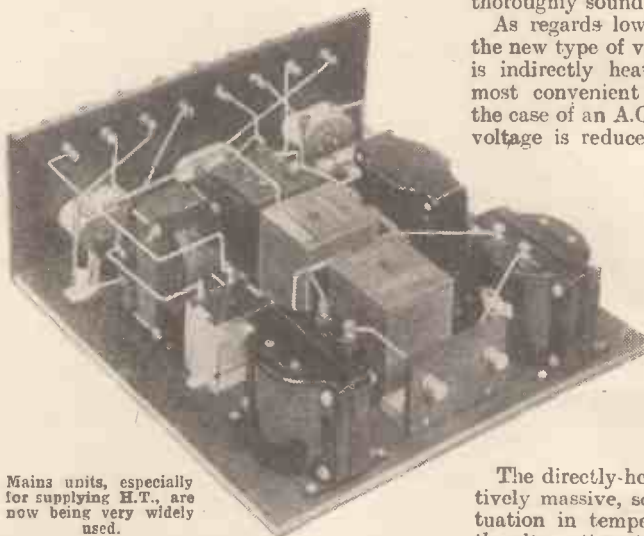
A Loftin-White one-valve set. The Loftin-White system was an interesting development of 1927.

with and may introduce undesirable noises into the set.

At the same time, the general standard of design in eliminator units, both of the A.C. and D.C. type, is rapidly improving. For loud-speaker work at short range, i.e. where H.F. amplification is not involved, the modern mains unit can be depended upon to give satisfactory results, and is a thoroughly sound investment.

As regards low-tension from the mains, the new type of valve in which the filament is indirectly heated appears to offer the most convenient solution, particularly in the case of an A.C. supply. Here the mains voltage is reduced to a suitable value by means of a step-down transformer. No rectifier is used, but a comparatively heavy A.C. current is fed to a "false" cathode fitted inside the valve in close proximity to a "true" cathode of the dull-emitter type, which liberates a stream of electrons under the influence of the radiated heat.

The directly-heated filament is comparatively massive, so that no perceptible fluctuation in temperature occurs in spite of the alternations in the current supply. The true cathode is, therefore, fed with a steady supply of heat and maintains a uniform supply of electrons free from any trace of the A.C. frequency of the mains.



Mains units, especially for supplying H.T., are now being very widely used.

vision paid to the brushes by the engineers at the power house of any particular supply company. Also, brush noise varies as between one dynamo and another, so that a D.C. eliminator which will work satisfactorily in one locality will not always do so in another.

Finally, as previously mentioned, because of the direct connection through the filter with the general network of the supply service, the effect of outside loads and disturbances caused by other consumers on the same system cannot be effectively dealt

### Gramophone "Pick-ups."

Amongst other general features of interest, it is to be observed that the horn loud speaker is tending to disappear in favour of the type of instrument using a cone or similar diaphragm of large area. The demand for high-quality reproduction is also tending to favour the moving-coil or electro-dynamic type of instrument in place of the older electro-magnetic action.

An interesting side line development which promises to become very popular, especially for providing reliable dance music, is the use of the wireless set to amplify ordinary gramophone records. An inexpensive pick-up device is combined with the record needle, and translates its vibratory movements into corresponding electric voltages, which are then applied to a valve receiver and reproduced at great volume in the loud speaker.



The gramophone and the radio set came closer together in 1927 than ever before, owing to the popularising of the "pick-up."





**PROFESSOR LEON THEREMIN** has recently given a series of successful demonstrations with a thermionic "music-maker," which is capable of producing a whole gamut of melodious notes, varying in quality from wood-wind to the richness of the 'cello.

In outward appearance the apparatus consists of a panel cabinet somewhat similar to a four- or five-valve receiver, to which a short rod "aerial" is attached at one side, whilst a small loop aerial projects from the other.

A tune is played simply by the movements of the performer's hand, to and fro, near the rod "aerial." At no time is the apparatus actually touched. The varying distance of the performer's hand from the rod changes the pitch of the emitted note, and so produces a tuneful sequence.

#### A "Mysterious" Effect.

Volume control is effected with equal facility by simply varying the distance between the performer's other hand and the small loop aerial. The effect is little short of miraculous. The music sinks or swells in sympathy with a gentle waving motion, similar to the baton of a chef d'orchestre.

The change of note from one pitch to another is not, however, perfectly clear cut. There is a slight slurring in which one hears a faint suspicion of all the intervening notes. The effect is, however, by no means unpleasant. It is, in fact, reminiscent of that obtained from the so-called "musical saw" beloved of *recherché* jazz-orchestras.

Another interesting feature is that no one note can be held absolutely constant for any length of time. No matter how steady the performer's hand may be, the slightest movement or wobble is reflected in a corresponding change in the pitch of the emitted tone.

#### The Secret.

The secret of the performance lies, of course, in the relative tuning control of two high-frequency circuits, and the corresponding changes in the pitch of the beat note as one set of oscillations heterodynes or "beats" with the other.

Most of our readers, turning back to their salad days at the art of tuning-in, will be familiar with the heterodyne howl caused when an oscillating set clashes with an incoming carrier-wave, and with the wailing rise and fall of that "howl" throughout the swing of the tuning condenser. The same

A simple explanation of the thermionic "musical box" recently demonstrated in this country.

By  
A SPECIAL CORRESPONDENT.

thing is perhaps more noticeable when the other fellow swings his knob and oscillates. At all events the effect can still be observed nightly even in these more regenerate days.

Again, when searching for a distant station, on a receiver set on the threshold of oscillation, the effect of the slightest movement of hand near the tuning control will usually produce a similar illustration of the importance of small capacity effects. Still another illustration can be obtained by jabbing a metal pencil or pocket knife through the "empty" space inside a plug-in tuning coil, either when the set is gently oscillating or when it is just on the verge of self-oscillation.

In all these instances the source of the sound is the interaction of two high-frequency oscillations. If both oscillations are kept at the same frequency, the resultant

note is of a steady pitch corresponding to the difference between the two primary frequencies. Of course, before such a "beat" note can be heard it must pass through the detector valve.

The rise and fall in tone is due to a change in capacity (or inductance) value in the local circuit, and to a consequent detuning, which, by altering the frequency of the local oscillations, varies the resultant "beat" frequency and, therefore, the pitch of the rectified note.

#### The Pitch Control.

In Professor Theremin's apparatus the pitch of the note is controlled by moving the hands to or from a short rod or aerial-forming part of a tuned H.F. circuit.

It must be borne in mind that the capacity value of the hand, or any other body in such circumstances, will depend upon the value and distribution of the electric field of force surrounding the charged control rod.

In the case of a simple charged "point," we know that the distribution of the electric field varies inversely as the square of the distance, whilst in the case of a charged rod it falls off approximately as the simple

(Continued on next page.)

## AN "ETHER MUSIC" DEMONSTRATION.



Sir Henry Wood, Sir Oliver Lodge and Prof. Theremin at a recent demonstration in London. Prof. Theremin (right), was actually operating his novel-instrument when this photograph was taken. By varying the distance between his left hand and the loop of wire he is able to vary very closely the volume of sound. The pitch is altered by his other hand by taking it nearer to or further from a metal rod which projects from the top of the instrument. Note the meters and controls on this latter.

## SOME PRACTICAL HINTS.

Accumulator Vent Plugs—"Silver" Valves—Working Ebonite.

### Accumulator Vent Plugs.

IF you happen to lose one or more of the vent plugs of your accumulator, get it replaced as soon as possible. Dust must not be allowed to get into the acid of the accumulator, for dust is an impurity which will cause trouble. Until you are able to obtain a proper replacement a cork can be utilised to fill the gap, but a small hole should be made through the centre of the cork in order to allow the gas to escape from the interior of the accumulator while it is on charge and directly after. Do not use wood or a plug of paper, for such things rapidly succumb to acid. By the way, do not forget that the gas that escapes from an accumulator immediately after charging is of a highly explosive nature. Also the celluloid casing embodied in many batteries is very inflammable, so do not light your pipe or cigarette near an accumulator, or place this close to the fire or any other flame.

### "Silver" Valves.

The irregularity of the silver coating on the interior of the glass bulbs of some valves should not cause their owners to doubt the operating efficiencies of these accessories. After as much air has been extracted from the bulb of the valve by vacuum pumps, what is known as the "getter" is brought into operation in order to absorb the remaining particles. This "getter" generally takes the form of a small piece of magnesium oxide.

During the assembly of a valve a small portion of this chemical is placed on the plate. Subsequently, by means of high-frequency currents, the interior of the valve is brought to a great heat and the magnesium oxide evaporates and in so doing absorbs that remaining small quantity of air. As the valve cools down so does the resultant vapour settle on the interior of the glass bulb and form the familiar silver lining.

That this latter is present at all is

something of a guarantee that the manufacturers have taken every possible precaution to exclude residue gases, and if it should be irregular it should not be taken as an indication that the process of manufacture has been likewise. Did an even coating of this silver lining prove essential to the successful operation of the valve, our manufacturers would soon see that this was obtained.

### Working Ebonite.

You can use an ordinary rip-saw with

not-too-coarse teeth for cutting down a large piece of ebonite, although the edge resulting will tend to be somewhat rough. For ordinary panel surfaces you should use a hacksaw having about twenty five teeth per inch. Metal working and not wood drills should be used for ebonite. Some constructors use only one small size of drill. With this, all the necessary holes can be drilled in the panel and enlarged to the desired sizes by means of a reamer.

Ebonite is not quite hard enough to take taps satisfactorily. Wood screws cannot be driven into ebonite. Unless braced by means of panel brackets, ebonite tends to warp. Warped ebonite panels can be straightened by dipping them in boiling water and then placing them between boards in which positions they should be held down by means of heavy weights.



Sir Robert Hadfield with Prof. Theremin examining the thermionic "music-maker."

## MUSICAL "OSCILLATIONS."

(Continued from previous page.)

distance. For other shapes of charged surface, the surrounding field-intensity will lie somewhere between these two values.

In fact, it would be possible so to design the shape of the control aerial that a person accustomed to play the violin could secure the same tone emission from the musical oscillator by making exactly the same finger movements as if he were grasping his favourite instrument.

Be that as it may, the fact remains that Professor Theremin has shown us that a skilled operator can produce violin music merely by moving his hand in the appropriate fashion near the oscillator.

For the complete instrument in its most elementary form, at least two valve oscillators are necessary. The first oscillator is set and maintained at a constant fre-

quency. The second comprises as part of its H.F. oscillatory circuit the control rod or aerial by means of which successive notes are produced.

In addition, there must be a detector—either a valve or a crystal—to rectify the beat note produced by the interaction of the first two.

This, of course, would only produce a thin reed-like note having no particular timbre. This quality can, however, be introduced by combining several harmonic frequencies. For example, by combining the output from the two elementary combinations described above the resultant complex note would be richer than the single note.

### The Volume Control.

The same result can also be obtained in a less complicated fashion by "loading" each valve, either by imposing an excessive grid bias, or by introducing variable resistances or capacities into the tuned circuits, so that the simple sinusoidal currents from a "pure tuned" circuit are deformed into higher harmonics.

A method of volume control can be ingeniously contrived as follows. When the second hand of the performer approaches or recedes from the loop "control" previously mentioned, the H.F. circuit, i.e. the plate circuit, in which the loop is inserted is slightly detuned.

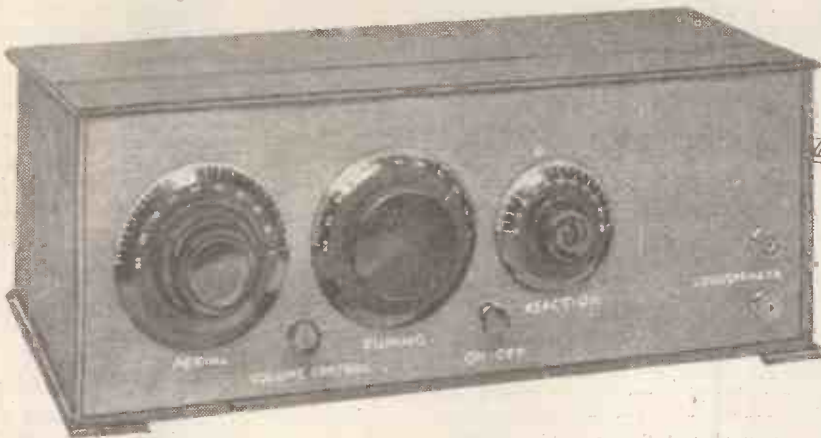
The normal value of the high-frequency current flowing in that circuit is therefore reduced. By connecting this circuit to the grid circuit, say, of the amplifying valve following the detector, the current fluctuations so set up can easily be made to vary the effective grid bias applied to the amplifier and thus control its output.

For instance, in the plate circuit containing the "hand control" capacity is inserted a high resistance which is also common to the grid-filament circuit of the amplifier valve. A reduction in plate current due to the detuning effect of the hand will cause the grid voltage on the amplifier to change accordingly, and so control or throttle the output to the loud speaker. In this way the volume of music swells or sinks in sympathy with the movements of the operator's hand.



# THE "PROGRESSIVE" FOUR -

## Concluding Notes



This week the final constructional details are given and the incorporation of certain refinements detailed.

By G. V. DOWDING, Grad.I.E.E.  
(Technical Editor.)

I SUPPOSE you have all noticed that up to now the "Progressive" has been lacking an "on-off" switch. I deliberately omitted this for the following reason. In my opinion the only reasonable place for a switch of this nature is on the front of the panel where it is readily accessible. Now, I could not place the switch in such a position right at the very beginning, so that its leads did not interfere with my step-by-step plan. Wherever I placed the switch on the panel, and whatever the route of its leads, these would tend to get in the way of the low-frequency additions and cause a slight confusion.

The leads could have been run under the panel, but this would have spoiled my wiring scheme, so, eventually, I decided to leave the business of this switch right to the very last. It can very easily be added, as I will show you, and the slight inconvenience occasioned by the delay in fitting it will, I am sure, be considerably out-balanced by the corresponding simplicity of the development of the receiver.

### The "On-Off" Switch.

The switch itself can be of any make, providing it is of the simple on-off single-pole type and is suitable for panel mounting. I, personally, prefer the push-pull type such as is made by Messrs. Lissen. The switch should be mounted on the panel between the second and third variable condensers (from the aerial end of the set) as shown in the photograph of the complete set and the diagrams which accompany this article.

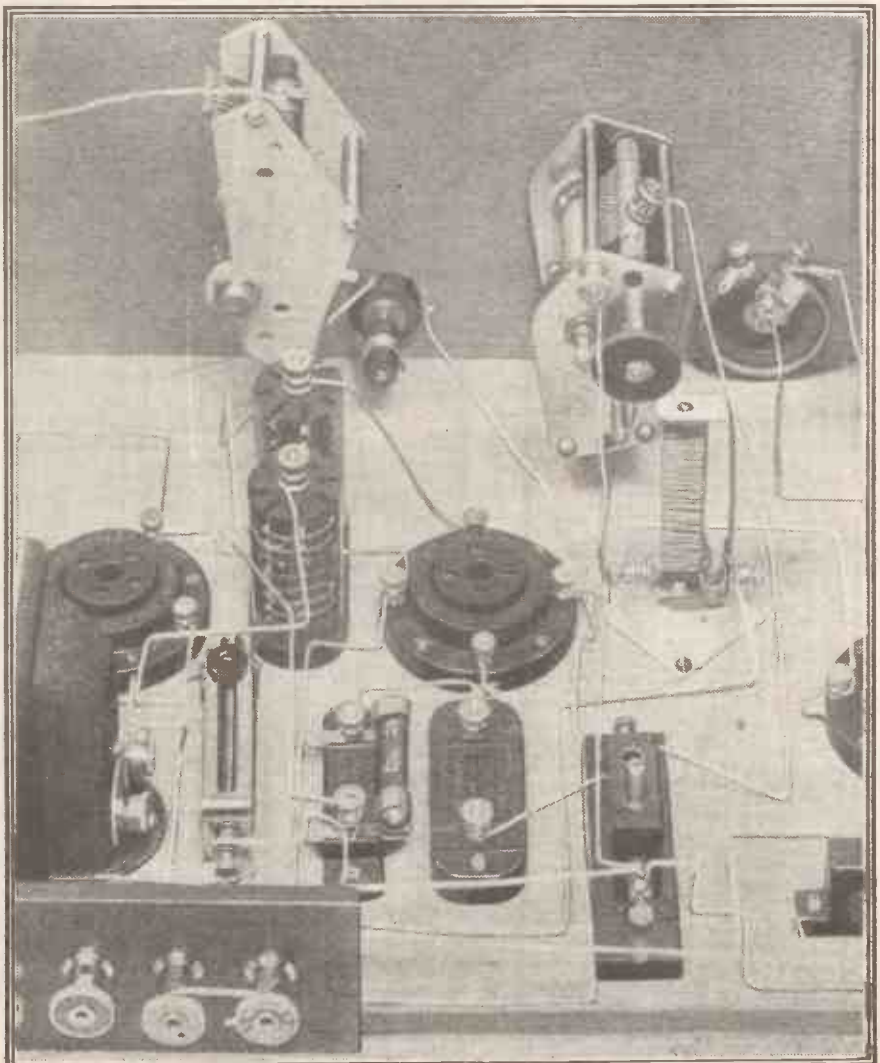
Lead No. 6 should be disconnected from the L.T. plus terminal and joined to one terminal of this switch. It is quite possible that this lead will not be found long enough to make its new connection, in which case another piece of wire will, of course, have to be used. Another new lead must then be connected between the L.T. plus terminal and the remaining terminal of the switch. This lead we will call No. 43.

This completes the little operation. Try to keep these leads well down on the baseboard. With a little ingenuity you will be able to tuck them well away so that they are quite neatly placed. Make absolutely certain that there is no risk of either of the leads in question touching any one of the other leads in the set even should anything be accidentally roughly handled,

for it is possible that all your valves can be completely destroyed merely by one of these L.T. leads touching another lead or any of the components to which they are not joined.

Now the last operation is the intro-

duction of a high-frequency stabilising device. Your particular set may be so stable that you do not feel that anything of this nature is necessary, nevertheless I would advise you to incorporate it in  
(Continued on next page.)



It would be very easy indeed to jump the leads straight over to the "on-off" switch, but it is a safer and better practice to keep them well down on the baseboard as shown. You will see that there is no possibility of either valves or coils fouling any of the wires.

## THE "PROGRESSIVE" FOUR.

(Continued from previous page.)

your set, for it will prove extremely useful as a volume control. You will be able to adjust the strength of the reproduction to a nicety without upsetting any of the tuning controls or doing anything that is likely to introduce distortion—such as, for instance, reducing the H.T.

You will remember that tappings are provided on the intermediate tuning coil for providing various strengths of reaction coupling. Now it is possible that you find the set oscillates rather too readily with the minimum settings of both this and the reaction condenser adjustments when the aerial and high-frequency tuning circuits are brought into tune. The stabilising device will cure this and any other tendency for the set to be over lively.

An ordinary potentiometer is the device

in question, although it is not used in the ordinary manner. In fact, it is not used as a potentiometer at all, but operates as a variable resistance in the grid circuit of the first valve.

Any good make of potentiometer can be used—I used a C.E. Precision and found it quite satisfactory. It should be mounted on the panel between the first and second variable condensers as shown in the photographs. Only two of its connections will be required—one of the outer ones, which is connected to the end of the resistance wire winding, and that one which is joined to the moving contact of the device. The other terminal should be ignored.

### Follow This Carefully.

The necessary alterations in the wiring are just a little more complicated than in the case of the on-off switch, so that I want you to follow me closely, although, of course, you have the wiring diagram to refer to and you can compare this with the one published last week if you should find anything that is not quite clear to you. I cannot help inter-

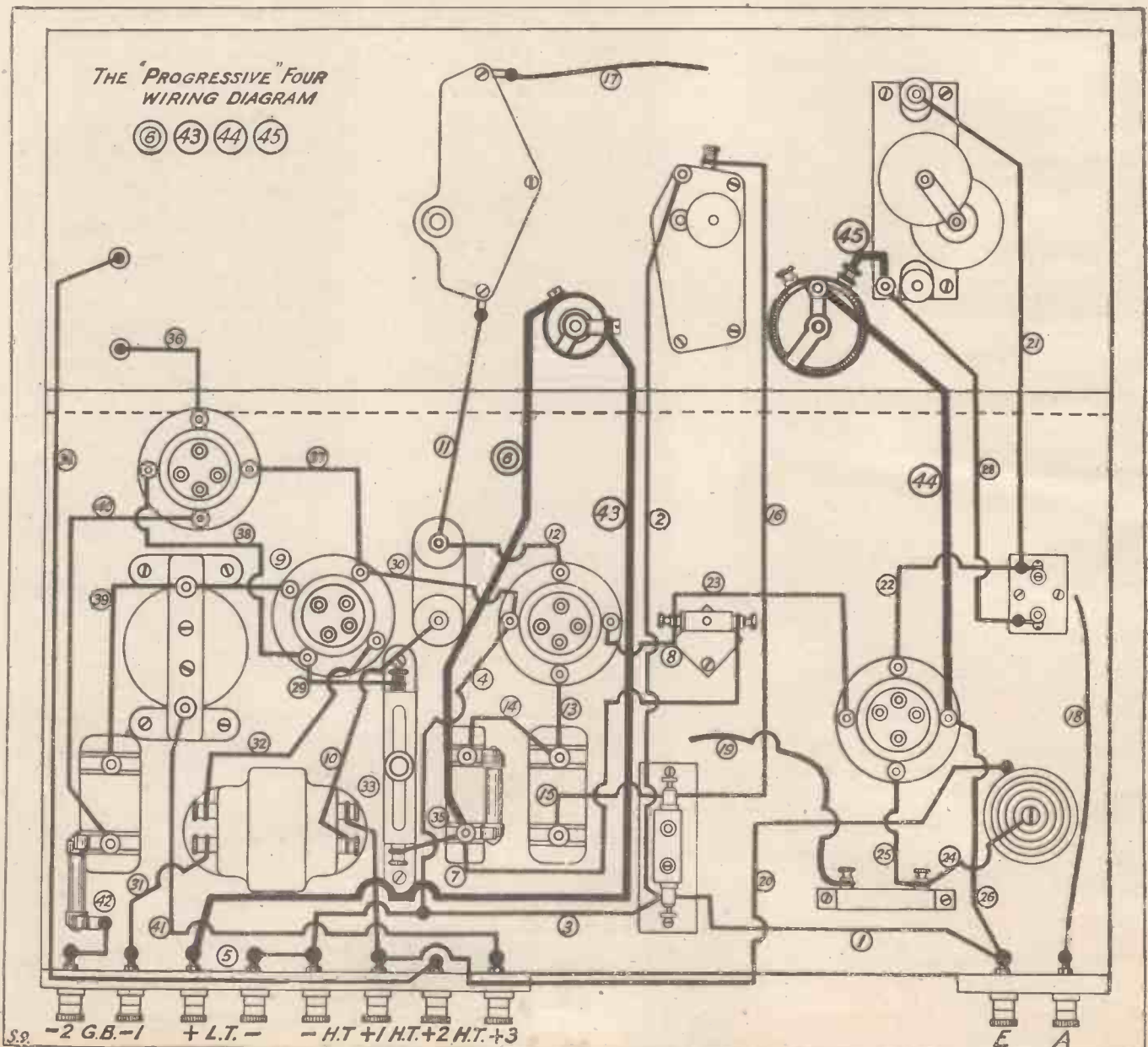
posing the remark that here, if nowhere else, my wiring numbers are fully going to justify themselves!

First of all, you must disconnect lead No. 27 from the filament terminal of the first valve holder. This lead can be snipped down tidily so that it finishes its journey at the point where lead No. 28 joins it. Leads Nos. 27 and 28 now become in effect one lead which runs between the lower terminal of the first variable condenser and the coil holder.

Now two new leads altogether are required. The first, No. 44 on the diagram, should be joined to that filament terminal of the first valve holder vacated by lead No. 27. The other end of the lead should be connected to the centre terminal of the potentiometer.

The other new lead, which we will style No. 45, is a very short one and passes from the other point on the potentiometer to the lower terminal of the first variable condenser. Well, I hope you were able to follow me clearly. You will see exactly

(Continued on next page.)





## THE "PROGRESSIVE" FOUR.

(Continued from previous page.)

how this potentiometer takes its place in the circuit by referring to the revised theoretical diagram which I am giving this week.

Normally, the set should be worked with this potentiometer-resistance set so that it brings no resistance into the circuit, but if it is desired to reduce volume or to stabilise the set, reference can be made to the device.

### The Volume Control.

It will be understood that this system of stabilising is known as a "losser" scheme. That means to say that stability is attained with its use only by introducing something that tends to cause a loss in general efficiency. If your "Progressive" proves to be very unstable without this component in use, I would advise you to try adjusting H.T. voltages and coil tapplings, etc., before you attempt to use it. As I said before, it makes an almost ideal volume control and a slight tendency towards instability can be corrected by bringing a little of its available resistance into circuit, but please do not employ it to "blanket" a serious fault as otherwise you will be reducing the general sensitivity of the receiver.

Now by this time I hope you will have learnt everything about the manipulation of this set that there is to know, but let me remind you that you can cut out the high-frequency stage of amplification in a very easy manner. All that you have to do is to remove the valve from its holder, disconnect flexible lead No. 19 from the intermediate tuning coil and connect flexible lead No. 18 to this point instead of to the plug-in aerial coil. This last can also be removed, as it will not then be in use, although it will not affect results if it remains in its holder. The first variable condenser also becomes inoperative.

### Fixed Condensers.

Now, some of you may have remarked upon the absence of fixed condensers in this set. I have cut these down to an absolute minimum, for a "dud" fixed condenser can cause an absolute failure in results. But now that you have, as I hope, the four valves all working properly and all doing

their utmost, the refinement of one or two fixed condensers here and there can be safely tried.

A .005 mfd. fixed condenser can be fixed to the back of the front panel and connected across the loud-speaker terminals. This will help to give a final polishing touch to the tone. If you can find room for them somewhere, three 1 mfd. Mansbridge type fixed condensers can be connected between the H.T. points in the following manner. One terminal of each of these should be joined together and taken to the H.T. plus terminal. The other terminals of the fixed condensers should be connected one to each of the three H.T. plus terminals. The introduction of these large fixed condensers may have no effect whatever on results, but when the H.T. battery starts to run down, they sometimes assist in smoothing out any little irregularities that occur in the supply.

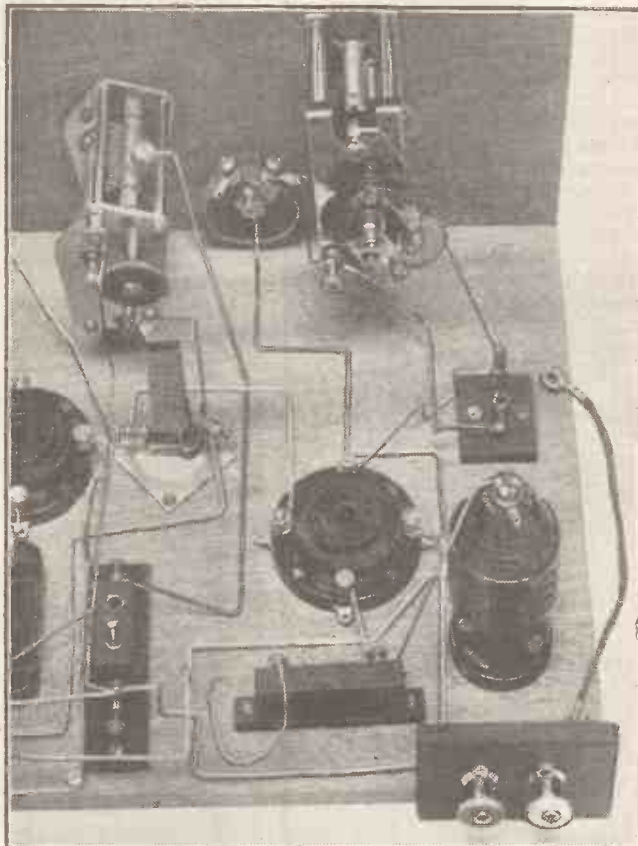
Some amateurs may accuse me of rank heresy, but I must admit that I seldom use these large condensers in my own set, and I cannot honestly say that I have often missed them! As with many other refinements they are "blankets" in the case of sets using battery H.T.'s. When an H.T. battery starts to generate irregular outputs then, in my opinion, it is time to change it. In the case of an H.T. mains unit, such are necessary and are invariably embodied in such an instrument.

Well, in conclusion, I do hope that you have all enjoyed this series of "Progressive" articles as much as I have

enjoyed preparing and writing them. And I hope that everyone of you who have built the set are genuinely satisfied with the results that you are or will be getting.

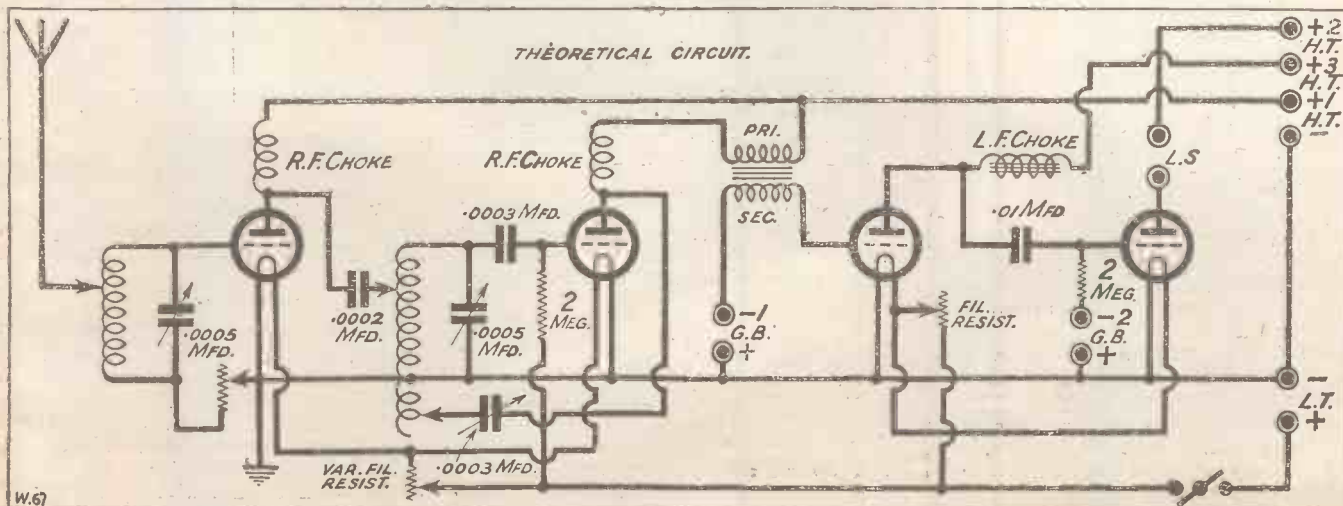
### In Conclusion—

The actual construction of the original set occupied but a comparatively small part of the time I have devoted to it—



Here you see the wiring of the volume control. The lead having four right-angle bends is numbered 44. Number 45 is the small lead connecting the volume control to the right-hand variable condenser.

the real work on my side was preparing the diagrams. But had these taken one hundred times as long to produce, my work would have been justified if the result had been what I hope it will be—the smoothing away of all the difficulties of the less experienced constructor.



## TECHNICAL NOTES.

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

## PICTURE TRANSMISSION.

WEAF—EFFICIENT RADIATION—ELECTRON EMITTERS—RADIO  
BROADCAST RECORDED.

## Picture Transmission.

THE well-known Cooley "Rayfoto" system is now being arranged for assembly by wireless constructors and experimenters in precisely the same manner as an ordinary receiving set.

In recent issues of "Radio Broadcast" (U.S.A.) full particulars are given for making up a picture-receiving apparatus from standard parts. Some of these, of course, are ordinary parts such as would be used in making up a conventional radio receiver, whilst others are parts supplied specially for the purpose.

The Cooley Rayfoto system is adapted only for the sending of "still" pictures. The received picture is produced upon a sheet of paper which is wrapped tightly around a rotating cylinder something after the style of the cylinder of a phonograph machine. It takes about three minutes for a complete picture to be reproduced on the cylinder. Examples of untouched photographs transmitted by the Cooley system are shown in the journal mentioned, and are extremely good.

## Broadcasting Pictures.

Pictures will be sent out by broadcasting stations using their regular assigned wavelengths, and no tuning changes are necessary in the ordinary receiver. For rotating the cylinder during reception, the motor of a gramophone or phonograph may be used, and special attachments are available to meet such a case.

It is anticipated that great interest will be aroused by this step forward in radio transmission and reception, and several U.S. manufacturers are already listing special parts to be used in connection with the system.

## WEAF.

I mentioned some little time ago the new high-power transmitter at WEAF, but tests have so far been rather disappointing. Most New York listeners have depended upon station WEAF for their particular programme service; but, in spite of its 50 kw. the station gives weaker signals at many points—say, within 25 miles of New York—than were previously given by a much smaller station.

## Experiments in Holland.

An official in the telegraph office at Haarlem, who is also a wireless amateur, has been granted a licence to erect a private distributing station for the purpose of making experiments with colour television. This is the first transmission licence in Holland to be issued to an amateur.

## Efficient Radiation.

Dr. Coblenz, the well-known scientist of the United States Bureau of Standards, has lately given some curious facts with regard to the radiation produced by certain

plants and insects. It is well-known that some insects (and fish) are able to produce a light glow, and the curious thing is that this is practically unaccompanied by the production of any heat.

Practically all our methods for the artificial production of light involve the use of some incandescent substance, and the amount of radiation which is produced within the visible range may be only, perhaps, one or two per cent of the total radiation, the remaining 98 per cent or 99 per cent being usually in the form of heat, and being, therefore, useless for the

however, it is not *light* which we are desirous of producing, but *electronic emission*. The electronic emission represents only a very small percentage of the total energy consumed in the filament, by far the largest part of the filament energy being dissipated in the form of heat. By the use of much more efficient electronic emitters it has been possible to cut down the incidental heat production, and we have the modern so-called "dull" and "dark" emitters.

Investigations upon the mechanism of fluorescence and phosphorescence will probably help considerably towards the further improvement in the efficiency of electron emitters to function as cathodes in wireless valves.

## Radio Broadcast Recorded.

For the first time outside Britain gramophone records of a radio programme are offered to the public—in U.S.A. This work has been carried out by the Victor Company, who have now placed on the market three double-sided records of the

ceremonies of welcome to Colonel Lindberg, the famous Atlantic flyer. On these discs are recorded the voice of President Coolidge, the various announcements, and a short address by Colonel Lindberg, also his principal speech at the National Press Club. The cheers of the crowd, the applause which interrupts the speakers, the blare of the bands, and Lindberg's quiet voice are all faithfully reproduced.

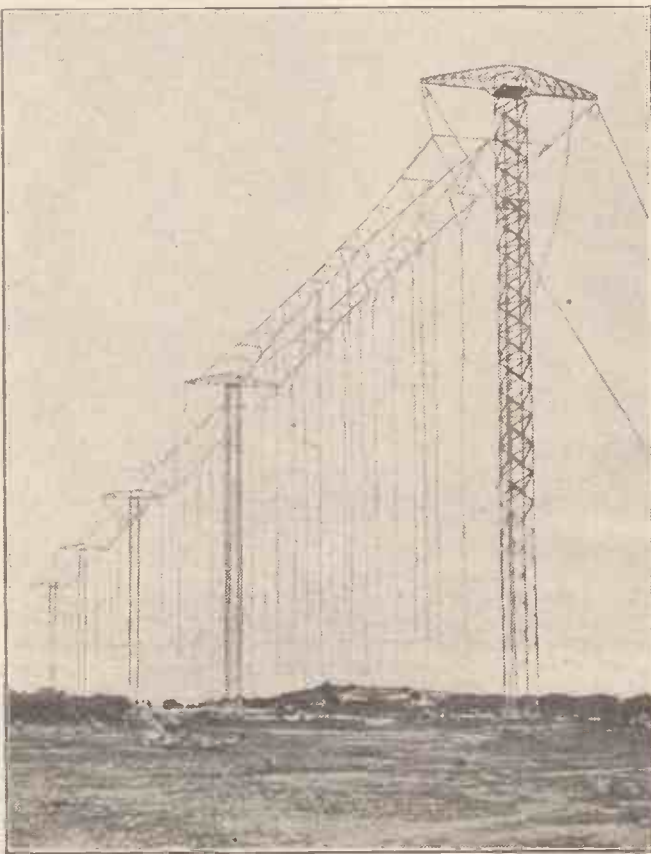
The Victor Company arranged a direct wire from Washington to their studios, over which their recording apparatus received the same programme as each of the broadcast stations. The ceremonies were recorded on forty-six "surfaces," and finally edited down to six.

The U.S. radio journals offer congratulations to the Victor Company on

this excellent step forward and they urge that similar permanent records should be made of various important broadcast events.

## Short-Wave Experiments.

Readers interested in short-wave experiments will no doubt be familiar with the Igranic neutro-regenerative short-wave amplifier outfit which comprises two special high-frequency transformers and has two aluminium screens and special H.F. chokes. Efficient H.F. amplification on the short waves is thus claimed with this apparatus.



The masts carrying the receiving aerial and reflector system at the Milnerton Beam receiving station, five miles north-east of Cape Town. (Marconi Co.)

purpose in view. Thus, for every unit of energy which is converted into light, 98 to 99 units of energy are incidentally thrown away in the form of heat.

Fluorescent and phosphorescent substances are examples of light-producing materials in which the production of light is practically unaccompanied by the production of heat.

## Electron Emitters.

The same arguments apply in regard to the filament of a wireless valve. Here,

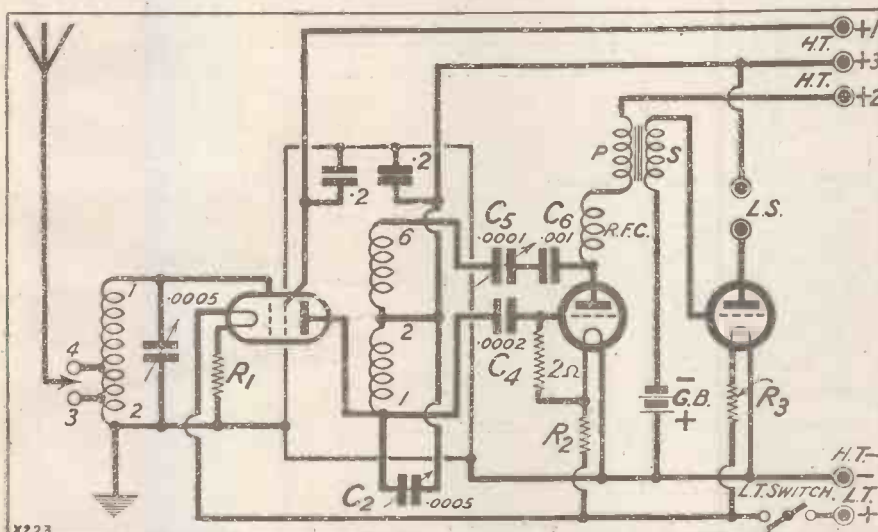




THE introduction of the screened grid valve has placed the designer of sensitive long-distance sets in a somewhat difficult position, since these valves bid fair to effect something like a revolution in the results which can be expected from a given number of H.F. stages, and in our methods of H.F. am-

Here is a "last word" three-valver which, although comparatively inexpensive to build, will give long-range loud-speaker results.  
Designed and Described  
By the "P.W." RESEARCH DEPT.

and many will not relish the idea of putting these on one side and purchasing fresh rather expensive valves and components, and readers in such a position have every right to expect that designs will continue to appear for their benefit for sets on the neutralised lines at present more or less standard for long-distance work.



plification, and it is being argued that they should be used in all receivers which make claim to be up to date; but, nevertheless,

most people have stocks of the old three-electrode valves, components such as are only used in neutralised circuits, and so on,

#### A Useful Compromise.

It will evidently meet the needs of many home constructors if something in the nature of a compromise can be effected, whereby sets can be built using the new system of H.F. amplification, but using as many of the older types of components, methods of screening, and so on, as possible. In some special cases it may even be possible to show how to modify some of the older but well-screened sets, so as to use the new type of valve, and this gives a way out of the difficulty which will, no doubt, receive full attention. The receiver which forms the subject of this article is, in a sense, a combination of both these schemes, although it may be regarded as an entirely new design from the point of view of the man who wishes to make up a new set. Standard components have been used as far as possible, and the final result is a set of very high efficiency, since the desire to use existing components has not been allowed to interfere with the production of a set capable of giving really good results.

The set in its general construction very

(Continued on next page.)

#### LIST OF COMPONENTS.

- 1 Cabinet, 16 in. x 8 in. x 12 in. deep, complete with baseboard and brackets (Artercraft, Camco, Caxton, Pickett, Raymond, etc.).
- 1 Ebonite panel, 16 in. x 8 in. x 1/4 in. (Any good branded material).
- 2 .0005 mfd. variable condensers, with slow-motion drive or vernier dials (Those seen in the set are J.B. Any good make can be used, square law or S.L.F.).
- 1 .0001 mfd. midget variable condenser (Igranic, Peto-Scott, or similar miniature type).
- 1 L.T. on-off switch (Igranic, L. & P., Lissen, Lotus, etc.).
- 1 H.F. choke, (Bowyer-Lowe, Burne-

- Jones, Lissen, McMichael, Ormond, R.I.—Varley, etc.).
- 1 L.F. transformer (Any good make, of about 3 to 1 ratio).
- 1 Standard screening box, with 6-pin base, and slot for screened valve holder (Any of the usual makes).
- 2 2 mfd. Mansbridge type condensers (Dubilier, Ferranti, G.E.C., Hydra, Lissen, Mullard, T.C.C., etc.).
- 1 Special valve holder for new screened valve (Colvern).
- 1 6-pin base for aerial coil (Burne-Jones, Colvern, Lewcos, Peto-Scott, etc.).
- 3 Baseboard filament rheostats (Any good make, in resistances to suit valves).
- 2 Anti-microphonic valve holders (Ash-

ley, Benjamin, B.T.H., Burne-Jones, Bowyer-Lowe, Lotus, etc.).

- 1 .001 mfd. fixed condenser Clarke, (Dubilier, Lissen, Mullard, T.C.C., etc.).
- 1 .0002 mfd. fixed condenser (See above).
- 1 2-meg. grid leak, complete with holder (Dubilier, Igranic, Lissen, Mullard, etc.).
- 1 Terminal board with 5 terminals.
- 4 Terminals for panel.

Quantity of No. 13 tinned copper wire, and one length of Sistoflex to fit wire.

Note.—It is not possible to give all the possible alternatives in the various makes of components, and only a few of those suitable can be mentioned. The names given are placed in alphabetical order.

THE  
"SUPER-SCREEN" THREE.

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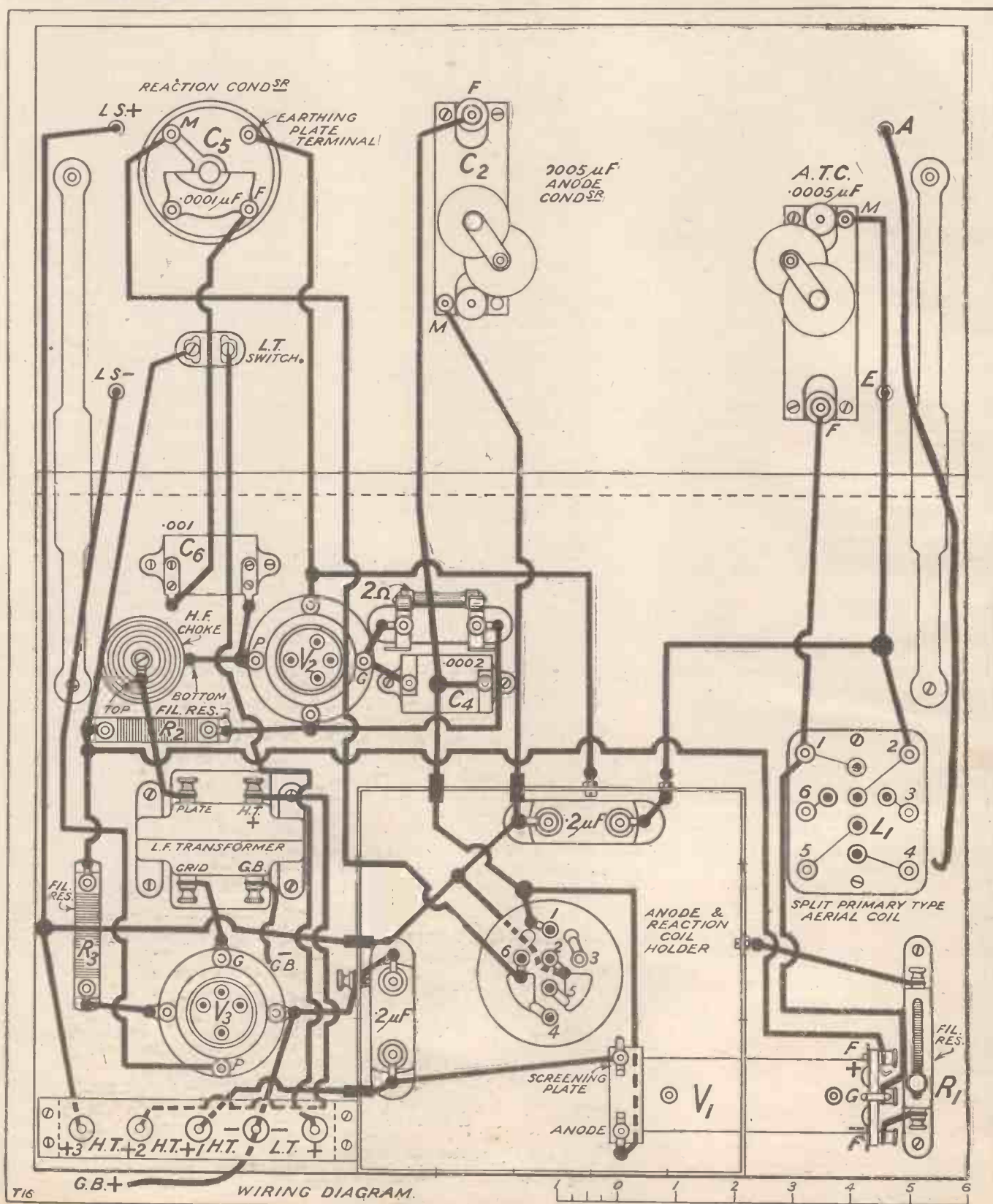
much resembles the "Cube-Screen" Three, described in these pages some little while

ago, and was actually made by taking the older receiver and modifying it in ways which we shall be considering in detail at a later point in this article.

The design can be regarded as a completely new receiver by those who wish to build a set on the new lines, whereas those who have built the "Cube-Screen" Three will be interested to see what modification

would be needed to use one of the new shielded valves, and can keep this article at hand for use upon some future occasion when they feel they wish to possess a set of greater sensitivity and distance-getting powers, when they may feel inclined to alter their present instruments. The "Cube-Screen" Three, in its original form, was a

*(Continued on next page.)*





## THE "SUPER-SCREEN" THREE.

(Continued from previous page.)

good example of a modern neutralised and well-screened receiver, and gave extremely pleasing results, with quite a number of distant stations on the loud speaker, and, of course, headphone signals from a very great number indeed. The present combination of one shielded valve in place of the normal three-electrode neutralised valve in the

special valves there is a fourth electrode which takes the form of a screening grid placed between the working grid and the anode, for the purpose; among others, of preventing what is called feed-back inside the valve. A lead is taken out from this extra electrode to a suitable tapping-point on the H.T. battery, usually at about 80 volts. This will be followed on the wiring diagram, and it will further be observed that a bypass condenser is provided straight from this electrode to the filament circuit, a capacity of .2 mfd. being used in this set.

The simplest, and one of the most

anode coupling, and for this reason and others, it is desirable that a coil of decidedly low H.F. resistance should be used in the anode circuit.

Accordingly, a special coil of reasonably high efficiency is required here, details of this being given at a later point in this article. Before leaving this point, however, I should like to explain that no attempt has been made to produce a coil of phenomenally low H.F. resistance, since the use of such inductances has the effect of producing a circuit of extremely low damping, which in turn tends to produce rather poor quality of reproduction, since the tuning becomes excessively sharp, and what are called the side bands of the telephony transmission tend to be cut off. It has been found in practice that quite a good effect can be obtained by the use of a suitable coil of solid wire of about No. 24 gauge on a former of the correct diameter, and this, of course, is extremely easy to wind.

Reaction of the usual Reinartz variety is provided upon the tuned anode, a special winding being added upon the same former for the purpose. The detector valve operates on the grid condenser and leak principle, and is followed by one stage of L.F. transformer-coupled amplification, this completing the circuit.

### The Screening.

Turning now to the practical details of the construction and lay-out of the receiver, the first point to claim our attention is that of the screening and other devices adopted to ensure the stability of the valve. For the sake of simplicity and ease of construction it was decided to use one of the standard screening boxes in this set, although other methods of screening are also applicable to the shielded valve. The box is arranged exactly as in the original "Cube-Screen" Three receiver, the difference being that the shielded valve is arranged through a hole

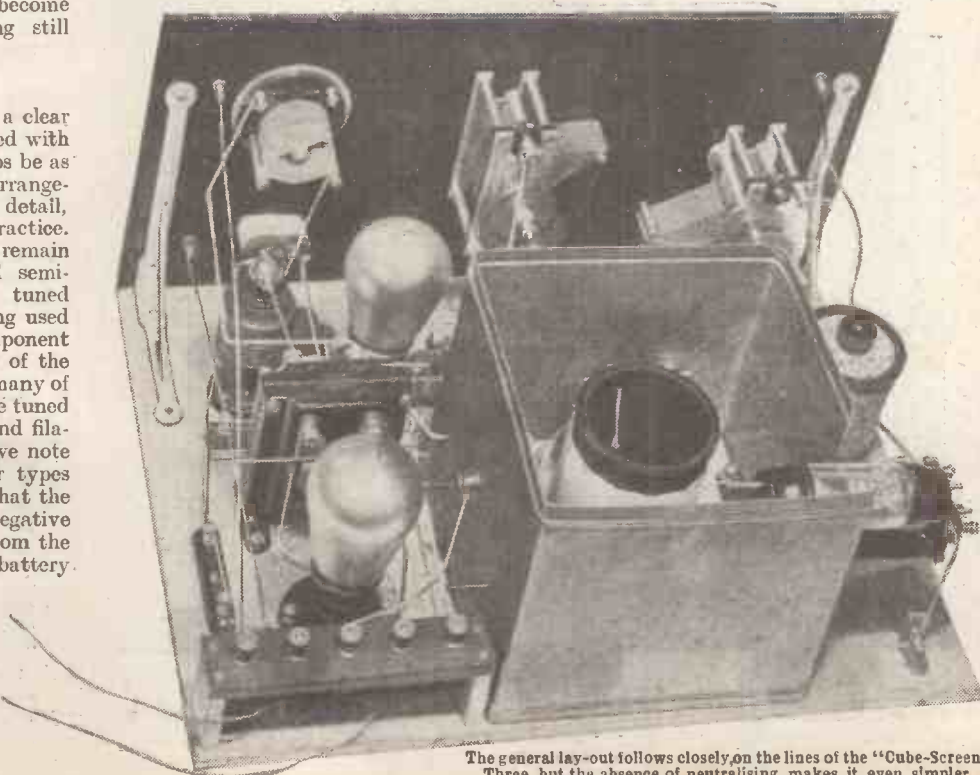
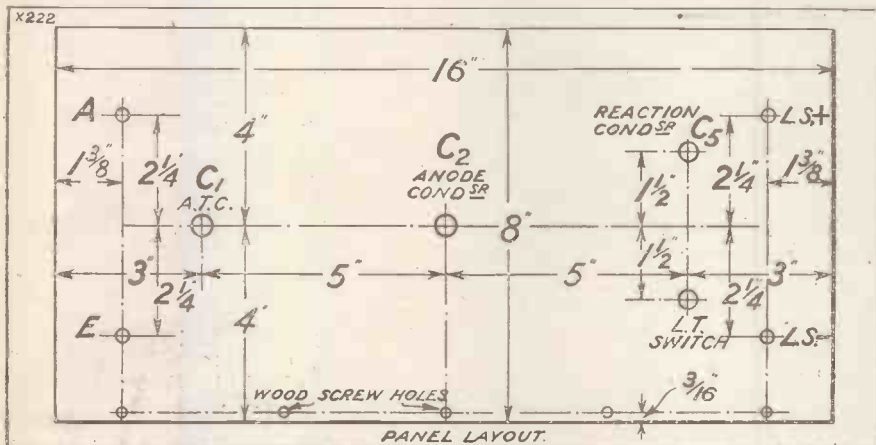
(Continued on next page.)

original set, followed by the same arrangement of detector with reaction and one transformer-coupled L.F. stage gives almost the impression that another stage of H.F. amplification has been added. With this set quite a range of foreign stations can be heard at good loud-speaker strength on anything like an efficient aerial, and the set as a whole is one which will satisfy the long-distance enthusiast for quite a considerable time to come. Hence there is no need to fear that you will soon become dissatisfied in favour of something still more powerful and up to date.

### The Circuit.

In order that the reader may get a clear idea of the special arrangements used with the new type of valve, it may perhaps be as well at this point to go through the arrangement of the circuit and the set in detail, noting the departures from ordinary practice. The aerial and secondary circuits remain unaltered, consisting of the usual semi-aperiodic aerial scheme with a tuned secondary circuit, auto-coupling being used between them, and the actual component employed for the purpose being one of the standard six-pin aerial coils, as in so many of the present-day receivers. Across the tuned secondary circuit we find the grid and filament of the H.F. valve, and here we note the first alteration from the earlier types of H.F. sets, since it will be noted that the filament rheostat is connected in the negative filament lead, and that the return from the tuned grid circuit is taken to the battery side of the resistance, so that the voltage drop across it is utilised to impress a small negative bias upon the grid of the valve. This is sometimes done with normal three-electrode valves, but it appears to be of more decided benefit in the present case. It will be remembered that inside these

effective, ways of using the shielded valve is with a tuned anode circuit, and this arrangement is used in the "Super-Screen" Three. A good tuned anode circuit with this valve enables a very high degree of amplification to be obtained, without, of course, any difficulty from instability such as used to be experienced with the normal three-electrode valve. There is a certain amount of difficulty in obtaining an adequate degree of selectivity with tuned



The general lay-out follows closely on the lines of the "Cube-Screen" Three, but the absence of neutralising makes it even simpler.

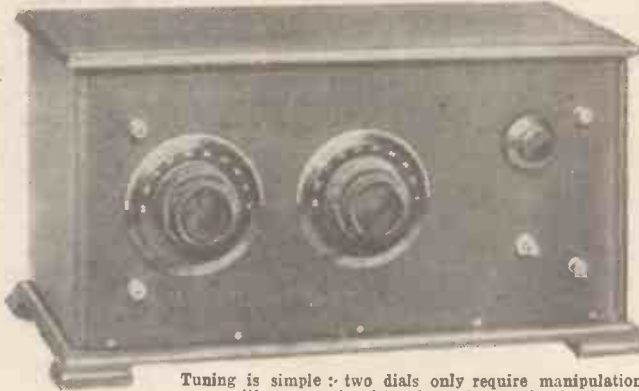
## THE "SUPER-SCREEN" THREE.

(Continued from previous page.)

in the box so that the grid end projects outside, the plate end being inside. Inside the box will also be found the tuned-anode coil with its reaction winding, this being carried in one of the standard six-pin sockets for convenience. The only difficulty at this point of the constructional work concerns the cutting of the hole on the side of the box, and really the best advice that can be given here is that the whole box should be taken to a tinsmith, who will quickly cut the desired aperture for a very small charge with the aid of the valve and valve socket, from which he can get the exact dimensions of the piece to be cut out.

The hole shown in the diagram is intended to fit the Colvern special socket for the shielded valve, since it was necessary to arrange to suit one particular type of socket, and the one in question is quite a convenient specimen. The mounting of this socket calls for just a little care, the first step being the drilling of two holes at suitable points below the lower edge of the hole cut out of the side of the box, these two small holes being for the two screws which hold the two parts of the valve holder together when it is mounted in position. One-half goes on each side of the "wall" of the screening box.

The details of the special tuned-anode coil are as follows. The former is one of the Collinson "Featherweight" type, with a diameter of approximately three inches. The tuned-anode winding consists of 60 turns of No. 24 D.C.C. wire, the lower end—that is to say, the end nearest the pins—being connected to pin No. 2, the finishing end being taken to pin No. 1. This winding should be arranged so that there is a space of about three-quarters of an inch



Tuning is simple: two dials only require manipulation, with an occasional touch on the reaction knob.

unoccupied at the lower end of the former to leave room for the reaction winding which will be put on next.

### Coil Details.

This consists of thirty turns of any available fine-gauge wire, such as 32 or 34 D.S.C., wound in the same direction as the No. 24-gauge coil; that is to say, as though it were a continuation of the other winding. The beginning of this reaction winding, that is to say the end nearest to the No. 24-gauge coil, is also joined to pin No. 2, this being a common point. The other end goes to pin No. 6, and when this last connection has been soldered

the coil is finished and ready for use. A blank space should be left between the two windings of, say, an eighth of an inch, although this is not at all critical.

The remainder of the constructional work is quite a straightforward job, and probably very little more need be said. The wiring can be done with any of the usual material, such as bare tinned copper wire, Glazite or other covered wire, one of the special easy soldering materials such as Junit, and so on, with sleeving where needed. (Further details next week.)

### POINT-TO-POINT CONNECTIONS.

One filament socket of each valve holder to one side of each respective rheostat.

L.T. + terminal to one side of the L.T. switch.

Other side of switch to the remaining sides of the rheostats,  $R_2$ ,  $R_3$  and to the F + terminal on the valve holder  $V_1$ .

Remaining side of the rheostat  $R_1$  to a screw through the copper screening box.

Terminal common to L.T. — and H.T. — to the remaining filament socket of  $V_3$  to the G.B. + plug via a flexible lead and to the terminal on the copper screening box.

Earthing plate terminal on the reaction condenser to the remaining filament socket of  $V_2$ , and to a screw through the copper screening box.

Moving vanes of the '0005 A.T.C. to the earth terminal on panel, to the No. 2 terminal on the aerial-coil holder and to a screw through the copper screening box.

Aerial terminal to the terminals Nos. 3 or 4 on the aerial-coil holder.

Fixed vanes of the '0005 A.T.C. to the No. 1 terminal on the aerial-coil holder and to the grid terminal of  $V_1$ .

Anode terminal of  $V_1$  to the No. 1 socket on the anode and reaction coil holder, to one side of the '0002 fixed condenser  $C_4$  and to the fixed vanes of the '0005 anode condenser  $C_5$ .

Moving vanes of same condenser to one tag of the first .2 mfd. Mansbridge condenser, to the No. 2 socket on the anode and reaction coil holder, to the H.T. + 3 terminal and to the L.S. + terminal on panel.

No. 6 socket on anode and reaction coil holder to the moving vanes of the '0001 reaction condenser.

Fixed vanes of the reaction condenser to one tag of the '001 fixed condenser,  $C_6$ .

Remaining side of  $C_6$  to the plate of  $V_2$ , and to the bottom contact on the H.F. choke.

Remaining tag of the '0002 fixed condenser  $C_4$  to the grid of  $V_2$ , and to one side of the 2-meg. grid-leak holder. Other side of the grid-leak holder to the filament socket of  $V_2$  which is joined to  $R_2$ .

Screening plate terminal on  $V_1$  to one tag of the second .2 mfd. Mansbridge condenser and to the H.T. + 1 terminal.

Remaining tags of the first and second .2 mfd. Mansbridge condensers to screws through the copper screening box.

Top contact on the high-frequency choke to the "plate" terminal on the low-frequency transformer.

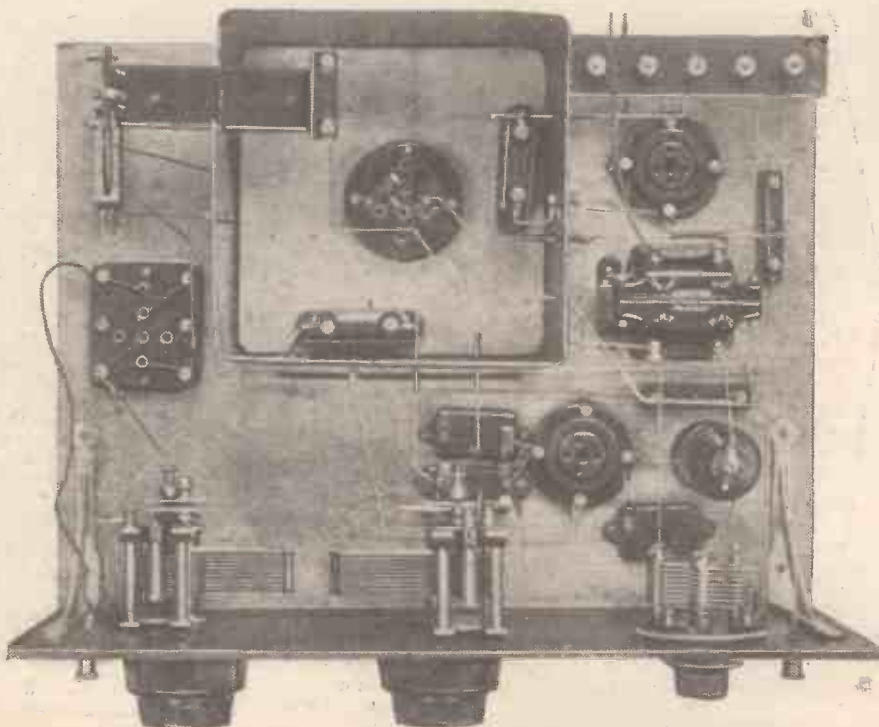
"H.T. + " terminal on transformer to the H.T. + 2 terminal.

"Grid" terminal to the grid of  $V_3$ .

"G.B." terminal to the G.B. — plug via a flexible lead.

Plate of  $V_3$  to the L.S. — terminal on panel.

This completes the wiring.



This plan view shows very clearly the method of mounting the screened valve socket in the side of the screening box.





**JACK HYLTON**, and his all-British Band, has for some years been an outstanding attraction, wherever he has played; and in thus establishing himself at the very top of his profession he has proved that British artistes can render light music as well as, if not better than, any foreign importation. He is undoubtedly the most successful and most sought-after recorder of light music for gramophones in England to-day, and it is almost safe to say that there is hardly a possessor of a gramophone in the British Empire who has not some of his work.

A rather quiet and reserved person, he has an inborn sense of orchestration and rhythm, and when conducting his orchestra he develops an amazingly magnetic personality which grips his artistes and audience alike. He appears to concentrate the music of his band in himself, and to hand it on to you with a quiet smile.

#### Danger of Monopoly.

Jack Hylton is, unfortunately, not a frequent broadcaster, but is always ready to consider giving a performance when approached. He speaks most cordially of the courtesy he has always received from the B.B.C. officials, but this does not prevent him being a downright and straightforward critic of their policy.

"The very fact," he said, "of their having an absolute monopoly of broadcasting gives them a savour of a Civil Service Department, with its attendant bureaucracy and its consequent mediocrity and monotony in their programmes. The public are not getting fair treatment in return for their licensing fees. They are entitled to the very best talent that is available, and so long as the B.B.C. expects artistes to give their services for inadequate payment, they cannot have the best.

#### Weeks of Preparation.

"If my orchestra is to give a concert it means days, and possibly weeks, of preparation. I have a standard of perfection which, in justice to my public and myself, I must achieve. I must consider that my audience is not localised in a theatre or restaurant, but is distributed throughout the Kingdom, and that therefore my programme must be arranged to suit the larger public. It does not follow that what is pleasing to a London audience will necessarily go down in Aberdeen, Huddersfield or Belfast. When my pro-

\*-----\*  
An interview with the famous  
dance band conductor.  
By "ARIEL."  
\*-----\*

gramme has been settled, it may be necessary to re-orchestrate certain pieces for the microphone—this means rehearsals. If I am lucky, it may be a few hours; if not, days, before I am satisfied; then come general rehearsals, during which I have to devise a method—and each piece requires different treatment—of imparting to my



A recent photograph of Jack Hylton.

unseen audience the true life and verve of whatsoever I am rendering. There can be no comparison between playing before an appreciative audience and the cold-blooded atmosphere of a studio. The very considerable labour and time spent in preparing a concert—and spent it must be—means longer hours for my colleagues and myself, interference with arrangements and possibly engagements. Unless I am adequately compensated for this I am not prepared to perform, because unless I can give of my best I would rather give nothing at all.

"The B.B.C. makes a great factor of the value of its publicity, and thrusts this

forward when it comes to discussing terms. I, myself, am inclined to be sceptical with regard to the publicity value.

#### Overrated Publicity.

"It should realise in the first place that leading artistes are by no means dependent on broadcasting—even if it were perfect—which is by no means the case; in fact, in some cases the publicity is of very doubtful value, and, secondly, I consider it grossly unfair that it should wave this phantom flag of publicity in the faces of those artistes who are aspiring to the first flight, and by this means obtain their services at a figure which is incommensurate with the work they have done. The result is that, with a few notable exceptions, the B.B.C. programmes are, as I have said, mediocre and monotonous.

"Reverting to the doubtful value of broadcasting, a small incident which occurred some little time ago is a very apt illustration of what I mean. I was staying down in the country with some friends, and one evening we wished to listen to a certain performance which was being broadcast. We tuned in, and the whole thing was vague, uneven and disappointing; and the generally expressed opinion was that 'So-and-so' was rotten. This I knew was not the case, and it transpired later that there was something wrong with the receiving set. It then struck me that this probably happens in dozens of instances daily, and that however perfect a performance I may give, and however perfectly it may be broadcast by the B.B.C., my entire work is wasted, and in some instances my reputation possibly injured by something over which I have no control. The publicity I obtain by my appearances in various centres, and by the sale of my gramophone records, is sure and certain, and the success and failure of it is entirely in my own hands.

#### Competition Required.

"In this there is no blame to be attached to the B.B.C., but the high value it places on its publicity powers must be modified by the present limitations of broadcasting.

"Do not imagine for a moment that I am in any way antagonistic to the B.B.C.—far from it; up to a point it has achieved wonders, but honest criticism doesn't harm anyone, and I would sincerely like to see some serious competition to my friends at Savoy Hill."



# THE GOVERNMENT AND BROADCASTING.

An impartial review of the situation to-day as compared with conditions two years ago.

By THE EDITOR.

NOW that the Broadcasting Corporation has been at work for a year, students of the Government control of public utilities are considering to what extent the B.B.C. is successful in the rôle of entertainer. These speculations are unfortunately based upon wrong premises. According to its constitution the new B.B.C. gives all the appearance of an ordinary State concern. But the officials at Savoy Hill have declined to accept this definition. In many respects—but not in all—their objections have been upheld in practice.

In theory, the disadvantages of the State control of broadcasting are a great deal more considerable than the advantages. Let us strike a balance. Taking the advantages first—there is the fundamental safeguard that the broadcasting service will not be used against organised society. Then its revenue is collected and guaranteed with the full authority of the State. There are also advantages of prestige and security of tenure. And, finally, there is the distinct advantage of centralised organisation.

Now for the other side of the picture. There is, first of all, the inevitable disadvantage

of red tape, both in mind and in method. The very necessity of unbroken continuity makes a Government department a glorified robot.

Then there is bound to be too much caution. The habit of "passed to you, please" slows down the machine, although it



Dr. Montague Rendall, who is a Governor of the B.B.C.

may reduce mistakes. Security of tenure breeds complacency. There is the further danger of partisan political control. Active political chiefs of Government departments may be tempted to use broadcasting to advance the cause of their party. But, of course, the most serious disadvantage is the absence of competition.

## An Anachronism.

So much for the theory of the thing. If British broadcasting had really been conducted as a State concern the above criticisms would have applied to it *in toto*. Fortunately, however, the B.B.C. is, in its organisation and conduct, an absolute anachronism. Let us review to what extent, if at all, its activities are characterised as above.

Under the Company, the Government had nearly absolute powers through the Postmaster-General, but neither the Government of the day nor the Postmaster-General was disposed to take broadcasting seriously. It was tolerated with a mild benevolence and given the freedom which might be accorded to an eccentric guest at a country house-party.

The programme censorship was not continuous or consistent. Obstacles were constantly put in the way of any far-reaching developments; but, on the whole, the old B.B.C. managed to struggle along from day to day, establishing greater freedom and independence than was ever contemplated.

## Too Much Red Tape.

It had been organised as a limited liability company, and it was administered according to current commercial practice under competitive conditions. There was thus no atmosphere of a Government department, and the minimum of red tape. During the General Strike the service was taken over as an instrument of Government propaganda.

But, apart from this, the four years of the old B.B.C. did not encounter any attempts at partisan political control, and even this one was generally accepted as national rather than partisan.

It may be said fairly, therefore, that British broadcasting, as long as it was administered by a limited liability company, suffered from none of the disadvantages normally associated with State control except the lack of competition.

So far so good! What of the Corporation? While it would be wrong to suggest that the Corporation has lost the vitality, directness, and business efficiency of the Company, there is no doubt that the past year has seen the intrusion of certain tendencies and habits of mind which are all too reminiscent of State concerns.

It is important to call attention to these now, so that they may be checked in the early stages. The first is red tape. Artists, business men, and the general public have all noticed a growth of red tape methods at Savoy Hill. This is not yet chronic, but it wants watching.

The second dangerous tendency is caution combined with complacency. There is less dash and fire than there used to be. There is also too strong a sense of security of tenure. Under the Company new blood was introduced more frequently and more ruthlessly. The third cause for alarm is the amazing increase in the number and length of official announcements broadcast from Government departments before the news bulletin.

It is not known whether these are sought by the B.B.C.; as they are so dreadfully dull (much more dreadfully dull than the Children's Hour, Sir John!), it seems unlikely that they are sought. The pre-

sumption is, therefore, that they are imposed upon the B.B.C. through the powers conferred by the Royal Charter. If this is the case, urgent remedies are called for. I commend the subject to Parliament.

Another tendency open to objection and savouring of Government department methods is the growing disregard of public opinion. The attitude of Savoy Hill is much less accommodating than it was. Sir John Reith, in his now famous speech at Manchester, said that a policy of giving the public what it wants was quite wrong. Apparently the B.B.C. does not worry any longer about what the public wants. The idea is to give the public what it thinks is good for it; or at least that is the only reasonable interpretation that can be given to utterances of the kind mentioned.

Firmness and decisiveness are, of course, necessary. But dictatorial prerogatives



Sir J. Gordon Nairne (another of the B.B.C. Governors).

cannot be associated for long with successful broadcasting.

To sum up, the B.B.C. is still far from being a Government department. Its system has much more in common with commercial practice than with State control. But, the farther we get away from the

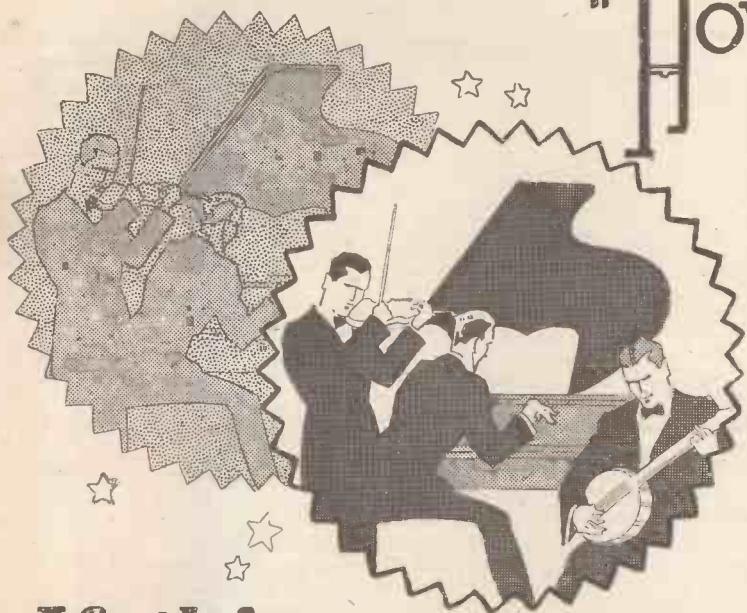
days of the Broadcasting Company, the more we observe the growth of tendencies—towards Government department methods. It may be that these tendencies are inevitable.

If they are, and if no effective move is made to check them, then the doom of British broadcasting is sealed. But I do not believe that any such thing is in store for the B.B.C. provided Sir John Reith remains at the helm in unhampered authority. If the present Director-General will desist from declaring his indifference to public opinion, and turn himself afresh to restoring the wonderful elasticity and efficiency of his organisation under the Company, we need not fear any debacle.

## Danger of Monopoly.

Monopoly is always a bad thing. Every monopoly in public utilities should always be considered wrong in whatever it does, until overwhelming evidence to the contrary can be adduced. It follows that the very best thing that can happen to the B.B.C. is continuous, intelligent, trenchant, penetrating criticism. The almost complete absence of criticism of this kind makes the achievements of the B.B.C. all the more wonderful. But, for the future, we cannot afford to take risks. The course of time will involve changes in personnel. Those who come after will not have the fire and the energy of the pioneers. They will need more "ginger."





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# BROADCAST NOTES

FROM OUR BROADCASTING CORRESPONDENTS.

The London Station—West Country Broadcasts—Two Interesting Plays—  
From 5 G B—Cardiff Station Items—Special Newcastle Programme—  
A Radio Pantomime—A "Schubert" Programme—Choral Works

## The London Station.

THE London programme between 7.45 and 9 p.m. on Saturday, January 14th, will consist of a concert relayed from the Kingsway Hall. It will include items for a military band combined with the organ, choral music and songs by popular artistes, some of whom have not yet been heard by listeners.

## West Country Broadcasts.

The Rt. Rev. J. H. B. Masterman, Bishop of Plymouth, is to give the address at a special service in the Plymouth Guildhall on Sunday evening, January 1st. His remarks will take the form of a New Year's message, and arrangements have been made to broadcast the service from the local station. On the following evening West Country listeners will have an opportunity of hearing the first broadcast by George Chinn, the well-known Cornish entertainer, who specialises in farmyard imitations.

Another interesting forthcoming programme from the same station is a concert by vaudeville artistes at 9.35 p.m. on Friday, January 6th, when in addition to selections by the Station Orchestra there will be items by Alma Vane (soprano), Franklyn Gilmore, and Ray Vincent and his Trio, who will be visiting the Plymouth Studio for the first time.

## Two Interesting Plays.

Two interesting plays have been arranged for Liverpool listeners on Thursday, January 12th, in which the Liverpool Playhouse Company will be assisting the local Radio Players. The first is "Trifles," in which Marjorie Fielding will appear as "Mrs. Hale," and the second "Bal Masque," a light-hearted fantasy in one act by Oliphant Down, when the part of "A White Pierrot" will be taken by William Armstrong.

## From 5 G B.

Henry Purcell, composer of many operas, suites and songs, is probably best known for his opera "Dido and Aeneas," which is to be broadcast by the Daventry Experimental Station on Sunday evening, January 1st. It is one of the finest English operatic works, and previous transmissions of "Dido and Aeneas" have been greatly enjoyed by listeners.

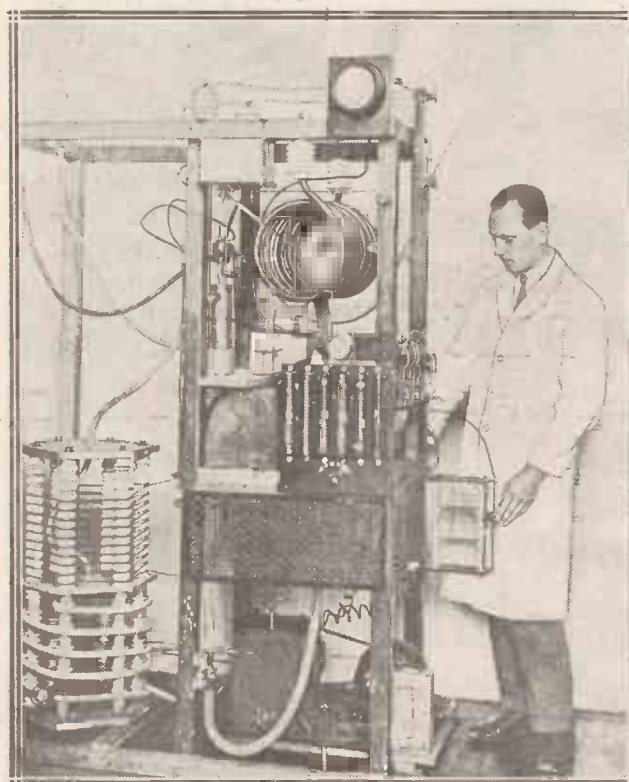
In fact, there seems to be no doubt that this composer of such charming and graceful music is beginning to receive the appreciation he deserves, and that the absurd ideas which used to exist about Purcell, among others that he imitated Handel—who, by the way, was only ten when the English composer died—are being dispelled.

The principal artistes in this transmission are Miranda Sugden, Emilie Waldron, James Howell and Geoffrey Dams. The Birmingham Studio Orchestra will be

under the conductorship of Mr. Joseph Lewis. The religious service on the same day, conducted by the Bishop of Birmingham, the Right Rev. Ernest William Barnes, is to be relayed from the Birmingham Cathedral. Immediately before the service the bells of the cathedral will be heard by listeners.

## Cardiff Station Items.

"The Spectre's Bride," a cantata for soli, chorus and orchestra by Dvorak, is to be broadcast by the Cardiff Station on Sunday, January 1st. The artistes taking part are Miriam Licette, Joseph Farrington



M. Belin, the French scientist, experimenting with a short-wave transmitter, with which he employs a water-cooled demountable valve.

and Tom Pickering. Earlier the same day a New Year's Day address, which was first delivered in Llandaff Cathedral in 1890, will be read under the title of "An Old Message for the New Year."

On the following day Kenneth Ellis, Yvette, Stainless Stephen, and Sidney Evans will give a gay New Year's revue called "First Footing." This old custom has caused much serious excitement and fun in the past, and listeners on this occasion will certainly not find the programme lacking in amusement.

## Special Newcastle Programme.

"Glimpses of the Past"—a series of special programmes, broadcast by the

Newcastle Station, each of which deals with an episode in the history of Newcastle and the surrounding district—have met with so much interest and appreciation that the B.B.C. intends to carry them on until a complete survey has been made of the local history right down to the present day. The next, and sixth episode, which, like all the other programmes in this series, will be arranged by Col. G. R. B. Spain, C.M.G., in collaboration with Mr. Thomas Haxon, is to be given on Friday, January 6th, and deals with the Siege of Newcastle in 1644.

It will be recalled that this event took place during the wars between the Royalist and Cromwellian parties, when Newcastle was first occupied by the Scottish Covenanters and then garrisoned by the King's supporters, and it was while the city was in the occupation of the latter forces that the Scots, after a struggle lasting for about three months, entered and sacked it.

## A Radio Pantomime.

Belfast Station is to broadcast "Our Pantomime," the lyrics of which are by Edward Teschemacher, and music by Herbert Oliver, on Monday, January 2nd. Later there will be popular items from musical comedies, the artistes being Janie Martin and Hugo Thompson, and the orchestra will play selections from old-time waltzes.

## A "Schubert" Programme.

A "Schubert" Programme is to be broadcast on Tuesday, January 3rd, by the Daventry Experimental Station. The programme includes "The Erl King" and other well-known items sung by Joseph Farrington (baritone), and the "Unfinished Symphony," the "Overture to Rosamunde" and the "Marche Militaire" played by the Orchestra.

## Choral Works.

Two short choral works—Debussy's setting to Rossetti's poem, "The Blessed Damsel," and "The Blest Pair of Sirens" by Parry—will be given in the Manchester Studio during the afternoon programme on New Year's Day.

## A Repeat Performance.

Winifred Small and Maurice Cole's interpretation of "The Kreutzer Sonata," by Beethoven, proved so popular with Manchester listeners when it was broadcast some time ago that a repeat performance is to be given on Friday, January 4th. This Sonata, while giving full scope for masterly technique, taxes to the utmost the artistes' interpretative abilities, and those who heard the last performance will look forward to their next broadcast.



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# THE MYSTERY OF "ROOM 40."

A WELL-KEPT WIRELESS SECRET OF THE WAR.

BY A CORRESPONDENT.

FROM time to time secrets, sometimes big, sometimes little, about the conduct of the war and its many and varied phases are, so to speak, "let out of the bag," and cause a nine days' wonder. Many secrets have been explained away since Armistice Day, but probably one of the most interesting was revealed by Sir Alfred Ewing, the Principal of Edinburgh University, when he gave a lecture for the Philosophical Institute, Edinburgh, some days ago.

## Sensitive Valve Receivers.

Sir Alfred, in fact, revealed the secret of Room 40 at the Admiralty. The "Secret of Room 40" sounds very much like the title of a shilling shocker, but, as a matter of fact, Room 40 at the Admiralty was where German wireless messages were deciphered. Sir Alfred was appointed by the Admiralty to undertake the task of collating and translating enemy ciphers. This job, by no means an easy one, was given him by the Director of Naval Intelligence, for when war broke out it seems there was no organised system for collecting intercepted wireless messages or any real method in force for deciphering them. However, Sir Alfred got busy and his department was the beginning of what grew to be a most vital factor in the conduct of the war.

The technical side was, of course, left to technical experts, and among them may be mentioned Captain Round, whose direction-finding stations and super-sensitive listening posts enabled Admiralty listeners to pick up buzzer signals which the German Navy sent out from time to time. In fact, while the German Navy was bottled up in Kiel ships used to communicate with each other by buzzer signals.

Buzzer signals, as the writer well remembers, were often a nuisance. When in convoy, for example, ships wishing to communicate with the Commodore's ship did not use the main wireless transmitting set, but just an ordinary buzzer connected to the aerial, untuned, and operating from an accumulator with power of about four to eight volts. These signals were just sufficient to enable communication over a distance of a few hundred yards, i.e. as regards normal reception.

## Valuable Warnings.

But Captain Round's super-listening valve receivers were such that these extremely weak signals could be picked up at the various listening posts established by the British Admiralty along the north-east and northern coasts, and there as many as two thousand messages a day were intercepted and sent along to Sir Alfred Ewing at the Admiralty and to his staff of cipher experts in Room 40.

In this way it was possible for the British Admiralty to determine the day before the battle of the Dogger Bank what German ships were coming out and also at what time and where they were going.

As my readers can imagine, this informa-

tion was of vital importance and enabled the British Admiralty to meet the enemy more than ready. During the action of the Dogger Bank the Admiralty experts deciphered every signal sent out by the enemy ships, and consequently could follow the battle in all its phases from start to finish.

The same with the Battle of Jutland. In fact, the Battle of Jutland was actually brought about because of the Germans using the buzzer signalling apparatus.

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Orders were overheard by the various Admiralty stations and, when deciphered at Whitehall, proved of such value that the Admiralty knew the German fleet was coming out into the open at last.

It is a remarkable fact that from December, 1914, the German Fleet made no movements which were not fairly well known in advance by the Admiralty, and all because of our experts who were able to translate into intelligible English the complicated ciphers sent out by the German wireless.

Room 40 was only referred to as Room 40, and the greatest secrecy was observed about the work done there, for, as can be guessed, the slightest knowledge of what was going on in Room 40, or the slightest clue given to the Germans that we were able to translate and un-

derstand their code messages would have been spoiling a very good thing. Room 40 was a great secret and remained so right until the end of the war.

From time to time the British Admiralty had extraordinary good luck in capturing in one way and another various German code books; but the Germans were wily and from time to time they also changed their code.

In fact, in 1916 they had the habit of changing the key of the principal naval code signal at twelve o'clock, but so expert had the deciphering staff at Room 40 become that these changes in no way interfered with the elucidation of the messages.

## Messages from Submarines.

According to Sir Alfred, the Zeppelins were very "talkative" by wireless, especially on their way home when they used to chat in code about their exploits. The same with submarines, and in May, 1915, wireless messages from the Submarine U20 were picked up and, translated, were found to be a glorified account of the sinking of the Lusitania.

Among the many other messages picked up and translated by Sir Alfred and his staff was the Zimmerman telegram which, as my readers will remember, was a conditional offer to Mexico of an alliance against the United States of America. At that time, President Wilson had not quite made up his mind whether to plunge the United States into war.

In fact, it might be said that he was hesitating on the very brink of a terribly vital decision as far as the Allied Cause was concerned.

## The Last Straw.

But when the Zimmerman telegram was translated and its contents communicated by Lord Balfour to the American Ambassador, Mr. Page, and by Mr. Page direct to President Wilson, that proved to be the turning point in the fateful decision made by the United States.

It might be said that through the expert work of Room 40 a wireless message, which was intercepted and forwarded to the United States, directly resulted in America coming into the war.



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A large amount of the success of every Set depends on the components used and we do most strongly advise you to keep strictly to the components we recommend beneath.

### The components specified by Mullard's are:

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| 1 Terminal strip, 2½ in. x 2 in. x ½ in.             | 1 Broadcast wave, Master Three coil (Colvern).                        | 4 Terminals—A, E, L.S.—, L.S.+ (Belling-Lee).         |
| 1 Coil base (Lewcos).                                | 1 Long wave, Master Three coil (Colvern).                             | 1 Set of A B C connecting links (Junit).              |
| 1 S.L.F. variable condenser, '0003 mfd. (J.B.)       | 1 On and off switch (Bulgin).   | 2 Spade terminals—1 red, 1 black (Ealex).             |
| 1 S.L.F. variable condenser, '0003 mfd. (J.B.)       | 1 R.C.C. unit, type A, (R.I.-Varley).                                 | 8 Wander plugs—4 red, 4 black (Ealex).                |
| 1 H.F. choke (Climax).                               | 1 L.F. transformer, G.P. (R.I.-Varley).                               | Suitable length of red and black flex.                |
| 1 Aluminium panel, 18 in. x 7 in. (Collinson).       | 1 Combined grid leak, 2 megohms, and condenser, '0003 mfd. (Mullard). | 1 Ebonite bush, ¾ in. diam., ¾ in. hole, ⅝ in. thick. |
| 3 Anti-vibratory valve holders with terminals (Pye). |   |   |
| 1 Pair panel brackets (Magnum).                      |   |   |

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Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department for test. All tests are carried out with strict impartiality in the "P.W." test-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

#### CAMDEN FIXED CONDENSER.

WE recently received a fixed condenser from The Camden Electrical Co. It is classified as a "super-tension" and it is stated that it is not a mass production article, but that each condenser of this type is hand made and stamped with a serial number, and is issued with a signed guarantee to give six months' satisfactory service under voltage conditions as tabulated in a descriptive leaflet. The sample sent us has a capacity of one microfarad and is known as the Mark 10 type, this being one that has a working voltage of 800 volts D.C. and 500 A.C. and costs 14s.

It measures about 4 in. by 2 in. by 1½ in. and is contained in a red-coloured metal casing on the top of which are two substantial brass terminals. On test we found the capacity to be very close indeed to the rating, actually being substantially as stated, while its power loss is extremely

low. It held a charge for a number of hours, an acid test for a component of this type. It appears to be in every respect a trustworthy production and we should have no hesitation whatever in connecting it directly across mains within the voltage limitations of those stipulated.

#### SIX-SIXTY CONE LOUD-SPEAKER PAPER.

We recently received samples of the new "Six-Sixty" Cone Loud-Speaker Paper. This is a specially prepared substance for the construction of home-made cone-type loud speakers. Full instructions for cutting and fixing the paper are provided but, as this latter is very clearly marked, it is a very simple business indeed. A minute or two's work enables one to possess a complete cone diaphragm equal in appearance and efficiency to a professional production. It is a most excellent material and is better than anything of its kind that we have yet

come across. The paper is obtainable in small and large sizes at 2s. 6d. and 3s. 6d. respectively.

#### N.S.F. VARIABLE CONDENSER.

Messrs. S. W. Lewis & Co., of Victoria Street, London, S.W.1, recently sent us one of their Mid Log Line '0005 mfd. variable condensers. It appears to be a very robust and attractive article. A solid metal girder construction carries the spindle and its bearings and the moving vanes. The fixed vanes are carried on two substantial ebonite cross pieces. A very useful feature is that the condenser can be mounted either on the panel, or screwed down on the baseboard. The movement is smooth and positive and such that it is impossible for the vanes to lose alignment. And, by the way, the vanes are of hard metal and are solidly grouped.

The N.S.F. Variable is a soundly-designed and soundly-produced component and will appeal to the discriminating constructor. From the same source we received a Weilo L.F. Transformer model 10 power. This is a German production, but we must say it is one of the best of these we have seen, although the average German L.F. transformer imported to this country is a pretty poor affair. This Weilo has a ratio of 5 to 1, is of the shrouded type and retails at 11s. 6d. On test it gave really good results, much better than its origins would lead one to anticipate. It embodies a fair amount of iron, actually it weighs 1½ lbs., and on an audio test it appeared to have a creditable curve.

(Continued on page 934.)

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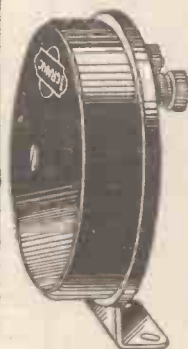
This L.F. Choke is outstanding as possessing an exceptionally high inductance, together with a very high saturation point, making it supreme for intervalve choke coupling. One of the wireless trade journals, in a review, stated the Igranic L.F. Choke, Type "G," to be the best they had ever tested. These qualities have been made possible by a specially wound coil of very low self-capacity and an iron core of very generous proportions.

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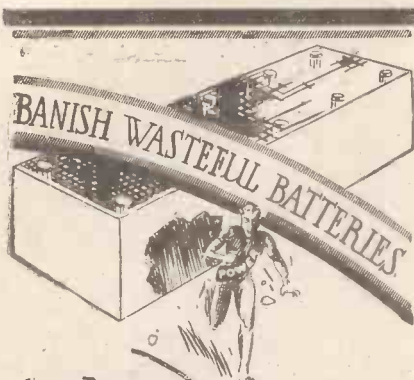
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HOWARTH'S BRITISH VALVE DEPOT,  
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## APPARATUS TESTED.

(Continued from page 932.)

### BROWNIE POPULAR TRANSFORMERS.

The Brownie Wireless Co., Ltd., of Nelson Street Works, Mornington Crescent, London, N.W.1, recently sent us one of their Popular transformers. It is quite a good little component, and appears to be well worth its 9s. 6d.

We should not advise its use in second-stage work, but for this there is recommended a Brownie L.F. transformer of a superior type costing 15s. The Popular model is contained in a cleanly moulded case, on the top of which are four substantial terminals. It is quite appreciably better than many of the cheap foreign transformers retailing at similar prices which we have tested, and it has the added advantage that it is British made.

### BURGESS BATTERIES.

The Rothermel Radio Corporation of Great Britain, Ltd., has just concluded arrangements with the Burgess Battery Co. which enables them to handle the complete range of Burgess Batteries exclusively throughout the British Isles. The Burgess Battery Company maintain extensive labo-

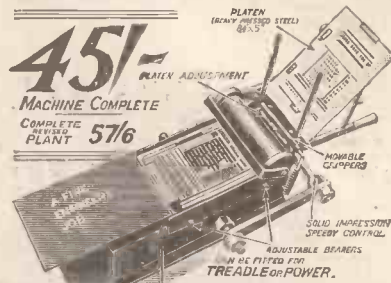


A five-valve self-contained receiver made by L. Mc Michael Ltd. Note the novel and effective frame aerial.

ratories, and is notable for the quantity of scientific literature they produce concerning their products. They make all types of dry batteries—from small ones suitable for grid bias up to large high-capacity types.

The 45-volter sent us by the Rothermel people has a weight of some 9½ lb., a length of about 8 in., and a height of about 7 in. It is stated that it will give up to 40-milliamps, while its service hours of life approximate 400 at a drain of ten milliamps. It is a heavy, well-made battery, and although we have had it in use now for some two weeks, at periods of discharge up to four hours, and currents between 20 and 25 milliamperes, its voltage has been maintained. There is a demand for heavy reliable H.T. batteries, and, if available at reasonable prices, these Burgesses can be assured of a hearty welcome.

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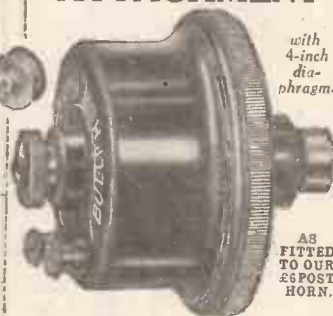
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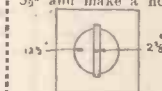
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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject 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.

### AMPLIFYING A CRYSTAL SET.

"VOLUME" (Chertsey, Surrey).—"Recently I purchased a one-valve amplifier which I have been trying to use with my crystal set, without much result. The crystal set itself gives very good results, but when the amplifier is connected up the strength is not much more and there is a faint but objectionable humming noise. Is it correct to connect the 'phone terminals of the crystal set to the input of the amplifier, and is this all that is necessary?"

In addition to connecting the output from the crystal set to the input of the amplifier, it is generally necessary to earth the amplifier's battery to get good

### "P.W." TECHNICAL QUERY DEPARTMENT

#### Is Your Set "Going Good?"

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offer an unrivalled service.

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you free and post free, immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

results. All that you need do is to connect the L.T. negative terminal of the amplifier to the earth terminal of the crystal set.

#### POLARITY OF TELEPHONES.

"CRYSTAL SET" (Swindon, Wilts).—"The terminals of my telephones are marked with a negative and positive sign, and the leads are red and black respectively. Does it matter

(Continued on page 938.)



Mr. Percy W. Harris, M.I.R.E., in an article on H.T. Economy, which appeared in "Popular Wireless," issued dated December 3rd, using the sub-heading, "How Long Should the H.T. Battery Last?"

Provided you have chosen the proper type of battery to suit the circuit and valves used in your set, you should get 9 months' service from it.

Read this extract from the article mentioned: "A set that has three or four Valves is very extravagant to run on the small size of high-tension batteries. The larger sizes are more expensive as to first cost, but much cheaper in their cost per hour."

Is it not better to have a 15/6 battery which lasts, say, nine months, than one at 7/9 which lasts only three?

### RIPAULT'S SELF-REGENERATIVE H.T. DRY BATTERIES

are super in construction and of exceptional capacity. They are supplied in Standard, Double, Treble, and Quadruple capacities.

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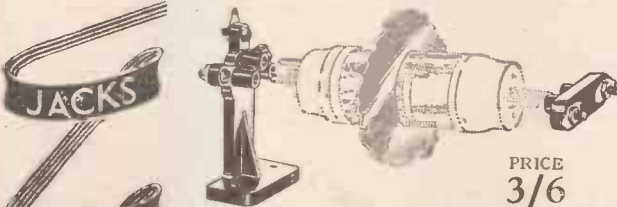
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### SCREENED-VALVE HOLDER

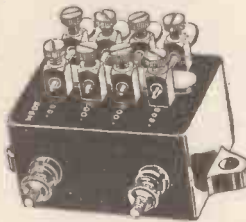


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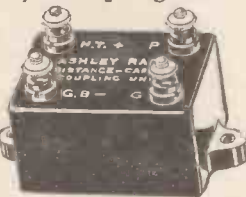
Although cheap enough to be incorporated permanently their main function is to determine the correct capacity of fixed condenser required in any specific circuit. Two ranges of capacity are made and capacities varying from .0001 to .0015 are obtainable in steps of .0001 and similar variations are to be obtained with the second unit the minimum capacity of which is .001. The acme of neatness and efficiency.



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Made to suit the valves now marketed for R.C. circuits it is a first rate example of what can be accomplished by a careful study of up-to-date requirements in every direction. So far as can be determined it represents the best ideas in practice, the more remarkable in consideration of its compactness. The "A" unit suits all valves the impedance of which is less than 40,000 ohms and is recommended especially for the detector stage. For valves with an impedance value of over 40,000 ohms the "B" unit can be most effectively used.



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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 936.)

which way round I connect them up on a crystal set?"

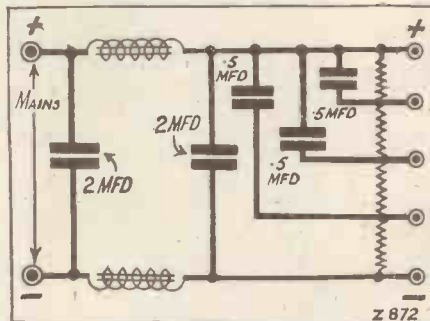
No, the marking is only intended for use in case of a valve set where a steady current flows through the 'phones which will demagnetise them if they are not connected in the correct direction. In a crystal set the 'phones may be connected either way round without detriment.

### TUNED-ANODE IMPEDANCE.

H. A. (Minehead, Somerset).—"Why is it that the tuned anode is spoken of as a high impedance when the coil through which the current flows has a resistance of only a few ohms. Surely this is a very low value when compared with, for instance, an anode resistance?"

The impedance of a tuned-anode circuit comprising a coil and condenser has very little to do with the direct-current resistance of its coil. When a coil and condenser are tuned to a frequency exactly corresponding with the frequency of the alternating current

### WHAT IS WRONG?



The above diagram is supposed to represent the connections of an H.T. Battery Eliminator, for use on D.C. mains, but it is wrong and would not work properly.

Next week the correct diagram will be given, and to test your skill we shall continue to publish every week a diagram in which a mistake (or mistakes) has been inserted. The correction will be published the following week.

No prizes are offered, but by following this series and trying to solve the problems week by week the reader cannot fail to learn a lot about radio circuits.

applied to them, the phenomena of resonance sets in, and they offer an extraordinarily high resistance to alternations of that frequency. This impedance can easily be of the order of many thousands of ohms, although the coil's resistance to direct current is only a few ohms.

### GRID-LEAK CONNECTIONS.

L. W. (Alexandria, Egypt).—"I have always been puzzled by grid-leak connections. Why is it that sometimes the grid leak is shown across the grid condenser; sometimes to the positive side of the valve filament; sometimes to its negative; and sometimes to a point on the lead between the battery and the rheostat? What is the correct connection for it?"

Whether it is better to connect the grid leak return to the negative or to the positive lead from the filament battery depends upon the type of valve to be used. Some valves give better results one way, and some the other. Most of the modern detector valves work at highest efficiency when the grid leak is taken to the positive lead. In practice it makes no difference whether the grid return is taken to the filament end of the lead, or to the battery end, nor whether it is between the rheostat and the valve or the rheostat and the battery.

### OVERHAULING TELEPHONES.

J. B. (Maidstone, Kent).—"As my telephones seemed to be getting weaker I very carefully took them to pieces the other day,

(Continued on page 940.)

## A NEW VALVE for the NEW YEAR

In addition to the renowned K Type Valve we have pleasure in announcing the introduction of the new

## FRELAT Dark Emitters

which are destined to be the New Valves for the New Year. It is the Valve you've long been waiting for. It is the really long life Valve. It guarantees perfect reception at minimum cost and consumption. Filament Volts 1'6-1'7 Filament Amps 1' Price 6/6. Also made to take 4 volts at same price.

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New K Type made with ebonite sockets 2 volts. Now use only '2 instead of '3  
Price reduced from 4/11-4/6. All valves sent Post Free or C.O.D. Plus 6d. Full particulars on request.

6/6



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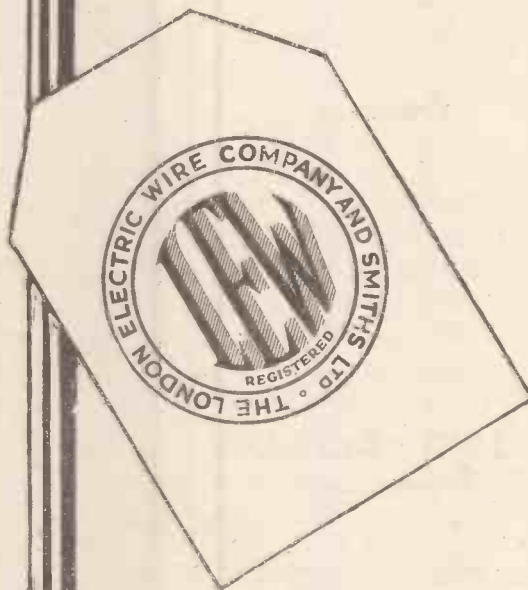
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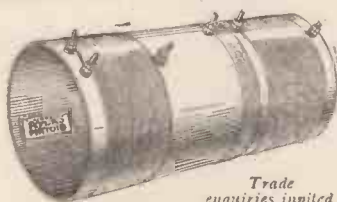


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*Ideal for every  
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250 to 550 and 1,500 to 2,000 metres.

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**SPEAKER PARTS.** Pleated Paper, 2/-; Twin 12 in. nickel rims, 5/-; Reed phones, with needle, Brown's A. 13/6. Skinder Reed Units. Famous Viola double pull Unit 5/6. Crystal Amplifiers, 25/-.

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**AERIALS.** Indoor Suspension, 2/6. Frame Aerials, midtop, 10/-; Pocket R.A.F., 110 ft. stranded cop., 1/3. Aeroflex, 49 strand cop., 100 ft., 1/4. Navy 7/22 Enam. bronze, 3/-; Electronic, 100 ft., 1/3. Maxi, braided cop., 50 ft., 1/3; 100 ft., 2/-. Indoor Aerial wire, 22 gauge, 1/- 100 ft. Earth Wire, 1/3 doz. yards.

**MASTS.** R.A.F. Steel Tubes, 15 ft., 7/6; 20 ft., 10/-; 30 ft., 14/-; in 2 ft. 8 in. by 1 1/2 in. sections. Heavy Mast in Section, 4 ft. 3 ins. long, 2 ins. 5/6 each.

**VALVE BARGAINS.** AC to DC 50 m/a Cossor. B.I.H. M.O., etc., with holder, 8/6. List 25/- 8-v. Grid Bias Battery, 1/-; 220v. Neoms 2/-.

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218, Upper Thames St., E.C.4

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 938.)

to find that one of the diaphragms was quite rusty. Can this be prevented?"

It is a good plan carefully to wipe the telephones after they have been used for long periods and to very lightly coat the diaphragms with vaseline or petroleum jelly to prevent the rust attacking them.

### SHORTING THE GRID-BIAS BATTERY.

R. V. E. (Rugby, Warwickshire).—"On the grid-bias battery that I have bought the hole marked "O" is so close to the marked 1 1/2 that when I put the positive plug in "O" and the negative in 1 1/2 volts the two plugs touch. Does this damage the battery?"

If the metal parts on the two plugs are allowed to touch you will certainly short your battery, and no grid-bias voltage will be in circuit. If, however, it is only the insulating parts of the plugs that are touching this will do no damage and should not affect the operation of the receiver in any way.

### THE EXTRA VALVE.

L. F. S. (Bradford, Yorks).—"I had a blue print given to me of a set called "The Universal Three." It is marked the "P.W." Blue Print No. 35, and shows four valves, although I am informed that it will work with only three. Is this correct, and why are there four valves shown when only three are necessary?"

Either three or four valves may be used in the "Universal Three," because in places where the receiver is situated fairly close to a broadcasting station the power developed is too great to be handled satisfactorily by one ordinary power valve, so the last two valves holders are connected in parallel so that two valves may be used here if desired. At greater distances there is less likelihood of the receiver being overloaded, and in these circumstances only one valve need be employed in the last pair of valve holders.

### H.F. INSTABILITY.

N. C. B. (Glasgow).—"I made the H.F. transformer exactly as described, but when I use it the set violently oscillates all the time. Moreover, it is hopeless to try and neutralise it for there is no silent point at all. With a different H.F. transformer the set is all right. What is likely to be the cause of the trouble?"

Probably, when making the coil, you mixed up the connections in it. Try the effect of reversing the leads to the neutralising windings, to the primary windings, or both.

### OVERLOADING THE LAST VALVE.

L. R. W. W. (Nottingham).—"My new three-valver gives me perfect results on several stations including Daventry, but unfortunately it always distorts a little on the local station when tuned in fully. When detuned a little it is perfect, but I cannot get the benefit of the full volume of which it is capable because of this distortion arising. What is the cause?"

Evidently you are overloading your last valve. When the input to the receiver is moderately strong the last valve can handle it on the straight portion of its curve. But louder signals cause the valve to work on the top or bottom bend (or both) and this causes uneven amplification which appears as distortion.

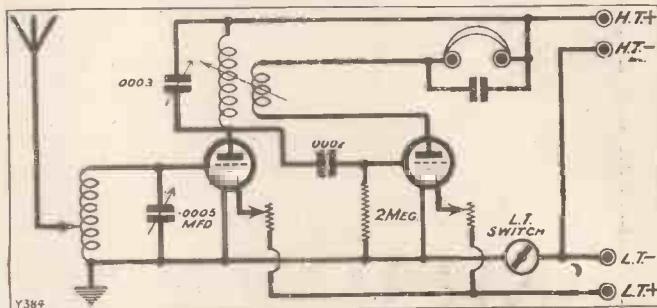
We regret that, owing to pressure on space, the last of the series, "The ABC of H.F. Amplification," and the column feature, "Notes on Short Waves," have had to be held out of this issue. They will, however, appear in "Popular Wireless" next week.

## LOUD-SPEAKER LEADS CAUSE HOWLING.

J. W. N. (Leigh-on-Sea).—"Not long ago I fitted long extension leads to my set to enable the loud speaker to be used in another room. Ever since that time I have been troubled with howling. Do you think that the long leads are the cause of this, and how can it be prevented?"

You do not say if you are using a coupled output or if the long loud-speaker leads are inserted in the plate of the last valve. If this latter is the case we should certainly recommend you to use an output transformer, or else the choke capacity method of output coupling. If, however, an output circuit is already in use, keep the loud-speaker leads well away from the earth wire, and if possible improve the insulation and efficiency of the aerial-earth system. (To run the loud-speaker leads through a lead-covered cable, and earth the casing of this, is a certain cure.)

### H.F. (TUNED ANODE) AND DET.



The correct connections for an H.F. and Det. receiver are shown above. In the "What is Wrong?" diagram last week the filament switch did not control both valves, the aerial condenser was '005 mfd. instead of '0005, and the grid leak was taken to H.T. + instead of to the filament circuit.

### GAMBRELL CENTRE - TAPPED

coils are recommended for use in all circuits which are designed for extreme selectivity. Besides being excellent for this purpose, Gambrell Centre-Tapped coils can also be used with advantage in ANY circuit. Standard fitting to all coil sockets. Occupy minimum baseboard space.

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a	4/10 ... 25
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B1	5/3 ... 40
B	5/6 ... 50
C	5/9 ... 75
D	6/3 ... 100
E1	6/9 ... 150
F	7/9 ... 200
G	8/6 ... 300
	10/- ... 500

Prices quoted are for Standard Coils. There is a Gambrell Coil Holder specially designed for use with these coils. Centre coils and which does away entirely Tapped, 6d. extra, with flex leads. Price 1/9 each.

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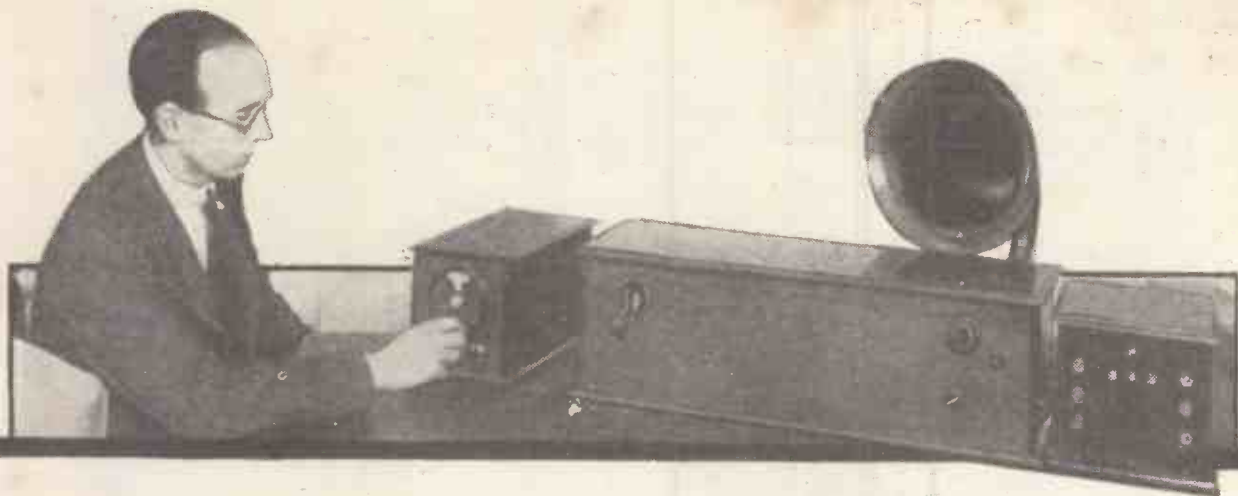
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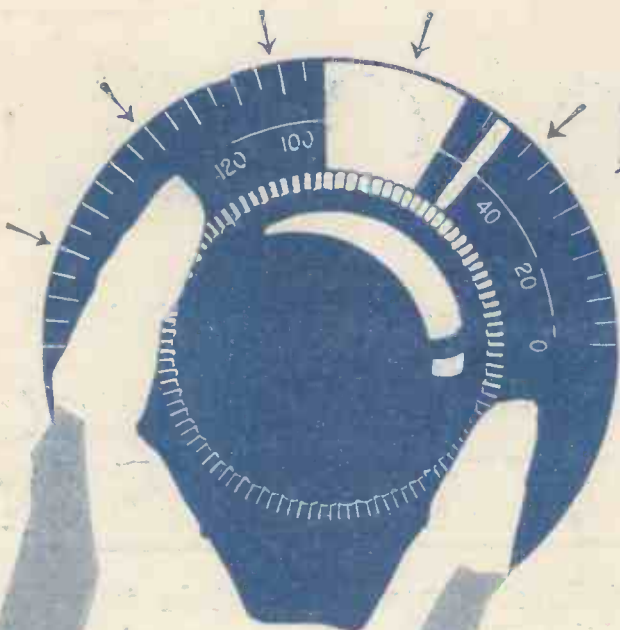
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