

A SIMPLE TWO-VALVE SHORT-WAVER—See Page 63.

Practical and Amateur Wireless

3^d
EVERY
WEDNESDAY

Edited by F.J. CAMM

GEORGE
NEWNES
Publication

Vol. 10, No. 237.
April 3rd, 1937.

AND PRACTICAL TELEVISION



VALVES

Types & Purposes

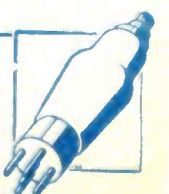
A Book for Every Up-to-date Wireless Enthusiast!

EVERYMAN'S WIRELESS BOOK

By F. J. CAMM (Editor "Practical and Amateur Wireless," etc.)

A Radio Consultant for the Listener, Expert and Amateur Constructor, explaining the Operation, Upkeep and Overhaul of all Types of Wireless Receivers, with Special Chapters on the principles of Radio Telephony, Installation, and Systematic Fault-finding. And 200 Illustrations. From all Booksellers only 3/6 net, or 4/- post free from

GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, LONDON, W.C.2.



Build this Model PETROL 'PLANE

THIS month's "PRACTICAL MECHANICS," the magazine of modern marvels, gives you full constructional details of a magnificent petrol-driven model aeroplane. Proportioned with absolute accuracy, it will take off like a real aeroplane and ascend to an enormous height—with a thrilling crackle from the exhaust almost as loud as that which issues from an actual machine!

Its flight is limited only by the amount of petrol carried, for it will fly for an indefinite period at speeds of about 6,000 revolutions per minute!

It is easy and cheap to build—and by making it you can enter "PRACTICAL MECHANICS" competition with a first prize of £50.

Other Special Contents of the April "PRACTICAL MECHANICS" include:

TRICK BOXES AND HOW THEY ARE MADE

SWISS MOUNTAIN RAILWAYS HOME-MADE BURGLAR ALARMS

OVERHAULING THE PIANO AN INVENTOR WHO DISAPPEARED

THE MONTH IN SCIENCE AND INVENTION, Etc.

"PRACTICAL MECHANICS" is profusely illustrated with specially-taken photographs, and diagrams, plans and drawings.



**FIRST
PRIZE
£50**

And numerous other prizes in "PRACTICAL MECHANICS" splendid Competition for builders of this 'plane.

**A GREAT
OPPORTUNITY FOR
THE MODEL 'PLANE
ENTHUSIAST.**

SEE THE APRIL

PRACTICAL **6^D** MECHANICS

THE MAGAZINE OF MODERN MARVELS

Of all Newsagents and Bookstalls, or by post 8d. from The Publisher, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

THE HEART OF THE SUPERHET —SEE PAGE 54



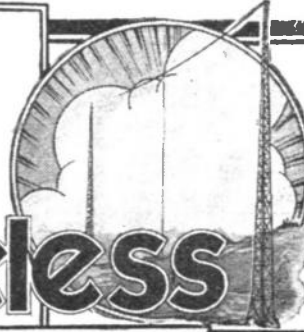
Practical

and Amateur

Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch.,
B.Sc., A.M.I.E.E., Frank Preston.



VOL. X. No. 237. April 3rd, 1937.

ROUND *the* WORLD *of* WIRELESS

The Simplest S.W. Two-valver

THE constructor will find much to interest him in the following pages, and of particular interest is the neat two-valve short-wave receiver, which is a development of the Simplest One-valver which has proved such a great success in the past. The numerous logs which have been published from readers show just what can be accomplished with a single valve when used in a suitable circuit, and the two-valver described on page 63 is a similar arrangement with the addition of a single L.F. amplifying stage, and consequently, will give louder signals. No blueprint is available for this receiver, but it is so simple to make up that all of the details given in the article will be found suitable for even the beginner. An interesting article is also included describing the construction of some simple and novel types of tuning dial. The present enthusiasm for simpler dials, especially of the "alphabetical" type, lends interest to this article, and every reader should find one type of dial included which will meet his requirements.

More Coronation News

FURTHER fixtures have been arranged by the B.B.C. for Coronation week, and it is now announced that on Coronation Night (May 12th) a special Coronation party will be held. So far, three well-known "acts" have been booked. These are Elsie and Doris Waters, Clapham and Dwyer, and the Two Leslies. It is hoped soon to announce the names of others who will be present, and the Party will follow closely the lines of the famous Christmas Parties, and will run for seventy-five minutes.

Copyright Waived

A FURTHER item of Coronation interest is that the B.B.C. will waive the copyright clause on its transmissions. This, it is hoped, will lead to very large public-address gatherings and meetings in all parts of the country, where the B.B.C. programmes will be relayed. The Marconi-Phone Company announce that the task of relaying the broadcast to the crowds thronging the route of the procession will involve over 25 miles of twin wire, connecting up over 50 tons of apparatus, with a thousand valves working continually

throughout 24 hours! In addition to this, there will be a complete "stand-by" apparatus in the unlikely event of a breakdown. Fifty trained engineers will be in charge of the apparatus for the entire 24 hours.

Television and Astronomy

DURING a speech at Strasbourg, Prof. Lallemand said that astronomers were keenly interested in the present television developments. It is expected that television will play a great part in future astronomical studies, as the fact that light is changed into electrical energy and changed back again by the television

wave Broadcasting Stations." It is estimated that 250 cylinders of hydrogen, each containing 100 cubic feet of gas, will be used before the last balloon is sent off.

France to Nationalise Radio?

IT is stated that the French Government has under consideration the question of nationalising the whole of the radio manufacturing industry. This is stated to be in pursuance of the Government's plans to nationalise all industries having any connection with war activities.

Sir James Barrie

ON May 10th, the Monday of Coronation week, a play by Sir James Barrie will be broadcast in the National programme. The play selected for this first opportunity listeners have had of hearing over the microphone any of the great dramatist's works is "Dear Brutus." First produced at Wyndham's Theatre in 1917, with the late Sir Gerald du Maurier in the leading rôle, it met with instantaneous favour and has since been frequently revived.

Variety in Miniature

ON April 2nd Cora Goffin, the musical-comedy star and principal boy in pantomime, is the chief attraction in this Midland programme of "Variety in Miniature," compiled by Martyn Webster. Billy Gordon, with his piano-acordion, has his first broadcast; Jack Woodroffe, who won a Birmingham newspaper talent competition, will appear in impressions; Jim Collier, the Singing Lumberjack, will sing some Hill Billie numbers accompanied by Martini and his Music; and Mr. Webster is to introduce a new character, Professor Whup, who gives "a Helpful Talk on Life's Little Problems" under the title of "This and It."

Coronation Television Arrangements

IT is announced that close-up pictures of the King and Queen as they pass in the Coronation procession will probably be seen on the television screen. The B.B.C. has been experimenting with a telescopic lens, which, it is hoped, will make this possible. Three special vans are to be used for televising the procession, and both land lines and a wireless transmitter will be available, as a link between them and the Alexandra Palace.

Binding Cases for Vol. IX

May now be obtained from the address below
Price 3s. 6d. complete
with Title Page and Index.

The Index alone costs 7d. by post.

Applications to be sent to:
The Publisher, George Newnes, Ltd.,
Tower House, Southampton Street,
Strand, W.C.2.

equipment will lead to amplification far greater than is obtainable by ordinary telescopic means.

Philco Balloons

LOOK out for one of the vari-coloured balloons released by Philco between March 22nd and April 3rd. These are filled with hydrogen gas which may keep them aloft for a considerable time. Approximately 2,000 of these have been sent up each day, and on them is printed a coronet with a message to the effect that if the finder writes to the Philco works, giving details of where the balloon is found, he will receive free a new and informative booklet. "A Guide to Reception of Short-

ROUND the WORLD of WIRELESS (Continued)

To Stop Radio Noises

WE are informed that another step has been taken towards legislation to make electrical interference with broadcasting illegal. Following a report of a special committee of the Institution of Electrical Engineers, it is understood that the Government ultimately intended to introduce such a measure. The chief causes of unwanted noise are lifts, trolley-buses, and trams, household appliances, such as vacuum cleaners, small electric motors. "Neon" signs and electro-medical apparatus.

Microphones at Coronation Ceremony

IT is stated that for the Coronation there will be microphones at 100 points in the Abbey. Many will be for the use of foreign commentators, whose descriptions will be relayed to the capitals of Europe.

There will also be 36 microphones on the route for the use of home and foreign broadcasters, and the four radio channels to America will all be working.

Sir Adrian Boult to Visit Dublin

IT is announced that Sir Adrian Boult, at the invitation of the Director of the Irish Free State Broadcasting Service, will go to Dublin on April 11th to conduct a public concert which will be broadcast from the Gaiety Theatre.

This will be the first time that the B.B.C.

Jack Hylton, who recently returned from a very successful European tour, and who may be heard on the air during Coronation Week.



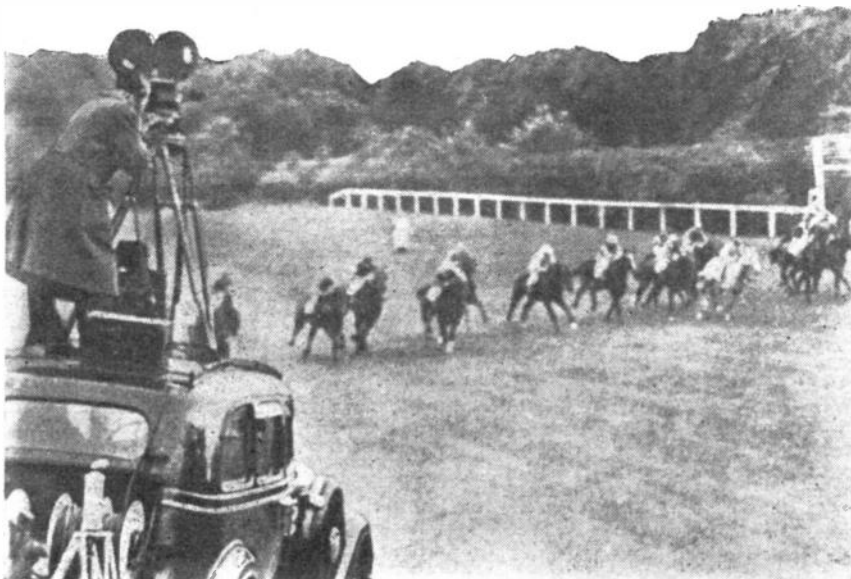
Director of Music has conducted a concert in Dublin, and it will also be the first appearance in public of the Irish Free State Broadcasting Orchestra. The soloists will be Thelma Reiss, who will play Elgar's Violoncello Concerto; and Renée Flynn, who will sing a group of arias with the orchestra. The main item in the programme will be Brahms's Symphony No. 2 in D.

True Stories

ANGUS BAXTER, manager of the Bristol Ice Rink, will tell "The Wayfarer's Story" in the series of True Stories in the Western programme on

INTERESTING and TOPICAL NEWS and NOTES

April 2nd. After sitting on an office stool for five years, he decided he wanted something more out of life than a further 36 years on the same stool, so he shook the dust of the city from his feet and set forth



The illustration shows one of the many uses to which Exide batteries are put—Pathe Pictures Ltd. use power from an Exide to operate the talkie apparatus in their portable camera unit. No doubt scenes of this type will soon be included regularly in the television programmes.

on the adventures about which listeners will hear.

Variety from Bath

A VARIETY programme will be broadcast from the stage of the Theatre Royal, Bath, on April 9th. The artists will include Jack Mayor and Alan Kitson in songs at the piano, and Sid Dooley, comedian. Charles Gordon will play handbells.

Violin Recital

PAUL BEARD, who is the leader of the B.B.C. Symphony Orchestra, will revisit his home town of Birmingham on April 3rd, and give a violin recital. The programme will include Brahms's Sonata in D minor. Paul Beard, who was formerly leader of the City of Birmingham Orchestra, is the son of a Birmingham violinist and the grandson of a Birmingham singer.

"Cine-Variety" from Gloucester

THIS is the first broadcast from the Theatre de Luxe, Gloucester, which in its thirty years has had the distinction of being the first to introduce a continuous programme of pictures in the West Country, the first to introduce talkies, and the first to introduce a policy of cine-variety. The manager, since early in 1929, has been Major Ernest Clifford. Wyndham Lewis, the organist, who will play in this Midland programme on April 8th, was formerly associate organist to Reginald Foort, at the Regal, Marble Arch. The instrument is a three-manual, nine-unit American theatre organ.

Regional Listeners to Share in Television Programmes

BROADCAST listeners will be interested to know that twice within the next month owners of ordinary broadcast receiving sets will be able to hear the sound portion of television transmissions from Alexandra Palace. The first occasion will be at 9 p.m. on Tuesday, April 6th, when the artists will be Frances Day, Irene

Prador and Lydia Sokolova. Sound will be transmitted as usual on 7.23 metres, as well as on the Regional wavelength.

On April 15th evening television transmissions will begin at 9 o'clock, with a thirty-minute programme by Henry Hall and the B.B.C. Dance Orchestra, and the sound part will be heard also by Regional listeners.

SOLVE THIS!

PROBLEM No. 237

Black built a battery superhet having a tone-control potentiometer and condenser connected in series between anode of the output valve and earth in the usual manner. When the set was switched on reception was satisfactory, but as the tone control was rotated towards minimum setting the fuse bulb glowed and eventually burnt out. What was the trouble? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 237 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, April 5th, 1937.

Solution to Problem No. 236

The primary winding in the aerial coil of Edmund's receiver was broken.

The following three readers successfully solved Problem No. 235, and books are accordingly being forwarded to them: F. H. Mercer, Ward 3, Sick Quarters, R.N. Barracks, Chatham; W. C. Young, 32, Emmadale Rd., Weymouth, Dorset; H. C. Cooke, 88, Dunstable Rd., Luton, Beds.

*Missing
Page*

*Missing
Page*

Terminals, Plugs and Sockets - - - - - - - - - There's No Connection!

The Trouble Does Not "End" at the Terminal. It Usually Commences There!

THE writer, a service engineer belonging to a company whose name is a household word, has recently been amusing himself by reading a number of books on service work published both here and in America, also sundry articles appearing in these countries, and gives below a number of faults which, although not uncommon, have been rarely, if ever, mentioned.

Stupid Mains Plugs

A common cause of spluttering in commercially-built receivers is such a stupid one that the engineer never bothers to mention it, and the amateur usually thinks of it last. This is the actual connection between the mains cord and the mains plug. The average mains plug is peculiarly unsuitable for this purpose, having the usual ridiculous hole in which the end of the flex is inserted, which in turn is intended to be gripped by a screw of absurd dimensions, which may, with luck, grip as many as half of the metal strands. This connection very often becomes loose due to one or more strands working out from under the screw, leaving the rest of the bunch a poor fit. In the absence of an intelligently designed plug, the best remedy is to bind the strands together so that the screw can be made to grip them without them spreading unduly. Where the cover permits of it, it is a good idea to bare about $\frac{1}{2}$ in., take the strands through the hole, round the outside, and back through the hole again. Obviously the screw should not be tightened to the point where the flex is cut, but it should be tight enough to prevent any possibility of arcing, which sets up most disagreeable interference.

Plugs and Sockets

There is an increasing tendency for manufacturers to terminate the aerial and earth connections of the set with sockets, and to generously provide two particularly nasty little plugs intended for the earth and aerial leads. At least one manufacturer recommends 7-22 copper wire for the earth "which should continue unbroken to the actual receiver," but thoughtfully provides a plug in which only three strands will pass through the hole provided for that purpose. These plugs are in themselves satisfactory, but many of them have a common failing. The wire is intended to be held in place by the metal plug portion which is screwed up against it. Often when screwed right home it will not properly grip a piece of wire of reasonable gauge, and while the wire is clean, all is well, but when the wire oxidises, nasty scraping noises are heard in the speaker if the lead aways. Trouble of this nature is peculiarly awkward to find, as if the lead is taken and shaken from side to side at an angle that is at all acute, it may bring the wire into perfectly good contact. It should not be necessary to add that such manufacturers go to great trouble to lower H.F. resistance of their tuned circuit, and it is intolerable that resistance should be set up in the aerial plug, which necessarily happens unless the plug grips the wire tight enough to prevent oxidization.

The Elusive Gas Pipe

Many listeners are obliged to use a water-pipe "earth" which, at best, must have a fairly high resistance. Along this resistance there is a potential drop, consequently if any metal comes in contact with the pipe throughout its length, which is in turn connected to earth, it will cause some sort of noise to be set up in the loud speaker. Many years ago a case was investigated where a set made the most alarming noises when a motor-bus went by. This was due to a water-pipe "earth" touching a gas-pipe momentarily when the motor-bus caused it to vibrate. Such a trouble as this is not difficult to find provided the water-pipe is visible throughout its length, but unfortunately this is rarely the case. To a lesser extent the same trouble can apply where the water pipe touches some other earthed object at a point above (possibly several stories above) where the earth lead from the set is connected.

Ancient Wall Sockets

Wall sockets that have been left undisturbed for a term of years often make very bad connection with the supply wires, due to damp, verdigris, and any of the other troubles which can attack a wall plug not protected by a box at the back. Such a state of affairs often gives rise to a minute arc between the wire and terminal, which, in turn, can produce a most appalling racket in a sensitive wireless set of the superhet class. The remedy is obvious, and it is sufficient, therefore, to draw attention to it. It will be appreciated that an ordinary A.C. volt-meter is not likely to reveal the trouble, the obvious pointer being whether

the set works satisfactorily when plugged into some other socket. The same trouble would, of course, appear with a broken wire, but this usually solves itself, as the broken ends of electric light cable very soon move apart so that a complete break occurs.

A Screw Loose!

The reprehensible habit of neglecting to "earth" a mains set is getting more and more common. Admittedly in nine cases out of ten reception is not improved, but it is unquestionably desirable from the safety aspect. An unearthed chassis brings quite a few lesser troubles in its wake; an example will serve to indicate them. Some chassis are fixed in their cabinets by four nuts and bolts. In due course the base of the cabinet warps, and a nut and bolt which were previously under tension become loose and rattle on the chassis. If the chassis is earthed, this does not matter in the slightest. If it is not earthed, it will still not matter in 99 cases out of 100, but in the odd case it will faithfully record its movements on the loudspeaker by a peculiar scraping noise, which can be imitated by scraping the aerial lead gently with a piece of metal. The trouble, of course, occurs in those receivers which are inclined to be on the verge of instability when the earth is removed, and it is more likely to occur with sets one or two years old, rather than with those of this season, which, taking them all round, are extraordinarily stable. Where the practice is indulged in of earthing the speaker chassis to the set chassis, the same trouble arises when one of the bolts becomes loose which fixes the speaker to the baffle.



Peter Yorke, a newcomer to the "H.M.V." lists, and a favourite broadcasting band leader, is here seen making his first records at the "His Master's Voice" Studios. They are entitled: "A Nice Cup of Tea," and "Love Me To-day" (H.M.V. BD5179) and "Smoke Dreams," and "There's That Look in Your Eyes Again" (H.M.V. BD5180).

The HEART of the SUPERHET

Indicating the Importance of the Frequency-changer Stage, with Useful Advice Concerning the Choice of Frequency-changer Valve. By Idris Evans

CONTRARY to a general belief, the superheterodyne is by no means a product of the past five years. Superhets were in use before broadcasting commenced in 1922, but they fell into disuse about ten years ago and then suddenly reappeared in 1932. Their disappearance in 1927 was partly due to the advent of the S.G. valve and the consequent improvement in straight receiver performance, but the main reason was the difficulty which was then experienced in obtaining stability and good quality reproduction from the superhet. These disadvantages were due to the imperfections of the frequency-changer stage—the most vital section of the superhet.

During the five years between 1927 and 1932 S.G. valves were gradually improved, and by the latter year the straight receiver using two H.F. stages had reached the

beat note, but it was found that one valve could perform this function equally well, thereby simplifying the wiring of the external circuits and reducing the current consumption. Several multiple valves are now in common use as frequency-changers—namely, the pentagrid or heptode, the octode, the triode-hexode, and the triode-pentode. The first to appear was the pentagrid. This comprises an S.G. valve and a triode in one bulb, the S.G. section acting as the modulator and the triode as the oscillator, the two sections being coupled by means of the electron stream inside the valve. The pentagrid is very suitable for use in receivers tuning to the normal medium and long wavebands. It can also be satisfactorily used for the normal short wavebands of 15 to 100 metres provided that the tuning circuits are carefully designed.

in the diagram, Fig. 1, it is customary to tune the oscillator grid when a pentagrid is used, but better results are generally obtained with the triode-hexode when the oscillator anode circuit is tuned—the circuit is shown in Fig. 2. The pentagrid and triode-hexode are interchangeable, however, without the necessity for any circuit alterations, and in most cases it will be found that good results will be obtained with the pentagrid and the triode-hexode with either the oscillator grid or oscillator anode circuit tuned.

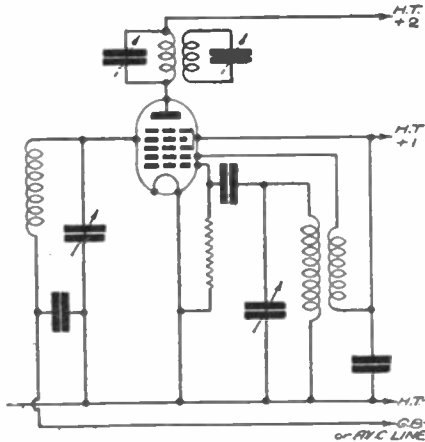


Fig. 1.—Showing the tuned circuits associated with the pentagrid frequency-changer.

height of its popularity. Its sensitivity and selectivity were of a high order. As the transmitting stations were increased in number and their power was doubled and trebled, however, it was realised that the selectivity of most straight sets fell short of requirements. It was then that the superhet reappeared—a greatly improved superhet from the 1925 type owing to the improvements which had, in the meantime, been made in the design of the frequency-changer stage and its associated components. Coils, tuning condensers, and I.F. transformers had been improved and by correct use of screening cans it was found possible to maintain stability even with both windings of the I.F. transformers accurately tuned by means of trimmers. This balancing improved the selectivity and sensitivity, and screening of the H.F. coils and wiring prevented the pick-up of unwanted signals, thereby providing a further improvement in selectivity and a reduction of whistles.

The Pentagrid Valve

Simultaneously with the improvement in coil design and screening technique came the modern frequency-changer valve. In the early superhet two valves were used to produce the intermediate frequency

The Octode

The octode works on the same principle as the pentagrid, but has an extra grid—the suppressor grid. In practice there seems to be little difference between the performance of these two types, and as far as the constructor is concerned they may be freely interchanged.

The Triode-hexode

The difficulty experienced in making the pentagrid oscillate satisfactorily below 20 metres accounted for the appearance of the triode-hexode. As interest in short waves increased, the necessity for a frequency-changer that would function equally well on the normal broadcast bands and on the short wavebands became evident. As its name indicates, the triode-hexode is a

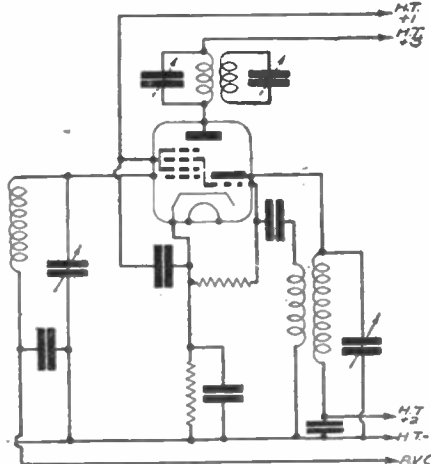


Fig. 2.—A frequency-changer stage using a triode-hexode. It will be noted that the oscillator anode circuit is tuned.

combination of hexode and triode, the difference between its internal construction and that of the pentagrid being the addition of a mixer grid which is connected internally to the oscillator grid. Its superiority over the pentagrid on the lower wavebands is accounted for by the almost complete absence of interaction between the oscillator and modulator sections. As shown

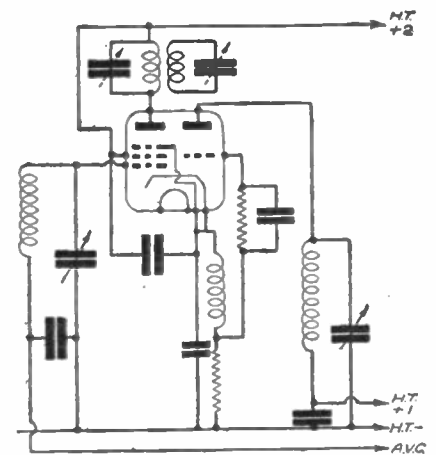


Fig. 3.—Showing the most commonly used circuit arrangement for a triode-pentode.

The Triode-pentode

The last type is totally different from the other three. It comprises a pentode frequency-changer and a triode oscillator screened from each other, and except for the common cathode the two sections are independent of each other. It is claimed that the screening of the two sections eliminates interaction between the aerial and oscillator circuits, thereby preventing frequency drift. This type of frequency-changer is suitable for long, medium, and short-wave reception, but owing to the fact that it is not interchangeable with the other three types it is not very commonly used by constructors.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPAEDIA

By F. J. CAMM | 4th Edition 5/- not.

(Editor of "Practical and Amateur Wireless")

Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear language.

From all Booksellers, or by post 5/6 from George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Practical Television

April 3rd, 1937. Vol. 3. No. 44.

Camera Progress

THE success of the transmitting side of television is indisputably linked up with the sensitiveness of the camera equipment used for scanning and generating the initial television signal. Lack of sensitivity reveals itself in the final picture as an overall covering of fine black and white spots, which for want of a better term is generally referred to by the technician as "mush." To give a better signal to mush ratio, therefore, it is quite common practice in the studios to submit the artists to the effects of glaring and high light intrinsic value lamps. Naturally, modern equipment is of much better quality than the early apparatus, although it was only a few months ago in France that the studios had to be supplied with special exhaust fans and tubes to dissipate the rather unbearable studio heat brought about by these lights. It is very trying for artists to act under these conditions, and continual research is being applied in an effort to effect the greatest possible improvement in camera sensitivity. The importance of the latest news concerning the Farnsworth electron camera cannot therefore be over-estimated. For head and shoulder close-ups it is claimed that in the American laboratories of this inventor only about half a kilowatt of lighting is necessary, a reduction which will be welcomed by all, for it suggests that outdoor scenes under non-favourable weather conditions should now be possible. Speaking of outdoor television shots, it is interesting to note that the B.B.C. have already made some moves in that direction. With the occasional brighter days, golf and horse-riding lessons have been featured, and the engineers on the cameras themselves have now been provided with leather helmets which incorporate the headphones used to give instructions from the control room without being influenced by extraneous noises. In addition, these men wear rather tight-fitting flying suits and leather gauntlets as a protection against the inclemency of the weather.

Censorship

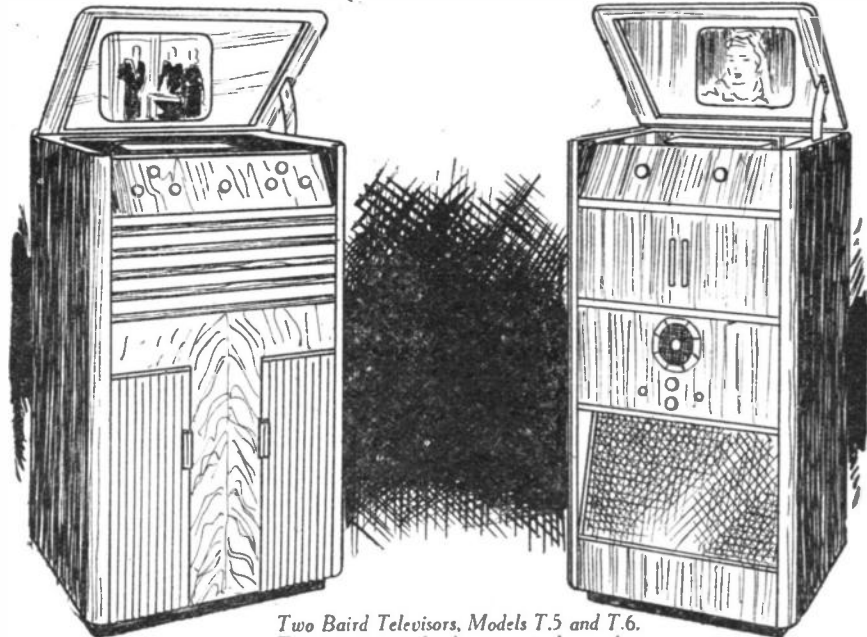
IT is being stated quite freely in many quarters that the main reason for the ban imposed on televising the Coronation ceremony scenes inside Westminster Abbey (some still hope the decision is not irrevocable) is one of censorship. When films are taken it is an easy matter for the small committee (already officially appointed) to censor the developed result, and delete anything which seemed to suggest a lacking of the dignity which must, of course, be associated with such a ceremony. On the other hand, the B.B.C. officials pointed out quite rightly that a half turn on one control knob would be sufficient to black out the television picture completely if those in authority felt that during any period the results observed did not fall within the prescribed conditions. Apparently this has failed to impress the Abbey authorities so far, and may be due to the fact that they have never seen a

picture or familiarised themselves with the Alexandra Palace apparatus.

Derby Prospects

ALTHOUGH some three months away, plans are already being discussed to see whether this year's Derby can be televised. The race itself always excites world-wide interest, and to link it up with television would be an excellent thing for the service. On two previous occasions this has been done. The first was on June 3rd, 1931, when the first portable daylight television van of the Baird Company was positioned against the course rails, the generated signals being sent by land line to Long Acre, thence to Savoy Hill, and finally, Brookmans Park, where they were radiated by the London National station as a thirty-line low-definition picture. A year later, however, a more ambitious experiment was undertaken, for a Baird daylight television van, with improved scanning equipment, sent signals showing the Derby scenes to the Metropole Cinema,

realise what increased picture size involves. The maximum picture area on any cathode-ray tube commercial receiver at present available is 110 sq. ins.; this being obtained with tubes having a fluorescent screen face of 15in. diameter. For home purposes, this is ample for most occasions, but where large audiences are to be entertained and cost is not a very prime factor, then this can be multiplied very considerably. The best method so far is to use a projection type cathode-ray tube. This is of the same standard type, but has an almost flat circular face with very thick glass. In this way, optical distortion is avoided altogether, and the actual picture size on the screen seldom exceeds 8in. in width and is often less. The picture is so bright and sharp, however, that it can be projected right through the end of the tube on to a screen remote from the receiving apparatus. In this way, pictures from 2ft. wide up to at least 6ft. wide can be shown. In the exhibit shown by Telefunken in Berlin recently, the actual screen itself was covered with small glass beads in order to concentrate the lighting, and so enable the brightness of the picture to be enhanced. It must be noted, however, that the anode voltage required to operate a tube of this nature is particularly high, anything up to 20,000 volts having been employed so far, while the deflecting voltages in the case of electrostatically operated tubes are also considerably higher than normal. It is these factors which govern the initial cost, but no doubt concentrated research will help very materially in making this a commercial proposition.



Two Baird Televisors, Models T.5 and T.6. These are now the lowest priced complete television receivers on the market.

London, where pictures were shown as a three-zone arrangement with ninety-line definition on a screen 10ft. by 8ft. Undoubtedly, this was a great achievement, and in addition to the land line pictures the race was again broadcast as thirty-line pictures by the London National station. With the hope of a high-definition Derby transmission, however, with its increased picture detail, the results should be outstandingly good.

Large Television Pictures

A GOOD deal is still being talked about large television pictures for the home, but in the majority of cases the persons participating in the discussions fail to

New Zoo Television Series

ALREADY a large number of children look forward eagerly to television's "Zoo Day," which occurs once a fortnight, when Mr. Seth Smith brings a new party of his little friends from Regent's Park. In the new series which opens on April 9th, it is hoped that some of the larger animals will be persuaded to face the television camera, for, with the approach of warmer weather, it may soon be possible to stage outdoor parties with animals which are too big to be comfortably accommodated in the studio.

It is hoped also to bring children into the picture with the animals.

Sir Noel Ashbridge's
Lecture

SIR NOEL ASHBRIDGE, in a recent lecture to the Institution of Civil Engineers, dealt with many of television's immediate problems as well as plans for the future. After explaining how signal distribution will be linked up with the work of the Post Office in laying the coaxial cable, he stated that there is to be a single main cable with side spurs leading to the principal theatres, the Cenotaph and Whitehall, and vantage points on procession routes. The Alexandra Palace is already connected with Broadcasting House via the P.O.'s trunk telephone exchange near St. Paul's, and when the television van units are completed it will be possible to plug in the camera equipment at any of these points and so enable the programme director to cover a large proportion of London events. Improvements were also in hand to extend the size of the studio stage, give greater mobility to the artists taking part in any performance, while the use of the telephoto lens would enable distant outdoor scenes to be covered.

The problems associated with reception interference by the ignition systems of motor-cars were also mentioned. Until a year ago, he said, electrical interference caused by spurious radiation from the ignition systems of motor-cars and from electro-medical apparatus was known to

Television Notes

exist, but the extent of the inconvenience likely to be caused was difficult to estimate. The effect of interference from the ignition systems of motor-cars had been found somewhat serious at distances of more than four or five miles from the transmitting station. The effect of a single motor-car was confined to a small area, so that even at distances of twenty or twenty-five miles from the transmitter the trouble was obtrusive only when a car was opposite a house where reception was being carried out. Conditions on a main road might be bad at any considerable distance from the transmitting station. Reasonably simple means existed for the prevention of those parasitic radiations, and it was to be hoped that means would be found for ensuring that all motor-cars were fitted with suppressors. The difficulty did not occur on ordinary broadcast wavelengths, so far as motor-cars were concerned, since the spurious emissions were not on wavelengths as high as 200 metres. Similar interference from electro-medical apparatus was more serious, but much less widespread. Its cure was far more difficult.

The use of directional aerials with reflectors was a material benefit as it brought the received television signal to a

level considerably in excess of the interference, and by reducing the degree of "gain" necessary in the set the quality of the observed picture was very noticeably improved.

Television at the Ideal Home Exhibition

SINCE the present television service is one which is designed to give home amusement it is quite natural to expect that the forthcoming Ideal Home Exhibition at Olympia will include this feature. This has been done on more than one previous occasion, the last being in conjunction with the fashion parade. A television studio complete with mobile scanning unit, amplifiers and microphone was set up on one of the gallery floors and linked by land line to a large back projection television screen about 7ft. high by 3ft. wide. Artists and mannequins situated in the studio were seen by the assembled audience watching the Pageant of Fashion in a hall some distance away, and the possibilities of television thereby demonstrated. With the present exhibition it is proposed to have studio equipment resembling that used at the Alexandra Palace, and visitors will see the resultant pictures on standard home receivers, thus being able to compare and contrast the real with its miniature electrically reproduced replica.

DIFFERENTIAL TRIMMING

THE problem of matching two adjacent tuning circuits of a multi-stage receiver is still unsolved in spite of many years of development and research. Considering the fact that the inductance values of two "accurately" matched coils may vary by as much as ± 0.3 per cent, and that no two sections of a two-gang tuning condenser can be adjusted so as to be completely equal throughout the whole of their angular rotation, we are still faced with the balancing out of the remaining small variations between adjacent circuits. The introduction of the well-known variable trimmer condenser provided upon the majority of receivers is a definitely useful, though not 100 per cent. efficient, adjunct. The latter is actuated by a control knob concentric with, and rotating freely upon, the same spindle as the main tuning control, enabling a small additional variable capacity to be placed in parallel with the front condenser section.

This variable trimmer, together with the small semi-fixed trimmers (at the side of each section of the condenser) assists in neutralising the capacitive variations caused by: (a) stray capacities, (b) transferred capacities, and (c) inherent capacities of the components themselves.

Upon analysing the causes of these variations one can see the futility of seeking a definite cure and must, therefore, provide methods of keeping their effect down to a minimum. Stray capacities (a) are developed by general receiver wiring, switches and screened leads; under group (b) are capacities transferred across H.F. transformer windings due to the aerial circuit, anode circuit capacity of the preceding valve, and reaction capacities which vary at different settings of the tuner; inherent component capacities (c) consist chiefly of the grid-cathode valve circuits, self-capacity

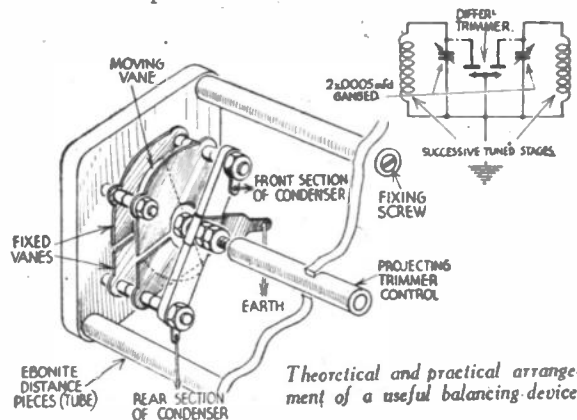
of tuning coils, and paralleled capacities caused by resonant points of high-frequency chokes.

Whenever a grid biasing potential is applied to one or both valves (e.g., variable-mu valves in A.V.C. stages) its decoupling components will further deviate the associated tuned circuit from its theoretical value.

These many enumerated capacities have a marked effect at the lower end of the tuning scale where they represent a large percentage of the total circuit capacity and, considering their total effect, it is clear that the excess may occur in either the first or second tuned stage, and may even transfer itself to the other stage upon different wavebands. The inclusion, therefore, of the small semi-fixed trimmer is detrimental at the lower parts of the waveband, and the additional variable trimmer (in parallel with the front condenser) is useless when the predominant capacity already exists in its own stage—although some degree of adjustment can be obtained by adding more capacity by means of the side trimmer associated with the rear condenser section.

Having no definite solution, one may resort to the use of a differential trimmer to enable tuning to be carried out to a greater degree of accuracy. Application of a "differential trimmer" has a decided advantage in that it is able to correct a two-way inter-stage error by an external (panel) control, and when used the semi-fixed side trimmers may be set at minimum, thus improving the selectivity upon the lower

wavelengths. Such a condenser can be easily improvised by modifying an old air-spaced variable micro-differential condenser of, say, .00004 mfd. maximum capacity. By removing one-half to two-thirds of both the fixed and moving vanes to obtain twice the dielectric spacing, a "zero" capacity (when the moving vanes are equally interleaved between the fixed vanes) in the region of .00001 mfd. will be obtained. External rotation may be effected by adopting a horizontal mounting so that a long ebonite knob may project a convenient distance through the face of the control panel.



Theoretical and practical arrangement of a useful balancing device.

The diagram illustrates the method of connection, although the valve circuits between the first and second stages, and after the second stage, are omitted for clarity. Again, it may be mentioned that the author has also applied the principle to facilitate trimming bandpass coupled circuits with definite advantage.—W. A. Harrison (Aintree).

The CYCLIST - - 2d.
Every Wednesday.



On Your Wavelength

By **THERMION**

Television Programme Delays

JUST as a mild warning to the B.B.C. I should like them to know that I am looking in regularly every day, and I tell them that having spent £70 on a television receiver to look in for two periods of one hour each per day, I am dissatisfied with the amount of each hour which is wasted in delays between the items. It is too bad to have to spend a large sum of money as I have done in the interests of science, to have to waste about 15 minutes of every hour; also I complain of the fact that the clock hands which appear before the programme starts are not correctly set. May I also say that the programmes do not start to time, and that some of the items are not suitable for television. Bands and that sort of thing should be heard and not seen. The other afternoon during an interval, a gramophone record was played, which lasted for six minutes. There

B.B.C.'s edict. We all know that the listening public doesn't want one, and I hope that we may now be left to listen in peace. Let those who want dance bands buy a gramophone or go to the music-halls.

If you find an immediate improvement in the television programmes I do hope you will show your approval in the usual way. I smoke anything and have no particular preference in the cigarette or cigar line. I drink whisky and champagne, and my car is in such a state of decrepitude that some of you out of sheer gratitude may like to club together and buy me a new one. Having spent my last available cash in the interests of the science of television I simply have not the money left to buy a new one, nor even to have my old one repaired, so do take pity on me. If you have any old clothes, such as shirts, or a pair of breeks which are not too badly patched, they would be very welcome. I shall be able to build a house very shortly with the bricks which readers are continually hurling at my head, so I merely ask them for a few old clothes and a few of the amenities of life which make it bearable. The way of the pioneer is indeed hard. For me the thorny paths of penury, and the hard knocks of adversity. It was always thus. Had I turned my undoubted ability into the channels of filthy lucre and hard commercialism I should have made a fortune. As it is I prefer to reside in the limbo of the unknown and have allowed Marconi and others to make the money which should have rightly come to me!

have added that some of them are supercilious, snobbish, silly, circumlocutory, circumnavigatory, and inane. Broadcasting appeals to their vanity because they like to know that it annoys their lady friends, who sit at home at afternoon tea parties, tearing the lady broadcaster's character to shreds. The same speaker said that the microphone was not kind to women's voices, and there was a sameness about the female voice that became irritating. I do not quite agree with this. There are some ladies with music in their speaking voice; there are others who speak in a manner which betrays a bad temper. Most quickly spoken women are bad, tempered, and lack voice modulation. Many of them rattle through their script as if they are anxious to get it over. Few of them succeed in putting it over.

The Prisoners Complain

I HEAR that the prisoners at an American prison recently held a demonstration (in this country we should hail it as a riot) against the type of programme that is being



Prison Radio

was no vision programme during this period. Now that the B.B.C. knows that no less a person than myself is looking in, I have no doubt that they will change their ways. I do not like to think that as a result of my continued onslaught about crooners and dance bands they have decided to let dance bands go, but the fact is, they are going, and you must draw your own conclusions.

"Superior, Swanky, or Condescending?"

AT a conference in Leeds arranged by the B.B.C. to discuss talks, a certain learned doctor said that women who broadcast are superior, swanky, or condescending. He might



The Female Broadcaster

supplied to them *via* the sets in their cells. They said that they were fed up (in this country we should say sated, cloyed, or nauseated) with too much highbrow uplift, and wanted more variety and light entertainment. The solution seems to be to withdraw the wireless sets altogether, for the American criminal is the worst in the world, and from some of the cases I read ought to have the cat-o'-nine-

tails twice daily for seven years. But in that comic country known as America anything can happen, and I have no doubt that in order to prevent a strike of prisoners they will placate them with champagne and feather-beds, or else release them altogether.

Radio Superstition

I AM surprised to hear that there is still a lot of silly superstition regarding the way in which radio functions and in the way it is obtained in the home of the listener. I recently heard of a man who was perturbed because he had been told that as his aerial sloped down from his window the wireless waves would run away from his set and he would get weak reception. Another listener was using a metal skewer stuck in a box of earth on the window-sill of a flat as his garden was so far away, and was watering it each day in order to maintain its efficiency. I really thought that all of these silly ideas had died long ago, but, no doubt, there is often some slight sub-stratum of truth underlying the idea. For instance, the sloping aerial idea may have originated in the case of a listener who had erected the aerial badly, perhaps had not used any insulators, or had used bad ones, and had afterwards altered the aerial, including insulators or improving insulation, and changing the angle. The increased volume or sensitivity may thus have led him to believe that previous troubles were due to the angle. Similarly, the use of a long earth lead to a flat may have picked up interference or given poor results, and the effect of the capacity earth may have led him to think that the box of earth was better. I wonder what other fallacies are still in existence? Drop me a line if you know of any.

The Octals are Coming

THE high price and diversity of types of British valves has in the past accounted for the predominance of American receivers in the Colonies and Dominions. There is no doubt that the best British valve types are more efficient than the American types fulfilling a similar function, but this very fact has been a disadvantage rather than an advantage. Their efficiency makes the receiver more prone to instability, and great difficulty is generally experienced in procuring a suitable substitute when the original type is not easily obtainable. The greatest diversity of types exists in the A.C./D.C. range of the various manufacturers. They have



Choosing Gang Condensers

THERE are some components, such as volume controls and switches, which still give a good deal of trouble and their design does not seem to have been materially improved during the past three years. This cannot be said of the gang condenser, however. Great improvements have been made on this component recently. It is not surprising, therefore, that old models are being sold so cheaply. Old types can be used fairly successfully in simple two and three-valve straight sets for reception of the normal broadcast-band stations. If the receiver is of the all-wave type, however, and especially if it is a superhet, it is certainly advisable to use a modern condenser.

Bar-construction Type

WHEN the stations to be received have a wavelength below 40 metres it is very necessary for the tuning condenser to have a low minimum capacity, and very good contact must be effected between the moving vanes and the external terminal or lead to which these vanes are connected—a bad contact will produce background noises which can be intolerable on the short wavelengths. The bar-construction type, as incorporated in the Vitesse all-waver, is the most commonly used at present. This type has the advantage of having a very low minimum capacity and if of reliable make the movement is noise-free. Constructors of the Vitesse should therefore adhere to specification if good results are to be obtained on the short-wave band.

Record Three Trimming

THE disadvantages of a high-minimum capacity on the short-wave bands have been dealt with before in these notes, and it has been pointed out that the value of the minimum capacity in the tuning circuit has an increasing effect as the frequency of the received signal is increased. A minimum of .00005 mfd. is not very noticeable at 2,000 metres, but at 20 metres its effect on tuning will be tremendously greater. In the Record Three the gang condenser has three sections, but only the back section is in use on the short-wave bands, and a trimmer is not therefore required on this section. The necessary trimming on the medium and long-wave bands can be effected by means of the trimmers attached to the first and second sections, and in order to keep the minimum capacity on the short-wave bands as low as possible the trimmer screw of the back section may be removed.

not been satisfied with choosing different heater current ratings—there are .18 amp., .2 amp., .25 amp., and .3 amp. types—but they must also differ with regard to the position of the external grid connection. American valves, on the other hand, are more standardised and consequently more readily interchangeable. It is true that in the majority of cases four British valves will do the work of six American valves, but when the price of the British types is much higher than that of the American types, little is gained by this high efficiency. The decision of Marconi and Osrams to manufacture 6.3-volt valves with octal bases is therefore likely to provide a great fillip to the overseas sales of British sets, and it is also certain to help in stabilising the home market. By standardising valve types valve prices will drop and so will the price of sets. This should have a snow-ball effect on sales; people will not worry so much about the valve replacement problem when they contemplate buying new sets, and as more valves will be required per set, this will also tend to increase valve sales.

Car-radio Development

I BELIEVE I have told my readers before that I am in favour of car-radio, and that I have made a point of testing several of the outfits on the market. Normally, I am perfectly content to listen to three or four stations at most, and prefer not to have to indulge in “knob-twiddling,” whilst driving. Despite the fact that many of the remote tuning controls fitted to present-day sets can be mounted on the steering column where the scale is easily visible, this is not good enough. When driving there are too many road signs to watch to be able to look down at a tuning dial.

It is for this reason that I have for some time been trying to persuade manufacturers to fit an automatic press-button tuning control, so that a few alternative programmes could be obtained as easily as operating the horn. I am afraid that I have been crying in a wilderness as far as British manufacturers are concerned, but I am now glad to see that at least one American firm has introduced an outfit with five push-buttons for pre-set tuning. These are mounted on a strip panel attached to the steering column. When stations are wanted which are not pre-tuned, the driver can operate a tuning dial in the normal manner.

Now, you British manufacturers, what about it?

A PAGE OF PRACTICAL HINTS

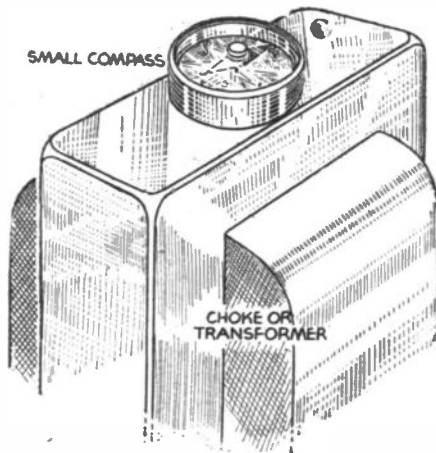
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Novel Fault-finding Dodge

BY placing a small vest-pocket compass on the top of the output filter choke deflection of the pointer will indicate that

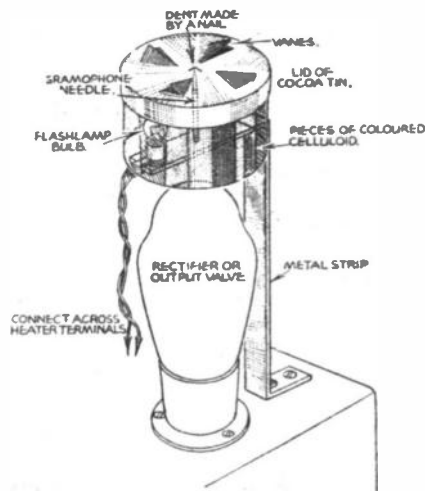


Using a small pocket-compass for simple fault-finding.

the valve is getting its current. When testing, this dodge is equally applicable to other anode leads if they are choke or transformer fed. Even H.F. chokes will show some deflection. This dodge greatly facilitates fault finding.—R. SHAW (Darlington).

Automatic Colour Changing for a Tuning Dial

HERE is a simple device which might be of some interest to wireless owners who like to amuse the children. I fitted one to my own set last Christmas, and it proved so popular that I have left it connected up permanently. It is very easy to make, and



A novel colour-changing device for a tuning dial.

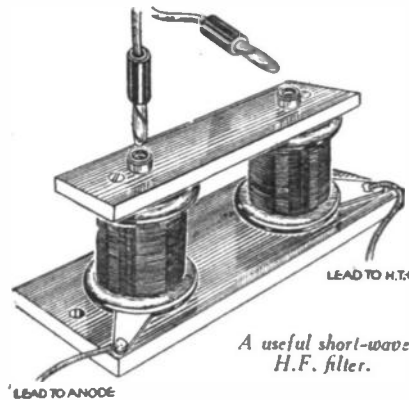
THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your wrinkles.

can be fitted to practically any mains set with the popular semi-transparent dial. Details of construction are clearly shown in the drawing. The hot air from a valve (rec. or output) causes the tin lid to rotate, and so causes the tuning dial to change colour continuously all the time the set is on.—J. EDGINGTON (Birmingham).

A Short-wave H.F. Filter

THE H.F. filter illustrated will be found extremely useful for overcoming head-capacity effects in short-wave receivers. It consists of an ebonite base measuring 1½ in. by 3 in. Two silk reels about ¾ in. in diameter, each wound in the same direction with one layer of fairly fine wire, form the two coils. These coils are mounted on to the

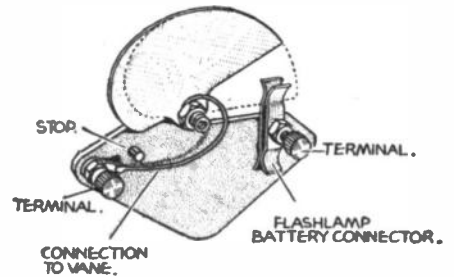


A useful short-wave H.F. filter.

ebonite base with their centres 1½ in. apart, soldering tags being provided, as shown, to which a wire from each coil is attached. Another piece of ebonite measuring ¾ in. by 2½ in. is screwed to the top of the coils, two holes being drilled to coincide with those in the coil centres, and plug sockets fitted to the ebonite with their bases inside the coils. It only remains to fit corresponding plugs to the 'phone leads which are plugged into the sockets, the filter being connected by the soldering tabs to the existing 'phone terminals of the receiver. Alternatively, soldering tags may be fitted to both ends of each coil and the unit connected in the 'phone leads of the set itself.—H. E. LELAND (Cambridge).

An Improved "On-off" Switch

THE advantage of this simple switch is the absence of crackle. Dismantle an old reaction condenser, retaining one moving plate, and securely lock it to the spindle, with the spring washer next to the bush. An old connection for joining flash lamp batteries together is fixed in place, as shown in the sketch. The completed switch gives a clean knife action, and is a



An improvised "on-off" switch made from an old reaction condenser.

one-hole fixing component. Another advantage of this simple switch is that all knobs on the set can be made to match. The rest of the moving plates can be kept for future replacements.—A. JARMAN (Ware, Herts).

Sharp Tuning with Iron-Cored Coils

RECEIVERS using good iron-cored coils are often so sharp in tuning that the sacrifice of the top register is too great, and some listeners would doubtless be willing to sacrifice a little selectivity in favour of better top note resistance. This is particularly noticeable when a detector is used, as this form of rectification has negligible damping. The response curve can be easily levelled out by connecting a suitable resistance across one or more coils. Where two tuned circuits are involved, the value between .1 and .25 megohms is suggested, or should there be a third tuned circuit, the value may have to be somewhat lower. The correct value can, of course, only be found by trial, as it is controlled by the degree of top note loss, and the degree of top note loss that can be tolerated.—R. H. WILSON (Pinner).

Milliammeter Switch Contacts

WHEN making up a multi-range milliammeter, it is very important to arrange the circuit so that there are no switch contacts in series with any of the low-value shunts. A shunt of 1 ohm, or even less, is quite common, and when it is realised that a resistance of a quarter of an ohm is not uncommon in quite a well-designed switch, it will be obvious how a serious error can be introduced.—A. WATERS (Croydon).

LATHE WORK for AMATEURS

1/-, by post 1/2, from
 GEORGE NEWNES, LTD., Tower House,
 Southampton Street Strand, London, W.C.2

MODERN DIALS Y

ONE of the most noticeable improvements in modern commercial receivers is the design of the tuning dial, and some of the latest dials are of particular interest in that they simplify the necessary operation of tuning the various stations. Unfortunately, the majority of these dials are not available to the home-constructor, and he is thus debarred from taking advantage of the ideas incorporated; but there are several simple devices which may easily be constructed with the minimum of tools to enable similar ideas to be incorporated in existing receivers, and the following details will no doubt be found of assistance. It should be emphasised that no attempt is being made to describe the construction of any existing dial, but it is inevitable that certain principles will be described which

carries a plain sheet of ivorine or white celluloid bearing a number of rectangular cut-outs. Behind this a second ivorine sheet moves with the condenser spindle, and upon it station names are marked. The simplest way of making a neat job of this is to cut out the names from a newspaper list of broadcast stations, and the main hints for making this type of dial are as follow. The openings must be staggered to avoid two names becoming visible at one moment. The names are fixed in position as the receiver is tuned, and to avoid getting two names together, pencil notes should first be made, as it will not be possible to affix the names in regular order from left to right. The method of moving the rear strip will be as shown later.

Alphabetical Dials

The most logical type of dial, and one which is now in use on one well-known commercial receiver, is the alphabetical dial. This has been in use for some time on certain Continental sets and has the advantage that a complete list of stations is printed in alphabetical order, and an indicator is moved to be brought in line with the desired station. There are many different ways of carrying out this idea, and the following three are

the simplest and most direct for the constructor. They are shown in Figs 2, 3 and 4. In Fig. 2 a large dial is used and the small section on the left carries an alphabetical list of the main stations (preferably compiled after the receiver has been carefully tuned for a few nights in order to locate just what stations are received at worth-

Details of a Few Novelties in Tuning
Constructed with the Minimum of Tools
Incorporated in Practically Any Set

while strength). A short line runs to the edge of this panel, which may be thin ivorine or white Bristol board. Travelling along behind this is another panel with a row of fine pencil lines marked to correspond with the lines by each station name. The receiver is then tuned slowly to each

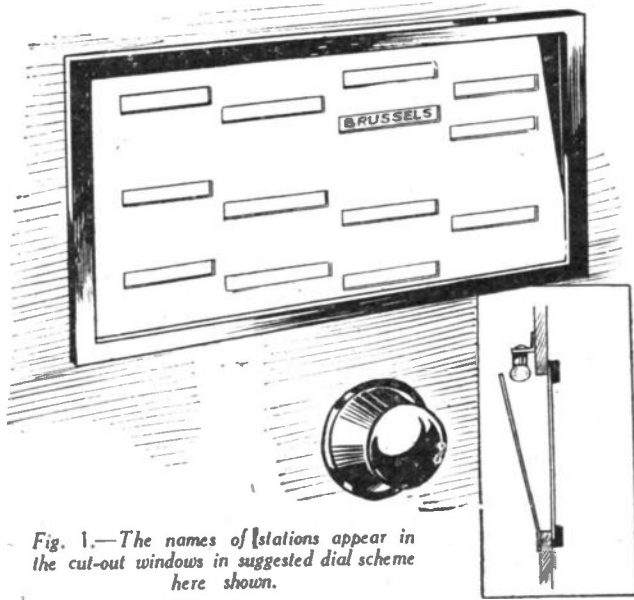


Fig. 1.—The names of stations appear in the cut-out windows in suggested dial scheme here shown.

may bear a similarity to commercial products, and perhaps, therefore, manufacturers will accept the usual disclaimer.

Station Names

The majority of dials fitted to earlier commercial receivers were of the large full-vision type, and carried the names of dozens of stations. The user is confused, until he is familiar with the dial, and takes some little time to locate a desired station before the pointer can be turned to the required setting. Such a difficulty may be overcome by using a dial in which the names of the stations appear in a window, although a criticism of this idea may be that all names but one are hidden, and the user does not know which way to turn. There is sufficient novelty in the idea, however, to warrant the construction of a dial of the type illustrated in Fig. 1, where a large rectangular escutcheon



Fig. 2.—Another interesting suggestion for a dial in which a list of stations is arranged alphabetically.

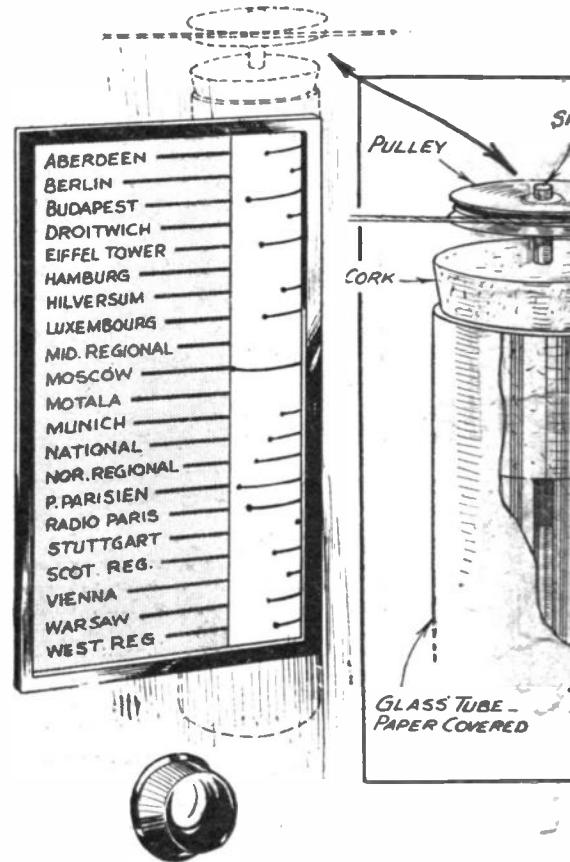


Fig. 3.—A rotating cylinder carries the indications in this alphabetical dial.

station, and when the exact point is reached a dot is made for indication. This may be done by attaching a thin wire behind the panel which will cast a shadow down the centre of the panel; by fixing a wire in front for easier visibility; or by marking close to the edge of the name panel. For this arrangement, as the indicating panel travels behind the name panel, the latter will have to be flood-lit from the front to avoid confusion due to the lines and dots travelling behind. When the final positions are decided the pencil lines should be inked in a series of thin broken lines and a large dot, preferably in another coloured ink, to denote the final position as above mentioned.

Rotating Cylinder

In Fig. 3 the indicating chart takes the form of a cylinder, which is rotated and carries the indicating lines. A few tests

YOU CAN MAKE

Tuning Dial Design which may be free of Trouble and which May Be Made by Set - - - By W. J. DELANEY

will have to be made in pencil. Again, various methods of indicating the final setting may be used, one of the schemes just mentioned being found most desirable. The indicating section may be constructed from a length of large diameter test tube. This may be cut off at the sealed end to the required length, and two corks pushed into the ends will enable a short length of rod to be inserted for pivots. A dial lamp of the ordinary type may be suspended inside the tube by passing the connecting wires through the corks, and on one pivot a pulley should be

from becoming dirty and to add to the general appearance.

Another idea is depicted in Fig. 4, where the names are spread over the entire panel or dial, and a round or square hole punched by the side of each. This dial should also be flood-lit, as for Fig. 2, the easiest way of doing this being to slope the dial away from the escutcheon and to fit a dial light above it. A piece of glass in front will keep out dust and add to the appearance. Travelling behind this dial is a second sheet of material, preferably opaque. As a station is tuned in, a mark is made through the opening corresponding to the station. This mark is afterwards punched out, and a coloured dial light is fitted behind. Thus, when a station is located a coloured light will glow at the side of the name, but again these will have to be staggered in order to avoid two openings being illuminated at one time,

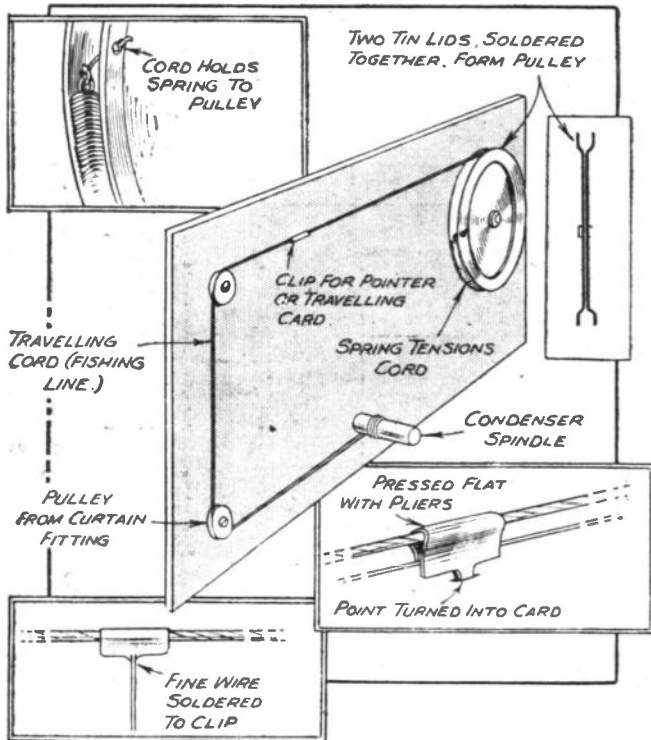
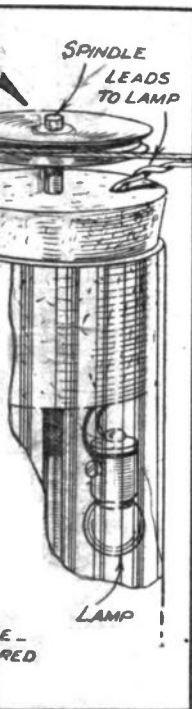


Fig. 5.—Details of a suitable driving mechanism for the dials described in this article.

soldered so that it may be rotated. The driving cord should be twisted once or twice round the pulley and the end should then be taken round a further pulley and a small weight attached. This will have to be adjusted so that it does not turn the indicating dial of its own accord but is sufficiently heavy to keep the cord taut when the dial is turned so that the cord is "unwound." A further suggestion to avoid using the weight is to employ an endless cord, attached at both ends to the large driving pulley. The paper carrying the dial settings may be stuck over the tube, or, if some indicating mark is first made so that it may be inserted in a previously decided position, it may be placed in the tube to prevent it

Driving Mechanisms

All of the devices described are quite simple in action, but some little difficulty may be experienced in putting them into practical effect. The method of moving a large panel or dial bodily such as is called for in Figs. 1, 2, and 4 may be carried out by means of cords and pulleys. The pulleys will have to be fitted to a metal framework or screwed to the back

of the cabinet or panel. For this purpose the small pulleys sold at the local stores as runners for use with the spring curtain rods will be found ideal. The dial may be attached to the cord by small pieces of tin or thin brass, bent round the cord and pressed with pliers so that it grips. Any adhesive may be used to hold the card to the clip, or points may be cut on it and driven in by pressing with the pliers. The cord should be twisted two or three times round the condenser spindle, and to obtain the necessary high gear a large

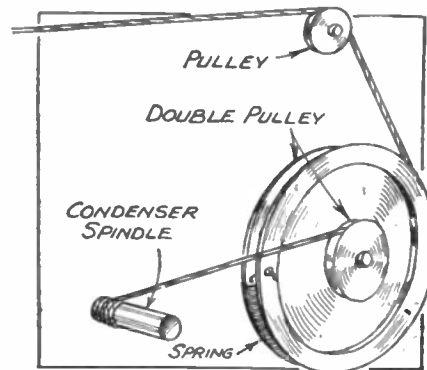


Fig. 6.—A suitable geared drive may be constructed as shown in this illustration.

pulley made by dismantling an old slow-motion drive or by sandwiching two "press-in" tin lids may be used. One end of the operating cord should be fixed permanently to one end of a short spring, the other end of which is attached to the drive. This will take up slack and give a positive drive. A similar idea may be used to cause a pointer to traverse a dial, a thin wire being soldered to metal clips clamped on the cord as above described.

Driving Cords

The most suitable material for the cord is good fishing line, a hank of which may be obtained from a shop dealing in fishing tackle, dressed silk line proving to have the longest wear. Salmon or jack line may be obtained of suitable thickness. Details such as differential lighting, which have already been discussed in previous articles may, of course, also be included in the dials mentioned and will add to the novelty, although they will also add to the difficulty of construction due to the complications of switching or changing the medium through which the lights show. The latter arrangement saves one bulb and simplifies wiring, but introduces the need for some very careful measurements and constructional work.

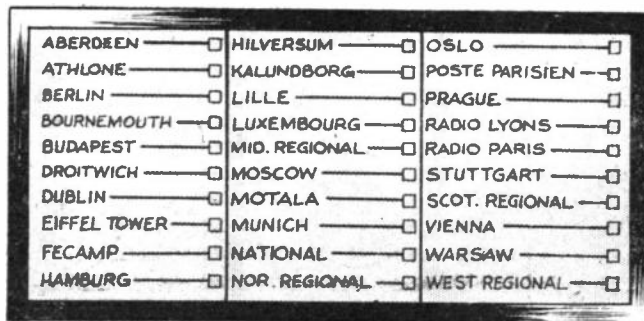
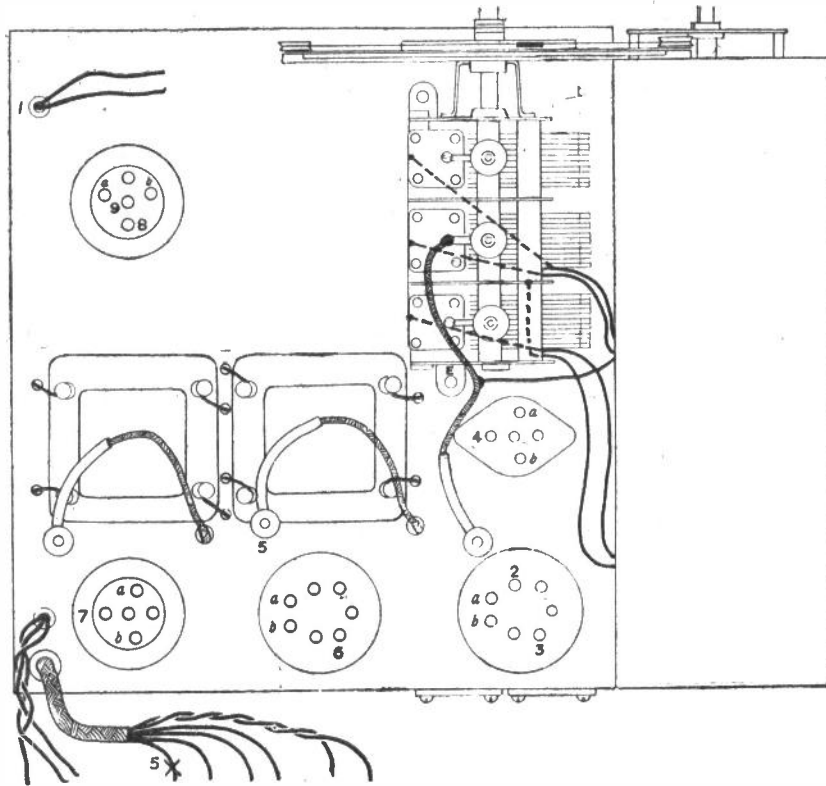
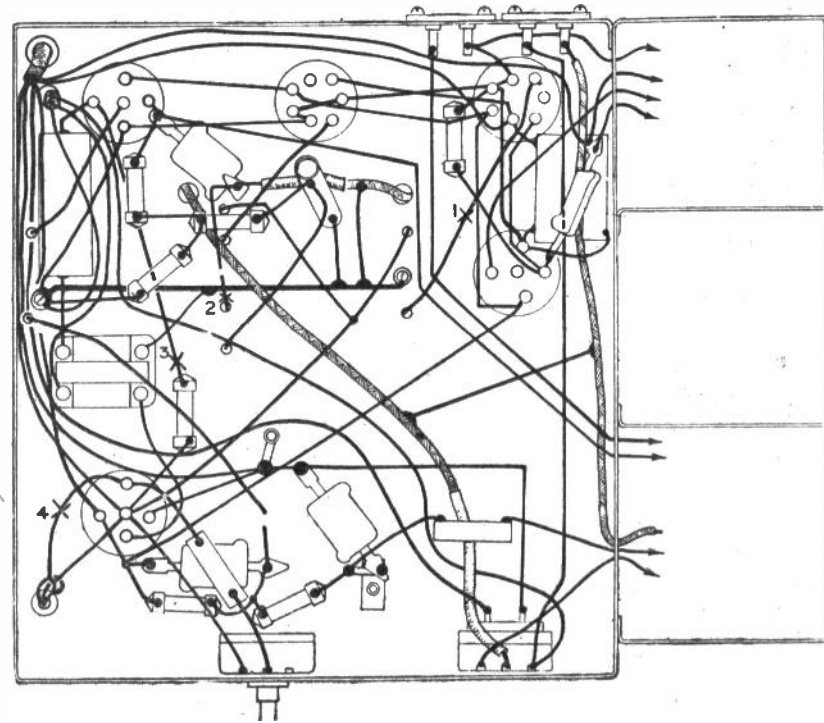


Fig. 4.—Small windows are punched by each name in this dial, and are illuminated by a coloured lamp at the back.



Top of Chassis View



Underside of Chassis

Approximate Voltage Readings

Voltmeter	— to E.
„	+ to 2 = 48 to 60 volts.
„	+ to 3 = 120 volts.
„	+ to 4 = 72 to 84 volts.
„	+ to 5 = 120 volts.
„	+ to 6 = 60 volts.

Voltmeter	+ to 7 = 75 volts.
„	+ to 8 = 118 volts.
„	+ to 9 = 120 volts.

Approximate Current Readings

Milliammeter	Connected at x1 = 1½ mA.
„	„ x2 = 2½ mA.
„	„ x3 = 1½ mA.

Milliammeter	Connected at x4 = 4½ mA.
„	„ x5 = 15 mA.

Approximate Resistance Readings

I.F. Transformers	
Ohmmeter	Connected across 1 and 2 = 3½ ohms.
„	„ „ 5 and 8 = 3½ ohms.



SHORT WAVE SECTION

THE SIMPLEST SHORT-WAVE TWO

The Receiver Described is a Modification of the "Simplest Short-Waver," a Single-valve Set Previously Described in these pages, and which has Proved Extremely Popular and Efficient in the Hands of Readers. — — By FRANK PRESTON

IN the issue of PRACTICAL AND AMATEUR WIRELESS dated September 14th, 1935, I gave constructional details for a single-valve short-wave set, which was called the "Simplest Short-Waver." This unit could be used as either a complete receiver or as an adapter or converter in connection with an existing set. The little unit was made by a large number of readers, and right from the date of publication letters have regularly been received by the Editor from readers who have been very enthusiastic concerning the results which it has given.

Unfortunately, the issue in which the article appeared was completely "sold out," and many who wished to obtain the back number were unable to do so. It was for that reason that the Editor reprinted the descriptive article in the issue dated December 12th, 1936. This brought forth a further outburst of good reception reports from those who had built it.

More Volume

Despite the undoubted popularity of the single-valve set, I believe that there are probably many enthusiastic short-wave constructors who would like to build a similar type of set, but of a rather more ambitious nature. That is why the modified circuit and pictorial illustration are given in this article. Those who remember the original set will see at once that the basic design remains unaltered, and that the same home-made coil and H.F. choke are employed. But there is now a second valve, this being a pentode used as low-frequency amplifier. Additionally, the construction is this time shown as being carried out on a wooden or metallised chassis instead of on a simple baseboard. This layout makes for a more modern appearance as well as tending towards rather better efficiency; nevertheless, there is no objection to using a baseboard as before, provided that the components in the detector circuit are grouped in a manner similar to that of the original set.

Standard Components

As in the original design, there are no special components to be bought, and the receiver can be built by those constructors who have not previously done any short-wave work and who, therefore, have no S.W. components at hand. It is, of course, necessary to use a special coil and choke, but these items are home-made, and need cost no more than a few coppers. A .0005-mfd. tuning condenser is used, in conjunction with any really good slow-motion drive, and there is a .0005-mfd. (maximum) pre-set condenser in series with this. The

reaction condenser has a capacity of .0003-mfd., and should be of the air-dielectric type and can, to advantage, be fitted with a reduction drive or slow-motion scale.

The object in using two condensers in series for tuning is that the capacity of the tuning condenser on short-waves should be about one-third of that used in a broadcast receiver; this is to render tuning reasonably easy, and to ensure maximum efficiency over the tuning range. By varying the adjustment of the pre-set condenser it is possible to alter the maximum tuning capacity from less than .0001 mfd. to approximately .00025 mfd., and thus a value can be found which best suits the slow-motion condenser drive which is employed. The highest capacity is obtained when the pre-set is adjusted to its maximum capacity, whilst a total tuning capacity of about .00016 mfd. (and this is generally most convenient) is given when the pre-set

is adjusted approximately to its midway position. Should the condenser drive employed have an extremely high reduction ratio the capacity of the pre-set can be increased, but where the ratio is low, tuning is considerably simplified by turning the condenser towards its minimum capacity.

Another advantage of the pre-set condenser is that it makes possible a variation of wavelength range over certain limits. Thus, when the pre-set is at about one-half maximum capacity, a tuning range of, roughly, 20 to 40 metres is provided. A slight adjustment of the pre-set will enable the range to be taken down to about 17 metres, or up to the 49-metre band.

The L.F. Stage

The low-frequency amplifier consists of a resistance-capacity-coupled pentode. It

(Continued overleaf)

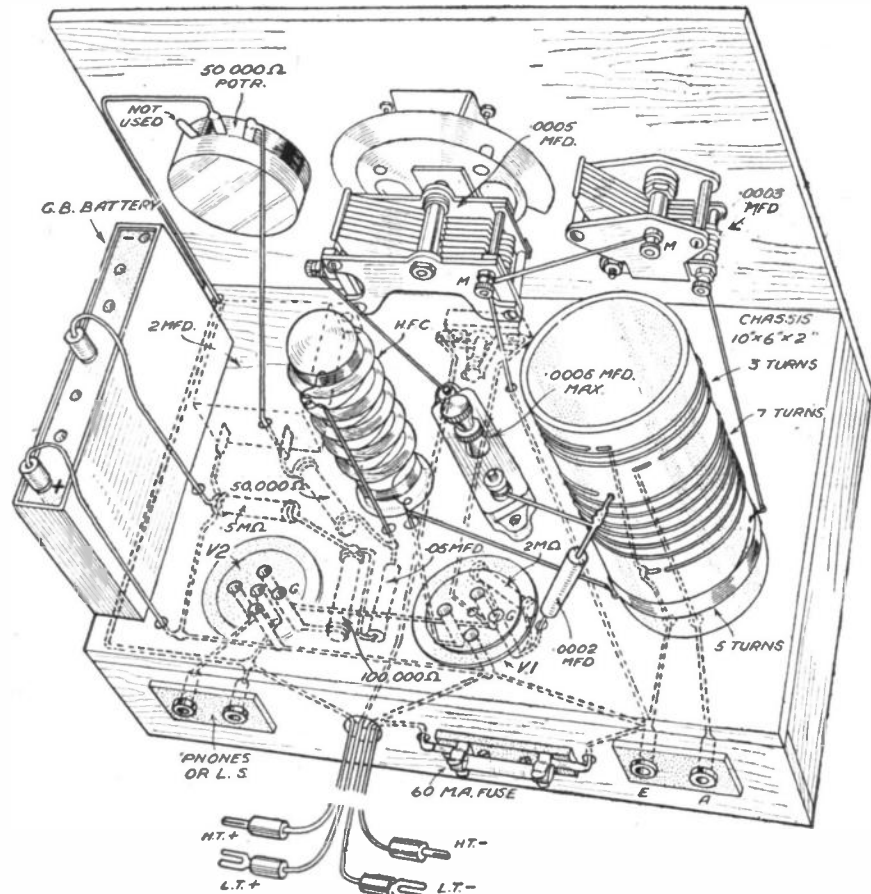


Fig. 1.—Pictorial view of the "Simplest Short-wave Two" showing the wiring connections.

SHORT-WAVE SECTION

(Continued from previous page)

might be argued that R.C. coupling does not give any step-up, and, therefore, that it is inefficient by comparison with transformer coupling. This is partly true, but R.C. coupling is less expensive and is generally completely free from instability troubles which are sometimes present when using an L.F. transformer. In any case, the amplification provided by the pentode itself is sufficient to ensure loudspeaker signals from many transmissions, and to give amply loud phone signals from any station in the world—provided that a fairly good aerial is employed.

A 100,000-ohm "stopper" resistance is included in the grid circuit of the pentode, and this is sufficient to prevent H.F. from "escaping" into the L.F. circuit. Apart from this, the low-frequency amplifier is perfectly standard, and is the same as is used on broadcast wavelengths. This resistance, as well as the other fixed resistances used, should be of the non-inductive (not wire-wound) pattern, and any good make can be used. The resistances can all be of the half-watt type if desired, but there is, of course, no harm in using components of higher wattage rating.

Principal Parts Required

None of the components, other than the coil and choke, is critical, but they should all be of good quality. The valve-holders can be standard Clix components, but it is worth while to use the pattern with low-loss ceramic base: it should be observed that one is of the four-pin, and the other of the five-pin type, but two five-pin holders can be employed if preferred by leaving the centre socket of V.1 disconnected.

A rather unusual arrangement is the use of a 50,000-ohm variable resistance or potentiometer for decoupling the anode circuit of the detector. This provides an excellent method of feeding the optimum H.T. voltage to the valve, and of pre-setting the most suitable conditions for smooth reaction. It is also useful when a very fine reaction setting is required when receiving a "difficult" station. The resistance can be set initially by adjusting the reaction condenser to its midway position and then turning the knob of the variable resistance until the detector just commences to oscillate, with the tuning condenser turned to its midway position.

Making the Coil

The variable resistance should, for preference, be of the carbon-track pattern, since a wire-wound component is likely to be rather "noisy" when used in this part of the circuit. It is worth mentioning, however, that the variable component can actually be replaced by a fixed resistance of similar value if the constructor is prepared to forgo the additional refinement which it confers.

Constructional details of the coil and H.F.

choke have been given in the previous articles to which reference has been made above, but they will be repeated briefly. The coil consists of three windings on a 2in. diameter shellacked cardboard or paxolin tube; the aerial winding consists of three turns of 26-gauge enamelled or d.c.c. wire slightly spaced; the grid coil has seven turns of 20-gauge d.c.c. or enamelled wire spaced by the diameter of the wire; and the reaction coil has five turns of 26-gauge wire (the same as used for the aerial winding) placed side by side. The disposition of the windings is shown in Fig. 1, where it can also be seen that they are all wound in the same direction. After winding, it is a good plan to apply a couple of thin coats of shellac varnish to the coil, since this prevents the windings from slipping.

from any chemist, and can later be mounted on the chassis by pushing it on to a cork, attached by means of a wood-screw. The turns are arranged in five "pikes," as shown in Fig. 1, these being placed about 1in. apart to reduce the self-capacity. The ends of the winding are secured by binding a strip of insulating tape round the tube, and it is best to solder short lengths of flex to the thinner wire for making connection to the other components. As with the coil, two coats of thin shellac varnish should be given to the choke after winding, to hold the wire in position.

Tuning

All other constructional details will be evident from the pictorial view of the

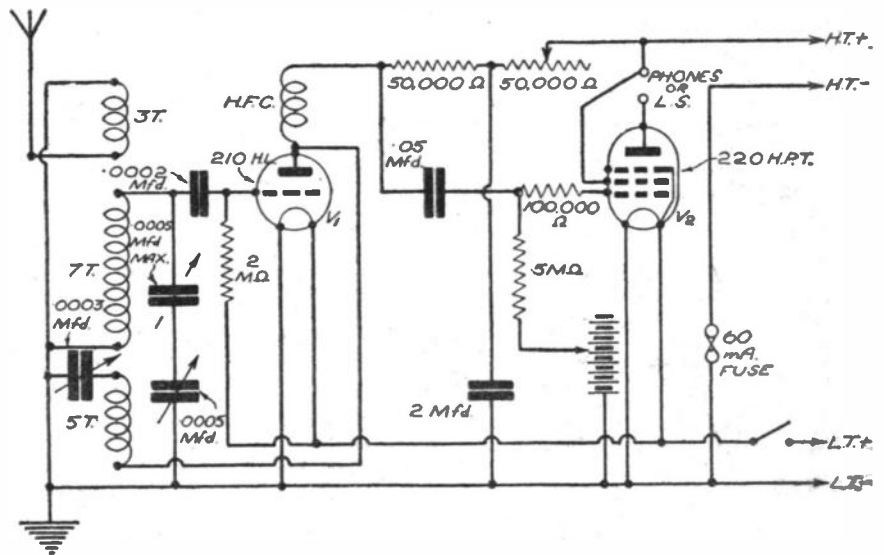


Fig. 2.—Theoretical circuit diagram of the "Simplest Short-Wave Two."

It can also be seen from Fig. 1 that the ends of the windings are anchored by passing them through pairs of holes in the former.

Note carefully the connections to the three windings, since if these are reversed reaction will not be obtained. The coil can be attached to the chassis (or baseboard) by means of small angle brackets or by making it a push fit over a disc of wood, or a large cork, screwed to the chassis.

H.F. Choke Details

The choke consists of a total of 150 turns of 36-gauge enamelled wire wound on a glass test tube 1in. in diameter. A length of ordinary glass or paxolin tubing could be used as an alternative. The test tube can be bought for about a penny

receiver given in Fig. 1. With regard to the operation of the set, this is the same as with any other Det. L.F. short-waver. When the detector has been brought to the verge of oscillation—indicated by a "breathing" sound in the 'phones—the tuning condenser should be operated slowly. If necessary, the reaction condenser should be adjusted meanwhile, in order to keep the detector just at the oscillation point. When a carrier-wave whistle is heard, reaction should be eased off, and the tuning condenser finally adjusted. It is best to use an H.T. voltage of 120, when the Cossor 220 H.P.T. will require 4.5 volts grid bias; if the H.T. voltage is reduced to 100 it will be possible to cut down the G.B. to 3 volts. A wide range of H.T. voltages can be applied to the Cossor 210 H.L. detector by means of the variable decoupling resistance.

SEVERAL manufacturers have drawn attention to radio gramophone motors becoming noisy due to lack of oiling. It would appear that though the instructions issued with radio gramophones lay great stress on the necessity for periodically oiling motors, little attention is given by actual users. It is apparently nothing unusual for listeners to use a radiogramophone for three or four years without so much as using a single drop of oil. However well made the gramophone motor may be, it cannot possibly stand this treatment. It is only necessary to remove the "D"

CARE OF RADIOGRAM MOTORS

shaped spring in the centre of the turntable, and to insert a small quantity of suitable oil in the two or three oiler holes or cups that will be revealed. Some types of motors also have a grease cup, which should be screwed down periodically. This cup should be removed and refilled with grease about every two years. Similarly, there is a great tendency to use the same gramophone needle over and over again, because a radiogram gives good reproduction with

a needle that would sound hideous on a mechanical gramophone. This is false economy, as the wear inflicted on gramophone records with one needle is at least as bad with a pick-up as with a sound-box.

The majority of radio gramophones have automatic stops, and failure of this to function in 99 cases out of 100 is due to a gramophone needle having rolled under the turntable and become lodged in the mechanism. Should the automatic stop fail to work, the turntable may be removed, when the offending needle can be readily discovered.

IDEAS for AMATEUR TRANSMITTERS

(Concluded from page 30, March 27th issue).

HERE are some further points worth mentioning in connection with transmitting coils generally:—

(1) 12 or 14 SWG bare copper wire can usually be obtained at ironmongers' by the pound weight. No. 12 runs about 30ft. to the pound.

(2) Form your turns to leave enough room for crocodile clips, i.e., so that turns will not be shorted. This means spacing about $\frac{1}{2}$ in. or so.

(3) Celluloid for making the strips, which should be $\frac{1}{2}$ in. wide, can often be obtained from a garage; old side-curtains are quite good enough.

(4) A substitute for the amyl acetate-celluloid paste is "Durofix," obtainable at ironmongers'. A 6d. tube will do one average-size coil.

(5) It is always best to make up coils having an even number of turns. Then, the centre-tap connection comes underneath, midway between the mounting ends.

(7) Don't leave off the grease proofed paper mentioned—you can get enough to last a life-time for 3d.—because it prevents the celluloid paste sticking to the cord, and keeps the paste where it is wanted. Some paste will stick to the paper, but it is easier to get the paper off than strands of string.

(8) Don't expect your first effort to make one of these coils to be a huge success. There is knack in the whole job, but after a little practice coils can be run up in half-an-hour or so.

Mounting Low-power Inductances

Coils for the crystal oscillator or buffer frequency-doubler stages can be close-wound on a 2in. diameter former, using No. 18 enamelled. If plug-in formers are not available, it is sometimes a problem how to mount such coils. One good way is to make use of banana-plugs and sockets. The latter are fixed the required

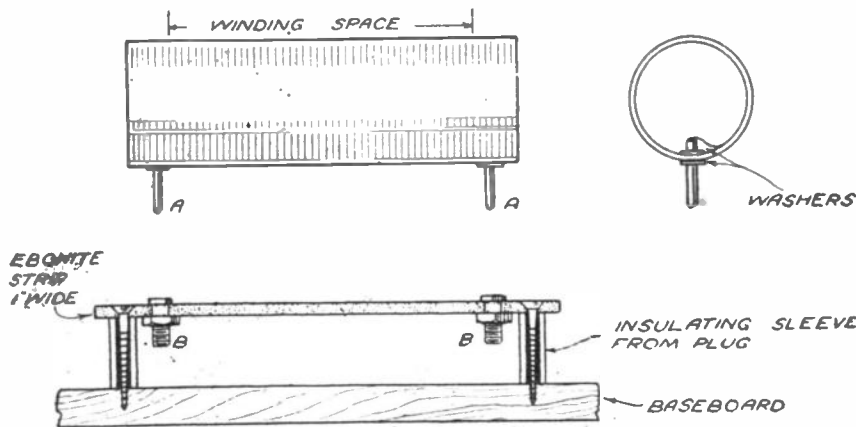


Fig. 2. Showing a convenient method of mounting low-power coils. A-A are plugs with the insulating sleeving removed. B-B are corresponding sockets. The sleeves from the plugs are used as spacers for holding the mounting strip away from the baseboard.

(6) Coils of No. 12 wire should be used; low capacity to keep the circulating current down. If the coil warms up, losses ensue. To explain this: A 14-turn copper-tube coil in the P.A. stage with 300 mfd. in parallel for 80 m., will warm up with 10-15 watts input, due to the high circulating current. Using a 30-turn coil of No. 12 of the type described, with about 50 mfd. in parallel for the same band, the coil will remain quite cold with 100 watts input, as the circulating current will be very low. The driven P.A. stage should always have a low capacity tank circuit.

distance apart on an ebonite strip, and the plugs have the insulating portion removed. Then drill holes at the ends of the coil former so that the stripped plugs are a tight fit. Slip 3/16in. brass washers over the plugs on each side, soldering them in position. The ends of the coil are then soldered to the plugs which, while they are tight electrically, have sufficient play to centre with the sockets.

Fig. 2 shows the idea, also how to use the discarded insulating sleeves of the plugs to act as spacers supporting the mounting strip.

ITEMS OF INTEREST

Neon Tuning Indicators

THE use of a neon tuning indicator for the correct tuning of a receiver is now generally understood. Some readers may have overlooked the advantage of this device when reganging, as it will act equally well as an indicator for the correct setting of tuning condensers as it does for the main tuning control.

Variety from Hanley

A VARIETY bill is to be broadcast from the Theatre Royal, Hanley, in the Midland Regional programme, on April 1st, when the chief turn will be given by Jan Ralfini and his Band.

Quarterly Talk

MR. G. L. MARSHALL, Northern Ireland Regional Director, is to give his quarterly talk on April 1, in which he will review plans for broadcasting during the coming quarter, April-June.

PETO-SCOTT AMAZING VALUE!

£1 DOWN ALL-WAVE 8 Valve 9 Stage A.C. SUPERHET CHASSIS

4 WAVE BANDS: 12.9-35, 35-81, 200-550, 900-2,000 Metres.

- Automatic Volume Control on 2 stages.
- Inter-station noise suppression.
- 2-4 watt push-pull output valves.
- All valves employed on short waves.

12 MONTHS' GUARANTEE **£9:17:6**

Carr. Paid

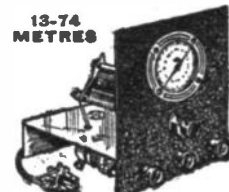


Size: 8 3/4" high; 14 1/2" wide; 1 1/2" deep.

With 8 BRITISH VALVES.

Highest quality reproduction. Bandpass input to Hexode Triode valve operating as Detector and Oscillator. Bandpass-coupled to Variable- μ H.P. Pentode as I.F. Amplifier. I.F. stage bandpass-coupled to Double-Diode as second Detector and the a.v.c. voltage. H.P. Pentode L.F. Amplifier coupled to triode feeding the two 4-watt push-pull output valves. Radio and gram. sides completely isolated by low capacity switching. Separate volume and tone controls. Tuning scale station and wavelength calibrated. Complete with 8 British valves and all knobs, leads, cables and plugs. For A.C. Mains only, 200/250 volts, 40-W cycles. Cash or C.O.D. Carriage Paid, £9/17/6 or £1 down and 11 monthly payments of 17/6. Special High Fidelity Auditorium Loudspeaker for above chassis £25:0 extra or add 5/- to above deposit and 4/3 to each monthly payment.

PETO-SCOTT 1937 SHORT WAVE ADAPTOR - CONVERTER KIT



Convert your existing Battery or A.C. set for operation on the short waves with this up-to-the-minute unit. No alterations to your set whatsoever. Two hours to build—a lifetime of world-wide entertainment.

- No coil changing
- Drilled steel chassis
- Drilled steel panel

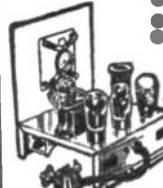
KIT "A" Cash or C.O.D. carriage paid, 29/6 or 2 6 down and 10 monthly payments of 3/-.

2/6 DOWN

Peto-Scott BANDSPREAD SHORT-WAVE SUPER 3 COVERING 12-94 METRES

KIT "A" £2:5:0

- Maximum volume and efficiency. Detector and 2 L.F. Circuit.
- Slow-Motion Reaction Condenser.
- Dual Ratio Slow-Motion Dial.
- Matched and Tested Components.



A simple-to-build and highly efficient short-wave 3 that will give you hours of thrilling entertainment on the short-wave band. Simple but efficient circuit comprising Det. and 2 L.F. valves, ready drilled and enamelled chassis. Bandspread tuning simplifies station finding.

KIT "A" Complete kit of parts including 3 coils, 12-94 metres, and building instructions and wiring diagram, less valves, speaker and cabinet. Cash or C.O.D. £2:5:0, or 2 6 down and 11 monthly payments of 4/3.

2/6 DOWN

All postal orders must be crossed and currency registered. **PETO-SCOTT Co. Ltd.,** Established 1919 77 (Pr.W.28), CITY ROAD, LONDON, E.C.1. Glassford 9875-8-7. 62 (Pr.W.28), HIGH HOLBORN, LONDON, W.C.1. Holborn 3248

A New 40-Page Booklet—Free



This booklet, which is yours for the asking, gives particulars of the many opportunities open to trained men engaged in the Radio industry. It also gives full information about the specialized instruction offered by the I.C.S.

The industry is progressing with amazing rapidity. Only by knowing the basic principles can pace be kept with it. I.C.S. Instruction includes American broadcasting as well as British wireless practice, and provides ambitious men with a thoroughly sound training.

- Here are the I.C.S. Courses :
 - Complete Radio Engineering
 - Complete Radio
 - Radio Servicemen's
 - Elementary Radio
 - Radio Service and Sales
 - Television

- Preparatory Courses for :
 - I.W.T. Associateship and Associate Membership Exams.
 - City and Guilds Exams. in Radio Communication.
 - P.M.G. Certificates in Wireless Telegraphy.
 - I.E.E. Graduateship Exam.

The Complete Radio Course covers equipment and radio principles as well as practice.

Efficient Servicing is of first importance to every wireless dealer and his assistants.

In addition to inculcating the art of selling, the Service and Sales Course provides that knowledge which enables the salesman to hold his own with the most technical of customers.

Television will soon be a tremendous branch of the industry. Our Course deals adequately with this subject.

SEND FOR OUR BOOKLET TO-DAY
And, if you wish, ask for our free advice.

Our standard fees are substantially reduced during the summer months.



Dept. 94, International Buildings, Kingsway, London, W.C.2.

Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

New Bulgin Switches

TWO new switches of the toggle type have been added to the Bulgin range, but these are of specialised application. Unlike the ordinary toggle switch, there is only one "set" position. When the dolly is depressed it must be held in the alternative position in order to make the necessary change in circuit, and it immediately returns to its original position when released. One of the switches is adjusted to be "On" in the set position, whereas the other is "Off" in that position, and accordingly they may find numerous applications in experimental circuits. For instance, for meter switching, where measurements are only required from time to time, the meter may be wired with the "off" type switch connected through a series resistance, so that it is impossible to damage the meter due to an overload, as the switch will have to be depressed and held in position in order to cut out the necessary series resistance. Alternatively, the other type may be used with current meters provided with shunts for a similar safeguard. Numerous other applications will occur to the experimenter, and the switches are rated at 3 amps. 250 volts. The samples which we have tested function perfectly satisfactorily, and it appears that the spring loading is much stronger than is provided for the ordinary type of toggle. The result is that the moment the dolly is released the contact returns with a very definite movement to its original position, and there is no risk of a defective or poor contact being provided. In all other respects the switch is up to the high standard set by Bulgin apparatus. The price is 1s. 9d. each, and the type numbers are S.171 for the "Off" type and S.172 for the "On" type.

Philco Demonstration Aerial

ALTHOUGH intended primarily for service engineers and those whose work entails the demonstration of receivers in a customer's home where an aerial may not already be fitted, the Philco Company's new aerial will be found of considerably wider application. The accompanying illus-

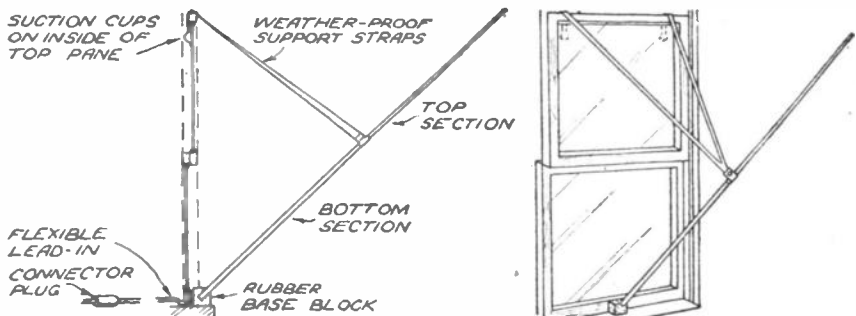
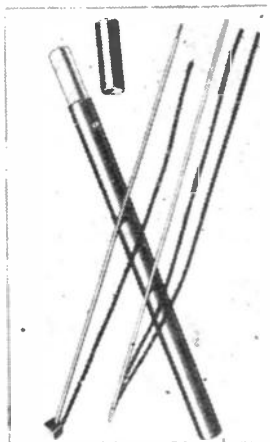
tration shows the complete apparatus, with the waterproof carrying case which is supplied with it. The aerial consists of two lengths of metallic tubing with a ferrule for connection between the two. A length of weather-proof strapping is provided with suction cups at the two ends, and these are pressed against the inner surface of the window glass, near the top of the frame, and the other ends passed outside the window. The small ebonite block attached to the end of one length of tubing is then placed on the outside of the window, and the result is that the aerial rod is left projecting outside the window as shown in the sketch. The price of this aerial is 14s. complete, and it will be found of great value for experimental work.

Russell's Hertzite

EXPERIMENTERS of the early days will remember the difficulty which was experienced in obtaining suitable crystals for use in the simple type of receiver, and a considerable degree of popularity was obtained with the form of galena known as Russell's Hertzite. This was extremely sensitive and very little difficulty was experienced in locating a good spot, although naturally the pressure on the contact wire required a little adjustment in order to make the most of the crystal. Owing to the increased interest in crystal receivers, the maker of this particular item has decided to market it again, and it is now obtainable as in the old days, complete in a box with a suitable cat-whisker, at 1s. A suitable detector mount of the glass-enclosed type may be obtained for 1s. 3d. A sketch and details of a crystal receiver are supplied with the detector. The address is L. G. Russell, "Radiomail," Tanworth-in-Arden, Birmingham.

Record Valves

IN addition to a wide range of battery and mains valves of standard characteristics, the Record Radio Company can now supply "Yale" valves for American receivers. The standard valves range in price from 3s. 3d. to 11s., and include pentodes, octodes and others.



The new Philco Demonstration Aerial, seen above with its waterproof carrying case, and in the lower illustration, the method of erecting it.

BRIEF RADIO BIOGRAPHIES—4

By RUTH MASCHWITZ

Jane Carr

JANE CARR, member of the popular White Coons, has never had any doubts about her career. At the age of two she decided to go on the stage. Her first performances were given on the landing with her dolls as audience seated on the stairs. Later her grandfather made a small stage for her at the top of the house, and Jane used to give song and dance exhibitions to her friends.

While still at school she broadcast—conversations between a monkey and a Teddy Bear—for which she was paid the princely sum of ten shillings.

Her father is a doctor, and the family was against a theatrical career. However, at seventeen, immediately she left school, she joined a repertory company. She studied the leading lady's performance in minute detail, and when she fell ill Jane was able to take her place. Later she joined the Hull repertory company, and toured with the Brandon Thomas seasons. In 1932 she came to the West End and appeared in two revues, and "Mother of Pearl." Since then she has been concentrating on films.

Two Aberdeen terriers are Jane's constant companions—in fact, during television they have been known to become entangled in the apparatus! On one occasion before a broadcast at St. George's Hall, leaping out of a taxi, they were terrified by the crowd and took refuge under a car. On the promise of an autograph spectators hastened to extricate them. The dogs became more frightened and took flight, but were eventually captured while listeners waited to hear Jane broadcast!

Nora Gruhn

NORA GRUHN, who has broadcast frequently for all types of B.B.C. programmes, is another artist who decided at an early age what her career should be. When three years old "I'm going to be an opera singer," she pronounced with great solemnity. At nine she was a composer. Each song she wrote was higher than the last, and when she sang them to her father who is a singing master, he could not fail to be impressed. He took her seriously in hand, and his training was followed by several years at the Royal College of Music, where Nora made a study of the piano.

Then she went to Germany and sang sixty roles or so in opera in a small town. The audiences, consisting of every grade of society, were intensely musical and attended the opera regularly. They often made presents to the artists which usually consisted of flowers and fruit. On one occasion Nora was presented with a huge basket which was unfortunately insecurely fastened. This resulted in a cascade of onions and carrots pouring over the stage. Next day in the market an old woman apologised for the mishap, and presented her with two bananas for consolation.

Nora went on to the Cologne Opera House, and since her return to England has sung at Covent Garden, taking part in the International Season for several years.

A charming reunion was recently effected when her old nurse, after listening to the radio, rang up Nora to ask if she really were the child she had looked after at the age of three.

The British Long-Distance Listeners' Club

More Abbreviations

MEMBER R. A. Loveland, of Haywards Heath, has sent us a few more commonly used abbreviations to add to the list which we recently published in this column. He also refers to the RST scale which we have already discussed, but the main terms worth mentioning are as follows:—

QSB—Fading (i.e., Your sigs. are R8, QSB to R4).

QSY—Can you (or shall I) change frequency?

BCL—Broadcast Listener.

DX—Distance.

FB—Fine Business.

HI—Laughter.

Rx—Receiver.

SKED—Schedule.

Wx—Weather.

There are, of course, many other terms, especially in the "Q" Code, and for those who wish to obtain a complete list we suggest that they obtain a copy of the G.P.O. Handbook for Wireless Telegraph Operators from His Majesty's Stationery Office, price 9d.

From Portuguese E. Africa

MR. D. E. WHYTE, who is a member resident in Beira, sends us an interesting letter in which he concludes by stating that he would be happy to hear from other members who want a live correspondent to exchange ideas, etc. His full address is P.O. Box 441, Beira, Portuguese East Africa, and perhaps those members who desire to do so, will communicate with him direct.

Verifications

REGARDING the recent controversy over QSL cards, another member, Mr. Hamilton, of Tadworth, says that during 1936 he sent out some 150 reports with postage, and received 110 cards, "which goes to show that a good report does more good than junk." He suggests that those readers who have not been fortunate enough to secure verification cards should try again, giving a much more detailed report.

With the Colt

THE Colt All-Wave Three which was described some time ago seems to have given extremely favourable results in the hands of Member F. E. Goffe, of Henley-on-Thames. He says: "My list is not in any particular order. But as I got the cricket results and play from VK3LR. I think that is pretty good. I also received W2XAF, W2XAD, W2XE, W8XAL, W3XAL, W9XF, CTIAA, EAQ, OLR, TPAL, TFJ, VKSLR, JVN, VK3LR.

Amateurs: ON4ZA in contact with VE1AW, HK1Z, E18, F3JD, HA8N, SUIKG FUIMK, VU2CQ, G5TZ, G6PW, G6QB, PAWN, VK3PL, V12AK, GU2CQ, G5NI, G18N, G2HC, E18L, G6AG, W3FIH, W1BLO, W2IFY, W3MD, W12RW, W21KY, W2SAV.

The Best Book on the Subject NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK.

2nd Edition

By F. J. CAMM

Price 3/6 or 4/- by post from the Publishing Dept., George Nones Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

BARGAINS!

S.G.3 CHASSIS with 3 BRITISH VALVES

LIST PRICE £4:4:0

BARGAIN

CASH OR
C.O.D.

42/-

Carr. Paid



Complete with 3 Valves.

- LATEST SCREENED-GRID CIRCUIT, comprising
- Screened-Grid, H.F., Detector and Pentode Output Valves.
- Screened wave-wound coils.
- 2-Gang Air Dielectric Condenser.
- Metal Chassis.
- Only 9 m.a. H.T. consumption.
- Illuminated and Wavelength Calibrated Dial.
- Wave range 200-2,100 metres.
- Complete with Valves, black escutcheon and all knobs.

This wonderful chassis will bring you a wide choice of English and foreign programmes with amazing purity of tone and remarkable volume. Available at this astonishing bargain price only from N.T.S. Secure yours while they last. 2/6 down secures; balance in 12 monthly payments of 4/-.

Also available with 3 Cosmor Valves at 46/-, or 3/- down and 12 monthly payments of 4/3.

2/6
DOWN

HALCYON AUTODYNE SHORT WAVE CONVERTER

Instantly attached to your present A.C. Mains set and makes it an efficient All-Wave Receiver.

LIST PRICE £3:3:0

BARGAIN

29/6



With Mullard 354V Valve.

Stand your set on this amazing unit and hear the whole world through your present (a.m.) receiver. Only from N.T.S. is this famous converter obtainable at this astounding bargain price. Secure yours now!

- FOR A.C. MAINS SETS ONLY
- 14-60 metres.
- No alterations to your set.
- Simply attach, and your set is an all-waver, a special switch enabling short-wave or broadcast reception to be enjoyed at will.
- Tuning and Sensitivity controls.
- Dial calibrated degrees.
- Walnut finished cabinet. Complete with plug-in adaptor and instructions.
- For A.C. mains sets only. 2/6 down secures; balance in 10 monthly payments of 3/-.

2/6
DOWN

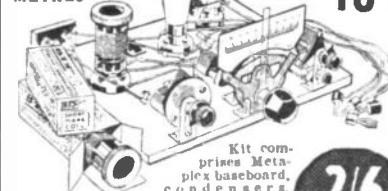
BARGAIN 1-valve S.W. KIT

LIST PRICE 35/-

12-94 METRES

Cash or C.O.D.

19/6



Kit comprises Metalplex baseboard, condensers, switch, valve and

coil holders, H.F. choke, terminals, slow-motion drive, 3 coils, wire, and FULL WIRING DIAGRAM. Less valve. Cash or C.O.D. Carriage Paid, 19/6, or 2/6 down and 8 monthly payments of 2/6. If headphones and valve required with Kit, deposit 2/6 and 11 monthly payments of 3/4.

2/6
DOWN

SEND FOR BARGAIN CATALOGUE. Postal Orders must be crossed and currency registered.

New Times Sales Co.

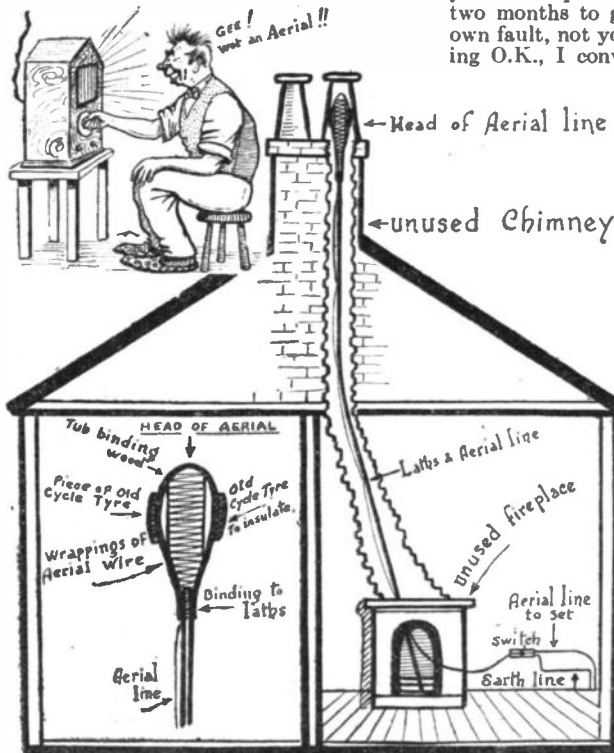
56 (Pr.W.13), Ludgate Hill, London, E.C.4. EST. 1924

LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

A Novel Indoor Aerial

SIR,—The following idea may prove useful to City dwellers and others who can only use an indoor aerial, and wish to get the best reception. I have tried out the idea and find it is as good, if not better, than most outdoor aerials. The idea is to pass an aerial line right up an unused bedroom or attic chimney, as shown in the sketch.



A general view of Mr. G. E. Hopton's novel indoor aerial.

Obtain 3 7ft. laths (2d. each), 1 piece of wooden hooping off an old tub, 2 pieces (6in. long) cut from an old cycle tyre, a suitable length of aerial wire, some stout binding cord, and a 2-way switch.

Bend the wooden hoop round until it forms an oval, bind the ends of this on to the first lath, then work the aerial wire inside of this "criss-cross" fashion (see sketch). Bind the pieces of old tyre to each side of oval to insulate it from the brickwork of chimney, letting the lead from aerial run down the side of the lath to which it is bound by a little binding cord at 2-ft. intervals.

As it is gently passed up the chimney (care being taken not to disturb any soot), bind on the other two laths, connect your lead to the switch, which gives the aerial line to set, and earth lead (in case of lightning).

Before I tried this idea, I had an ordinary

indoor aerial—now my set seems to have doubled its pulling power.—G. E. HORTON (Manchester).

Simple One-valver

SIR,—It is exactly twelve months since I became interested in wireless and, of course, your valuable paper. In the third book I received, you showed a diagram of your "Simple One-Valver." It took me two months to get a signal out of it—my own fault, not yours. Having got it working O.K., I converted it into an adapter, and used it in conjunction with an eight-year-old "Straight 3," and enjoyed L.S. reception from the local stations. As time went on, I put in good short-wave components and improved it. I am enclosing my log of stations received from August 19th, 1936, all, of course, "phone" transmissions.

Also in two of last year's issues were letters with reference to "How old is a valve?" Well, the valves used in the receiver up to one month ago were Mullard, one of them eight years old and two ten years old, and they are still used and working as well as ever in the "Straight 3," but when I constructed an 0-v-1, I got new valves.

Now, last of all, I desire to get in touch with any S.W.L. in Bolton, either by letter or come round and see me.—HAROLD WILLETS, 1, Moorfield Grove, Tonge Moor, Bolton, Lanes.

[The log is too extensive to publish, but includes quite a number of W stations, and over 200 G stations.—ED.]

On Two Valves

SIR,—I feel that I must drop you a few lines in appreciation of your paper. Since I started taking this paper, I must say my interest in radio has increased a hundredfold. So thanks very much for your most interesting articles and, for special mention, those on amateur transmitting.

Having seen many S.W. logs published in PRACTICAL AND AMATEUR WIRELESS, and not seeing one from this district I thought maybe mine would be of interest.

14 mc. fone: F3FA, F3PK, VE1AW, VE1JA, LAIG, HB9BY, HB9A, I1TMT, IISR, SUICH, SUIKG, VP9G, PY2EJ,

VO11, OZ1NW, HI5X, SM7WR, SM5SV and 59 W. stations. These stations were heard during the last fortnight.

The receiver is an 0-v-1 with 20ft. indoor aerial. Reports are sent by printed card, and I do not use reply coupons.—KEN. N. SMITH (Ossett).

A Good Ten-metre Log

SIR,—As I have not seen any ten-metre reports from this district in PRACTICAL AND AMATEUR WIRELESS, I am sending mine.

My receiver is a S.G.-v-2, and goes down to 7 metres. For ultra-short waves, I use a 12-ft. vertical aerial, while on short waves, a 33ft. inverted "L" gives best results. Here is my 10 metre log.

- WIC CZ, WIHQ N, WIH HU, WI MA,
- WI ET D, WICK F, WIZ D, WIJ ZA,
- WI DE Y, WI BQQ, WI COO, WI W V,
- WI IY T, WI ADM, WI DNL, WI GD Y,
- WI AM M, WI EJO, WI EGF, WI GJK,
- WI JQR, WI DKJ, WI FGV, WI HW X,
- WI HGU, WI ADI, WI CU Z, WI JKC,
- WI FWK, WI CYK, WI AUC, WI EMM,
- WI GIZ, WI FPL, WI PC, WI AIB,
- WI CWG, WI AKX, WI FVO, WI GPM,
- WI FKK, WI EDQ, WI BYY, WI BMR,
- WI FT, WI ANN, WI NN, WI GRZ,
- WI DUK, WI DDP, WI FSA, WI EBS,
- WI OBN, WI CHB, WI KTW, WI LWA,
- WI FYC, WI MWL, WI BDO, WI ORA,
- WI BOF, WI BHT, WI EKD, YL2CZ,
- YL2CJ, YL2BG, YL2ZZ.

I find that most of the W fones on 10 metres QSL, whether return postage is enclosed or not, and I have QSL's from a good number of the above.

Among other stations I have received are W2XDV (8.43 metres), which comes over about R6-7 every day; W1XAO and W2XEM, two police stations; and W9XAZ. I have QSL's from W1XAO—which is usually about R8—and W2XDV.

Alexandra Palace comes in about R7 on the loudspeaker.

A reader asks about W4BYY; in August last year I sent him a report for 14 mc. reception, and he sent a QSL by return: I did not enclose return postage, but as he has now raised his power to 450 watts, he is probably getting more reports than he can cope with.—J. G. COCKRILL (Westcliff-on-Sea).

CUT THIS OUT EACH WEEK.

Do you know

- THAT an A.C. receiver designed for use on 50-cycle mains should not be used on mains of lower periodicity.
- THAT an earth lead may often be used as an aerial simply by connecting it to the aerial socket.
- THAT when the above procedure is adopted it often results in a reduction of atmospheric noises.
- THAT headphones should always be joined to a mains receiver through fixed condensers.
- THAT gas-pipes are not advisable for earth connections to any receiver.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, George Nevins, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

West London Radio Society

THE annual general meeting of the above Society was held at Headquarters recently, when several new committee members were elected, and arrangements for the summer were discussed. Meetings are held weekly at Ross and Robinson, Ltd., 16, Bond Street, Ealing, W.5, on Tuesday evenings, at 8.15 p.m. All particulars may be obtained from the Hon. Sec., D. Reid, 15, Tring Avenue, Ealing Common, W.5.

Radio-Physical and Television Society

ON March 2 a demonstration was arranged at the premises of Messrs. Kamroe Radio Co., Ltd., of an H.M.V. television receiver, at which a party of thirty members and friends attended. The demonstration was entirely successful, the members expressing the view that it was the best they had ever seen.

At the lecture given at the society's headquarters on March 5, by the President, Dr. C. G. Lemon, the subject chosen was "Experiments in Light," and mainly consisted in showing how the human eye is very easily deceived. The beginning of the lecture dealt with the construction of the eye and particular stress was laid on the fovea centralis at which the centre of vision occurs.

The main part of the lecture consisted of demonstrations showing how the eye can be artificially fatigued to different colours and thereby giving an entirely different colour version of an object; and also, by means of rotating discs, colours were produced from black and white drawings.

The society's headquarters have been redecorated and a library has been installed, which contains radio and scientific publications, for the benefit of members. Two meetings are held weekly: on Wednesday evenings at 8.15, when members can attend for general discussion, use of library, morse test, and calibration of apparatus;

and on Friday at 8 p.m. lectures are given on radio and other subjects.

Enquiries concerning the society should be addressed to the Hon. Secretary at headquarters, 72A, North End Road (off Talgarth Road), West Kensington, W.14.

Southall Radio Society

ABOUT one hundred people—the best attendance of the season—were present to hear a representative of Messrs. Lissen, Ltd., give a talk on short-wave reception, with special reference to his firm's products. The talk was illustrated with lantern slides, and a demonstration of several of Messrs. Lissen's receivers followed. Conditions for short-wave reception were reasonably good, and a number of U.S.A. stations were received at entertainment strength.

The most ambitious summer programme which the society has ever attempted is in the course of preparation, and interested readers should get in touch immediately with the Hon. Secretary, Mr. H. F. Reeve, 26, Green Drive, Southall, if they wish to take part in any of the contests arranged.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

J. S. (Hull). We thank you for your offer, but another reader had previously sent an issue and it has been sent on to the querist.

W. H. S. (Fonstanton). We have no details from the station in question, but suggest you send them a reception report.

W. H. T. (Via Rotherham). We cannot guarantee any receiver to pick up the countries named as conditions vary from time to time and in different parts of the country. We can only suggest that the superhet. is the most likely receiver for your purpose and in this connection we recommend the Vitasee. Ordinary 7/22 is quite suitable.

R. F. T. (N.10). If sufficient interest is shown in the circuit we shall publish details.

J. Z. (Malta). The series of articles for the Service Engineer which we recently published should meet all of your requirements.

R. G. (Cheltenham). We do not think you can carry out the process satisfactorily at home. We suggest you send the speaker to a firm who specialises in the work. A capacity bridge would be the only satisfactory method of carrying out the condenser tests.

C. H. (Brixham). So far as we know all of the programmes are "electrical transcripts," or gramophone recordings. Write to the company concerned for full particulars.

L. R. (Leeds). Either the output is not sufficiently smoothed, or the receiver circuits need decoupling. The latter is an important point.

E. A. J. (Potton). 500,000 ohms and .5 megohm are one and the same. Your set is apparently not ganged correctly. We suggest that you re-trim the I.F. transformers.

J. I. (Alcester). Unfortunately all of the issues are now out of print.

A. T. R. (Birkenhead). We are not familiar with the speaker and suggest that you write to Messrs. Lissen concerning it. We cannot advise concerning the transformer without further details.

A. S. H. (Southampton). Try the effect of increasing the H.T. applied to the detector valve, as this can cause the trouble mentioned.

R. P. (Walton-on-Thames). We do not carry blueprints of commercial receivers, and suggest you write direct to Messrs. Telsen.

W. W. (Croxley Green). Your query is not clear. There are many short-wave condensers and you are not restricted to any one capacity. The capacity governs the wave-range of the coil which is in use.

G. C. (N. 7). The valves should be suitable and approximately 9 volts G.B. should be used.

J. H. B. (Broadstairs). The old pattern 6-pin coil was not standardised, and we cannot give you connection details. A good local radio dealer should be able to trace out the appropriate pins for you.

H. H. (Marlborough). The battery is not of a higher resistance, but a lower resistance. You are apparently confusing voltage and resistance. However, modern valves are designed to take 150 volts and, therefore, you need not worry about the additional 30 volts. Use tapings as with an ordinary H.T. battery to obtain maximum results, and then calculate the values of resistance for each tapping by measuring the current flowing at each point.

G. M. (Weymouth). Either 4,000 or 8,000 ohms is suitable. The specified make was Erlinsons.

C. M. B. (Patcham). Apparently the set is unstable, and when the efficiency of the stage is reduced the instability ceases. We advise careful attention to layout and to the voltages used in each stage.

M. F. (Cardiff). We have not described a set of the type mentioned.

G. J. B. (Boxley Heath). We have no details of the coil and, therefore, cannot advise you. It should, however, be quite suitable for a simple crystal set, in which the efficiency is not very high. The coils mentioned were used in the Add-on-Superhet Unit.

J. S. (Sheffield 8). The only way to prevent the trouble will be to use a transformer for the speaker.

K. W. C. (Birmingham). We have no details of a set of the type mentioned.

J. P. N. (Beverley). We cannot quote a price as we are not certain that the coil unit, for instance, is still obtainable. Write to Messrs. Peto Scott. Some difficulty may be experienced on the short waves with the mains unit.

A. S. (W.12). As mentioned previously, the users of the apparatus should take steps to prevent the trouble. Obtain a form from your local Post Office in order to make the necessary complaint. There is a possibility that it will shortly be made illegal to use interfering apparatus.

S. G. (Glasgow, C.5). We cannot trace the set from your details. Can you give further particulars.

F. E. (Birmingham, 8). A switch must be used, and should be of the 3-point type. The aerial or anode is joined to the point marked "tap." I.F. means the intermediate-frequency, that is, the frequency into which the received station is converted for subsequent amplification.



"I've had no Radio trouble since they fitted EDDYSTONE Components"

EDDYSTONE HIGH GRADE SHORT WAVE COMPONENTS

For complete Reliability and Outstanding Performance

SEND FOR ILLUSTRATED LIST. Stratton & Co., Ltd., Eddystone Works, Birmingham. London Service: Webb's Radio, 14, Soho St., W.1.

Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS.		
	Date of Issue.	No. of Blueprint
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver ..	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D), 2 LF (Trans.)	—	PW10
Sixty Shilling Three (D, 2LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	—	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D, Pen)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow)	—	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	June '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.3.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.33	PW62
The Centaur Three (SG, D, Pen)	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Fury Four (2 SG, D, Pen)	—	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF, Pen, D, Push-Pull)	—	PW40
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.G.-D.C. Two (SG, Pow)	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	23.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW30
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW34
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF, Pen, D, Push-Pull)	9.2.35	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three Valve)	—	PW40
F. J. Camm's 2-valve Superhet Two-Valve	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	—	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitono" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	15.9.34	PW38A

Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Bandspeed S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
PORTABLES.		
Three-valve : Blueprint, 1s.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	16.5.36	PW65
Four-valve : Blueprint, 1s.		
Featherlight Portable Four (SG, D, LF, Cl. B)	—	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set ..	12.12.36	AW427
1934 Crystal Set ..	—	AW444
150-mile Crystal Set ..	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW397
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det. Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW388A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver ..	July '36	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Coscor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	June '33	WM327
Economy-Pentode Three (SG, D, Pen)	Oct. '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	Mar. '34	WM354
Iron-core Band-pass Three (SG, D, QP 21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	June '35	WM398
Certainty Three (SG, D, Pen)	Sept. '35	WM393
Minutube Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	Dec. '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2 SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2 HF, D, QP 21)	19.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	Aug. '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	Feb. '35	WM381
The H.K. four (SG, SG, D, Pen)	Mar. '35	WM394
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	April '36	WM401
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2 HF, D, RC, Trans)	May '33	WM320
Class B Quadrydive (2 SG, D, LF, Class B)	Dec. '33	WM344
New Class-B Five (2 SG, D, LF, Class B)	Nov. '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoclectric Two (D, Pen) A.C.	—	AW403

These blueprints are drawn full size. Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, which are additional to the cost of the blueprint. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless .. 4d. Post paid.
 Amateur Wireless .. 6d. "
 Practical Mechanics .. 7d. "
 Wireless Magazine .. 1/3 "

The index letters which precede the Blueprint Number indicates the periodical in which the description appears: thus PW refers to PRACTICAL WIRELESS, AW to Amateur Wireless, PM to Practical Mechanics, WM to Wireless Magazine.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable), to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C./D.C. Two (D, Pen)	Sept. '35	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen)	July '33	WM326
Harris Jubilee Radiogram (HF Pen, D, LF, P)	May '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	Oct. '35	WM395
The Request All-Waver	June '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	May '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode ..	Apr. '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
TWO H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-rauger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-wave (SG, D, Pen)	Jan. 19.'35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A. W. Short-Wave World-Beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	Mar. '35	WM383
Superhet : Blueprint, 1s. 6d.	—	—
Simplified Short-wave Super	Nov. '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	Aug. '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	June, '35	WM387
Listener's 5-watt A.C. Amplifier (1/6)	Sept. '35	WM392
Radio Unit (2v.) for WM392	Nov. '35	WM398
Harris Electrogram (battery amplifier) (1/-)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram	Mar. '36	WM403
New Style Short-waver Adapter (1/-)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter (1/-)	Dec. 1, '34	AW456
Superhet Converter (1/-)	Dec. 1, '34	AW457
B.L.D.L.C. Short-wave Converter (1/-)	May, '36	WM405
Wilson Tone Master (1/-)	June '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	July '36	WM408

ENGINEERING OPPORTUNITIES

This unique Handbook shows the easy way to secure A.M.I.C.E., A.M.I. Mech. E., A.M.T.E.E., A.M.I.A.E., A.M.I.W.T., A.M.I.R.E. and similar qualifications. **WE GUARANTEE "NO PASS—NO FEE."** Details are given of over 150 Diploma Courses in all branches of Civil, Mech., Elec., Motor, Aero., Radio and Television Engineering, Building, Government Employment, etc. Write for this enlightening Handbook to-day FREE and post free.

British Institute of Engineering Technology,
409, Shakespeare House, 17, 18, 19, Stratford Pl., W.1

FREE 268 PAGES

EASY TERMS

WE OFFER THE LOWEST TERMS FOR ALL RADIO SETS.

Radiograms, Loudspeakers, Valves, and all accessories. It will pay you to secure our quotation—Send list of requirements and we will quote by return. Prompt Delivery. Cash and C.O.D. All goods Carriage Paid. Established 1925 (Phone National 1977).

THE LONDON RADIO SUPPLY CO.,
11, Oat Lane, Noble St., London, E.C.2.

RECORD

The quality valve in the COMPLETE range

RECORD RADIO LTD., 2, 3, Eldon Street, E.C.

EARN EXTRA MONEY by hiring out the M.P.R. 7 Watt Amplifier to dances, socials, etc. Complete with Four Valves, Speaker, and Volume Control. Push-Pull output. Will reproduce Gramophone Recordings or Radio at full Band strength. Supplied ready for connecting to pick-up or microphone. For A.C. mains only. Price £4-5-0 net, or 10/- monthly. Send for full particulars. Phone: Romford 258.

M.P.R. Electrical Co., 222, Victoria Road, Romford, Essex.



PATENTS AND TRADEMARKS.

KINGS PATENT AGENCY (Director: B. T. King, Patent Agent). Advice, Handbook and Consultations free.—140A, Queen Victoria Street, I.C.4. Phone: City 6161.

FREE ADVICE BUREAU COUPON

This coupon is available until April 10th, 1937, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS,
3/4/37.

ADVERTISEMENT INDEX

British Institute of Engineering Technology *Inside Back Cover*

International Correspondence Schools, Ltd. *66*

Kings Patent Agency *Inside Back Cover*

London Radio Supply Co. *66*

M.P.R. Electrical Co. *Inside Back Cover*

McCarthy Radio, Ltd. *Inside Back Cover*

New Times Sales Co. *67*

Peto-Scott Co., Ltd. *65*

Premier Supply Stores *72*

Record Radio *66*

Stratton and Co., Ltd. *Inside Back Cover*

RADIO BARGAINS

AMAZING PRICES. 1 load, others follow. All wave A.C./D.C. Table models, £6/15/-, 1937 Superhets, £7/15/6, 1937 Radiograms, listed 18 gus. My price £12/10/- Sealed cartons, A.C./D.C. compact, 5 valve, 60/- Other bargains. American, English valve replacements. Components, Speakers, Stamp for list. Full stock. Amazing all-wave Fernox models. Trade supplied.—Litter, The Midland Tower, 2, Barras Lane, Coventry. Phone: 5935.

RECEIVERS, COMPONENTS AND ACCESSORIES
Surplus, Clearance or Secondhand, etc.

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

RECEIVERS.—Vidor 3-valve battery sets. Model R.C.N. 212, complete, in attractive walnut cabinet, with 3 Mullard valves, moving coil speaker, batteries, and accumulator, new, in sealed cartons: £3/17/6 (list 64 guineas).

VIDOR 3-valve Battery Portable Receivers, complete with 3 Oram valves, special Vidor long life batteries and accumulator, moving coil speaker, brand new, in sealed cartons; £3/17/6.

LUCILLE.—5-valve American Midget sets, complete with 5 valves, moving coil speaker, ready for use on any mains 100-250 volts A.C./D.C., long and medium waves; £3/15, new, in sealed cartons.

RECORD CHANGERS.—Garrard Model R.C.4, plays automatically and changes eight 10in. or 12in. records of any kind; new, in sealed cartons; £6.

GRAMOPHONE MOTORS.—Collaro electric radiogram units, for A.C. or D.C. mains, 100-250 volts, fully auto stop, complete with pick-ups, can be used on any mains, brand new, in sealed cartons, 57/-; Collaro electric radiogram units, complete with pick-up and fully auto stop, for A.C. mains only, 37/6 each; Collaro spring gramophone motors, with 10in. turntables, complete with all accessories, 11/-; all Collaro motors are brand new, in sealed cartons.

SPEAKERS.—Celestion Soundex permanent magnet, 10/-; Telsen permanent magnet, with 10-ratio transformer, to suit any receiver, 12/6; Telsen loudspeaker units, 2/6; all brand new and boxed.

COILS.—Telsen iron core, W349 (Midget size), 4/-; type W478 (twin), 9/- pair; type W477 (triple), 16/- per set; type W476 (triple superhet, selector and oscillator), 16/- per set. Telsen short-wave coils, matched set of three, 4-pin bases, 12-26, 22-47, 41-94 metres, 5/- per set; Telsen dual range H.F. transformer and aerial coils, type W154, 3/- each; all ganged coils complete on base with switch; Telsen I.F. transformer coils, 110 kc/s, 5/-; Telsen dual range coils, with aerial series condenser incorporated, type W76, 4/-; Telsen aerial condensers, with shorting switch, 2/-; all Telsen components brand new, in sealed cartons.

AMERICAN VALVES.—A full range of valves for all American receivers: 6/- each.

MISCELLANEOUS BARGAINS.—All brand new, in original sealed cartons: Telsen A.C./D.C. multimeters, test anything, radio or electrical, 8/6; Telsen 2-range voltmeters, 8/-; 3-range meters, including milliamps, 4/-; Ace (P.O.) microphones, with transformer, ready for use with any receiver, 4/6; Bell transformers, 200-250 volts input, 3, 5, or 8 volts output, 3/6; Morse signal units, incorporating buzzer, taper and flash, with international code, complete with batteries and bulb, 3/6 each; Marconi 24 and Q type valves, useful for short-wave experiments, 1/6; lightweight headphones, double-pole, 4,000 ohms each earpiece, 3/- pair.

REGENTONE Eliminators, A.C. 200-250 volts, type W54, with trickle charger, 87/6.

SOUTHERN RADIO.—Branches at 271-275, High Rd., Willenden Green, N.W.10; 46, Lisie St., London, W.C.2. All mail orders to 323, Euston Rd., London, N.W.1.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). Phone: Euston 3775.

HEADPHONES.—Guaranteed. Sterling, B.T.H., Nesper, Siemens, T.M.C., Brandea, etc., 2,000 ohms, 2/6; 4,000, 5/-. Postage 6d. Special. Ericsson, 4,000 ohms, as new, 7/6. Telefunken, adjustable, 2,000, 4,000 ohms, 7/6. Crystal Sets, Burne-Jones. Complete, guaranteed, 5/6. Ditto, double circuit, 8/-. Sensitive permanent detectors, 1/6.—Post Radio, 183, Caledonian Road, London, N.1.

MISCELLANEOUS

LEEDS' SPECIAL OFFER!

3/- EACH. ALL POPULAR TYPES AMERICAN VALVES, INCLUDING 6L6, 6K7, 6C5, 6F6, 25A6, 6J7.

LEEDS—G6, NEW CRIGGATE, LEEDS.

REPAIRS

ALL British or American sets repaired or modernised by qualified engineers. Satisfied customers throughout the World are your guarantee. Send to-day for free estimate—free collection 10 miles radius of London.—Scott-Seasons and Co., Exchange Works, Dukas Avenue, Muswell Hill, London, N.10. Phone: Tudor 4010.

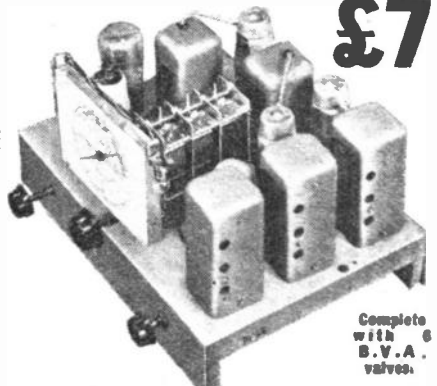
SHORT WAVES

SHORT WAVE on a crystal set. Full building instruction and crystal 1/2 post paid.—Radiomall, Fawcorth-in-Arden, Warwickshire.



NEW BATTERY ALL-WAVE SUPERHET

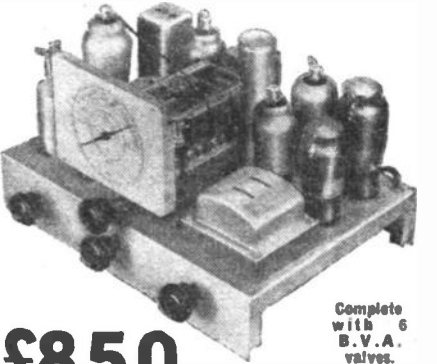
£7



The only receiver of its type now on the British market. Results on all 3 wavebands equal to mains receivers of equivalent type. Latest technical developments incorporated in circuit. Latest types valves, transformers, tuning coils, switches, etc.

Specification in brief: radio frequency amplifier, first detector with separate triode oscillator, I.F. amplifier, double diode detector, I.F. amplifier, low consumption pentode output. D.A.V.C. Volume control and tone control both operative on gramophone. Illuminated dial with station names. Wave-ranges: 16-52, 200-550, 900-2,000 metres.

ALL-MAINS ALL-WAVE SIX
with radio frequency stage



£8.5.0

"De Luxe" 6 valve receiver with 8 valve performance (especially recommended for tropics and foreign reception conditions). Built on special cadmium-plated 16 gauge steel chassis. Valves iron-cored I.F. coils. Lit-wound tuning coils. 3 wave-ranges—16.5-2,000 metres. Illuminated "Airplane" dial with principal station names. Micro-vernier 2-speed drive. Circuit comprises: Pre-selector radio frequency amplifier (operative on all wavebands), triode-tetrode frequency changer, double band-pass coupled I.F. amplifier, double diode detector, D.A.V.C. applied to 3 preceding valves, I.F. amplifier and pentode output. Variable tone control and volume control operate on radio and gramophone.

All McCarthy receivers supplied complete with valves, knobs, pilot lamps, leads, mains cable and plug. 12 months' guarantee.

Deferred terms on application or through London Radio Supply Co., 11, Oat Lane, E.C.2.

Cash with order on 7 days' approval. Also write for illustrated catalogue of complete range of all McCarthy receivers.

MCCARTHY RADIO LTD.
44a, Westbourne Grove, London, W.2
T.L. phone: Bayswater 3201/2.

A WONDERFUL OPPORTUNITY FOR YOUNG MEN

FIRST PARTS
NOW ON SALE

"AERO

TO BE COMPLETED
IN ABOUT
32
WEEKLY PARTS

ENGINEERING" 1/- WEEKLY



Very Brief Outline of "AERO ENGINEERING"

ESSENTIAL REQUIREMENTS OF MODERN AEROPLANES. PRINCIPLES OF FLIGHT. SURVEY OF MODERN AIRCRAFT PRODUCTION. WORKSHOP PROCESSES USED IN AIRCRAFT PRODUCTION—Bench Work—Marking Out—Drilling, Reaming and Tapping by Hand—Measuring and Gauging.

MACHINE TOOLS—Turning and Boring—Drilling, Milling, Grinding—Reamering—Screw Cutting—Capstan Work—Tool Setting—Planing and Shaping—Gear Cutting. SHEET AND PLATE METAL WORK—The Rolling and Drawing of Tubular Sections—Metal Spinning—Panel Beating. COMPONENT JIGS. AIR FRAME JIGS.

MATERIALS USED IN AIRCRAFT CONSTRUCTION—Steels—Alloy Steels—Aluminium, Duralumin and other Aluminium Alloys. HEAT TREATMENT. THE ANODIC PROCESS. METAL CUTTING. WELDING, SOLDERING AND BRAZING. RIVETING. INSPECTION STANDARDS AND METHODS. WOOD AND WIRE CONSTRUCTION. METAL FRAME CONSTRUCTION. LANDING GEAR. HULLS AND FLOATS. AIR FRAME ASSEMBLY. ENGINE INSTALLATION. AEROPLANE INSTRUMENTS.

FITTING THE ELECTRICAL EQUIPMENT. RIGGING. GROUND EQUIPMENT. AEROPLANE MAINTENANCE. THE INSPECTION SCHEDULE:—Main Planes—Centre Section—Petrol System—Empennage—Fuselage Controls—Under-carriage—Skid—Air Screw—Instruments—General Equipment—Lubrication—Final Check, etc., etc.

Written by men with years of experience in the Aircraft Industry. Over 1,000 specially taken "action" photographs and drawings, etc. Also many tables and data.

FREE DATA SHEET is given with every part throughout this work.

ORDER FORM

To..... Newsagent
 Please supply each week one copy of Newnes' Important New Part Work, "AERO ENGINEERING," 1/- weekly.

Name

Address

"AERO ENGINEERING" is also obtainable direct from the Publishers, GEORGE NEWNES, LTD., Tower House, Southampton Street, Strand, London, W.C.2. (1/2d each part post free).

FILL UP THIS FORM TO-DAY

And hand to your Newsagent so that you are certain to receive "Aero Engineering" each week.



George Newnes, Ltd.