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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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MARCONI PATENTS.

IN our issue of August 8th we reported on two cases which had been heard before the Comptroller-General of the Patent Office in the Patents Court. Both were actions in which a compulsory licence was sought to manufacture under certain of the Marconi patents and, in addition, a plea was made for a reduction in the present royalties and a modification of the existing system of assessment. In both cases, as we reported, the Comptroller-General stated that he would reserve judgment for a week, and expressed the hope that in the interval the parties would reach an agreement. No agreement having been reached, the decision of the Comptroller has been arrived at and recently published.

Taking first the case of the Brownie Wireless Company of Great Britain, Ltd., the Comptroller has given as his decision that a licence shall be granted on the basis of a royalty of ten per cent. on the wholesale selling price of the article, subject to a minimum charge of 5s. on the first valve-holder, and 2s. 6d. on each additional valve-holder fitted in the apparatus as sold, this rate of royalty to be substituted for the rate proposed

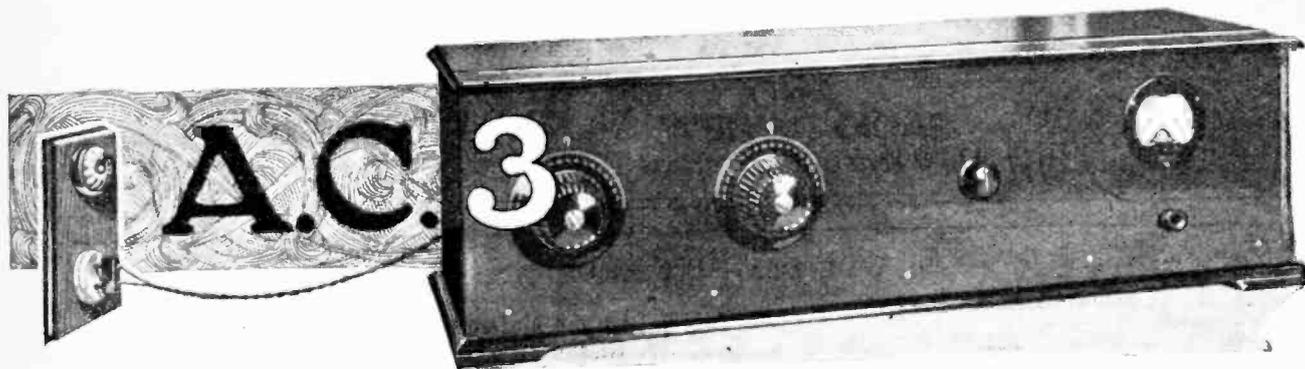
by the Marconi Company of 12s. 6d. per valve-holder. In the case of the appeal for a licence made by the Loewe Radio Co., Ltd., to employ the Loewe multiple valves, the decision of the Comptroller is that a licence shall be granted on the basis of payment of 1cs. on each triple valve, and 7s. 6d. on each double valve; in the event of any other forms of multiple valves being manufactured by the licensees the royalty should be calculated on the basis of 5s. in respect of the first unitary valve in the multiple structure, and 2s. 6d. in respect of each additional unitary valve in the multiple structure.

Recommendations of The Wireless World.

These decisions are likely to have a far-reaching effect on the future development of the radio industry, and it is interesting to observe how the view taken by the Comptroller coincides with the recommendations which have been made by *The Wireless World* in the past. Looking back we find that in our issue of July 27th, 1927, writing under the title of "The Handicap of the Cheap Valve Set," we stated that we believed that "royalties payable on any article should be a reasonable percentage of the selling price of that article, and there must be something seriously wrong with a system which calls for the payment of 25s. royalty on an article which sells for £7 17s. 6d., when the same royalty is charged on an equipment costing £30 or £40. . . . A change in the basis on which the royalties are calculated seems to us to be overdue," and again in our issue of August 10th of the same year, when commenting on the reduction that had then taken place in the price of valves, we said: "A reduction of the Marconi royalty so as to bring the charge on to a scale reasonably proportional to the selling price of the set is a matter to which we urge that the Marconi Company should give their close consideration."

There can be no doubt that a reduction in the royalty so that the selling price of modest valve sets can be substantially reduced is going to have an immediate effect in stimulating interest in valve reception in place of the crystal receiver. The gradual elimination of the crystal receiver is, in our opinion, bound to increase the popularity of broadcasting, and, moreover, it will enable the B.B.C. to modify their present policy of insistence on catering for the crystal set user.

The Marconi Company has the opportunity of appealing against the decisions of the Comptroller-General of the Patent Office, but must do so within twenty-one days from the date of the decisions. At the time of writing it is too early to learn whether an appeal will be made or not.



A Long Range Quality Receiver.

By N. P. VINCER-MINTER.

ONE of the principal arguments in favour of receivers which obtain all their power from the mains over those taking it from H.T. and L.T. accumulators, is that it is possible to make them self-contained and of extremely neat appearance, since the only external connections are to aerial and earth, loud speaker, and to the nearest wall plug or lighting socket; the usual entanglement of dangling wires leading to the batteries on the floor is no longer present; indeed, in the eyes of many people this reason for using the mains as a source of power is fully as cogent as the more obvious one of getting rid of the nuisance and general "messiness" of accumulators.

Knowing this, it is surprising how many amateurs of considerable experience go to the trouble of building a special receiver, often of considerable magnitude, which is specially intended for mains operation, but contains no apparatus for smoothing (and in the case of A.C. mains, of rectifying also) the power from the mains. In fact,

a separate mains unit, battery eliminator, or power pack, whichever one cares to call it, has still to be built. It will be a bulky unit, which will in all probability be stood upon the floor, the festoons of flexible wire to the set being as bad as in the case of batteries, with the added dangers of accidental short-circuits and shocks. The idea seems to be nothing more than a relic of the barbarism of 1922, when instead of building neat-looking sets complete in cabinet, it was fashionable to string together a heterogeneous collection of units, not, in most cases, for the purpose of serious "experimenting" (O, beloved word) but for receiving ordinary broadcasting.

Eliminator and Set should be Designed Together.

In the case of "Mains sets" there is not even the excuse of experimenting, since in these times the highly efficient transformers and chokes, etc., that are upon the market demand that the set and the mains eliminator be built to work in conjunction with one another. We can

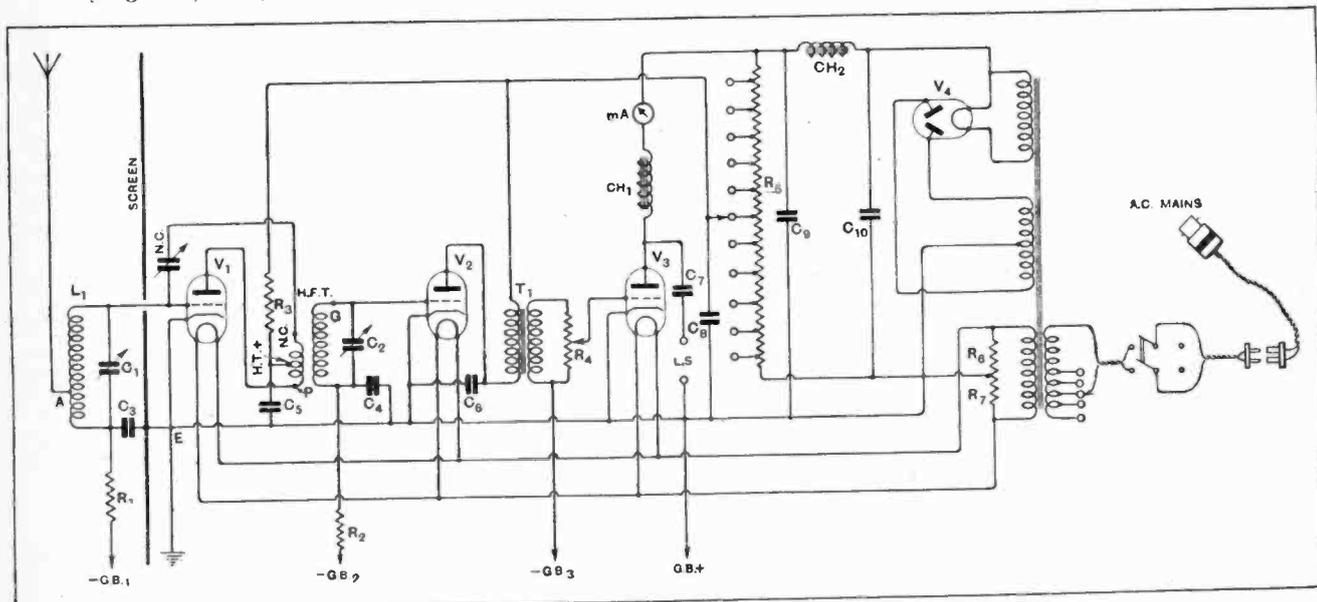


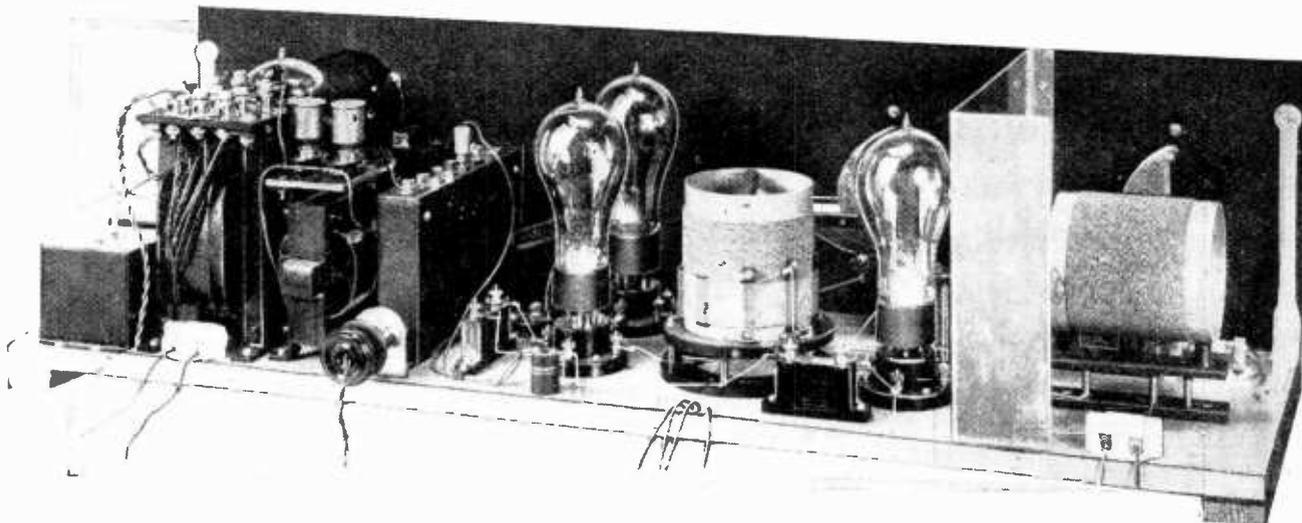
Fig. 1.—The theoretical circuit diagram. Values are as follows: C_1 and C_2 , 0.0005 mfd.; C_3 and C_4 , 0.25 mfd.; C_5 , 0.015 mfd.; C_6 , 0.003 mfd.; C_7 , C_8 , C_9 and C_{10} , 4 mfd., 500-volt test; R_1 and R_2 , 0.25 megohm; R_3 , 600 ohms; R_5 , Igranic Pot.; R_4 , Centralab Pot. 500,000 ohms; R_6 and R_7 , 50 ohms.

A.C. 3.—

no longer purchase or build a receiver and be certain that any design of eliminator will give good results when used in conjunction with it, as we could in years gone by when valves and components in general had such poor efficiency that "motor boating" was a comparatively rare occurrence. Having decided, then, that receiver and battery eliminator must be designed together, why not build them in the same cabinet? There is a certain school of thought which thinks that in this way lie such troubles as direct induction, complicated motor boating, and terrible quality. If they seriously think this, it can be certain that they have never tried it.

In actual practice no complicated screening of the set from the eliminator is necessary, nor any cabinet of such gargantuan dimensions that even a native of Brobdingnag might consider it large enough for a snuff-box. True, the cabinet must necessarily be somewhat larger in order to accommodate the power apparatus. It can be made deeper, higher, or longer. The first-mentioned is usually objectionable, as it may perhaps render the set awkward to accommodate in the average room; the second

transformer in which the H.T. and L.T. power supply were derived from different windings on the same core, in addition, of course, to the mains winding, and that for lighting the H.T. rectifying valve. The length of the panel was 21 in., the other dimensions being proportional. The receiver and the power unit both occupied about the same amount of space, and the components of both were extremely cramped. There was scarcely any space to spare, but the main thing was that the receiver worked straight away after the final wiring had been completed and valves inserted, and external connections made, and it worked extremely well, there being no hum discernible at all on the loud speaker. Headphones, of course, revealed a slight hum, as was expected. No mains-operated set has yet been designed in this country or elsewhere in which a slight residual hum cannot be heard when wearing telephones. Having no H.F. stage and possessing variable reaction, it naturally had its limitations, and a certain compromise between range and quality had to be made in connection with this design, as was explained in the article dealing with it. The quality obtainable was very good



Rear view of receiver.

involves the use of a double-decker cabinet, with all its constructional difficulties; and the third, which is by far the best, involves a greater length of panel. The advantages of the third method are that a standard cabinet may be used, and the rectifier and smoothing gear can be more easily and more efficiently disposed in relationship to the other part of the receiver.

Efficient H.F. Transformers.

In a very recent issue of this journal, the writer described a complete receiver for operation from A.C. mains.¹ The receiver was an ordinary regenerative detector followed by a stage of transformer-coupled L.F. amplification, the output valve being followed by the usual choke-filter output system. The entire combined H.T. and L.T. eliminator was built in the same cabinet. This was rendered possible partly by the use of a power

It was the demand of readers for a more ambitious design giving enhanced range, still better quality, and freedom from the trouble of reaction adjustment which led to the design of the present receiver. This instrument is 9 in. longer, the majority of the space being occupied by the apparatus associated with the receiver. Indeed, the mains apparatus occupies scarcely more space than it did in the "A.C.2." The reason for this is that a modern type of H.F. coupling is adopted which uses the type of highly efficient H.F. transformers which has been specially developed by this journal. Liberal and proper spacing of components is necessary in order that the efficiency gained in the coils be not lost, due to crowding up of the H.F. components.

The aerial is connected in the normal manner *via* a tapping on the grid coil of the first valve, which acts as an H.F. amplifier (Fig. 1). This valve is coupled to the anode bend detector by means of one of the five-pin high-efficiency H.F. transformers already mentioned

¹ *The Wireless World*, August 22nd, 1928, page 214.

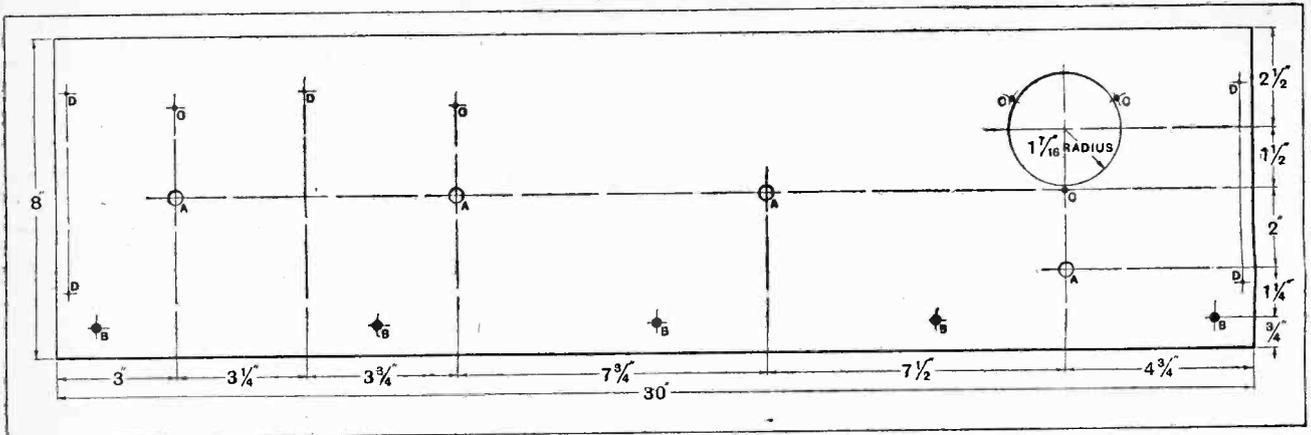


Fig. 2.—Front panel layout. Drilling details are as follows: A, $\frac{3}{8}$ in. B, $\frac{1}{8}$ in. and countersunk for No. 4 wood screws. C, $\frac{1}{2}$ in. D, blind holes drilled on the underside to take 6 B.A. screws.

It will be noticed that the coils are of the plug-in type, enabling both long and short broadcasting to be received, as well as Croydon and his satellites, who come in on the lower end of the tuning scale when using the long-wave coils.

Anode-bend Detection.

The anode bend detector is followed not by the customary R.C. unit, but by a transformer, and, moreover, by one which does not possess the highest primary inductance of any on the market, although it is an excellent instrument. It was chosen solely because its characteristics were specially suitable for use in this position in this particular set. There is no such thing as a "best" transformer on the market. Whether any given transformer by a reputable maker is the best to use depends upon the task which it is required to perform. If a plain anode bend detector were used it would probably be best to follow it by an R.C. stage. If reaction were used it would possibly be better to follow by a transformer of fairly high impedance. In this particular receiver an H.F. stage is used, and, therefore, tuning is rather sharp. This means a lessening of high-note amplification, and if we permit this to go uncorrected the reproduction from the loud speaker will not be good. We must "correct" in our L.F.

amplifier, therefore, in order to even up the high-note loss caused by the H.F. stage. Briefly, our amplifier must give slight over-emphasis to the higher notes, and the resulting musical balance will pass on faithful reproduction to the input terminals of the loud speaker. We cannot obtain this balance if we use an R.C. unit after the detector, whilst even a transformer of high inductance will not achieve our purpose unless our tuning circuits are rather flat, and, therefore, causing no great high-note loss. In this particular case tuning is sharp, although not sufficiently so to run the risk of cutting ourselves on it. The transformer used, together with a 0.0005 mfd. shunting capacity, was found to counterbalance the loss of high notes when the H.F. transformer had the same number of primary turns as the standard *Wireless World* instrument used in various receivers, such as the "Standard Four," etc. However, in order to sharpen tuning it was realised that, since the A.C./G. valve is of lower impedance than the type of valve customarily recommended for use with this type of transformer, it would be necessary to remove turns from primary and neutralising windings, and three were removed from the short-wave coil, and a proportionately greater number in the case of the long-wave.

The battery eliminator is of conventional design

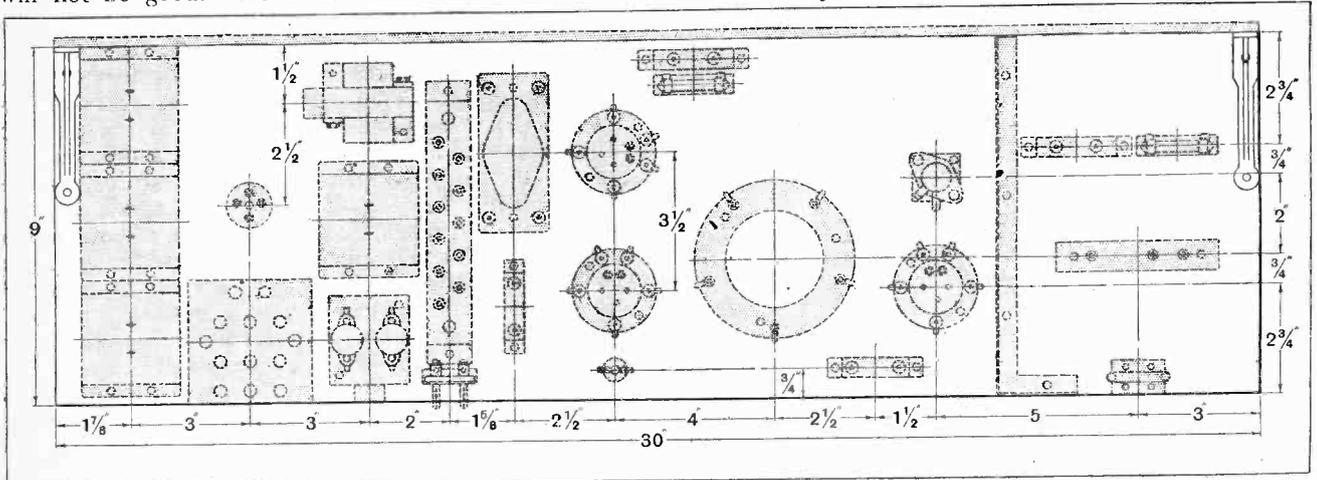
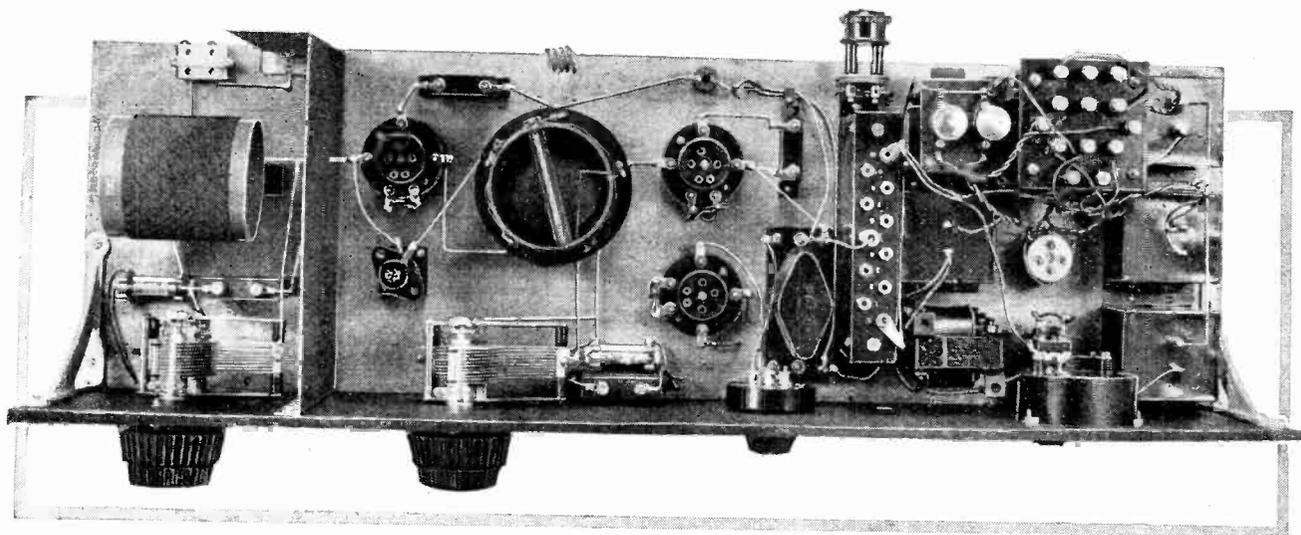


Fig. 3.—The layout of the baseboard.

A.C. 3.—

and possesses no special features except that one power transformer supplies both H.T. and L.T. Be careful to see that the test voltage of the smoothing condensers is twice that of their normal working voltage. A potential divider is used in place of the series feed scheme, because it gave a much better idea of the approximate voltage on the various valves, and as the rectifying valve is one having ample emissive properties (50 mA.), considerably more than is necessary to satisfy the requirements of the potential divider, it is greatly to our advantage to use it. In use it is perfectly satisfactory. It does not cause any undesirable effects in this set because eliminator and set were built to work in harness with each other. This does not mean to say, however, that it would not cause trouble if it were used in conjunction with another receiver. The 0.25 mfd. by-pass condensers and 0.25 megohm deflection resist-

The entire constructional work of the receiver consists of perfectly straightforward assembly work; the baseboard components should just be screwed down into position, as shown in Fig. 3. The aluminium screen consists of a piece of 18 gauge aluminium bent to the usual "L" shape. The right-angled portion at the back of the set is necessary to provide slight additional screening, owing to the high efficiency of the valves. The position of the two fixed 50-ohm. resistances, which are connected across the 4-volt winding for the cathode to form a fixed potentiometer, the actual cathode busbar being tapped at the centre of these two potential dividing resistances, is perhaps unusual. The method of mounting is, however, simple. The two chokes have "feet" at each end, so that they can be mounted either way, and so advantage is taken of this to mount a small ebonite platform which is secured through the hob in each "foot" by the usual nut and bolt. The



Plan view of receiver.

ances associated with the grid circuit of H.F. and detector valve are to prevent the passage of H.F. energy along to the grid battery under certain circumstances and to compel it to take the alternative and easier path through the condenser to cathode. The resistances are ordinary grid leaks. It is naturally permissible to use grid leaks of larger resistance if they happen to be on hand. The condensers are not of the mica-dielectric type, as they have to withstand only the grid bias voltage.

Constructional Details.

In the case of the anode circuit it was found desirable to provide a by-pass condenser and deflection resistance merely as an additional safeguard. This resistance cannot at the moment be obtained commercially. It consists merely of a small length of ebonite tube having two small grooves cut side by side around its periphery. Thirty-six turns of Eureka wire are wound into one slot, and thirty-six turns are wound in the other slot in the reverse direction, thus giving a non-inductive effect.

resistor holders are then simply mounted on the platform by nuts and bolts.

The Volume Control.

That portion of the instrument containing the wireless receiver is wired up with the customary stiff wire, but at the eliminator side of the set rubber-covered wire must be used, as space is so cramped. These wires may be run without regard to mutual interference. It is necessary to twist those wires carrying actual A.C., having carefully noted them first; this simple piece of work must be carried out diligently, or a distressing mains hum will be heard.

We are obviously unable to make use of the usual form of volume control consisting of a rheostat in series with the filament of the H.F. valve, and we must, therefore, exercise this control on the secondary of the transformer. It should be specially noted that this does not consist of the repellent method of connecting a variable resistance of 0 to 0.5 megohm range across the secondary. The result of using this is to load the secondary heavily when on diminished volume, so

LIST OF PARTS.

- 1 Ebonite panel, 30in. x 8in. x 1/4in.
- 1 Baseboard, 30in. x 9in. x 1/4in.
- 1 Cabinet, 30in. x 8in. x 2 1/2in. ("Camco").
- 1 Pair panel brackets ("Magnum," Burne Jones, 288, Borough High Street, S.E.1).
- 2 Variable condensers, 0.0005 mfd. Log plain (J.B.).
- 2 Friction control dials (Type R/137 Ormond).
- 1 Neutralising condenser (J.B.).
- 2 Fixed condensers, 0.25 mfd. (Dubilier/Mansbridge).
- 1 Fixed condenser, 0.015 mfd. (620 Dubilier).
- 1 Fixed Condenser, 0.0003 mfd. (620 Dubilier).
- 4 Fixed condensers, 4 mfd., 500 volt test (Type "B.D." Dubilier/Mansbridge).
- 1 L.F. transformer (Type "P.M." Mullard).
- 4 Coils, two short wave, two long wave (Type "Standard Four" Wearite).
- 2 Bases for above (Wearite).
- 2 Porcelain terminal blocks, 2-way (Athol).
- 1 Special insulated mains adapter ("Deckorem," type P.12, A. E. Bulgin & Co., 9/11, Curator Street, E.C.4).
- 1 Electric light adapter.
- 1 Valve (Type S.P. 42U Cosmos).
- 2 A.C. valves (Type AC/G Cosmos).

- 1 A.C. valve (Type AC/R Cosmos).
- 3 A.C. valve holders (Cosmos).
- 1 Porcelain valve holder (Athol).
- 1 600 ohm resistance former (Ebonite rod 3" dia.).
- 3 yards Eureka wire (47 S.W.G.) for above.
- 2 Grid leaks, 0.25 meg. (Dubilier).
- 2 Porcelain grid leak holders (Bulgin).
- 2 Dial indicators (Bulgin).
- 1 Meter, 0-15 m.A. (No. 2 Flush Type R.I.F.a. Ferranti).
- 1 Mains transformer (Type "A.B." Cosmos).
- 2 L. F. chokes (Type 250 Cosmos).
- 2 Resistances, 50 ohms (Burrdept).
- 2 Holders for above (Burrdept).
- 1 Grid bias battery, 16 1/2 volts (Siemens).
- 1 Push-pull switch (Type W. 171 "Utility").
- 1 Potential divider (Igranic).
- 1 Potentiometer, 500,000 ohms ("Centralab," Rothermel).
- 5 Wander plugs (Lisenin).
- 1 Aluminium screen, No. 18 gauge.
- Wires, screws, etc.
- Approximate cost of above parts, excluding cabinet, coils and valves, £14.

In the "List of Parts" included in the descriptions of THE WIRELESS WORLD receivers are detailed the components actually used by the designer, and illustrated in the photographs of the instrument. Where the designer considers it necessary that particular components should be used in preference to others, these components are mentioned in the article itself. In all other cases the constructor can use his discretion as to the choice of components, provided they are of equal quality to those listed and that he takes into consideration in the dimensions and layout of the set any variations in the size of alternative components he may use.

causing distortion. In this case a good 500,000-ohm. potentiometer is used, so that there is never less than

simply attached to the slider, and a fine control is obtained.

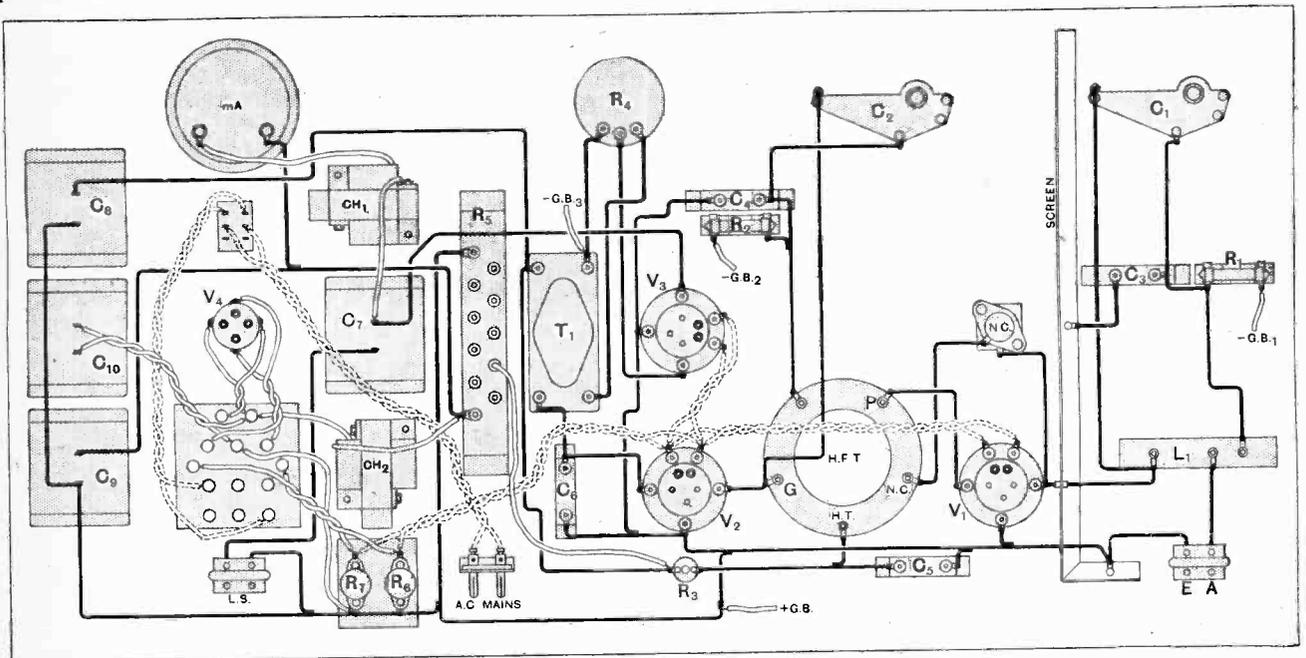


Fig. 4.—The practical wiring diagram.

500,000 ohms across the secondary. The loading-up effect is then negligible. The grid of the last valve is

The milliammeter in the plate circuit of the final valve serves as an excellent indicator of overload.

S. A. Lamplugh, Ltd., Kings Road, Tyseley, Birmingham. Art catalogue of 1928-29 receiving sets and illustrated price list of components, including moving coil loud speaker parts; also instruction broadsheet showing use of Lamplugh panel plate and baseboard units.

Siemens Bros. and Co., Ltd., Woolwich. New edition (August, 1928) of catalogue No. 641 relating to Siemens batteries.

CATALOGUES RECEIVED.

C. A. Vandervell and Co., Ltd., Acton, London, W.3. Illustrated leaflet of unspillable accumulators, types 2NS9 and 2NS13, containing jellied acid electrolyte.

E. K. Cole, Ltd., "Ekco" Works, London Road, Leigh-on-Sea. Leaflet dis-

cussing "Ekco" eliminators in relation to the I.E.E. recommendations "For the Installation of Radio Apparatus connected to Public or Private Supply Mains."

H. Clarke and Co. (M/c), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester. Leaflet No. 31, illustrating and describing "Atlas" battery eliminators for A.C. incorporating Westinghouse metal rectifiers.



A Personal Narrative. By HUGH W. GILMOUR.

ONE of the main features of the Courtney Atlantic Flight was the wireless equipment, because our only means of navigation beyond dead reckoning was the Marconi Wireless Direction Finder, by means of which we were able to obtain our position by night or day, in clear weather or fog. Captain Frank T. Courtney, the leader of the expedition, was of opinion that this method of navigation was the safest and most reliable for the purpose of Atlantic flying.

The Wireless Gear.

A short description of the wireless apparatus fitted aboard the Flying Boat G.C.A.J.I. may be of interest to readers of this story.

The type A.D.6 Aircraft Set has been developed as a result of wide world experience in the operation of aircraft wireless. The transmitter was arranged for tonic train (I.C.W.) telegraphy, thus no control valves were employed, two M.T.3 valves being used in parallel as oscillators, telegraph keying being effected by interrupting the grid-leak circuit *via* a manipulating key and an interrupter commutator on the generator shaft. The A.T.I. was arranged to give a 600-metre wave, as it was decided to use the commercial wave for all our transmissions.

The receiver which is illustrated on the next page fitted in the case above the transmitter and was a transformer-resistance-coupled five-valve circuit.

The wireless direction finder consisted of two parts: (A) the radio-goniometer unit, (B) the receiver unit.

As the direction-finder aeriels are small, the amplification must be great to drown the interference experienced aboard aircraft. For this reason a seven-valve H.F. amplifier is used, the last valve acting as a rectifier, the signals then being passed on to a five-valve super-sonic amplifier.

False Starts.

We left our moorings in the Bon Success Dock, Lisbon, which had been kindly put at our disposal by the Portuguese Aviation Maritime, on June 26th. We had left our rooms at the Avenida Palace Hotel, Lisbon, at four

o'clock in the morning, complete with thermos flasks full of coffee and with a quantity of fresh sandwiches to satisfy our hunger during the voyage. Of course, the machine was already well stocked with emergency rations.

We said good-bye to our friends and to the pressmen and photographers who were down to bid us farewell and took off down the river. During the first hour in the air we communicated with all the commercial stations on the Spanish and Portuguese coasts, but about a hundred miles from the River Tagus, our taking-off place, Mr. Fred Pierce, our mechanic, ever alert near the engines, discovered a bad water leak in our cooling system which necessitated our immediate return to Lisbon. The wireless was used at this period to inform our friends at Bon Success Dock that we were returning, and at five past eleven we landed on the waters of the River Tagus, after nearly two hours flying.

Late that evening we were all ready again, thanks to the assistance of Mr. Beeson, of the Shell Oil Co., and so we retired to rest at the British Club, feeling very tired.

At five o'clock the following morning we—that is Captain Frank Courtney, the pilot; Mr. Fred Pierce, the mechanic; Mr. Elwood B. Hosmer, a Canadian, our passenger and backer of the flight; and, lastly, myself—left the British Club and once more went aboard the plane, and at eight-fifteen we left on what proved to be our successful trip to Horta, the little town on the island of Fayal in the Azores, the first halt on our projected flight to New York.

All went well until ten past nine. We had informed the local wireless stations of our departure, and they in turn had broadcast the news to all ships, but while calling the Lisbon Station our transmitting power was seen to drop about fifty per cent., and then the aerial ammeter suddenly registered nil. This was followed by a sudden break in received signals.

It is rather a hopeless feeling to be sitting in the cockpit of a flying boat with a W/T set that has developed faults. The noise of the engines is so great that it is barely possible to hear a person shouting

Wireless on the Courtney Flight.—

while standing alongside of one, which explains why all questions are exchanged by notes when not wearing a helmet fitted with a speaking tube, and, of course, the wireless man's helmet has to be fitted with wireless telephones, and so notes are his only means of communication. Again, room is limited, and there is no table to work on, and even if there were, the vibration, though not severe, would cause things placed upon such a table to vibrate off it and be lost. Linen satchels hanging on the sides of the hull are used for holding spare parts and stationery, and the operator's knee is his table.

The main aerial drops through a fairlead in the bottom of the hull, and trails out behind the machine with a weight attached to its end. The instruments generally are all within easy reach of the operator's chair, but it was the wireless generator that was suspected for faults. The wind-driven generator is fitted outside on the hull of the machine, and a propeller fitted on its shaft is turned by wind pressure. This was seen to be turning comparatively slowly, so it was obvious that the propeller was damaged, and this was confirmed by the slight vibration felt and full power could not be obtained. The great force of the wind pressure outside of the machine made it impossible to make a closer inspection.

The aerial was next wound in on its little aerial winch and it was found necessary to fit a new bobweight to its end, to replace the one found missing. Still no signals were obtained until, on short-circuiting the aerial

were quite safe, but only working on half power. This was done *via* a ship station because, owing to wireless jamming and our low power, we were unable to raise Lisbon Radio direct at 230 miles distance.

From 10.30 until 2.30 a.m. little of note happened, we had everything working satisfactorily, breakfast of coffee and sandwiches had been enjoyed, and the weather, although a little cloudy at times, was good. Seven fully paid commercial messages were sent to Great Britain and U.S.A., and notes, greetings, and messages received from ships on the ocean below. These ships also supplied us with weather information, and by means of their positions and our direction finder we were able to get a check on our course line.

Taking Bearings.

At 2.49 p.m., when about 304 miles from San Miguel, the first of the islands of the Azores, we commenced taking bearings of the wireless station on the island, and at 4.15 found ourselves with San Miguel right abeam, and not until we had turned at right angles and covered about 130 miles, did we arrive on its northern shores. The direction finder proved our big drift to the north, and at 5.40 we were able to set ourselves on the correct course for the island of Fayal, our first halting place.

We expected to arrive in an hour and twenty minutes, and so a number of messages were sent off by wireless. In fact, about twenty-one messages were despatched on the trip from Lisbon to Horta, Fayal Island.

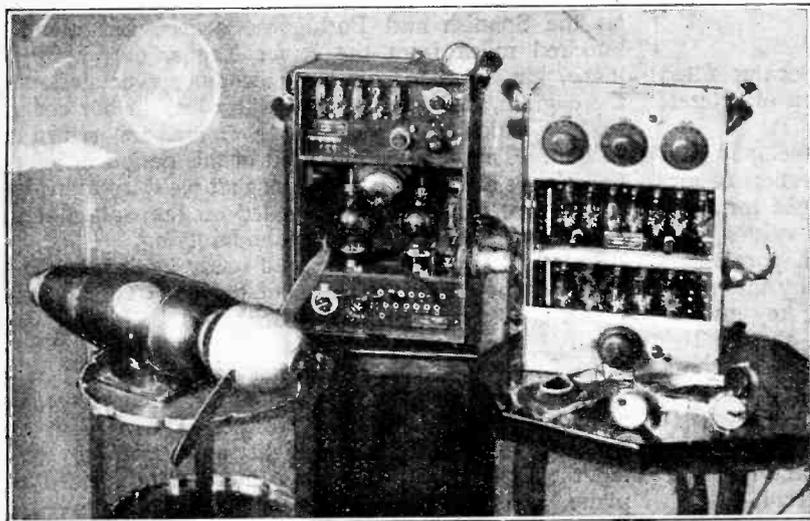
At this time we were flying over a large sea of clouds with the ocean below entirely hidden from view, and on account of a fault which developed in our altimeter were slowly climbing, so that when Pico Island, which is only seven miles distant from Fayal, was sighted, just visible as a rock in a bed of snowy clouds, we knew we were at about eight thousand feet, because the island we were looking down on is about seven thousand feet above sea level.

Arrival at Horta, Fayal Island.

About twenty miles from Pico we dived through a hole in the queer cloud formation, and after a series of bad bumps found ourselves in the channel between Pico and St. George's Island. Here, after saying good-bye to San Miguel Radio and all ships, we wound in our aerial, and, after cruising along

the coast, we landed on the water at the entrance of the harbour of Horta, which is the town of Fayal Island. Here we were given a great reception, but as this is to be an account of the wireless side of the flight, the details of our welcome must be omitted.

An examination of our wireless gear after twelve hours in the air showed all was in working order except the propeller on the wind-driven generator, which had one blade shorn off, thus accounting for our half-power working.



The wireless equipment salvaged from the flying boat and now at Mr. Gilmour's home.

ammeter, which is directly in the aerial circuit, and later adjusting the telephone plug, which had vibrated loose, good received signals were obtained and transmission on half-power found possible.

This fault-tracing and repairing occupied the best part of an hour, but watch was kept on the wireless direction-finder receiver, which has its own aerial, and Lisbon Radio was heard excitedly calling the plane and addressing all ships, seeking information about our safe passage. The first thing we did was to inform them we

Wireless on the Courtney Flight.—

With the aid of the electricians and mechanics of the local cable companies, especially through the good efforts of Mr. Cameron, of the Commercial Cable Company, who spent a great deal of his own time helping us, we made and tested a brass propeller which did not satisfy us. However, we got permission to use a propeller belonging to the wireless stores of Mr. Rohrbach, a well-known Atlantic-flying aspirant, who cabled us to make use of his spares on the island, and we succeeded in adapting it to our generator with what proved to be excellent results. Thus on July 4th everything was working even better than it had done on our previous flight.

We might have left on the morning of the 28th after just a few hours' sleep, as the boat had been refuelled, but Captain Courtney decided he required full-power working and a general all-round test of the machine, quite a sound scheme, as we were not engaged on a race across the Atlantic, but on a test flight.

The Atlantic Attempt Begins.

On Sunday, July 8th, came a suitable weather report, and so we set out for Newfoundland and New York. It was a lovely day when we left Horta, but after an hour and a half flying, with the islands of Flores and Corvo well behind us, we ran into a mist. We had exchanged notes with members of the Horta Wireless Society, who were out in a motor boat fitted with a small wireless spark set even before our departure at 4.30 a.m. The wind grew very strong and visibility became very poor, and so we proceeded to collect weather information by our wireless from ships on the Atlantic Ocean routes.

After five hours' flying, that is about five hundred miles from the scene of our departure, we had found that winds of 30-40 m.p.h. existed over three hundred miles of our route ahead, and information received from Cape Race Radio in Newfoundland, and relayed to us by a steamer, told of thick fog around the coast where we had hoped to land, so we reluctantly decided to return to Horta, and wondered where the fine weather was that the U.S.A. weather bureau had promised us. A cargo steamer seen ploughing her way across the Atlantic at this time was experiencing heavy weather, and spray could be seen breaking over her bows.

We got some excellent results from our wireless. San Miguel Radio was spoken to at over 450 miles distance, seven messages were sent, some to New York and Canada *via* an American liner, and others to Great Britain *via* Devizes Radio with the help of a French

liner, and again a message was received from Cape Race, Newfoundland, *via* a British liner.

Back in Horta.

So about 2 p.m. we were back in Horta and again commenced the long wait for good weather and taking-off water conditions. Meanwhile we overhauled the W/T apparatus, especially the generator, while the engines were also carefully adjusted, and day by day we prepared ourselves more and more for the hazardous flight across to Newfoundland.

Many attempts were made to leave, on which occasions we would rouse ourselves about 2 a.m., and troop down to the plane accompanied by many willing enthusiasts, with our thermos and sandwiches under our arms. On two occasions we were towed round to the lee side of the island, only to find the swell was too great even there.

On July 23rd Captain Paris, the leader of a French Naval Atlantic-flying expedition, arrived in Horta with a damaged front engine. He had to abandon his flight and expressed a wish to cross the Atlantic aboard our plane, but when the time came could not obtain the necessary permission from the French Government.

On August 1st yet another Atlantic flying man was due to arrive in the early afternoon. We were up in the early dawn ready to leave, but not till 4.30 on this beautiful afternoon were we able to make the attempt.

The Final Attempt.

As Captain Courtney's flying boat dashed across the water at 60 miles an hour preparatory to taking off from the water on our second attempt to reach Newfoundland, the eagerly awaiting throng of Fayalites still had caught no sight of Captain Franco, the expected Spanish airman. As we flew over Horta Harbour we called L.R.13, the wireless name of the Spanish seaplane, but no reply was received. We heard later he had had a forced landing off the Spanish coast.

Everything aboard our boat was working perfectly as we left Flores and Corvo, the last of the Azorean islands, behind us.

By nightfall we had made our departure known to San Miguel Radio and to a large number of steamers.

At midnight the clear night weather was left behind, and for two hours we were flying through a thick mist, indeed, at times it was impossible to see the navigation lights on the tips of the wings. During this period Captain Courtney showed his ability to pilot at night under the worst possible flying conditions.

The cockpit of the machine formed an eerie sight as



A happy snapshot of Mr. Fred Pierce and Mr. Hugh W. Gilmour.

Wireless on the Courtney Flight.—

the navigation instruments and engine recorders, with their phosphorous dials glowed out of the darkness, and the guiding red, white, and green lights of the gyro-compass gave the pilot the necessary indications to keep on his course.

In the rear of the cockpit the lights of the wireless receiving valves threw a dull light around which showed Mr. Hosmer, our passenger, sitting dozing on his seat, and the alert face of Mr. Pierce, our mechanic, looking out through the door of the tank room.

Wireless in Emergency.

How we caught fire in the middle of the Atlantic and succeeded in landing on the sea, extinguishing the fire, and existing on the water for nineteen hours on a far from calm sea is a story that would take too long to tell here, but readers will be interested to read how our emergency wireless equipment behaved under these conditions.

After we had landed and assured ourselves that the danger of burning, explosion, or drowning were past, we busied ourselves with the erection of the emergency wireless mast. This mast has two uses: under ordinary circumstances it is used as a boat-hook when mooring the boat, but for wireless working it is fastened by clips to the engine-room bulkhead, and stands out above the engine room to a height of about thirty-three feet above the water. The physical strain of the past twenty-four hours began to tell on us when we put up the mast, because the boat was rocking and pitching violently, but we succeeded at last, and about twenty minutes after we discovered the fire in the air we sent out our first S.O.S.

When the machine is in the air a 60-ampere hour battery is floating across the low-tension supply from the generator, but for emergency working this battery is used to drive the generator and produce the H.T. for our transmitting valves, as well as to light the receiving valve filaments. It is therefore clear that the amount of work that can be done on emergency is limited, and for this reason when we found that no ships had heard our first distress call Captain Courtney agreed that it would be better to wait until 8 a.m. It was then about three in the morning, and few, if any, cargo steamers would have a wireless man on duty, while at this time most passenger steamers would be occupied receiving wireless press news, so, as there was no immediate danger, it was better to wait until 8 a.m., when all ships would have an operator on watch.

So it was that at 8 a.m. we sent out our second S.O.S.,

which was immediately answered by the 21,000-ton White Star liner *Celtic*. We told her that the Courtney Flying Boat G.C.A.J.I. was down on the water at approximately 42 degrees North and 41 degrees West, damaged by fire, but not in immediate danger. The *Celtic* broadcast this news, and immediately we were spoken to by a number of well-known Atlantic liners, including the White Star liner *Cedric*, the Dollar liner *President Hayes*, the 22,000-ton Atlantic Transport Line vessel *Minnewaska*, who eventually picked us up and took us to New York.

About noon the *President Hayes* reported she was at our position but could not see us, we got no reply to our answers to the calls she sent out, although a British cargo vessel, the *Achatina*, who was also searching for us, could hear us.

At this time we were collecting the positions of the steamers that were searching for us and their schemes of search. We also took wireless bearings of these steamers, but these were not very exact, because our drag anchor had carried away and an emergency arrangement was not working very well, so that the boat had a frightful motion and we were all very seasick, with the exception of Mr. Hosmer, our phlegmatic passenger.

A Happy Ending.

However, with these bearings, distances estimated by strength of received signals, dead reckoning, and Captain Courtney's good pilot sense, we were able to work out a very accurate new position, which we sent out to all ships. The *Achatina* picked it up and passed it on to the *Minnewaska*.

This led to our rescue, and had it not been for the fast drift of an aeroplane, we would have been very near the position given. Captain Claret, the commander of the *Minnewaska*, was too good a seaman to leave this out of his reckoning, and so he knew just where to look for us. I may be prejudiced, but it may be excusable, to say that of the hundreds I have seen this ship is the finest one I ever sighted!

As Captain Courtney stated many times, the flight has demonstrated that a metal flying boat, equipped with a good radio and wireless direction finder, handled by an experienced wireless operator, can come down on the Atlantic and be rescued although no steamers are within a radius of a hundred miles or more.

Wireless, an invention of modern times, has once again proved its utility and rescued lives that might otherwise easily have perished unheard of on the wide spaces of the Atlantic.

Mathematics for Engineers. Part I. Including Elementary and Higher Algebra, Mensuration and Graphs, and Plane Trigonometry. Seventh Edition, revised and enlarged, by W. N. Rose, B.Sc. Pp. 524, with 261 diagrams, charts, and curves. Published by Chapman and Hall, Ltd., London, in their Directly-Useful (D.U.) Technical Series. Price 10s. 6d. net.

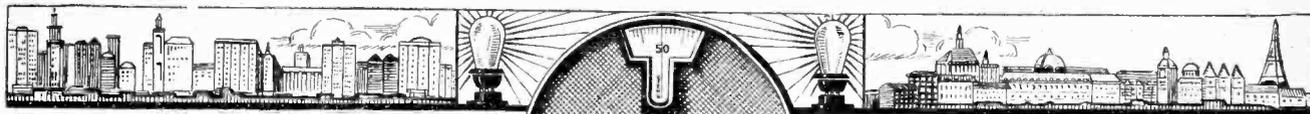
Handbuch der Experimentalphysik. Part 13. Comprising:—*Physik der*

BOOKS RECEIVED.

Glühelektroden (Physics of the Valve), by W. Schottky and H. Rothe: *Herstellung der Glühelektroden*, by H. Simon, and *Technische Elektronenröhren und ihre Verwendung*, by H. Rothe. Pp. 492, with 179 illustrations and diagrams. Published

by Akademische Verlagsgesellschaft m.b.H., Leipzig. Price M.44 in paper cover or M.46 bound.

Die Ausbreitung der Elektromagnetischen Wellen (The Propagation of Electromagnetic Waves), by Dr. Alfred Sacklowski. Pp. 129, with 46 diagrams, and reference list to 474 publications. With an introduction by Professor K. W. Wagner. Published by Weidmannsche Buchhandlung, Berlin. Price M.4.50 in paper cover or M.6 bound.



PROGRAMMES

FROM ABROAD

SATURDAY, SEPTEMBER 8th.

All Times are reduced to British Summer Time and are p.m. except where otherwise stated.

BARCELONA (Radio-Barcelona). Call FAJL (344.8 metres); 1.5 kW.—6.0. Market Prices. 6.15. Orchestral Selections: Indian March, Taj Mahal (Hansen-Lotter); Mazurka, Celosa (Solér); Waltz, Wienerblut (J. Strauss). 6.30. Baritone Song Recital: Por una mujer (Lambert); La del Soto del Parral (Soutullo and Vert); Pensant en tu (Longis); La Barca (Morera). 7.0. Dramatic Selections from La Prisa (Quintero Bros.); Manolito Pamplinas (José María de Granada). 7.20. Orchestral Selections: La Chaste Susanne (Gilbert); Potpourri, Spanish Airs (Planas); Andalusian Airs (Lucena). 7.50. Soprano Song Recital: Cançó (Zamacois); Canticle (Toldrà); Nuptial (Lanote de Grignon); Recitative and Air from Lakmé (Delibes). 8.20. Orchestral Selections: Overture to Peot and Peasant (Suppé); Selection from La Gioconda (Ponchielli-Limentà). 8.40. Sports Notes. 9.0 (approx.), Close Down.

BERGEN (370.4 metres); 1.5 kW.—7.0. Programme for Children. 7.30. Talk for Girls. 8.0. Concert: Hungarian Comedy Overture (Kéler Béla); Vid Larsens (Peterson-Berger); Waltz, Amorettenreigen (Fucik); A Tear (Moussorsky); Potpourri on the Geisha (Jones); Chinese Parade (Neumann). 9.0. Talk: A Rhine Trip. 9.30. Hardanger Fiddle Recital. 10.0. Weather Report, News and Time Signal. 10.15. Selections by the Exhibition Orchestra. 12.0 Midnight (approx.), Close Down.

BERLIN (Königsruherstation). (1,250 metres); 40 kW.—4.0. Shorthand Dictation by Fritz Westermann. 4.30. Talk by Hans Jahn. 5.0. Programme from Hamburg. 6.0. Heinrich Bachmann, Talk: Democracy in the Olden Days. 6.30. Spanish Lesson. 6.55. Orchestral Selections. 7.20. Prof. Minde-Pouet, Talk: Do we still read Goethe's Novels? 8.0. Programme from Hamburg followed by Programme from Voxhaus.

BERLIN (Voxhaus). (484 metres); 4 kW.—10.10 a.m., Market Prices. 10.15 a.m., Weather Report, News, Sports Notes and Time Signal. 11.0 a.m., Programme of Gramophone Records. 11.30 a.m., Exchange Quotations. 12.55. Time Signal. 1.30. Weather Report, News and Sports Notes. 3.10. Agricultural Prices and Time Signal. 3.30. Programme of Gramophone Records. 4.0. Talk by Dr. Käte Frankenthal. 4.30. Dr. Monty, Jacobs, Talk: Clemens Brentano. 5.0. Concert by a Wind Instrument Orchestra, relayed from the Wireless Exhibition; Athletik-Klub-Marsch (Einodshöfer); Overture to Mignon (Thomas); Waltz from Die Schönbirner (Lanner); Spring Song (Gounod); Selections from La Bohème (Puccini); Der Flieger-Sieger (Einodshöfer); Overture to Nakiri's Wedding (Lincke); Waltz, A Paradise on Earth (Einodshöfer); Tango from Ein Frau von Format (Krausz); Selections from Der Obersteiger (Zeller); Programme Announcements in the Interval. 7.0. Talk by Leopold Lehmann. 7.30. Dr. Ernst Kother, Talk: The Power of Suggestion. 8.0. Orchestral Concert, relayed from the Wireless Exhibition: Overture to Peot and Peasant (Suppé); Holzschnittanz from Czar and Carpenter (Lortzing); Military March No. 1 (Schubert); Overture to The Thieving Magpie (Rossini); Ballet Music from La Gioconda (Ponchielli); March from Aida (Verdi); Ballet Music from Coppelia (Delibes); March to the Mute of Portici (Auber); Overture to Alexander Stradella (Flotow); Ballet Music from The Queen of Sheba (Goldmark); Coburger Marsch, followed by Weather Report, News, Time Signal and Sports Notes. 10.30. Dance Music. 12.30 a.m. (Sunday), Close Down.

BERN (411 metres); 1.5 kW.—8.0. Time Signal and Weather Report. 8.5. Reading by K. Frauler. 8.30. Folk Music Concert from Bern, Basle (1,000 metres), and Zurich (588 metres)—Dialect Poetry, Vodeling and Introductory Talk on Music. 9.45. News and Weather Report. 10.0. Selections by an Italian Orchestra. 10.35 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—4.0. Book Review, by Richard Steinott. 4.30. Orchestral Concert. 6.0. Shorthand Lesson. 6.15. Talk in Esperanto, by Elsa Koschate. 6.25. Walther Schimmel-Falkenau, Talk: Breslau Sketches. 7.25. Herbert Brunar, Talk: Public Life in America. 7.50. Georg Lichey, Talk: Moses. 8.30. Light Variety Programme with Max Ehrlich; Orchestral Selection: Overture to Die

geschiedene Frau (Fall); Humorous Selections; Songs, (a) Die geschiedene Frau (Fall); (b) Frasquita (Lehár); Orchestral Selections (Lehár), (a) Frasquita; (b) Der Zarewitsch; Humorous Selections; Songs from (a) Teresina (Oscar Straus); (b) Der Zarewitsch (Lehár); Humorous Selections; Orchestral Selections (Oscar Straus), (a) Die Perlen der Kleopatra; (b) Teresina. 10.0. News. 10.30. Dance Music. 12.0 Midnight (approx.), Close Down.

BRÜNN (441.2 metres); 3 kW.—6.0. Time Signal and German Transmission. 6.25. Programme of Talks. 7.0. Selections by a Russian Orchestra. 8.0. Musical Selections from the Works of Dvorák. 9.30. Exhibition Programme. 10.0. Programme from Prague, followed by Exhibition Programme.

BRUSSELS (508.5 metres); 1.5 kW.—5.0. Dance Music from the St. Sauveur Palais de Danse. 6.0. Talk: The Theatre of Victorien Sardou. 6.30. Orchestral Concert: Overture to Norma (Bellini); Selection from The Daughter of the Regiment (Donizetti); Pianoforte Solo, Prélude (Mendelssohn); The Sleeping Beauty (Stolz); Chinese Boston (Huntley); Cantilène (Gabriel-Marie); 'Cello Solo, Arlequin (Popper); Help (Szule); Suite (Marie). 7.30. Radio-Chronique. 8.15. Gramophone Selections. 8.30. Orchestral Concert: Sérénade (Widor); Three Dances (Dvorák); La Jéria (Lacôme). 8.40. Talk on Topical Events. 9.0. Symphony Concert relayed from the Kursaal, Ostend. News.

BUDAPEST (555.6 metres); 35 kW.—5.0. Concert of Hungarian Folk Songs. 6.30. Talk: Women in America. 7.10. Sports Announcements. 7.30. Gramophone Selections. 8.0. Dramatic Programme. In the Interval, Racing News. 9.10. Time Signal and Sports Notes. 10.0. Concert of Tzigane Music.

COLOGNE (283 metres); 4 kW.—12.10 to 12.50.— Programme from Langenberg. 1.5. Concert: Overture to Der Wildschütz (Lortzing); Waltz, Himmelsfunken (Waldteufel); Selections from Othello (Verdi-Weninger); Boston, Gedicht (Fibich); Boston, Finmal kommt der Tag (Benatzky); Tenor Solos: Suite from Nell Gwyn (German); Eine Rose ist dein roter Mund (Stransky); Potpourri, Von Heidelberg bis Barcelona (Borchert). 2.30. Household Hints. 3.40. Programme from Langenberg. 4.0. Dr. Kersten, Talk: Germany's Step-children. 4.30. Programme from Langenberg. 5.0. Margarete Schuckert, Talk: The Professional Woman in German Legislation. 5.20. Rhineland Sketches. 5.45. Orchestral Selections: Comedy Overture (Scheinplugg); Pianoforte Concerto (Prokofeff). 7.15. Programme from Dortmund (see Langenberg), followed by News, Sports Notes, Commercial Announcements, Concert and Dance Music. 1.0 a.m. (approx.) (Sunday), Close Down.

CRACOW (566 metres); 1.5 kW.—7.0. Miscellaneous Items. 7.55. Talk: A Review of Foreign Politics during the past week. 7.55. Agricultural Report and News. 8.15. Programme from Warsaw. 10.30. Concert from a Restaurant. 11.30 (approx.), Close Down.

DUBLIN Call 2RN (319.1 metres); 1.5 kW.—1.30. Weather Report and Gramophone Selections. 7.20. News. 7.30. Talk by Patricia Hoey. 7.45. Irish

Lesson by Seamus O'Duinnne. 8.9. Pipe and Violin Selections by Sean O'Loaghaire and P. MacFlannchaigh. 8.15. American Vaudeville by Jack Dwan and Company. 8.45. The Station Orchestra. 9.15. Gaelic Vocal Selections by M. Ni Annasain. 9.30. Request Music by the Station Orchestra. 9.40. Soprano Solos by Ruby Boughton. 10.0. Pipe and Violin Selections by Sean O'Loaghaire and P. MacFlannchaigh. 10.15. The Station Orchestra. 10.30. News, Weather Report and Close Down.

FRANKFURT (428.6 metres); 4 kW.—1.0. Gramophone Records. 3.5. Children's Corner. 3.40. Reading by O. W. Studtmann. 4.35. Vocal and Orchestral Concert from the Works of Dvorák. 6.15. Wireless Notes and Announcements. 6.45. Prof. Hillmann, Talk: Tolstoy's Folk Stories. 7.15. Prof. Naumann, Talk: The German Folk Ballet. 7.45. W. Chmelnitzky, Talk: Tolstoy as a Dramatic Poet. 8.15. Tolstoy Commemoration Programme: "Leo Tolstoy," Sketch of his Life (Alfons Paquet); "Trío in A Minor, Op. 50 (Tchaikovsky) in Memory of a Great Artist"; Recitations from the Works of the Poet; Eine Nacht auf dem kahlen Berg (Moussorsky); "The First Distiller," Comedy (Tolstoy), followed by Programme from Voxhaus.

HAMBURG Call HA (in Morse), (394.7 metres); 4 kW.—10.15 a.m., News. 11.0 a.m., Programme of Gramophone Records. 12.10. Weather Report. 12.15. Exchange Quotations. 12.30. Concert, relayed from Hanover (297 metres), Shipping Forecast in the Interval at 12.45. 12.55. Time Signal. 1.10. News. 2.40. Exchange Quotations. 3.30. Review of Books. 4.0. Labour Exchange Report. 4.15. Dr. Bernhard Engelle, Talk: Schleswig-Holstein in the History of German Song, with Pianoforte Illustrations, relayed from Kiel (254.2 metres). 5.0. Clemens Brentano Anniversary Concert (Born 8th September, 1778); Recitation, Scenes from my Childhood; Songs, (a) Anor (R. Strauss), (b) Ich wollt ein Sträusslein binden (Raimund), (c) Der Spinnerin Lied (Rüter), (d) Wenn die Sonne weggegangen, (e) An die Nacht; Recitation: Songs, (a) Säusle, liebe Myrte (R. Strauss), (b) Heimatsgefühl (Raimund), (c) Als mir dein Lied erklang (Rüter), (d) Wenn ich ein Bettelmann wär, (e) Singet leise, leise, leise; Recitations. 6.0. Request Concert. 7.0. O. Taube, Talk: Aids for Children with Defective Speech, relayed from Kiel 7.20. Talk by Graf Luckner. 7.55. Weather Report. 8.0. Film Programme, relayed from the Emetka Palace, Hamburg. 10.15. (approx.), Weather Report, News, and Sports Notes. 10.30 (approx.), Concert from the Winterhuder Fährhaus.

HILVERSUM (1071 metres); 5 kW.—9.40 a.m. Concert on the Occasion of the Industrial Fair, Utrecht. 11.40 a.m., Police Announcements. 12.10. Concert of Trio Music. 1.40. Concert, relayed from the Tuschnski Theatre, Amsterdam. 5.40. Time Signal. 5.42. Concert: Romantic Overture (Kéler Béla); Waltz, Loin de mon pays (Maduro); Intermezzo (Joan Fresco); Baritone Solos; Selection from William Tell (Rossini); Torch Dance (Meyerbeer); Baritone Solos; Baby Parade (Manfred); Selection from The Circus Princess (Kalman); Tox-Trot, Strike up the Band (Gerschwin); Finale. 7.25. Police Announcements. 7.40. Programme, arranged by the Workers' Radio Society. 11.15 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits from 5.40 to 1.870 metres.—1.10. Concert of Trio Music. 5.10. Gramophone Selections. 7.25. Talk by Dr. Hofmann. 7.40. Orchestral and Choral Concert.

JUAN-LES-PINS (Radio I.L.) (244.5 metres); 1.5 kW.—1.0. Concert: Valse des Blondes (Ganne); Patrouille Arabe (Monfred); Danse sous la feuillée (Razigade); Così fan Tutte (Mozart); Tambourin (Mareucci); Sérénade from Le Marchand de Masques (Wolff); La Gioconda (Ponchielli). 8.0. News, Weather Report, Talk for Women by Mme. la Comtesse de Treméuge, and Concert. 10.0. Dance Music.

KALUNDBORG (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres)—7.30 a.m., Morning Gymnastics. 11.0 a.m., Weather Report. 3.0. Trio Concert: March, Die Regimentkinder (Fucik); Selection (Lehár); Selection from Samson and Delilah (Saint-Saens); He's the last word (Donaldson); Elegy (Massenet); Violin Solo, Humoresque (Dvorák); Fox-Trot, Dreamy Amazon (Kéler); Recitations

Programmes from Abroad.—

Valse des Blondes (Ganne); Selection from Sylvia (Delibes); Fox-Trot; Souvenirs (Nicholls); Sérénade favorite (Drigo); Gavotte (Martini); Selection from La Gioconda (Ponchielli). 6.20, Aage Petersen, Talk: Children and Books. 6.50, Weather Report. 7.0, News, Exchange Quotations and Time Signal. 7.30, Talk: Ewald's Fishers. 8.0, Chimes from the Town Hall. 8.2, Experimental Relay from the Studio, Axelborg—Orchestral and Soloist Concert, followed by News. 10.15, Dance Music. 12.0 Midnight, Chimes from the Town Hall. 12.15 a.m. (approx.) (Sunday), Close Down.

KATOWITZ (422 metres); 10 kW.—5.25, Dr. Michalik, Talk: Aviation. 6.0, Programme for Children. 7.0, Miscellaneous Items. 7.30, Programme from Warsaw. 7.55, Agricultural Report. 8.15, Concert. 10.0, Time Signal, Weather Report and News. 10.30, Dance Music.

KAUNAS (2,000 metres); 7 kW.—7.0, Time Signal, Weather Report and News. 7.30, Talk. 8.0, Czecho-Slovakian Programme.

LAHTI (1522.8 metres); 35 kW.—5.0, Orchestral Concert. 6.15, Talks. 7.0, Variety Programme. 8.45, News in Finnish and Swedish. 9.15, Dance Music.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres), and Münster (250 metres)—12.10, Gramophone Selections. 1.5, Programme from Cologne. 3.40, Talk on Wireless Technique, relayed from Elberfeld. 4.0, Programme from Cologne. 4.30, Dr. Karl H. Meyer, Talk: Count Leo Tolstoy's European Mission, from Münster. 5.0 to 6.30, Programme from Cologne. 7.15, Talk from Dortmund. 7.40, Concert of Quartet Selections from Dortmund: Holde Erinnerung (Kämpf); Am Lindenbaum zur Rosenzeit (Hafeneiger); My old Kentucky Home (Foster); Cradle Song (Brahms); Rheintreu (Hansen); Ich hatte einst ein schönes Vaterland (Hansen). 8.15, Variety Programme from Dortmund, followed by News, Sports Notes, Commercial Announcements, Concert and Dance Music from Cologne. 1.0 a.m. (approx.) (Sunday), Close Down.

LEIPZIG (365.8 metres); 4 kW.—4.30, Concert: Festival Overture (Volkmann); Largo and Scherzo from the New World Symphony (Dvorák); Sérénade for String Orchestra (Elgar); Selections from Herzog Wildfang (Siegfried Wagner); Hungarian Rhapsody (Liszt); Waltz, Wiener Bürger (Ziehrer); Wireless Notes in the Interval. 6.30, Programme relayed from Königswusterhausen. 7.0, Talk by Gerhard Kunze. 7.30, Talk on Leo Tolstoy. 8.0, Weather Report, Time Signal and Wireless Announcements. 8.15, Klemens Brentano Anniversary Recital. 9.15, C. R. Koellinghoff (Berlin) in his own Programme. 10.15, News and Sports Notes. 10.30, Programme from Voxhaus.

LILLE, Call PTT (267 metres); 0.5 kW.—7.0, Market Prices. 7.10, Concert. 8.20, Wireless Talk. 8.45, Concert arranged by the Wireless Association of North France, followed by News.

MADRID (Union Radio), Call EAJ7 (375 metres); 3 kW.—7.0, Sextet Selections: Fantasia (Lysler); Suite Op. 98 (Dvorák). 8.0, Dance Music. 9.45, Market Prices. 10.0, Chimes and Concert: Orchestral Selection, Canción de cuna y danza (José María Franco); La Guardia cuidados (Cervantes); Orchestral Selections from Heraldos (Bacarrisse); El Mayo de repente (Ramon de la Cruz), News. 12.0 Midnight, Dance Music. 12.30 a.m. (approx.) (Sunday), Close Down.

MILAN, Call IMI (549 metres); 7 kW.—8.35, Time Signal and Talk. 8.45, News. 8.50, Variety Concert: Orchestral Selections, (a) Overture to Oberon (Weber); (b) Intermezzo from Cabrera (Dupont); (c) Intermezzo from Manuel Menendez (Eliás); Three Soprano Solos (Brahms); Mezzo Soprano Solos from (a) La Gioconda (Ponchielli), (b) Carmen (Bizet); Trio in C Major (Martucci); Gipsy Sérénade (Sarasate); Nocturne and Scherzo for Violin and Cello (Ranzato); Ballade for Pianoforte (Debussy); Hungarian Caprice for Cello and Pianoforte (Dunkler); Soprano Solos (Strauss), (a) Abendtraum, (b) Dedication; Mezzo Soprano Solo from Sanson and Delilah (Saint-Saëns), Prelude to The Mastersingers (Wagner). 10.55, News and Dance Music from the Majestic Hotel Diana. 11.45 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (260.9 metres), Östersund (720 metres), Sundsvall (545.6 metres)—5.30, Light Musical Selections. 6.30, Programme for Children. 7.0, Accordion Recital. 7.30, R. Findstrom, Talk: Holidays on the little islands round

Saturday, September 8th.

All Times are reduced to British Summer Time and are p.m. except where otherwise stated.

Stockholm. 8.0, The S.O.S. Cabaret. 9.15, News and Weather Report. 9.45, Topical Talk. 10.0, Old Dance Music. 11.30, Selections by the Rolf Orchestra. 1.0 a.m. (approx.) (Sunday), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (134.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrunn (500 metres), and Rjukan (418 metres)—6.30, Programme for Children. 7.15, Weather Report, News and Agricultural Report. 7.30, M. Selmer, Talk: Introduction to the Study of Phonetics. 8.0, Time Signal. 8.2, Orchestral Concert: Overture to Fatinitza (Suppé); The Gipsy Baron (Strauss); Maritza (Lohár); A Waltz Dream (Strauss); Quintessence (Moreno). 9.30, Weather Report and News. 9.45, Topical Talk. 10.0 (approx.), Dance Music from the Grand Hotel. 12.0 Midnight (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres): 0.5 kW.—4.30, "Radio Journal de France." 8.0, Sports Notes and News. 8.30, Concert arranged by the Association Générale des Auditeurs de T.S.F., followed by Dance Music from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres): 5 kW.—6.45, "Le Journal Parlé." 8.10, Weather Report. 8.30, Concert: Polonaise in F (Schubert-Levadé); Invocation à la Nuit (Charpentier); Élegie d'Amour (Reuschel); Rive Sacrée (Rohan); Tristesse éternelle (Chopin); Dans l'Oasis baignée de lune (Bernheim); Sonata for Flute and Pianoforte (Granum); Les Lunettes de Grand'maman (Mondrat); La Prière et l'Amour (Dassien); Ballet from Véronique (Messager).

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Selections, Talk, News and Announcements. 9.0, Concert: Giroflé-Girofla (Lecocq); Selection from Pépita Jimenez (Albéniz); Symphony Orchestra, (a) Finale from the First Symphony in C Major (Beethoven), (b) Joyeuse Marche (Chabrier); La Cigale Suite (Massenet); Réverie (Debussy); Finale from the Divertissement Persan (Renaud); News in the Intervals.

PARIS (Radio-Paris), Call CFR (1,750 metres); 6 kW.—12.30, Gramophone Selections: Fifth Symphony (Beethoven); Cossack Choruses; Air from Hérodiade (Massenet); Quartet in D (Tchaikovsky); Violin Solo; Hungarian Dances in F (Brahms); Organ Selection, Toccata (Bach); Song, Slow River; Song, Oh, How I Love My Boatmen; American and English Duets: Fox-Trot, Hello, Blue Bird; Keep Sweeping the Cobwebs Off the Moon. 1.50, Market Prices and Exchange Quotations. 3.45, Dance Music; News in the Interval. 8.0, Agricultural Report. 8.15, Dr. Evrot, Talk: Water is the Poetry of Life, followed by Market Prices and News. 8.30, Concert: Symphony Music, La Flâncée du Scaphandrier (Terrasse); News in the Intervals.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—11.0, Telechron Time, Baseball Scores and Selections by the Crowder Brothers. 11.30, Concert of Band Music. 11.55, Baseball Announcements. 12.0 Midnight, Time Signal and Concert (continued), 12.30 a.m. (Sunday), Home Radio Club Meeting; J. Weir (Chairman). 12.45 a.m., Organ Recital by Lew J. White, from WJZ, New York. 1.15 a.m., A Week of the World's Business, from WJZ, New York. 2.30 a.m., Selections by Macnanti's Accordion Quartet. 3.0 a.m., Time Signal and Baseball Scores. 4.0 a.m., Weather Report and Time Signal. 4.10 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—6.0, Miscellaneous Items. 7.0, Talk. 7.30, Programme from Warsaw. 8.0, Finance Report. 8.30, Soprano Song Recital. 10.0, Time Signal, News and Weather Report. 10.20, Miscellaneous Items. 10.40, Dance Music from the Palais Royal. 12.0 Midnight, Concert, arranged by the Maison Philips. 2.0 a.m. (Sunday), Close Down.

PRAGUE (348.9 metres); 5 kW.—6.0, German Transmission. 6.25, Agricultural Report. 6.35, Talk for Workers. 7.30, Weekly Literary Report. 8.0, Concert from the Works of Sevsik; Quintet in A Major; Overture, Water-Sprite; Slavonic Rhapsody. 9.30, Exhibition Programme from Brünn. 10.0, Time Signal, News and Exhibition Programme from Brünn.

RIGA (526.3 metres); 4 kW.—6.0, Programme of Talks. 7.0, Variety Programme. 9.0, Weather Report,

Concert and News, followed by Dance Music from the Opera Café. 11.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—8.10, Time Signal and Government Report. 8.30, Sports Notes, News, Exchange Quotations and Weather Report. 8.47, Topical Talk and Time Signal. 9.0, "Sanson and Delilah," Opera (Saint-Saëns); in the Intervals, Art and Literature Review and Topical Talk. 11.5, News. 11.15, Close Down.

SCHAERBEEK (230 metres); 1.5 kW.—8.30, Gramophone Concert. 9.0, Pianoforte Recital by M. Derrider. 9.30, Orchestral Concert, from Brussels. 11.0, News and Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—11.55, Baseball Announcements. 12.0 Midnight, Statler's Pennsylvanians, directed by Johnny Johnson, from New York. 12.30 a.m. (Sunday), Concert from the Hotel Sagamore, Rochester. 1.0 a.m., Programme, arranged by the Waldorf System, Inc. 1.30 a.m., Time Signal. 1.32 a.m., The New York Philharmonic Orchestra, conducted by Willem Van Hoogstraten, from the Levisohn Stadium. 3.20, a.m., Organ Recital by Robert Berentsen, Rochester. 4.0 a.m., Dance Music from the Hotel Ten Eyck, Albany. 5.0 a.m. (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—6.15, Concert of Turkish Music. 8.30, Weather Report and Time Signal. 8.40, Concert: Overture to Le Roi d'Yves (Lalo); Trio Selection (Schubert); Songs; Nocturnes (Chopin). 10.0, News and Close Down.

STUTTGART (379.7 metres); 4 kW.—6.0, Time Signal and Weather Report. 6.15, Rudolf Küstermeier, Talk: The World Peace League of Youth, relayed from Freiburg (577 metres). 6.45, Talk on Commerce by L. Leibfried. 7.15, Labour Market Report, Time Signal, Weather Report and Sports Notes. 7.45, Dr. Wittkop, Talk: Tolstoy on the centenary of his birth, relayed from Freiburg. 8.15, Programme from Frankfurt, followed by News and Cabaret Concert; One-Step, Jeder einmal in Berlin; Nach Hause gehn wir nicht; Liebe kommt plötzlich; Das ist der Herr von Schubert (Arnold); Spiel' mir den Blues aus jener Frühlingzeit (Stolz); Ich lass' nichts auf mein Deutschland kommen (Raymond); Ja, wann der Frühling erst mal blüht (Popoff); Zither Solo; Tzigane Tango; In the First Class Waiting Room," Comedy (Müller); Fox-Trot, Geh, Bubi; In der Heimat blühen die dunkelroten Rosen (Padilla); Gray Eyes (Kutschera); Ein neues Hüthen und neue Schuh' (Hendersen); Eppis Luschtigs us der Schweiz; Meine Herren (Krauss); Zither Solo; Humorous Item: Wenn Herr Maier untertaucht—Fox-Trot (Hirsch); Nur dir kann ich nicht treu sein; Was mir blieb, ist Erinnerung; Ein bisschen hebenbei; Humorous Item; Zither Solo; One-Step, Paris (Padilla).

TOULOUSE (Radiophonie du Midi), (391 metres); 3 kW.—12.30, Saint Saëns Recital, followed by Selection of Military Music. 8.0, Exchange Quotations and News. 8.30, Concert of Argentine Songs with Guitar Accompanist. 9.0, Orchestral Concert: Cadet March (Souza); Overture to Monte-Christo (Galutti); Les Cloches de Corneville (Planquette); Paris-Flage (Boyer); Waltz, Santiago (Corbin); Overture to Fête mondaine (Delmas); Polka, Mlle. Trompette (Hilfemann); March, Paris—New York (Trespalasi); In the Interval, Dance and Accordion Music. 11.0, North African News. 11.15 (approx.), Close Down.

VIENNA (577 and 517.2 metres); 1.5 and 15 kW.—4.15, Orchestral Concert. 6.30, Concert: Ewig Liebe (Grieg); Nachtigall (Brahms); Freundliche Vision (Strauss); Air from Rigoletto (Verdi); Selection from A Masked Ball (Verdi); Violin Solo (a) Romance in E Flat Major, Op. 44 (Rubinstein), (b) Mazurka Op. 33, No. 2 (Chopin-Kreisler); Selections (Fohringer), (a) Spätblau, (b) Sommerstille; Selections (Kroiss), (a) Einsamer Frühling, (b) Verlangen; Pianoforte Solos, (a) Scherzo (Dohnányi), (b) Scherz; (Schubert), (c) Capriccio (Reger). 7.45, Schubertliade: Selections from the Song Collection, Die schöne Müllerin. 9.0, Programme of Dance Music.

WARSAW (1,111 metres); 10 kW.—6.0, Programme for Children, relayed from Cracow. 7.0, Miscellaneous Items. 7.30, Wireless Review by Dr. M. Stepowski. 7.55, Agricultural Report. 8.5, News. 8.15, Popular Concert: Potpourri, Pour le cœur et l'âme (Konzak); Soloist; Waltz, My Dream (Waldteufel); Cracovienne (Zelensky); The Changing of the Guard (Eilenberg); Selection from Les Cloches de Corneville (Planquette); Boston, Golden Autumn (Wiehler); March from Aida (Verdi); Mazurka (Namysłowski); News in French during the Interval. 10.0, Time Signal, Aviation Notes, Weather Report and Sports Notes. 10.30, Dance Music from the Restaurant Oaza. 11.30 (approx.), Close Down.

SUNDAY, SEPTEMBER 9th.

All Times are reduced to British Summer Time and are p.m. except where otherwise stated.

Programmes from Abroad.—

BARCELONA (Radio-Barcelona). Call EA11 (344.8 metres) : 1.5 kW.—12.0 Noon, Relay of Chimes from the Barcelona Cathedral; General Weather Report for Europe and Weather Forecast for North-East of Spain; Aerial Route Conditions. 1.30, Light Concert Programme by the Iberia Trio, with Gramophone Records in the Intervals. 2.45 to 6.0, No Transmission. 6.0, Exchange quotations and Market Prices, followed by Instrumental and Vocal Concert by the Radio Barcelona Orchestra and Soloists. 9.0 (approx.), Close Down.

BASLE (1,010 metres) : 1.5 kW.—8.30, Humorous Selections by Alexander Vailas, of Vienna. 9.45, News Bulletin and Weather Forecast. 10.15 (approx.), Close Down.

BERGEN (370.4 metres) : 1.5 kW.—19.30 a.m., Divine Service relayed from a Church. 12.30, Weather Forecast and General News Bulletin. 3.0, Concert by the Station Orchestra. 2.30, Mr. J. A. Thorbjørnsen, Talk: The Catacombs. 9.30, Orchestral Concert. 10.0, Weather Report, News Bulletin and Time Signal. 10.15, Musical Programme from a Restaurant. 12.0 Midnight (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres) : 40 kW.—8.55 a.m., Chimes relayed from the Garrison Church, Potsdam. 9.0 a.m., Morning Concert from Voxhaus, followed by Chimes from the Berlin Cathedral. 11.15 a.m. (approx.), Orchestral Concert relayed from Voxhaus. 2.0, Funkheinzelmänn's Programme for Children, relayed from Voxhaus. 3.45, Market and Weather Reports of the Week. 3.55, Talk for Farmers from Voxhaus, followed by Light Music. 6.30, Two Talks followed by programme relayed from another German Station. 12.30 a.m. (approx.) (Monday), Close Down.

BERLIN (Voxhaus) (484 metres) : 4 kW.—8.55 a.m., Chimes from the Potsdam Garrison Church. 9.0 a.m., Sacred Recital of Vocal and Instrumental Music, with Address, and followed by Chimes from the Berlin Cathedral. 11.15 a.m. (approx.), Programme of Music. 2.0, Funkheinzelmänn's Programme for Children, arranged by Hans Bodenstedt. 3.30, Agricultural Hints. 3.45, Market and Weather Reports. 3.55, Talk for Farmers, followed by Orchestral Concert and Talks. 7.0, Talks. 8.15 (approx.), Programme of Music, Weather Forecast, Time Signal and Sports Notes. 12.30 a.m. (approx.) (Monday), Close Down.

BERN (411 metres) : 1.5 kW.—10.30 a.m., Festival in Memory of Leo Tolstoy. 1.0, Time Signal and Weather Forecast. 1.15, Concert of Orchestral Music. 8.0, Time Signal and Weather Forecast. 8.30, Instrumental Concert. 9.45, Sports Notes, General News and Weather Forecast. 10.0, Orchestral Concert. 10.35 (approx.), Close Down.

BEZIERS (158 metres) : 0.6 kW.—8.15, General News Bulletin and Sports News. 8.30, Instrumental Concert of Symphony Music. 9.0, Dance Music. 10.0 (approx.), Close Down.

BRESLAU (322.6 metres) : 4 kW.—8.45 a.m., Chimes relayed from Christ Church. 11.0 a.m., Morning Recital followed by Musical Selections and Talks. 2.35, Talk on Chess. 3.0, Stories for Children. 9.30, Transmission for Farmers, followed by Talks and Music. 8.30, Concert. 10.0, General News Bulletin. 10.30, Outside Relay of Dance Music. 12.0 Midnight (approx.), Close Down.

BRÜNN (441.2 metres) : 3 kW.—7.0 a.m., Orchestral Concert followed by Agricultural Report. 11.0 a.m., Concert of Instrumental Music. 12.0, Musical Selections. 2.0, Programme relayed from the Exhibition. 6.0, German Transmission followed by Concert. 10.0, Time Signal, News Bulletin and Music.

BRUSSELS (508.5 metres) : 1.5 kW.—5.0, Dance Music. 6.0, Sylvia and Bonzo in their Programme for Children. 6.30, Orchestral Concert. 7.30, Le Journal Parlé of Radio-Belgique. 8.15, Instrumental Selections. 10.15 (approx.), News Bulletin. 10.30 (approx.), Close Down.

BUDAPEST (555.6 metres) : 35 kW.—9.0 a.m., News Bulletin and Beauty Hints for Women. 10.0 a.m., Morning Service. 12.15 (approx.), Orchestral Concert. 3.30, Talk. 4.0, Children's Corner, followed by Musical Selections. 7.30 (approx.), Musical Programme. 9.30 (approx.), Orchestral Concert.

COLOGNE (283 metres) : 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (468.8 metres) and Münster (250 metres).—9.0 a.m., Catholic Morning Recital—Renderings by Choir and Soloists. 11.30 a.m. to 12.55, Commemoration Programme dedicated to Leo Tolstoy, on the Hundredth Anniversary of his Birth. 1.0, Orchestral Concert, followed by Programme of Talks and Music. 8.0, Transmission of an Opera, followed by Sports Notes, Last News Bulletin, Concert of Orchestral Music and Dance Music Selections. 12.0 Midnight (approx.), Close Down.

CORK, Call 6CK (400 metres) : 1.5 kW.—8.30, Concert with Baritone and Mezzo-Contralto Songs, Violin and Piano/forte Solos, and Selections by the Station Quintet. 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

CRACOW (566 metres) : 1.5 kW.—10.15 a.m., Divine Service, relayed from one of the Polish Cathedrals. 12.0 Noon, Fanfare from the Tower of the Notre Dame Church in Cracow, followed by Time Signal and Meteorological Report. 4.0, Talks for Farmers, followed by the "Chronique Agricole" of Dr. St. Wasniewski. 5.0, Relay from Warsaw. 6.30, Variety Items. 6.50, Talk. 8.0, Fanfare from Notre Dame and Sports Notes. 8.30, Concert of Vocal Selections, accompanied by the Piano/forte of Professor St. Schwarzenberg. 10.0, Programme relayed from Warsaw. 10.30, Relay of Orchestral Programme from a Restaurant. 11.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres) : 1.5 kW.—8.30 to 11.5 (approx.), Programme relayed from Cork: Vocal and Instrumental Concert, with Gaelic Traditional Songs by Nora Ni Mhathghamhna. 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

FRANKFURT (428.6 metres) : 4 kW.—8.0 a.m., Sacred Morning Recital, followed by Talks and Musical Selections. 1.0, Wiesbaden Agricultural Report; Musical Selections and Talks. 6.30, Rhein-Main Educational Programme. 8.30, Orchestral Concert, followed by probable relay from Berlin. 12.30 a.m. (approx.) (Monday), Close Down.

HAMBURG, Call HA (in Morse) (394.7 metres) : 4 kW.—Programme relayed by Bremen (272.7 metres), Hanover (297 metres) and Kiel (254.2 metres).—8.25 a.m., Time Signal, Weather Forecast, News Bulletin, Industrial Notes and Forthcoming Programme Announcements. 9.15 a.m., Morning Recital. 10.55 a.m. (for Kiel only), Divine Service, relayed from the University Church at Kiel. 11.0 a.m. (for Hamburg, Bremen and Hanover), Talk. 11.30 a.m. (approx.) (for Hamburg, Bremen and Hanover), Talk. 12.55, Time Signal from Nauen. 1.0 (for Hamburg and Kiel), Orchestral Selections. 1.0 (for Bremen), Instrumental Concert. 1.0 (for Hanover), Selections of Gramophone Records. 2.0, Programme of Stories for Children, by Funkheinzelmänn. 3.0, Instrumental Concert. 4.30 (approx.), Programme of Talks and Concert relayed from the Café Walthof, followed by Sports Notes and Musical Selections. 9.30 (approx.), Weather Forecast and Talk on Current Topics: Concert from the Café Walthof (for Hamburg and Kiel); Outside Relay of Orchestral Concert (Hanover and Bremen). 11.0 (approx.), Close Down.

HILVERSUM (1,071 metres) : 5 kW.—12.40 to 2.10, Orchestral Concert by the Station Trio. 2.40, The Residence Orchestra. Concerto for Piano/forte and Orchestra in E Minor Op. 11. (Chopin). 7.40, Weather Report, General News Bulletin and Sports Notes. 7.55, Concert of Orchestral Selections. 10.15 (approx.), Close Down.

HUIZEN (340.9 metres) : 4 kW.—Programme on 1,870 metres from 5.40. 8.10 a.m. to 9.10 a.m., Divine Service and Address. 9.50 a.m. (approx.), Divine Service, relayed from Utrecht: Address by the Reverend J. F. Beerens. 12.10, Programme by the "Winkels" Trio of Amsterdam, followed by Talks and Musical Selections. 5.0 (approx.), Divine Service, relayed from a Dutch Church. 7.25, Talk. 8.0, Concert of Orchestral Music. 10.25, Epilogue by a Choir under the Direction of Mr. Joseph Pickers. 10.40 (approx.), Close Down.

JUAN-LES-PINS (Radio L.L.), (244.5 metres) : 1.5 kW.—1.0 to 2.0, Concert of Instrumental Music, followed by Programme for Children, with a Talk by "Radiolo" (Marcel Laporte). 2.0 to 9.0, No Transmission. 9.0, General News Bulletin Weather Report and Orchestral Concert. 10.0, Programme of Dance Music by the Dance Orchestra of the Juan-les-Pins Municipal Casino. 10.30 (approx.), Close Down.

KALUNDBORG (1,153 metres) : 7 kW.—Programme also for Copenhagen (337 metres).—10.0 a.m., Divine Service, relayed from a Church in Copenhagen. 11.30 a.m., (Kalundborg only), Weather Report and Forecast from the Meteorological Institute of Copenhagen. 3.0 (approx.) to 6.50, Programme of Music, followed by relay of Divine Service and Items for Children. 6.50 (Kalundborg only), Weather Forecast. 7.0, General News Bulletin. 7.15, Time Signal. 7.30, Talk. 8.0, Chimes, relayed from the Town Hall in Copenhagen, followed by Programme dedicated to the Memory of Leo Tolstoy, on the centenary of his birth; Extracts from Geirsenberg's Translation of "Anna Karina," rendered by Elith Pio. 9.45, Orchestral Concert. 10.45, Popular Programme of Dance Music; in the Interval at 12.0 Midnight, Chimes from the Copenhagen Town Hall. 12.30 a.m. (approx.) (Monday), Close Down.

KATOWITZ (422 metres) : 10 kW.—12.0 Noon, Time Signal and Weather Report, followed by Talks and Selections of Light Music. 10.0, Time Signal, Weather Forecast and Last News Bulletin and Sports News. 10.30, Dance Music. 11.30 (approx.), Close Down.

KAUNAS (2,000 metres) : 7 kW.—12.0 Noon, Chimes, followed by Time Signal and Weather Report. 12.10, Concert of Sacred Music. 1.0, Children's Corner. 5.0, Programme of Talks and Musical Selections. 7.0 (approx.), Ceremony of the Lowering of the Flag at the War Museum. 8.0, Orchestral Concert of well-known Waltzes, including Court Dances by Lanner.

KÖNIGSBERG (303 metres) : 4 kW.—Programme, relayed by Danzig (272.5 metres). 9.0 a.m., Address with Instrumental Solos. 11.0 a.m. (Koenigsberg only), Weather Report, followed by Morning Recital of Orchestral Music. 12.55, International Time Signal, relayed from Nauen. 3.0, Talk on Chess Problems by P. S. Leonhardt, followed by Talks and Concert of Instrumental Music. 8.10, "Die Geschichte vom Soldaten," by Igor Stravinsky, on the Poem by Ramuz, German Translation by Reinhardt; Introductory Comments by the Conductor, Hermann Scherchen; Recitative by Gerda Müller-Scherchen. 10.30, General News Bulletin and Sports Notes. 10.30, Programme of Dance Music. 12.15 a.m. (approx.), (Monday), Close Down.

LAHTI (1,522.8 metres) : 35 kW.—Programme also for Helsingfors (375 metres). 9.0 a.m., Divine Service in Finnish. 10.50 a.m., General News Bulletin. 11.5 a.m., Songs and Cello Solos by Peter Endras. 11.59, Time Signal and Meteorological Report. 12.0 Noon, Divine Service in Swedish. 5.57, Time Signal and Weather Report, followed by Orchestral Concert and Song Recital. 8.45, Last News Bulletin given in Finnish and Swedish. 10.0 (approx.), Close Down.

LANGENBERG (468.8 metres) : 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres) and Münster (250 metres).—9.0 a.m., Catholic Morning Recital. 11.30 a.m. to 12.55, Programme, relayed from Cologne. 1.0, Concert of Instrumental Music and Talks. 8.0, Programme, relayed from Cologne, "Die Geschiedene Frau," Operetta by Leo Fall, Last News Bulletin and Sports Notes, followed by Light Music and Dance Music Selections. 12.0 Midnight (approx.), Close Down.

LAUSANNE (680 metres) : 1.5 kW.—8.30, Protestant Address, followed by Musical Selections. 10.0 (approx.), Close Down.

LEIPZIG (365.8 metres) : 4 kW.—8.30 a.m., Organ Recital, relayed from the University Church in Leipzig, Organist, Professor Ernst Müller. 9.0 a.m., Morning Concert of Vocal and Instrumental Music, followed by Programme of Talks and Music. 2.30, Concert of Orchestral Music by the Dresden Wireless Orchestra, relayed from the Jahresschau, Dresden, directed by Gustav Agunte, followed by Literary and Musical Programme and Talks. 7.30, Programme dedicated to the memory of Leo Tolstoy, on the Hundredth Anniversary of his Birth; "The Power of Darkness," Drama by Tolstoy, in five scenes, arranged for wireless transmission by Paul Prina of the Municipal Theatre, Leipzig. 10.15, Sports Notes. 10.30, Dance Music Programme, relayed from Voxhaus. 12.30 a.m. (approx.) (Monday), Close Down.

LYONS (Radio Lyon), (291 metres), 1.5 kW.—11.0 a.m., Concert of Sacred Music. 12.0 Noon to 7.30, No Transmission. 7.30, "Le Journal Parlé," General News Bulletin and Press Review, followed by Sports Notes. 8.15, Orchestral Concert, Works of Beethoven, (a) The Eroica Symphony, (b) Fidelio. 9.15, Old and New Dance Music. 10.0 (approx.), Close Down.

MADRID (Union Radio), Call EA17 (375 metres) : 3 kW.—Programme relayed by Salamanca EA22 (405 metres).—2.0, Orchestral Concert. 3.30 to 7.0, No Transmission. 7.0, Children's Programme with Kiki and his friends, and Selections by the Union

Programmes from Abroad.—

Radio Sextet; Interlude by Luis Medina. 8.0, Popular Dance Music by the Union Radio Sextet. 8.30 to 10.0, No Transmission. 10.0, Time Signal and Chimes. 10.5, Concert by the Union Radio Orchestra, Selections from well-known operas, including "The March of the Tsarevitch from "Boris Goudonov," by Moussorgsky. 10.45, Concert relayed from the "Paseo de Rosales" by the Municipal Orchestra under the direction of Señor Villa and Dance Music Selections by the "Palermo en Rosales" Orchestra. 12.30 a.m. (approx.) (Monday), Close Down.

MILAN, Call IMI (543 metres); 7 kW.—10.30 a.m., Recital of Vocal and Instrumental Sacred Music. 11.15 a.m. to 12.30, Interval. 12.30, Time Signal. 12.32, Instrumental Selections by the Station Quartette. 1.50 to 5.0, No Transmission. 5.0, Popular Concert of Quintet and Vocal Selections. 5.25, Agricultural Talk. 5.30, Selections by the Orchestra of the Majestic Hotel Diana. 6.0 to 8.25, No Transmission. 8.25, Opening Signal, Current Topics and Sports Notes. 8.50, "Fedora," Opera by Giordano; In the Interval between Acts 1 and 2, Talk; Late News Bulletin and Sports News at the end of Act 2. 11.45 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (290.3 metres), Östersund (729 metres), and Sundsvall (545.6 metres). 11.0 a.m., Divine Service relayed from a Church. 12.55, Time Signal. 5.0, Children's Corner. 5.55, Chimes from the Stockholm Town Hall. 6.0, Evensong relayed from a Church. 7.15, Programme in commemoration of the Hundredth Anniversary of the Birth of Leo Tolstoy; Talk on Tolstoy and Literary Recital, followed by a Concert and presentation of a Drama by Tolstoy. 9.15, General News Bulletin. 9.30, Weather Forecast. 10.0, Selections of Dance Music. 11.0 (approx.), Close Down.

MUNICH (535.7 metres), 4 kW.—Programme relayed by Augsburg (596 metres), Kaiserslautern (277.8 metres), and Nuremberg (241.9 metres).—11.0 a.m., Chimes from the Munich Town Hall. 11.15 a.m., Transmission of Wireless Weather Chart for Bavaria. 11.45, Time Signal. 1.05, Time Signal, Weather Report and Programme Announcements. 1.15, Agricultural Notes. 4.0 (approx.), Orchestral Concert. 7.15, Three Talks on Tolstoy by Otto Kandner, of Cologne. 8.0 (approx.), Concert or Opera, followed by General News Bulletin and Musical Selections.

NAPLES, Call INA (333.3 metres); 1.5 kW.—10.0 a.m., Sacred Morning Recital of Vocal and Instrumental Music. 4.45, Programme for Children. 5.0, Concert of Orchestral Music; Soloist, Signora Carla Spinelli (Soprano). 5.30, Time Signal. 8.20, News of the Day. 8.40, Time Signal. 8.48, Communiqué from the Harbour Authorities of Naples. 8.50, Concert of Instrumental Selections, Solos and Sketches including "Chi sa il gioco non l'insegna," a one-act play in verse by Ferdinando Martini. 10.0, Sports News. 10.55, Calendar and Announcements of Programmes. 11.0 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrund (500 metres), Rjukan (448 metres).—10.30 a.m. (approx.), Chimes and Divine Service relayed from a Church. 8.0, Time Signal. 8.5, Programme of Orchestral Music and Solos. 9.30, Weather Forecast and Press News. 9.45, Talk on Current Topics followed by Dance Music relayed from the Hotel Bristol, Oslo. 12.0 Midnight (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPIT (458 metres); 0.5 kW.—Programme relayed at intervals by the following Stations: Bordeaux PTT (275 metres), Eiffel Tower (2,650 metres), Grenoble (416 metres), Lille PTT (267 metres), Limoges (285 metres), Lyons PTT (476 metres), Marseilles (303 metres), Rennes (280 metres), Toulouse PTT (260 metres).—8.0 a.m., General News Bulletin. 10.25 a.m., International Time Signal and Meteorological Report. 12.0 Noon, Instrumental Concert. 1.0, Industrial Notes. 1.30, Concert of Orchestral Music arranged by the General Association of French Wireless Listeners, Adagio Cantalude, by Beethoven. 3.0, Concert. 6.30, Le Radio-Journal de France. 8.15 (approx.), Talk under the auspices of the General Union of French Associations. 8.30, Instrumental and Vocal Concert arranged by the General Association of French Wireless Listeners followed by News Bulletin, and Dance Music Programme relayed from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—8.56 a.m., Time Signal on 32.5 metres. 10.28 a.m., Time Signal on 2,650 metres. 6.45, Le Journal Parlé par T.S.F. Talks by MM. Marc

Sunday, September 9th.

All Times are reduced to British Summer Time and are p.m. except where otherwise stated.

Frayssinet, André Delacour, George Delamare, Julien Maigret, etc. 8.10 to 8.20, Weather Forecast. 8.30, Programme by Mario Cazes and his Orchestra. 8.56, Time Signal on 32.5 metres. 11.26, Time Signal on 2,650 metres. 11.30 (approx.), Close Down.

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Records. 8.50, Talk. 8.55, Press News. 9.0, Vocal and Instrumental Concert. Artiste, Mademoiselle Yole Bertacchini, of the Theatre Artengina, Rome. 9.25, General News Bulletin. 9.30, The Half-Hour of Symphony Music. 10.0, General News Bulletin. 10.15, Concert of Popular Instrumental Selections. 11.0 (approx.), Close Down.

PARIS (Radio-Paris), Call CFR (1,750 metres); 6 kW.—8.0 a.m., General News Bulletin and Press Review. 12.0 Noon, Talk on "Le Bonheur, comme l'Horizon, semble reculer toujours," by the Reverend Father Pade, followed by a Concert of Sacred Music, arranged by "La Vie Catholique." 12.45, The Albert Locatelli Orchestra in a Programme of Light Music. 4.30, Dance Music by the Grand Vatel Orchestra, with News Bulletin in the Interval. 7.45, Children's Corner. 8.0, Agricultural Notes. 8.15, General News Bulletin. 8.30, Programme of Instrumental Selections under the direction of M. Eugène Bigot, with Press News in the Intervals.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—4.0, Divine Service. 7.0, Roxy's Stroll Programme, relayed from New York. 9.0, Dr. Sockman's Question Box, from New York. 10.0, Twilight Réveries from New York. 11.0, Telechron Time Signal, followed by Baseball Scores and Orchestral Concert. 11.30, Dinner Concert. 12.0 Midnight, Telechron Time and Baseball Scores, followed by Continuation of Concert. 1.0 a.m. (Monday), Dramatic Programme. 1.45 a.m., The Whittall Anglo-Persians, from New York, followed by Variety and Longine Time. 3.0 a.m., Baseball Scores, Telechron Time Signal. 3.30 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—10.15 a.m., Relay of Divine Service from the Posen Cathedral; the Cathedral Choir under the direction of the Abbé Dr. Gieburowski. 12.0 Noon, Time Signal. 5.0, Orchestral Concert by the Philharmonie de Varsovie, relayed from Warsaw, followed by Programme of Talks. 7.15, "Silva Rerum," by Mr. B. Busiakiewicz. 7.45, Relay from Warsaw. 8.30, Instrumental Concert. 10.0, Time Signal, General News Bulletin, Weather Forecast and Sports Notes. 10.20, Variety Programme. 10.40, Programme of Dance Music, relayed from the Palais Royal Restaurant in Posen. 12.0 Midnight (approx.), Close Down.

PRAGUE (348.9 metres); 5 kW.—7.0 a.m., Morning Concert, followed by Agricultural Report. 11.0 a.m., Orchestral Concert. 12.0 Noon, Musical Selections. 1.20, General Topics. 5.0 (approx.), Concert. 6.0, German Transmission, followed by Evening Concert. 10.0, Time Signal, General News Bulletin and Instrumental Concert.

ROME, Call IRO (447.8 metres); 3 kW.—10.15 a.m., Opening Signal. 10.20 a.m. to 11.0 a.m., Sacred Recital of Vocal and Instrumental Music. 11.0 a.m. to 1.0, No Transmission. 1.0 to 2.0, The Radio Trio. 2.0 to 5.0, No Transmission. 5.0, Opening Signal. 5.5, Concert from the Studio. 6.0 to 6.30, Dance Music Programme from the Casineta. 8.0, Opening Signal and General News Bulletin. 8.20, Agricultural Notes. 8.30, Sports Notes and News. 8.48, Talk on Topical Events. 8.59, Time Signal. 9.0, Concert by the Grand Symphony Orchestra: The Second Concerto in F Minor, Op. 21, by Chopin, for Pianoteur, with Orchestral Accompaniment, (a) Maestoso, (b) Larghetto (c) Finale—Allegro vivace; Pianist, Lidia Trombetti; in the Intervals: Review of Reviews. 11.15, Last News Bulletin. 11.15 (approx.), Close Down.

SAN SEBASTIAN (Union Radio), Call EA8 (335J metres); 0.5 kW.—10.0 to 12.0 Midnight, Orchestral Concert, relayed from the Casino of San Sebastian. 12.0 Midnight (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—4.0, Relay of Divine Service from the St. George's Episcopal Church in Schenectady. 10.30, The Ballad Singers in a Concert, relayed from New York. 11.0, "Stetson Parade" Programme from

Boston, Mass. 12.0 Midnight, Concert by String Quartet from New York. 12.25 a.m. (Monday), Baseball Scores from New York. 12.30 a.m., Capitol Theatre Programme from New York. 2.0 a.m., Talk by the Editor of the "United States Daily," relayed from Washington, D.C. 2.15 a.m., Atwater Kent Programme from New York. 2.45 a.m., A Biblical Drama, relayed from New York. 3.15 a.m., Television Signals—Experimental Transmission. 3.30 a.m. (approx.), Close Down.

SEVILLE (Union Radio), Call EAJ5 (434.8 metres); 1 kW.—2.0, Concert by the Station Orchestra. 10.0, The Station Orchestra in Popular Selections, followed by Flamenco Songs and Dance Music. 12.0 Midnight (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—4.30, Orchestral Concert. 5.30, Exchange Quotations. 6.15, Concert of Turkish Compositions. 8.30, Meteorological Report and Time Signal, followed by Popular Concert. 10.0, Late News Bulletin. 10.30 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—11.0 a.m. (approx.), Morning Recital of Instrumental and Vocal Music. 12.0 Noon, Orchestral Concert, followed by Gramophone Record Selections. 2.0, Children's Corner, by Funkhinzelmann, relayed from Voxhaus. 3.0 (approx.), Vocal and Instrumental Programme, followed by Sports News, Time Signal and Talk. 8.0 (approx.), Orchestral Programme, followed by News and Dance Music.

TOULOUSE (Radiophonie du Midi) (391 metres); 3 kW.—12.30, Weather Report. 12.45, Orchestral Concert devoted to the Works of Beethoven: "The Eroica Symphony, (a) Allegro con brio, (b) Adagio assai, (c) Allegro vivace, (d) Allegro molto. 1.0, Carillon. 1.45, Press News from "Le Télégramme," "L'Express" and "Le Midi Socialiste." 8.0, General News Bulletin. 8.30, Concert of Instrumental Music. 9.0, Concert of Operatic Selections, under the auspices of the "Association des Commerçants Radio Electriciens," Toulouse. 10.15, The North African "Journal sans papier." 10.30 (approx.), Close Down.

VIENNA (577 and 517.2 metres); 1.5 and 15 kW.—Programme relayed by Graz (357.1 metres), Innsbruck (294.1 metres), Klagenfurt (272.7 metres) and Linz (251.2 metres).—11.0 a.m., Programme of Popular Selections by the Vienna Symphony Orchestra. 4.0 (approx.), Concert of Light Orchestral Music. 6.15 (approx.), Concert. 8.30, "Sonja," Operetta in Three Acts, by Rudolf Presber and Leo Stein, under the direction of Victor Flemming, Musical Setting by Leo Ascher. 11.0 (approx.), Close Down.

VILNA (435 metres); 1.5 kW.—12.0 Noon, Time Signal and General News Bulletin, relayed from Warsaw. 12.15 (approx.), Orchestral Concert and Talks. 8.15 (approx.), Concert, followed by Time Signal and General News Bulletin, relayed from Warsaw. 10.30 (approx.), Dance Music Selections. 11.30 (approx.), Close Down.

WARSAW (1,111 metres); 10 kW.—19.15 a.m., Divine Service, relayed from a Polish Cathedral. 12.0 Noon, Time Signal and Fanfare from the Tower of Notre Dame Church in Craoew, Aerial Route Conditions and Weather Report. 12.10 to 3.55, No Transmission. 3.55, Weather Forecast. 4.0 to 5.0, Three Agricultural Talks. 5.0, Popular Concert of Orchestral Music. 6.30, Variety Programme. 6.50, Historical Talk. 7.15 to 7.45, Interval. 7.45, Talk. 8.15, Concert of Instrumental and Vocal Music by the Orchestra of the Philharmonie de Varsovie, under the direction of J. Oziminski and arranged by the "Radio Polonais"—Artists: L. Dworakowski (Violin Solos), H. Ostrowska (Pianoteur). 10.0, Time Signal, Aviation Route Report and Weather Forecast. 10.5, General News Bulletin. 10.20, Police Notes. 10.25, Sports News. 10.30, Dance Music by the Orchestra of the Oaza Restaurant, conducted by W. Roczkowski and J. Karbowiak. 11.30 (approx.), Close Down.

ZAGREB (319 metres); 0.35 kW.—11.30 (approx.), Orchestral Concert. 2.0, Relay of the Official Opening of the New "Gradjanski" International Motor Racing Track. 8.30, Wireless Propaganda Talk, followed by Dramatic Programme.

ZURICH (593 metres); 1 kW.—11.0 a.m. (approx.), Instrumental Concert. 12.29, Weather Forecast. 12.59, Concert of Orchestral Selections. 4.0, Concert by the Carletti Orchestra, relayed from the Carlton-Elie Hotel. 7.30, Sermon. 8.0, Orchestral Concert. 8.30, Recital of Songs and Selections from Operettas, by Karl Melzer of the Zurich Stadt Theatre, with Accompaniment by the Station Orchestra and Otto Strauss at the Piano. 10.0, Weather Forecast, Last News Bulletin and Close Down.

CURRENT

TOPICS



HIND

Events of the Week

in Brief Review.

3,477 LICENCE INCREASE.

2,511,736 broadcast receiving licences were current at the end of July compared with 2,506,259 at the end of June.

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SAFETY FIRST!

"Do not solder the circuit we publish this week or any other!" says an Irish newspaper. "Our season programme is rich in experimental propositions."

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POPE'S BROADCAST MESSAGE.

A message from the Pope, intended for the whole world, was broadcast from the Sydney station, 2FC, on Thursday last by Cardinal Cerretti on a wavelength of 28.5 metres.

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JOAN OF ARC AND WIRELESS.

Apropos of our note in last week's issue concerning the choice of Joan of Arc by French radio operators as the patron saint of wireless, we now learn from the "Universe" that such a decision was "out of order." The journal states: "Such a proclamation, where Catholics are concerned, is reserved to the Holy Father, though His Holiness would naturally take into consideration the wishes of the persons concerned."

THE LATEST GADGET.

The newest American de luxe receiver incorporates a self-winding electric clock built into the front panel. The manufacturers are the Sleeper Radio Corporation of New York.

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MARCONI PATENT ROYALTIES.

Since our last issue went to press the Comptroller-General of Patents has published two decisions of great importance to wireless users and to the industry generally.

In the application of the Brownie Wireless Company for a licence to manufacture valve sets under patents held by the Marconi Company, the tribunal decided that the royalty of 12s. 6d. per valve holder payable to the Marconi Company should be reduced to 10 per cent, on the wholesale selling price, subject to the minimum payment of 5s. on the first valve holder and 2s. 6d. on each additional valve holder.

In the case of the Loewe Radio Company, which applied for the grant of a

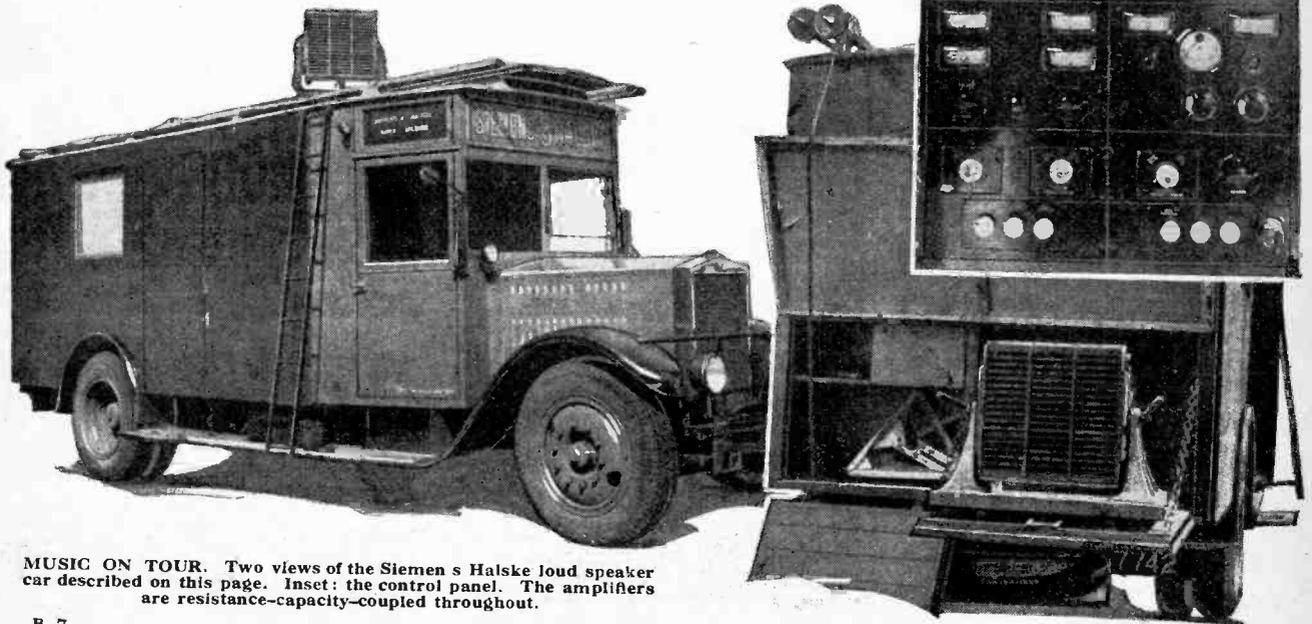
compulsory licence under Marconi patents to construct sets containing Loewe multiple valves, the tribunal decided that the royalty of £1 17s. 6d. payable on each triple valve should be reduced to 10s., and that of £1 5s. on the double valve to 7s. 6d.

Editorial comment will be found on page 273.

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STENTOR ON WHEELS.

The Siemens Halske broadcasting car, illustrated on this page, is at present being used by *The Evening News* for a tour of the south coast seaside resorts. Fitted with a six-cylinder Krupp engine and an unusually long wheelbase, the car incorporates not only an amplifying



MUSIC ON TOUR. Two views of the Siemens Halske loud speaker car described on this page. Inset: the control panel. The amplifiers are resistance-capacity-coupled throughout.

room, but a separate "studio" from which concerts can be broadcast. The equipment includes an electrically reproducing gramophone and amplifiers, together with a multi-valve wireless receiver operated from a receiving aerial which can quickly be erected on the roof.

The generators of H.T., L.T., and field current are actuated by an auxiliary shaft which can be thrown into action whether the car is moving or stationary, while a separate carburettor is used for slow running when the loud speaker is in operation. The H.T. generator supplies 1,500 volts at 1 amp.

The Siemens Halske loud speaker can be rotated in all directions. Although exceptionally powerful it yields remarkable purity of speech and music over great distances.

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THE BETTER PART OF VALOUR.

The Newcastle broadcasting station closed down during a thunderstorm a few evenings ago after warning listeners to earth their aerials.

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SHARE QUOTATIONS BY SHORT WAVE.

A request for a short-wave licence to transmit stock quotations from America to Europe has been refused by the U.S. Federal Radio Commission. The applicants, the International Quotations Company, have demanded a reconsideration of the application on the grounds that the decision was prompted by "powerful interested organisations."

The Autumn Awakening.

While many societies make hay while the sun shines, a great many prefer to confine their energies to the autumn and winter months. There are now unmistakable signs that this busy season will shortly be upon us. Club secretaries are busy preparing syllabuses for the winter, and these will shortly blossom forth in those little printed brochures which the genuine enthusiasts cherish in their breast pockets until winter is past or the brochures are in tatters.

We shall be glad if secretaries will remember to forward their programmes to this office. The "Forthcoming Events" panel is carefully watched, and often leads to an accession of new members, particularly when the menu is appetising.

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A Provocative Debate.

During the summer months the Stretford and District Radio Society was responsible for several interesting activities, the most successful of which was the provision of a loud speaker van to advertise the local Hospital Pageant on July 21st. During the close season the club headquarters have been redecorated, and arrangements are in hand for a grand reopening to-morrow, Thursday, September 6th, when a debate will be staged under the provocative title "Are Radio Societies Played Out?"

Hon. Secretary: Mr. W. Hardingham, 21, Burleigh Road, Stretford, Manchester.

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Organised Visit to Olympia.

A feature of considerable value to the wireless beginner has been inaugurated by Slade Radio, Birmingham. This consists of readings from standard works on wireless to be given on alternate Thursday evenings and followed by a discussion. It is hoped that by this means beginners will rapidly acquire sufficient knowledge to enable them to profit by the more advanced lectures given at the ordinary meetings of the Society.

The Society is organising a special trip to the National Radio Exhibition at Olympia on

BI-LINGUAL WIRELESS JOURNAL.

Latest in the field of wireless journalism is the "Indian Radio News," which is printed in English and Bengali. The paper is published fortnightly, price one anna, at 5-1, Kenderdine Lane (Central Avenue), Calcutta.

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LOUD SPEAKERS IN A CHURCHYARD.

For the thanksgiving service held at St. Martin-in-the-Fields last week in celebration of the Peace Pact, loud speakers were placed in the crypt and also in the churchyard, thus enabling an overflow congregation of over two thousand to participate.

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NO WAR, NO WIRELESS.

The scheme for the erection of a high power wireless station at Canberra, as reported in our issue of July 4th last, has been vetoed by Mr. Bruce, the Prime Minister. The station had been advocated as a precautionary measure in case of war, but Mr. Bruce contends that under the present pacific conditions the precaution is unnecessary.

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PRACTICAL "JOKE"?

The American Radio Relay League has offered a reward of £100 for the apprehension of the person who transmitted messages purporting to have been sent by Messrs. Hassell and Cramer from the aeroplane Greater Rockford which has been missing since it left Ontario for Greenland on August 18th.

The S.O.S. signals were picked up on 42 metres by a member of the A.R.R.L., Mr. Joseph Williams, of Toledo, Ohio, and stated that the airmen were stranded

NEWS FROM THE CLUBS.

September 29th, and there is evidence that a large number will take advantage of these arrangements.

Full particulars can be obtained from the hon. secretary, Mr. H. Clews, 52, St. Thomas Road, Erdington, Birmingham.

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New Club for Glasgow.

Before the days of broadcasting a very active radio club flourished in Glasgow, but for some unknown reason the society appears to have faded away. A number of enthusiasts are now endeavouring to found a new society, and it is believed that it is only necessary to mention such a project in order to enlist the sympathies of the many wireless amateurs in the Glasgow district. All interested are invited to communicate with Mr. A. Weir Mitchell, 237, North Street, Charing Cross, Glasgow.

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A Successful Exhibition.

A demonstration of modern receiver principles was a feature of the exhibition recently held by the London Western Postal Radio Society. Great keenness was shown by the many visitors in the instruments on view, and it can be said that practically every type of set in common use was represented. The stewards were bombarded with questions throughout the exhibition.

The exhibition was divided into competitive and non-competitive sections, and prizes were given by the Dubilier and Igranite Companies. For the moving coil loud speaker demonstration accumulator high tension was provided by batteries lent by members of the Society.

Hon. Secretary: Mr. E. G. Nurse, Western District Post Office, London, W.1.

on an island 100 miles north of Newfoundland.

It is now believed that the message was a fake.

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TROUBLE OVER LEAGUE OF NATIONS WIRELESS.

The attitude of the Swiss Government to the proposal of a League of Nations wireless station at Geneva is causing dissatisfaction which, according to a Geneva report, may mean the departure of the League from Switzerland. Such a station would be used for private communications between members of the League.

The Swiss Government apparently offers no objection to the building of such a station, but demands complete control, only permitting the League exclusive use of the service in time of war. It is expected that the question will be raised during the present Assembly.

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METAL RECTIFIERS.

Attention is drawn to the need for employing transformers of good regulation in conjunction with the metal rectifier. A transformer of bad design which will give the required output on load may develop an excessive potential across its terminals when open-circuited. This potential rise when applied to a metal rectifier may have a detrimental effect on the rectifying cells. With a transformer of good regulation, however, there is little possibility of impairing the properties of the rectifier should it be switched into operation without a load in the D.C. output circuit.

Speech Amplification Described.

The modern method of addressing large audiences was demonstrated in an interesting fashion to members of the North Middlesex Radio Society at the last meeting, at which Mr. Kirlow operated a speech reproduction equipment. The microphone, which stood in front of the speaker and was energised by a 2-volt accumulator, produced speech currents which were fed by means of a step-up transformer into the grid circuit of the first valve of the amplifier. A three-stage amplifier was used, and speech from an adjoining room was delivered from the loud speaker at considerable volume. A stage by stage description of the apparatus was given, and attention was drawn to the modifications which would be made in a large installation of the commercial type where a number of banks of loud speakers would be used distributed over a large area.

In concluding his lecture Mr. Kirlow gave an amusing anecdote, which served as a warning. On one occasion he had been experimenting with a public address system, and had inadvertently omitted to switch off the apparatus at the end of the tests. When the ladies of the household subsequently began conversation in the room the effect was rather startling!

Hon. Secretary: Mr. E. H. Laister, "Endcliffe," Station Road, Winchmore Hill, N.21.

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North Middlesex Field Day.

The North Middlesex Radio Society will hold a field day on Saturday next, September 8th.

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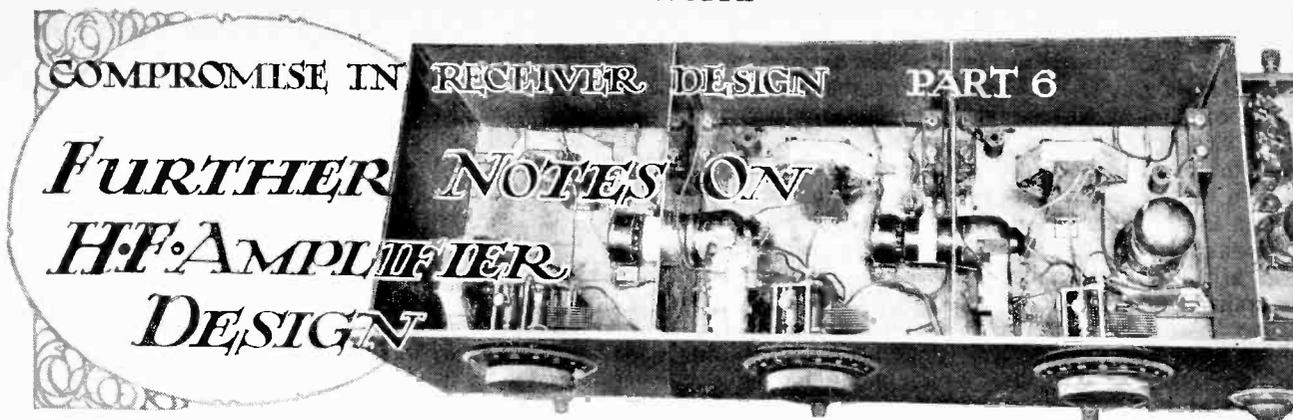
Transmitters in Conference.

The T. and R. section of the Radio Society of Great Britain will hold the annual convention on September 28th and 29th.

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Photo-Telegraphy in Operation.

Members of the Edinburgh and District Radio Society will pay a visit this evening (Wednesday) to the photo-telegraphy department of the "Scotsman" newspaper.



A Discussion on the Methods of Achieving Selectivity.

BEFORE the high-frequency amplifier can be built, or the design finally settled, it will be necessary to decide upon the number of stages of amplification that are to be used, and upon the number of tuned circuits that will be required. In a normal design these two points will, of course, be to a great extent interdependent, for whenever a stage of amplification is added an extra tuned circuit is added with it.

In practice, a receiver with no high-frequency amplification at all usually contains but one tuned circuit, and if there are n stages of amplification the number of tuned circuits is generally $n + 1$. Thus a receiver with one high-frequency stage will have two tuning controls, with two stages there will be three, and with three, four. If, as may very easily happen, it is found that all the amplification required can be obtained with only one stage of amplification, but that the selectivity afforded by two tuned circuits is insufficient, some departure from normal design is called for. In such a case it will, of course, be necessary to add a third tuned circuit to provide the additional selectivity that is required.

Wave-trap Difficulties.

This may, if desired, take the form of a wave-trap with which the interference it is desired to eliminate (usually the local station) can be "trapped out." On paper, at any rate, this is the best solution, because the interference can be removed without any increase in the general selectivity of the receiver, and hence without accentuating the inevitable loss of side-bands. Further, the presence of a wave-trap in addition to the two tuned circuits of the receiver should not add appreciably to tuning difficulties, as it will not need to be re-adjusted in passing from one distant station to another. The writer, however, is inclined to look upon the use of wave-traps with disfavour, because all those with which he has had experience have played such extraordinary tricks with the tuning of the aerial circuit of the receiver that they have added far more to the difficulties of tuning than any normally connected tuned circuit could possibly do. Perhaps his experiences with wave-traps have been unfortunate, or his experiments unskillfully conducted, but he has not been successful in obtaining satisfactory elimination of the local station without employing a coupling between trap and aerial circuit that

is close enough to make independent tuning of the two an utter impossibility.

If we decide on these grounds not to use a wave-trap—though it is only fair to say that some users wax positively lyrical about their efficacy—we shall have to use in place of it a tuned circuit connected in the ordinary manner. There are at least two ways in which this can be done. The first and most obvious of these is to arrange the extra tuned circuit as a loose-coupler, as shown in Fig. 1. The insertion of the additional tuned circuit makes but little difference to signal strength if it is properly designed, but there is undoubtedly a slight

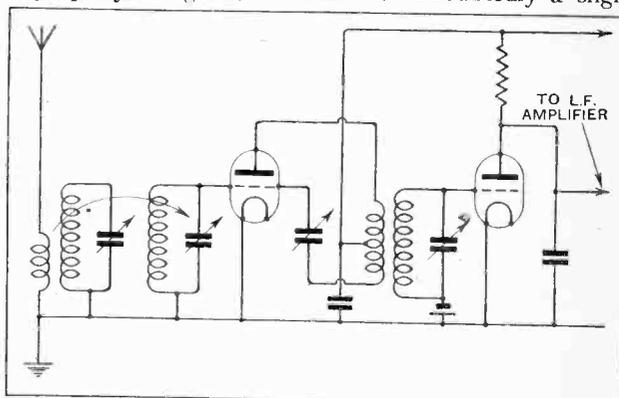


Fig. 1.—If an extra tuned circuit is required to increase selectivity it may be added as a loose-coupler.

loss, although to set against this the increase of selectivity obtained is very decided.

The chief problem arising in connection with the loose-coupler is that of finding a suitable way of coupling together in a variable manner the two tuned circuits. Now that plug-in coils and two-way coil-holders are little more than museum specimens, and find no place in any receiver having any pretensions whatever to efficiency, the old convenient way is no longer available, since with modern solenoid coils it is hardly practical to attempt to move them about bodily to vary the coupling between them. There are, however, several alternative methods which may be tried if variable coupling is insisted upon.

Electrostatic coupling may, for example, be used, a small variable condenser being connected in either of

Compromise in Receiver Design.—

the two ways indicated in Fig. 2. The arrangement of Fig. 2(a) is simple, but has the drawback of requiring a coupling condenser of extremely small capacity if too close a coupling is to be avoided. For this purpose the average neutralising condenser has much too large a capacity, and has in consequence to be adjusted almost to its minimum all the time. This difficulty is very simply surmounted by the arrangement shown in Fig. 2(b), which permits of the comfortable use of a neutralising condenser, or even of a "reaction condenser" of 0.0001 mfd. capacity, thereby being made quite convenient to handle and calling for no unusual component. An equivalent circuit could be made by connecting the coupling condenser to a tapping about one-fifth of the way up the secondary, and so dispensing with the separate primary. If the secondary is wound with Litz, the primary will probably be preferred as making for easier construction, while if the coil is wound with solid wire the tapping will prove quicker to arrange.

Further comments on capacity-controlled loose-coupling have recently appeared in these pages. (*The*

whereas this proceeding brings in its train a very decided loss in signal strength. If a closer coupling than this is used, the interactions between the two circuits makes tuning difficult and extremely exasperating. There is thus an optimum value for the coupling, which is practically invariable under all conditions. By the exercise of a little care and skill in fixing the relative positions of the coils in the set, this position can be found once and for all, so that the advantage of variable coupling is hardly great enough to warrant the existence of an extra control to deal with it. If the coils are permanently fixed so that they are very nearly, but not quite, in the position of minimum coupling, it will be found unnecessary to trouble about them further.

Aerial Dimensions and Selectivity.

As an alternative to the use of a loose-coupled aerial circuit, it is possible to insert two tuned circuits, in place of the usual one, between the high-frequency amplifying valve and the detector—or, if more than one high-frequency stage is in use, between these stages. The effect is much the same, so far as selectivity is concerned, as is obtained with the loose-coupled aerial circuit, and practical details of a receiver embodying this arrangement have been published in this journal, and may be consulted by those interested.¹ Mention is made of it here chiefly to draw the attention of those seeking very high selectivity to the possibility of using the two schemes together in the same receiver.

A further possibility, when it is found that amplification is adequate but selectivity is insufficient, is the adoption of an extra stage of high-frequency amplification. Since we have assumed that the sensitivity is adequate without this extra stage, this would seem at first sight to be an extravagant way of attaining the increase of selectivity required. It is, however, not quite so wasteful as it appears, because the additional amplification afforded by the stage permits of a very considerable reduction in the dimensions of the aerial, which is in itself a very great aid to selectivity. Consequently, the addition of the extra stage of amplification, provided that a compensating change in the size of the aerial is simultaneously made in order to keep the sensitivity of the equipment as a whole roughly constant, confers a much greater increase in selectivity than can be attained by the addition of a simple loose-coupler. Nor does this extra bit of selectivity make tuning in any way more difficult or more complicated.

The Question of Cost.

Whether or no it is necessary to seek for selectivity over and above that afforded by the smallest number of tuned circuits that the number of high-frequency stages used naturally implies, is a question that must be decided by every designer for himself, bearing in mind all the advantages and disadvantages that selectivity

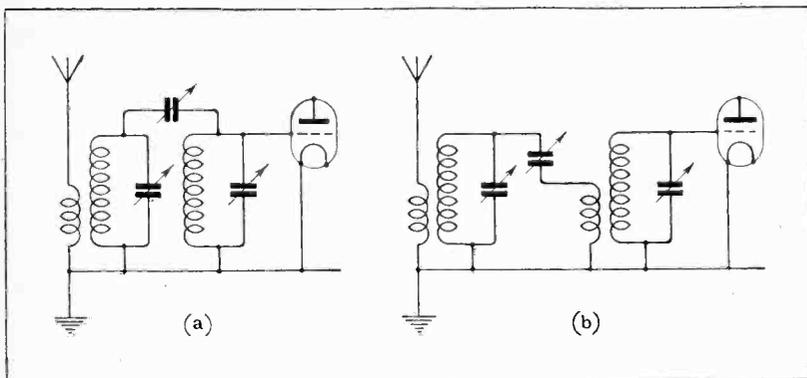


Fig. 2.—Examples of electrostatic coupling. In (a) a condenser of extremely small capacity is required. In (b) no unusual component is called for; the ordinary neutralising condenser has approximately the correct capacity.

Wireless World, May 9th, 1928, p. 489, and June 20th, 1928, p. 673.)

If the use of a condenser is looked upon with disfavour, variable coupling may be attained magnetically if there is no objection to constructing a special vario-coupler for the purpose. This may take the form of the usual three-inch tube bearing the secondary, and rotating within it a small coil of perhaps five turns or less, which is a part of the primary. The circuit of this arrangement is shown in Fig. 3. So far as the writer knows, it has no advantages over Fig. 2(b), other than the fact that the vario-coupler can be made at home, while the small condenser will probably have to be purchased.

But where, as in the case we are discussing, the loose-coupler is to be built in as an integral part of the set, and not just added as a kind of afterthought, it is not really necessary to make any arrangements at all for varying the coupling. With modern high-efficiency coils there is but little gain in selectivity to be had by loosening the coupling beyond the point at which the tuning of the two circuits becomes entirely independent,

¹ *The Wireless World*, May 26th, 1926, p. 689.

Compromise in Receiver Design.—

brings in its train. The nearness of the local station, the skill in tuning of the prospective user of the set, together with the degree of selectivity aimed at and the price-limit to which the designer is working, are the chief of the many factors which will control the decision. If this additional selectivity is required, the choice of the means of attaining it must be largely based on personal preference, for no one of the methods suggested has any overwhelming advantages over the others.

Influence of the Detector.

When discussing the choice of the detector, it was pointed out that for the most satisfactory working the leaky grid detector should be provided with quite a small input, and the signal strength should be made up to the required value by amplification after rectification. When an anode-bend rectifier is to be used, on the other hand, the bulk of the amplification should be done at high frequency, and the low-frequency amplifier should be quite a modest affair. We

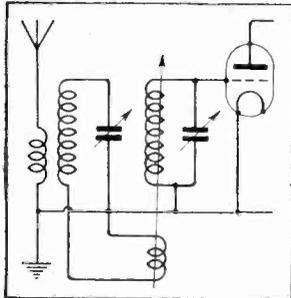


Fig. 3.—If variable magnetic coupling is favoured the Vario-coupler circuit here shown will be found satisfactory.

shall, therefore, arrive at very different high-frequency amplifiers for feeding the two types of detector.

It is a moot point whether it is necessary to use any high-frequency amplification at all before a grid detector. Certainly a receiver of the o-v-2 type, used under conditions where there is no serious local source of interference, will pull in a surprisingly large number of stations, though it is practically useless for any but local-station reception anywhere within a dozen miles of the latter except when equipped with a loose-coupler or a wave-trap. If expense is a really serious matter, there is much to be said for relying solely upon reaction for obtaining the distant stations. Quality will admittedly be bad if reaction is pushed to the limit, but this is of small importance in a receiver designed primarily for cheapness, for neither the low-frequency amplifier nor the output stage of a cheap receiver are such as to deliver signals of first-class quality.

If inexpensiveness is not the first consideration, or if the aerial available is not particularly good, one stage of amplification at high frequency may be deemed desirable. In this case the reaction control must be retained to counteract the damping imposed by the detector on the tuned circuit immediately preceding it, so that the circuit diagram of the receiver will be something like that shown in Fig. 4.

The diagram shows a neutrodyne circuit, though a screened-grid valve might equally well have been used; in either case, although it is essential to retain the reaction control, there is no need for it to take the exact form shown, for there are plenty of alternatives. In passing, it may be remarked, as the point is frequently overlooked, that all forms of reaction control involving the movement of a coil are dangerous where high-fre-

quency amplification is in use, as the moving coil is very liable, at some stage of its movement, to couple with the wrong tuned circuit, and so introduce serious complications into the task of neutralising the receiver.

Owing to the amplification afforded by the first valve, it should not now be necessary to press reaction to anything like the extent required if this valve is omitted, so that quality should be quite good.

Except when employing a minute aerial, the writer would not recommend the use of more than one stage of amplification before a grid rectifier, otherwise overloading of the detector valve, accompanied by distortion of a very unpleasant form, is likely to ensue. If a greater measure of selectivity is required than is compatible with this limitation, it is recommended that an anode rectifier be employed.

In this case a far greater measure of high-frequency amplification can usefully be employed—indeed, must be employed if the highest efficiency is required of the receiver. The writer, who is a bit of an extremist, would be inclined to employ two stages with a full-size aerial, and three with an indoor aerial or a frame. The amplification, however, would be cut down below the maximum attainable in order to retain good quality, and to make the stabilisation of the receiver comparatively easy.

A highly efficient stage can be made to amplify about forty times, but there is some difficulty in persuading each of two stages in cascade to provide so large a contribution as this and still to achieve perfect stability. Nor is it necessary to try, for the resulting amplification

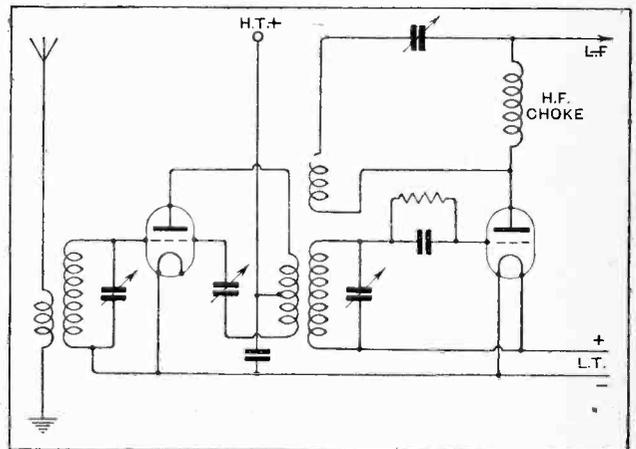


Fig. 4.—Where leaky grid rectification is employed, reaction is advisable to counteract the damping on the tuned interstage coupling.

of 1,600 times would be unnecessarily great, except where a very small aerial was in use. If the coils are wound astatically with Litz, or normally with solid wire, it is possible to reduce the amplification to some twenty times per stage, or four hundred times in all, which is a much more suitable value for our purpose.

It is important to remember, however, that whereas in designing an amplifier to precede a grid detector, there always remains the possibility of decreasing the resistance of at least one coil by means of reaction, and increasing the amplification attained very largely in so

Compromise in Receiver Design.—

doing, we are deprived of this resource when an anode detector is in use. The design of an amplifier for an anode rectifier should therefore allow for a generous measure of amplification, quite apart from the fact that this detector requires a large input for satisfactory operation. If too much amplification is provided, it can always be reduced by detuning or by dimming the filaments of the H.F. valves, keeping the full amplification in reserve for the really faint stations.

It will have been gathered that the writer does not contemplate the use of reaction in any form with an anode rectifier, for he is of opinion that the extra amplification attained by its use is too small to warrant the introduction of an extra control knob. As a direct consequence, the two-H.F. receiver with an anode rectifier possesses no more controls than the one-H.F. receiver with a grid rectifier, and so is, if anything, easier to handle. The extra selectivity afforded may, therefore, be regarded as a free gift, since there are no corresponding drawbacks other than those which must inevitably accompany selectivity, however attained.

If for any reason it is thought that the erection of a two-stage high-frequency amplifier is too ambitious an

undertaking, it is quite possible to make do with one only, though the single stage must then be made as efficient as possible, and some care must be exercised in choosing, and adjusting accurately, a valve which is highly sensitive as an anode-bend detector. Since the input to the detector will be smaller, a greater measure of low-frequency amplification must be provided, so that there will probably be no saving of valves. This design is likely to appeal primarily to those who live at some considerable distance from the nearest station, and who have in consequence no great need for selectivity.

Conclusion.

The writer is quite well aware that, in this last section of the series, he has presented his own opinions as to the best forms of high-frequency amplifiers to use instead of giving, as was his original intention, as detached a commentary on the various possibilities as his prejudices would permit. In view of the enormous scope of the subject, this was found to be inevitable if the discussion was to be kept within a reasonable compass, but it is confidently expected that the reader's violent disagreement with some of the opinions here expressed will serve to remind him that there is still much to be said for other compromises, made along quite different lines.

RELAY STATION CHANGES.**An Official Statement Issued by the B.B.C.**

DURING November and December ten relay stations will take over the national exclusive frequency of 1,040 kilocycles (288.5 metres), replacing the international common frequencies which they have been sharing with stations abroad. The process will be a gradual one, each station changing its frequency as soon as the necessary additional plant is installed. The few programme changes involved will take effect on November 1st.

Heterodyne interference has become so serious on the international common frequencies that the service areas of relay stations have shrunk to from one-half to two miles radius during the hours of darkness, thus seriously discounting their value under existing conditions.

Pending the introduction of the regional scheme, rather than withdraw the relay stations, an attempt will be made to revive their usefulness by the expedient of single wavelength working. It is anticipated that this will considerably improve conditions of reception, particularly in the thickly populated areas of Liverpool, Stoke-on-Trent, Bradford, Hull, Sheffield, Swansea, Plymouth and Dundee. Leeds being in such close proximity to Bradford, and already working under conditions moderately free from interference, will continue on its present frequency of 1,080 kilocycles (277.8 metres). The exclusive frequency of Bournemouth—920 kilocycles (326.1 metres) will be transferred to Aberdeen. The reason for this is the importance of enabling Aberdeen to serve a much wider area than is possible on a common frequency—national or international. The transmitter at Bournemouth will continue its service on the national frequency of 1,040 kilocycles (288.5 metres). It is anticipated that this arrangement will

provide adequate service for Bournemouth itself, while the surrounding district will normally get its programme from Daventry 5XX.

The disadvantage of the changes will be in some reduction of the proportion of local programme material at relay stations. During the main evening period of transmission all ten relay stations will be bound to radiate the same programme. Experience proves that after nightfall stations on the same frequency, even a considerable distance apart, radiating different programmes, seriously interfere with each other's service. This disadvantage is partly offset by the probability that in the daytime, when interference is less acute, "group" transmissions will be satisfactory. "Group" programmes are programmes originating within the region concerned.

While "group" programmes will be composed mainly of material from the regional centres—Manchester, Glasgow, and Cardiff—it is hoped to retain and incorporate the best and most characteristic items of established local features, such as the Children's Hour.

Nottingham will take its place beside Birmingham in the service area of 5XX and 5GB. The transmitter at Nottingham will give way to the more efficient and uninterrupted transmitters at Daventry.

These arrangements are necessarily experimental, designed to supplement the service during the interim period which must elapse before the new regional system of high-power stations is fully inaugurated.

The Board of the B.B.C. feel that the substantial benefits to be derived from these changes will more than offset the temporary inconvenience caused in the adjustment of receiving apparatus.

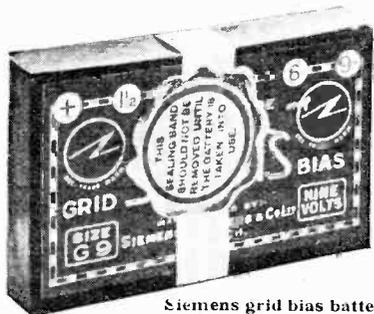


WIRELESS WORLD
LABORATORY TESTS

A Review of Manufacturers' Recent Products.

SIEMENS G.B. BATTERY.

The success of the popular type (green label) high tension batteries has induced Messrs. Siemens Bros. and Co., Ltd., Woolwich, London, S.E., to produce a 9-volt grid bias battery of the same type. The new battery, which is known as type G9, weighs 11oz., and measures



Siemens grid bias battery G9 "Popular" type.

5 x 1 x 3 3/4 in. Sockets are provided for tapping off intervals of 1 1/2 volt. The price is 1s. 6d.

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MARCONIPHONE COIL DRIVE LOUD SPEAKER.

The most interesting feature of this new loud speaker is the method of suspending the cone. This is attached to a brass rod projecting from the centre pole piece by two thin paper webs, one at the apex of the cone near the pole piece and the other half-way down the cone. Parallel movement of the cone without side play is ensured, and in consequence the air gap has been considerably reduced, enabling the requisite flux to be produced with much less expenditure of power in the field magnet. It is natural to enquire whether the restoring force due to two centring webs would introduce resonances, but the makers claim that any trouble from this source has been overcome by correctly proportioning the thickness and strength of the material in the webs. The edge of the cone is free in the acoustic sense, but carries a light felt ring which prevents circulation of the air round the edge of the cone at very low frequencies.

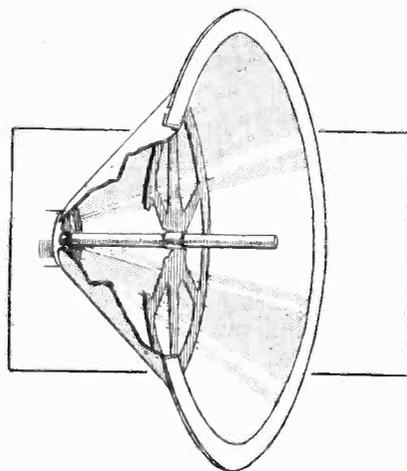
The performance of this loud speaker is as near perfection as one could wish. It is certainly impossible to detect any signs of resonance, high notes are reproduced with brilliance, the bass is present in natural and not overpowering volume, and there appears to be less rounding of transients, thus giving unusually faithful reproduction of the musical effect known as "attack."

Another important quality of the Marconiphone moving-coil loud speaker is its sensitivity. In this respect it is even better than a loud speaker with balanced armature movement. The direct consequence of this is that more than sufficient volume for domestic use can be obtained with an output valve of the standard "super" power type such as the D.E.5A or the new P625A. Using the latter valve with only 150 volts H.T., solo instruments, such as the violin, could be reproduced in a large room at twice their natural volume

Models are available for A.C. and D.C. mains or for 6- or 10-volt accumulators. The latter type consumes only 6 watts in the field magnet (1 amp. at 6 volts or 0.6 amp. at 10 volts), but the power consumption in the case of the mains units is higher. The D.C. model actually tested took 0.1 amp. at 200 volts



Marconiphone R.K. moving coil loud speaker.



Double suspension of cone in the Marconiphone R.K. loud speaker.

without distortion. This new model will do much to dispel the current belief that prohibitive power is necessary in order to get realistic results with a moving-coil loud speaker.

or 20 watts, but this cannot be regarded as excessive, since it is less than the consumption of a single electric light bulb. Half this power is dissipated in a series resistance which has been incorporated to make the unit suitable for 100-120 or 200-240 volts, so that the power taken at 100 volts would be only 10 watts.

The moving-coil unit alone, including output transformer, costs £6 6s. The oak cabinet models for 6-10-volt accumulator and D.C. mains cost £10 10s., and the A.C. model £16 16s. £1 1s. extra is charged in each case for mahogany cabinet.

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LEWIS EXPANDING SCREWDRIVER.— A CORRECTION.

The price of the large-size expanding screwdriver made by The Lewis Spring Co., Ltd., Resilient Works, Redditch, is 1s. 9d., and not 9d., as stated on page 205 of the August 15th issue.

USEFUL DATA CHARTS. (No. 8.)

The Reactance of a Condenser at Radio Frequencies.

IN the units which are most suitable for radio frequencies the reactance is given by:

$$\text{Reactance in ohms} = \frac{10^9}{\mu\mu\text{F} \times 2\pi \times \text{kilocycles}}$$

or in the alternative form:

$$\text{Reactance in ohms} = 531 \times \frac{\text{metres}}{\mu\mu\text{F}}$$

The second formula is an easier one for mental calculation; in the abac the right-hand scale shows both

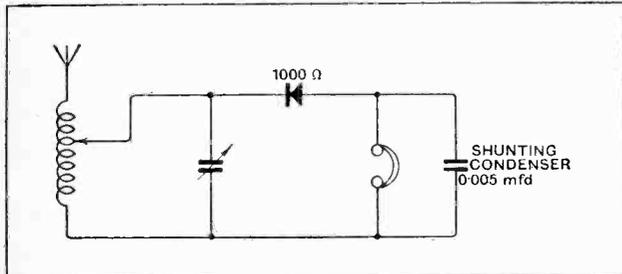


Fig. 1.—A typical crystal receiver. The abac accompanying this article is useful in determining the value of the condenser shunting the telephones.

megacycles and metres, since some readers prefer to think in frequency and others in wavelength.

A good exercise in the use of this abac is provided by the condenser which shunts the headphones in a crystal set (Fig. 1) so as to by-pass the H.F.

The impedance of the headphones at high frequencies is almost entirely due to the distributed capacity in the phones and their attached leads: an average value is 100 micromicrofarads. The reactance at a million cycles is given by the abac as 1,600 ohms, and since this reactance is in series with the crystal whose resistance is about 1,000 ohms it will, in the

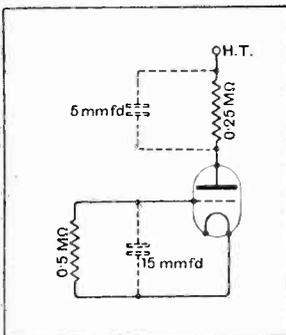


Fig. 2.—An equivalent circuit showing why a resistance amplifier is inefficient at radio frequencies.

absence of a shunting condenser, choke down the H.F. current and so diminish the rectifying efficiency of the detector. If now we shunt the phones by a 0.005 microfarad (5,000 micromicrofarads) condenser, whose reactance is read off as 32 ohms, a path of low impedance is opened up for the H.F. current and the crystal will act at full efficiency. We must take care, however, that the speech frequencies are not shunted away from the phones. Abac 7 shows that a 0.05 condenser has a reactance of 3,200 ohms at 1,000 cycles, and, therefore, a 0.005 will be equivalent to 32,000 ohms: the phones will have an impedance of about 3,000 ohms, so that they will evidently take nearly all the speech current.

Turning to another subject let us see why a resistance-

capacity amplifier fails at radio frequencies. The plate resistance (Fig. 2) is shunted by its distributed capacity which may amount to 5 micromicrofarads, whose reactance at a million cycles is 32,000 ohms, so that although the plate resistance is 0.25 megohm, the effective impedance is only about 30,000 ohms. Again, a valve with a 4-pin socket will have a grid-filament capacity of perhaps 15 micromicrofarads, the corresponding reactance being 10,700 ohms, which acts in parallel with the grid leak and thus throws a heavy load on the preceding plate circuit of the amplifier. The grid-filament capacity is smaller in the case of a valve such as the DEQ, in which the grid connection is led out to a terminal at the side of the valve tube, but even in this case the capacity will be 5 micromicrofarads and the reactance of 32,000 ohms will lower the total grid-filament impedance excessively.

In the first stage of a L.F. amplifier a resistance of 0.25 megohm is often inserted in series with the grid as

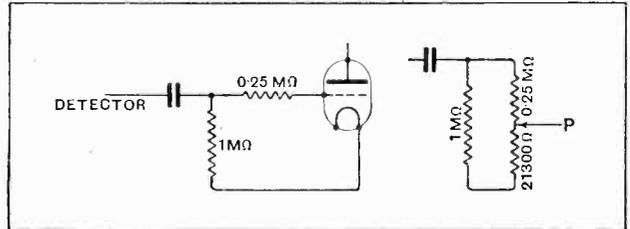
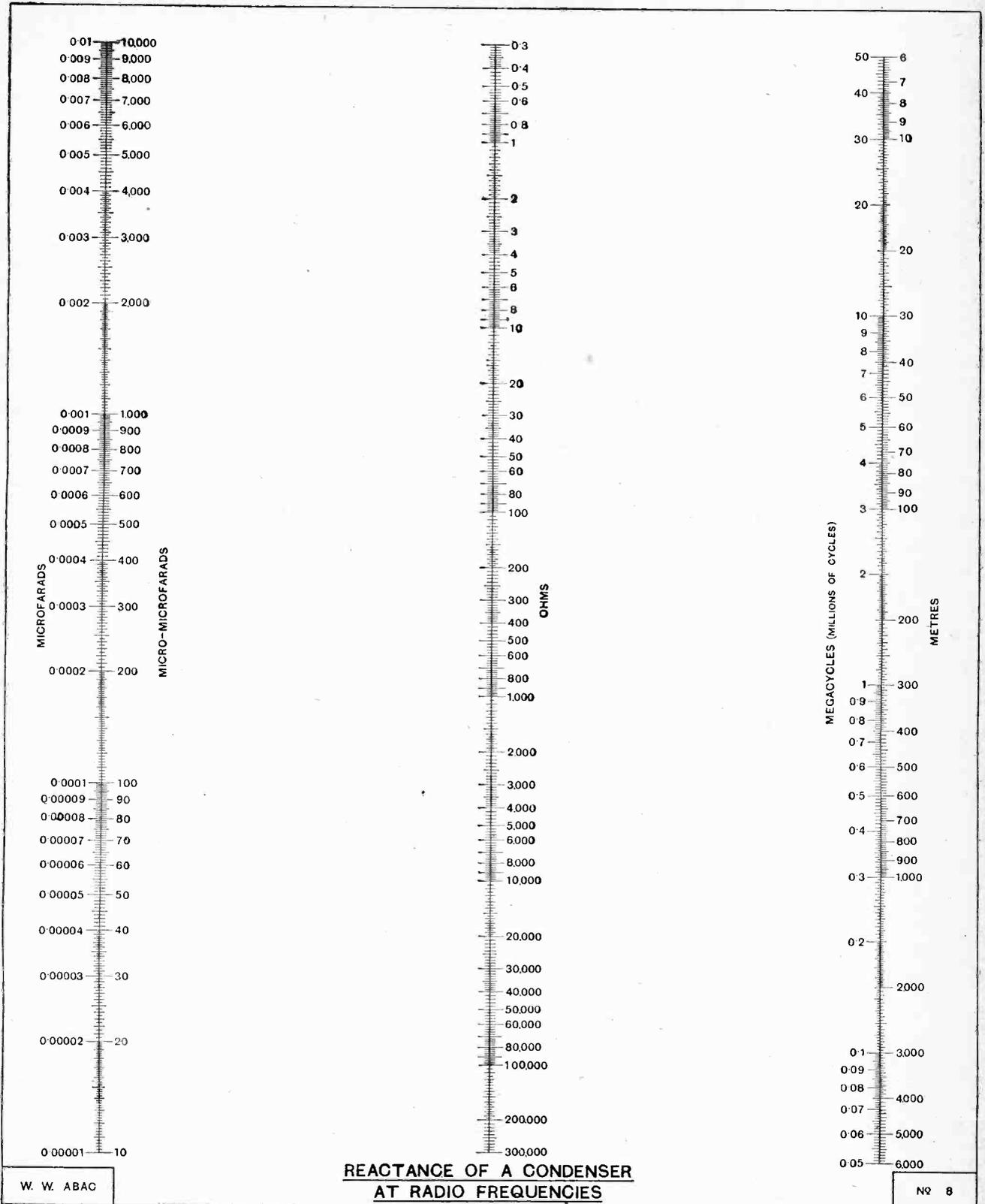


Fig. 3.—The actual and equivalent circuits containing a H.F. stopper resistance.

in Fig. 3, with the idea of keeping the H.F. oscillations out of the L.F. stages. At first sight this device would seem meaningless, but when we recollect that the grid-filament capacity of 15 micromicrofarads has, at 600 metres, a reactance of 21,300 ohms, we see that the diagram can be re-drawn showing this reactance in series with the 0.25 megohm, so that any H.F. voltage applied across the grid leak is considerably attenuated at the point P. Practically no attenuation of speech frequencies will take place, since at 1,000 cycles the reactance is 10.7 megohms (this can be ascertained from abac 7 by finding that 0.015 microfarad corresponds to 10,700 ohms, so that 0.00015 microfarad will correspond to 10.7 megohms). The addition of capacities in series is a troublesome operation to carry out numerically. If the capacities are C_1 and C_2 , their resultant C_3 is given by $\frac{1}{C_3} = \frac{1}{C_1} + \frac{1}{C_2}$ which is an operation too difficult to carry out mentally. Usually, however, we only want to know the resultant reactance, and this is simply the sum of the two separate reactances. Thus, at a wavelength of 600 metres the reactance of 100 micromicrofarads is 3,180 ohms, while that of 1,000 micromicrofarads is 318 ohms: if these capacities are in series we add the reactances and get 3,498 ohms as the answer. The resultant capacity comes out at once by putting a ruler across 3,498 ohms and 600 metres, and the answer is 90.9 micromicrofarads. R. T. B.



W. W. ABAC

№ 8



News from All Quarters : By Our Special Correspondent.

Relays on a Common Wavelength.—5SW : A Query.—“Surprise Night.”—Listening to Radio Plays.—Broadcasting on the Paris Stage.—Satisfaction in South Africa.

The Relays.

As forecast exclusively in these columns last week, the B.B.C. is about to embark on a scheme whereby the relay stations are to work on a common wavelength, this being the national common wave of 288.5 metres (1,040 kilocycles). The full official statement of the Corporation appears elsewhere in this issue.

B.B.C.'s “New Home.”

Despite the publicity given in the last week or two to the suggestion that the B.B.C. headquarters staff will shortly forsake Savoy Hill for more commodious premises, I understand that the whole question is still only a matter of conjecture. The Savoy Hill offices were overcrowded a year ago, which was one reason why Captain West's research department moved to Clapham.

Why Not More “Proms”?

There is still time for the B.B.C. to include more Promenade Concerts in the broadcast programmes. On an average 2LO and 5GB between them relay only three of the concerts a week; this number could quite easily be increased. The argument that too much broadcasting would be antagonistic to box office receipts at the Hall itself is not supported by first-hand evidence. On a recent Bach evening I found the Hall uncomfortably full, though the performance was being broadcast from 2LO and 5XX!

September “Proms.”

According to present arrangements, Promenade Concerts are to be relayed from the Queen's Hall to 2LO and 5XX during September on the following dates : September 6th, 14th, 17th, and 28th. 5GB listeners will hear “Proms” on September 1st, 3rd, 7th, 13th, 15th, 19th, 26th, and 27th.

Sunday at Ostend.

Sunday next, September 9th, has been chosen for a Continental relay by 2LO and 5XX from the Kursaal at Ostend.

The symphony orchestra will be under the direction of M. Francois Rasse, and

the vocalist, Mlle. Eugenia Buyko, will sing three ancient chansons, “Marie-Madeleine au desert,” “Chanson religieuse du Troubadour,” and “Complainte de Saint Nicolas.” The orchestra will play the conductor's own suite, “La Maitre a Danser,” and items by Lalo, Mendelssohn, Massenet, and Tchaikovsky.

FUTURE FEATURES.

- London and Daventry (5XX).**
 SEPTEMBER 13TH.—Swiss National Programme.
 SEPTEMBER 15TH.—“Tommy's Tours,” a programme by Messrs. Tommy Handley and Company.
Daventry Experimental (5GB).
 SEPTEMBER 10TH.—“The Two Talismans,” an Eastern Comedy by George Calderon.
 SEPTEMBER 11TH.—“King Lear.”
 SEPTEMBER 13TH.—A Summer Symphony Concert, relayed from the Winter Gardens, Bournemouth.
Cardiff.
 SEPTEMBER 9TH.—A Service in Welsh, relayed from Ebenezer Welsh Congregational Church.
 SEPTEMBER 11TH.—“Romance Unlimited” (Second Edition). More Microphone Matrimonials by Dorothy Eaves.
Manchester.
 SEPTEMBER 10TH.—A programme by Bert Feldman's “White Blackbirds,” relayed from the Central Pier, Blackpool.
Newcastle.
 SEPTEMBER 11TH.—Municipal Orchestral Concert from Whitley.
Glasgow.
 SEPTEMBER 13TH.—Scots Vaudeville Programme.
Aberdeen.
 SEPTEMBER 13TH.—Programme by the Scottish National Players.
Belfast.
 SEPTEMBER 13TH.—“The Mystic Trumpeter.” Words by Walt Whitman. Music by Sir Hamilton Harty.

Without Comment.

A weekly journal of the non-wireless variety informed its readers last week that the Postmaster-General was so impressed by the parliamentary criticism of B.B.C. programmes that he proposed in future to send Lord Wolmer to the Savoy Hill programme meetings when he is unable to be present himself.

This tit-bit was followed by the declaration that “the whole of the B.B.C. is in a wild tumult about whether there should be women announcers.”

Is 5SW Still Experimental?

Letters which appear from time to time in the columns of *The Wireless World* give eloquent testimony to the delight with which 5SW, the Chelmsford short-wave station, is heard in distant corners of the world. But the station is still experimental, and it is therefore rather surprising that the B.B.C. is at present making no systematic attempt to collate reports. When 5SW first opened we were told that expert observers in different parts of the world were to render carefully considered reports on 5SW's signal strength at different times of the day. On enquiring at Savoy Hill, I found that this part of the scheme appears to have fallen in abeyance.

Are we to take it, then, that 5SW has now passed the experimental stage and is now the fully fledged Empire broadcasting station of Great Britain?

“Foundations of Music”: An Innovation.

In the past the “Foundations of Music” series broadcast from 2LO each evening at 7.15 have for the most part consisted of instrumental music. A new departure will be made in the week beginning September 17th, when madrigals will be sung by the Wireless Singers. The chorus master is Mr. Stanford Robinson.

For Gramophone Enthusiasts.

Readers who have recently become interested in the gramophone owing to the advent of electrical reproduction should make a point of listening to a gramophone recital to be given from 2LO on September 21st. This will consist of records showing the progress of gramophone recording since the old-fashioned cylindrical records of the 'nineties down to the electrically-recorded discs of today.

Chief Rabbi to Broadcast.

The Chief Rabbi, Dr. J. H. Hertz, will broadcast a talk on “The Day of Atonement” from 2LO on September 23rd

Friday is Hair-raising Night.

It looks as if the Friday evening "Surprise Item" will become an institution. The idea of a broadcast nightcap of this sort was first mentioned in *The Wireless World* in June last. It was felt that the introduction of an element of suspense would avert the tendency for programmes to "fizzle out" with nothing but the announcer's farewell greeting by way of dramatic climax.

If the success of the feature is to be sustained, the "stunt department" must be given full rein for the display of the genius which led them to take us into the King's Cross signal box a fortnight ago. This was a piece of real imaginative enterprise.

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Some Ideas.

What about a few minutes in the offices of one of the great "dailies"? 11 p.m. would be the ideal time for "seeing the paper to bed." Some of us, again, would probably enjoy hearing the cross-chat at the speaking tube in the Savoy Hotel kitchen while theatre suppers are being ordered. Or would this interfere with subsequent sleep?

"Take us to Madame Tussaud's," somebody will suggest, "and let us listen to the unearthly silence of the Chamber of Horrors."

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A Radio Nightmare.

A tale comes from Paris of a listener who fell asleep with the phones on his head. Although the set was tuned in to a perfectly innocuous programme from Radio Paris, consisting of light orchestral music and vocal items, the sleeper dreamt (a) that he was back in the trenches during an artillery barrage, (b) that his favourite dog went mad and bit him, (c) that he was almost overwhelmed in an eruption of Vesuvius, and (d) that he met his death in a railway accident.

The only moral to be drawn from this seems to be that if you really must sleep with the phones on, first switch off the set.

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Listening to Radio Plays.

A chat over the coffee cups after we had listened to a radio play the other evening showed that there are several conflicting views regarding radio drama. One member of the group—a hardened playgoer—asserted that the radio play has attained the summit of development and that it remains a pale and ineffectual attempt to ape the legitimate drama of the stage. His antagonist, who happened to be a young woman with a profound knowledge of cinematographic art and its exponents, hotly contended that radio drama was "all right if you look at it the right way."

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An Argument.

Knowing what the lady meant, I offered my strong support. Switch off before it is too late, I urged, rather than court the disappointment which is in-

evitable if you expect a broadcast play to save you the bother of exerting a little imagination. The playgoer retorted that it was the imagination of the playwright that we paid for; if we had to use our own it was like having to bring bread and cheese to a restaurant. The young lady then chimed in with the indelicate but forceful remark that it was no use entering a restaurant without your digestive organs, and these were analogous to the imagination required by the audience. Here, again, I think she was near the truth.

o o o o

B.B.C. Views.

I understand that the attitude of the B.B.C. to radio plays will find expression in the booklets, referred to last week, which are to be issued in connection with the National Drama series of broadcasts.

In the case of plays not specially written for broadcasting, the confession is made that they are not easily comprehensible by the listener to whom they are not already familiar. The Dramatic Department argues that there is a quantity of information connected with the details or structure of any work of art without which many of its finer points may be missed. This is the information which the booklets are intended to furnish.

Plays written or specially adapted for broadcasting should not, of course, re-

St. Leger Broadcast.

A running commentary on the St. Leger will be broadcast by Mr. R. C. Lyle, the well-known racing correspondent, on September 12th.

o o o o

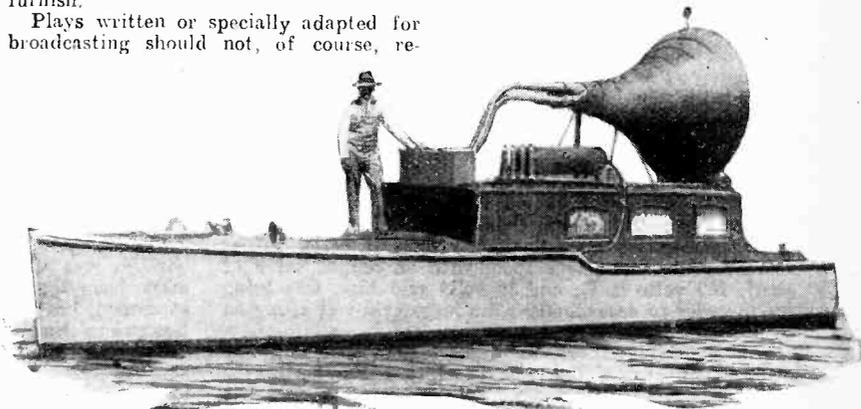
Yodelling from 2LO.

A Swiss national programme from 2LO on September 13th will include yodelling music by Ernest Ansermet, who has on several occasions conducted for the B.B.C. in London, and an account of the historic feat accomplished by the mountaineers who were the first to climb the Matterhorn.

o o o o

Broadcasting on the Stage.

M. Amiel, the author of "L'Image," recently produced in Paris, makes a neat and novel use of a broadcast receiver. The lonely heroine, telephoning to a friend, and wishing to "prove" that she has a houseful of guests, has the bright idea of moving the mouthpiece of the telephone up to the loud speaker, which at the moment is reproducing jazz from a dance hall. Simultaneously she protests that she "can't hear herself speak when they leave that door open," and on "closing" the imaginary door, removes the telephone again and apologises to her friend for the interruption.



"TELLING THE WORLD." This picture, which comes from Los Angeles, shows a loud speaker which is reputed to carry a man's voice over a distance of four miles. Several diaphragm units are employed.

quire outside aids of this description, though there are doubtless many people who share the view of a correspondent whose letter recently appeared in a daily paper. She asked that listeners should be provided in advance with the full text of every play broadcast!

o o o o

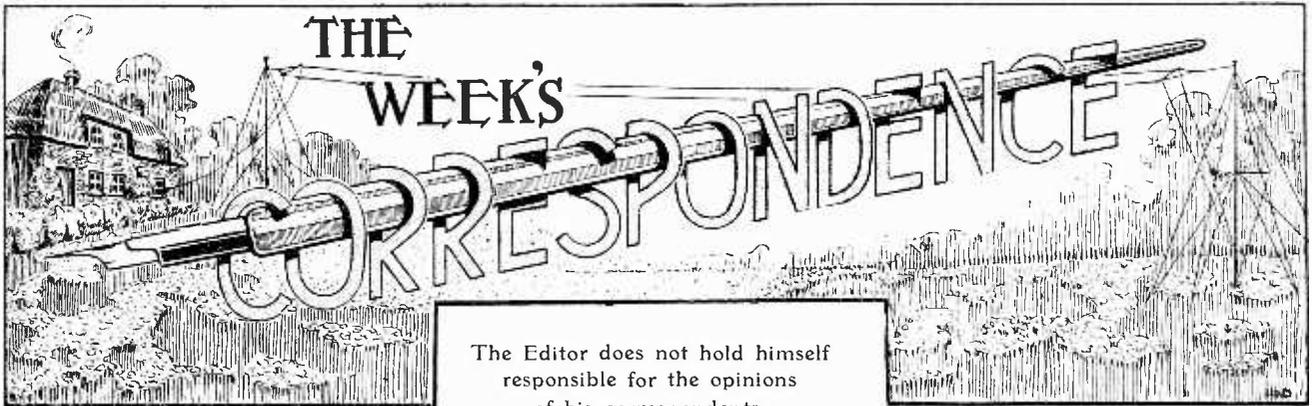
Horrors!

"The Greater Power" is the title of a dramatised novel to be broadcast from 2LO and 5XX on September 18th. This is frankly a thriller. It is the story of a disgruntled man who seeks to revenge himself on an unkind world by attempting to exterminate the human race. The author, Francis J. Mott, seeks to convey the horror of the use of death-rays and similar devices to the listening audience. The action takes place in the year 1978.

Joys of Anticipation in "S.A."

Not long ago the air of Cape Town was blue with the imprecations of listeners whose ideas about broadcasting programmes did not coincide with those of the good people at the Cape Town broadcasting station. Happily a change must have taken place, for one now hears that "the most enjoyable, or shall we say, the most anticipated, programmes are those of the Cape Town station." I assume that in a comment of this kind, South African "Wireless Weekly" voices the opinions of its readers.

By the way, that phrase, "the most anticipated programmes," is one of the happiest I have heard. If anticipation carries with it half the joy of listening, we can be assured that the B.B.C. will always give us 50 per cent. satisfaction



Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Tador Street, E.C.4, and must be accompanied by the writer's name and address.

COMPROMISE IN RECEIVER DESIGN.

Sir,—I have read with considerable interest the articles on the above very ambitious subject. Whilst most of the conclusions of your contributor are sound, there are a number of points which are open to criticism. To discuss all these would occupy too much space, so for the moment I will confine my remarks to the reference to the horn type of loud speaker.

Your contributor, in discussing an *inferior* cone type of loud speaker, says that "it lies, in its general characteristics, very close to the best of the horn loud speakers." If he had said this of the *best* of the cone type (excepting, of course, the moving coil type) I might have agreed. I have tested on a good set various types of cone speakers, including those which are accepted as the best, and having made a number of experiments with the horn type I would say definitely that the best horn type is superior to the best cone. Another statement made is that "If the loud speaker is of the horn type it will not be of any advantage to try to obtain loud signals, on account of the lack of bass notes in such models." With a properly designed unit and a straight logarithmic horn 8ft. 6in. long I get all the bass that anyone could desire, with a satisfactory response throughout the musical scale. The volume is adequate in a large room with an output valve of 3,000 ohms, 150 volts H.T., and 16 volts grid bias, this being necessary in order to accommodate the large grid-volt swing on the low notes.

I have no financial interest in either loud speakers or any other wireless apparatus, but I do feel that the horn type of speaker has not had a chance. To say that "it does not seem necessary to bother about frequencies lower than about 200 cycles" may be justified when applied to some of the trash put on the market, but to even talk of a cut-off below 70 cycles with a good horn type speaker is quite unjustified.

Derby.

H. H. DYER, A.M.I.E.E.

August 15th, 1928.

5SW.

Sir,—I wish to express appreciation of the programmes regularly received here by short-wave from 5SW.

I use a three-valve set built for me by an amateur in Canada of American parts. I have excellent results but find considerable difficulty in the maintenance of batteries, being some distance from a battery-charging station.

We listen regularly to the New Princes orchestra and to the orchestras at the Carlton and the Savoy and other places. On most nights reception is good enough for loud speaker. Some time ago we listened to the broadcasting of the singing of a nightingale at Pangbourne, in Berkshire, received on loud speaker.

One realises the difficulty of compiling programmes in advance, but it would be a great boon to distant listeners. The mail takes three weeks or more to reach some parts of Nigeria.

Two comments on the broadcasting I have recently heard are :

first, that no items of news are broadcast; and, secondly, that no broadcasting takes place on Saturday and Sunday nights, particularly on Saturday nights, when the duties of the day do not require one to rise early the following morning. One does not think of suggesting these as complaints, being happy to hear so much as one does.

We are fortunate in this—that, with British Summer Time, Big Ben is heard at midnight in Bida. A. G. BEATTIE,
British West Africa.
Supt. of Agriculture.
July 25th, 1928.

Sir,—I see reports from time to time, and from various parts of the world, on the reception of the B.B.C. short-wave transmitter 5SW at Chelmsford.

It may be of interest to you to know that 5SW is taken regularly, and at loud speaker volume, here.

Sunday programmes from 5SW would be very acceptable.
Quebec, Canada. D. H. BARCLAY.

July 31st, 1928.

INTERFERENCE.

Sir,—As your correspondent points out in this week's issue, wireless is a very great boon indeed to those of us who live away from the dear homeland, and, so far as this district is concerned, has been a real pleasure to listen to until within the last two or three weeks.

Ordinary interference from shipping and from local signal stations can be accepted without murmur, because in the majority of cases the interference only lasts for a relatively short time, and takes place at lengthy intervals, giving periods of comfortable reception for nine days out of ten; similarly atmospherics have to be accepted with due resignation, especially at this time of the year.

Your correspondent referred to transmissions being mutilated in the mornings by the arc transmission of the high-powered long-wave station at Croix d'Hins, near Bordeaux, and spoke of its appalling interference. I wonder if this particular transmission is responsible for the recent prolonged and constant interference we are now being treated to in this district—morning, noon and night, weekdays, feast days, Sundays and every day. If by an odd chance his transmission is silent when one switches on, in a very short time a shrill whistle comes along, lasting several seconds, and followed by a succession of three dots and a dash, repeated *ad infinitum* until some sort of a signal unfolds itself. His rest periods are filled in with that cursed three dots and a dash.

We have had this interference several times during the last couple of years, and someone told me it was due to an emergency set in use at Bordeaux, owing to some breakdown in the main station transmitter. That seemed quite a feasible reason, because the interference ceased after a few days or so; on the present occasion there seems to be no immediate prospect of relief, as it has lasted nearly three weeks.

Is there no possibility of an appeal being made to some

central authority, such as at Geneva? Surely it is a crime for such a transmitter to be allowed to continue to function and to mutilate the ether, even in the sacred cause of commerce.

Bilbao.

August 5th, 1928.

FASTIDIADO.

P.S.—I ought to have mentioned that the interference is concentrated exactly on the Daventry long-wave transmission.

PIANO BLASTING AND MOVING COIL REPRODUCTION.

Sir,—Your correspondents who complain of piano blasting may be interested and perhaps surprised to hear that the higher notes of the piano, even when played softly, are, *electrically*, among the loudest passages handled by their receivers, and cause excessive voltage swings which are not always accommodated by the capacity of the valve and its grid bias.

I observed this by means of recording instruments when the trouble was first mentioned several years ago.

Some of the loudest passages from organ, band, and orchestra give only half the voltage fluctuations of these piano notes. That is to say, the aural intensity of sound from a loud speaker is not alone an indication of its electrical intensity, and it is a false notion to assume that because a hefty orchestral passage sounds perfect that the valves are capable of carrying anything and that the grid bias is adequate.

The correspondence on moving coil speakers is amusing. One gathers the impression that the owners of these white elephants are endeavouring to feel pleased with them, while at the same time being conscious of "something not quite right."

Before investing in a moving coil I am waiting to hear one that will turn out speech as natural and clear as I can now get it from a 16-year-old horn speaker with reed movement and new type of baffle, render musical tones in their correct relative proportion, and do its work without a prodigious expenditure of energy.

In my experience the cause of the doubtful reproduction given by a large number of M.C. speakers is due to high L.F. amplification of a badly rectified signal; a rectified signal that with two moderate L.F. stages would be passably good.

The introduction of an eddy current circuit inside the moving coil, making it dead beat, is an improvement, as without this it is obvious there is too much "overshooting the mark," so to speak, of the moving coil, resulting in a peculiar "wuffiness" on certain notes and harmonics peculiar alone to this type of speaker.

B. S. T. WALLACE.

Norbury S.W. 16.

August 15th, 1928.

MOVING COIL REPRODUCTION.

Sir,—The letters on moving coil reproduction have nearly all mentioned the treble blasting effects on piano transmissions.

The B.B.C. are blamed for so many things that I refrain from saying that they are the sinners, but the following facts are interesting.

Before we get to the facts a little explanation is necessary first.

I have lost the greater part of my hearing. To listen to broadcasting I use headphones shunted across the coil of a H.R. moving coil loud speaker. To listen to the piano at home I have, with the help of a very kind gentleman on the B.B.C. engineering staff, evolved an approximation to the Reisz carbon microphone. It is a long way from being perfect, and the imperfection lies chiefly in the higher frequencies with which we are concerned.

Now the facts. People listening to the piano transmission *via* my M.C. loud speaker complain of this treble blasting. I hear it also on my headphones. Disconnect my headphones and they still hear it on the L.S. Disconnect the L.S. and I still hear it on my headphones, so it cannot be an effect of shunting the L.S. with the phones. It might be the set.

The set is one H.F., an anode detector (P.M.5x), a D.E.5b resistance coupled to an L.S.5a, with 400 volts on the plate and 180 volts G.B. This valve runs at a dull red heat; incidentally I think we might cut out overloading in the set. In parenthesis it is surprising how easily the L.S.5a is overloaded by drums. The D.E.5a brigade would be astonished!

For reasons of portability the amplifier I use with the imita-

tion Reisz microphone cannot have more than 100 v. H.T. It is invariably overloaded, yet when listening to my wife playing the piano there is not a trace of this treble blasting.

On a home-made microphone with an amplifier with no overload factor of safety the piano is as perfect as I could wish for. On a good set with ample margin against overload it is bad. Why?

R. G. KENNARD.

Kingswood, Surrey.

August 15th, 1928.

Sir,—Several of your correspondents have recently stressed the impossibility of obtaining realistic reproduction from moving-coil loud speakers working from average sets. I would suggest, however, that even with the most carefully designed L.F. amplifiers, only those fortunate enough to reside in the service areas of 2LO, 5XX or 5GB can rely upon obtaining results consistently good enough to do justice to a moving-coil speaker.

My set consists of two stages of H.F. amplification, anode bend rectifier resistance-coupled to a 10,000-ohm. valve followed by an A.F.5 transformer and, in the output stage, an L.S.5A valve with 350 volts on the anode. This set surely deserves a moving-coil instrument, but not more than a quarter of the reproduction I can get will do justice to a "Kone" loud speaker.

Here in Northumberland we have two alternative sources of programme. The first is the local station taking most of the London programmes through 300 miles of land-line. This is a reliable source of second-rate quality. The other is 5XX, an unreliable source of music of excellent quality, which, at its best, is certainly worthy of a moving-coil speaker, but in the summer is usually spoilt by atmospherics. After dark in the winter periodic fading and severe night distortion usually spoil reception. From the local station we also have to suffer much more of that irritating modulation control than is noticed from 5XX, and over-modulation is much more frequent. Instead of tracking down oscillators, I wish the B.B.C. would employ some of their vans in a tour checking the quality of the provincial stations.

B. P.

Whitley Bay, Northumberland.

*August 18th, 1928.

Sir,—After very careful consideration of the various points raised for and against the coil-drive loud speaker by correspondents in your columns, we are under the impression that many of your non-technical readers may be left with the idea that such loud speakers require experts to use them, and a large quantity of apparatus and power to back them up.

Mr. West's letter also appears to suggest that the coil-drive loud speaker may be likened to the racing car, and its real place is in the experimenter's laboratory.

We have recently carried out considerable experimental work with coil-drive loud speakers, with a view to their embodiment in inexpensive commercial receivers, and in view of the fact that it was highly probable that our commercial receivers would be called upon to feed coil-drive loud speakers, using comparatively small battery power.

The results of these experiments show us that a perfectly straightforward and simple 2-valve receiver, using 100 volts high tension, can be made to operate a coil-drive loud speaker with full volume for an ordinary living room, and the quality of reproduction is far superior to anything that we have been able to obtain using any other form of loud speaker.

We have also been experimenting for a considerable period with coil-drive loud speakers and super power amplifiers, and we appreciate exactly the type of results that can be obtained with such apparatus under varying conditions.

Our sole purpose in writing this letter is to remove any doubts from the minds of the less technical of your readers as to the possibility of utilising coil-drive loud speakers with inexpensive and economical apparatus. May we advise them, through your columns, not to be frightened by the "400-volt L.S.5A Brigade," and to assure them that, at the forthcoming Radio Exhibition, they will be able to hear coil-drive loud speakers being operated from simple 2-valve sets.

Warwick.

EAGLE ENGINEERING CO., LTD

August 16th, 1928.

COLIN H. GARDNER,

Technical Department

READERS' PROBLEMS

"The Wireless World" Supplies a Free Service of Technical Information.

The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.

Grid Bias for H.F. Valves.

What is the reason for the application of negative grid bias to an H.F. amplifying valve? I notice that it does not affect the quality of reproduction as with an L.F. amplifier.

K. C. A.

Negative grid bias is applied to an H.F. amplifier primarily with a view to preventing the flow of grid currents, thus reducing damping effect exerted on the circuit by the valve, and, generally speaking, improving both selectivity and sensitivity. Furthermore, the consumption of anode current will be reduced, and the useful working life of the valve will be increased.

□ □ □ □

Impedance and Input.

Your recent review shows that the Mul-lard P.M.4D. valve has normally a very low impedance, but in spite of this fact an A.C. resistance of some 6,000 ohms is increased to 50,000 ohms when biased for rectification. It would therefore appear that a valve of higher normal impedance would be quite useless as a bottom bend rectifier followed by a transformer, assuming its impedance to go up in equal proportion. I have recently been experimenting with a 20,000 ohm valve used in this way, with a good L.F. transformer, and find that quality is very pleasing; the low notes are apparently present at good strength. Is this a delusion, or is it possible for the combination to give good results?

B. S. R.

The P.M.4D. valve, biased for anode bend rectification, would have the high impedance mentioned only when dealing with a very weak signal. Now, in practice one does not usually operate a rectifier of this kind on small inputs, and the effect of a reasonably large H.F. voltage on the grid is to reduce its mean negative potential, and consequently its impedance. The same applies to the valve you have been using.

□ □ □ □

L.F. Stability Assured.

My receiver contains two H.F. stages coupled by neutralised H.F. transformers, the detector being followed by a single L.F. amplifier. Am I likely to benefit in the matter of quality by adding the anode feed resistance scheme?

V. D. S.

Is you have attained complete stability

as far as the H.F. side of your set is concerned, we do not think that you are likely to gain anything by fitting decoupling resistances; a receiver of the kind described is not likely to suffer from L.F. instability.

□ □ □ □

The "D.C.5."

Will you show me how a gramophone pick-up may be connected to the "D.C.5"? I should prefer to fit a switch by means of which it could be thrown in or out of circuit at will.

C. K. S.

If your pick-up is of average sensitivity, we think it probable that it will give sufficient output fully to load the

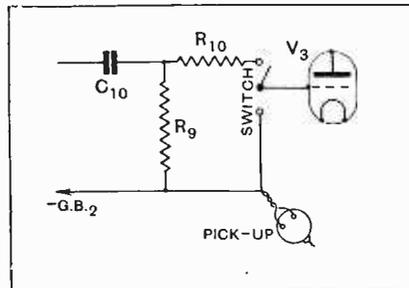


Fig. 1.—Gramophone or wireless: how to connect a pick-up to the "D.C.5."

push-pull output valves if it is connected in the grid circuit of the first-stage L.F. amplifier. A circuit diagram showing the necessary alterations is given in Fig. 1.

RULES.

- (1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."
- (2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.
- (3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.
- (4.) Practical wiring plans cannot be supplied or considered.
- (5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.
- (6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers. Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

Mains-fed Filaments.

I am about to construct the "D.C.5," and should be glad to know if there is any technical objection to my using a battery for biasing purposes instead of taking "free" voltages from the drop across the resistances.

S. W. H.

There is no reason why you should not introduce the desired modifications. You could fit separate batteries for each of the push-pull output valves, and connect cells and a potentiometer in the H.F. grid return lead.

□ □ □ □

Red-hot Valves.

An H.T. voltage of 300 is used for my output valve, which is an L.S.5a. Its grid is biased to 65 volts negative, and the anode current passed is about 45 milliamps. I notice that the anode becomes a dull red colour after the set has been used some time. This heating can only be noticed when the room in which the set is installed is darkened. Do you think that the valve is likely to be harmed by operating it in this manner, or would you recommend me to reduce the applied H.T. voltage?

T. L. C.

Valves of the L.S.5 class are specially constructed and pumped with a view to being used with extremely high anode potentials, and it is found that they have a long life even when used under the conditions you describe. For the grid bias impressed the anode current would appear to be fairly normal.

□ □ □ □

Loud Speaker Resonance.

My horn loud speaker gives a rattling, metallic sound on certain notes. What do you consider to be the probable cause of this, and how can it be remedied?

M. T. V.

It seems likely that there is mechanical looseness in one or more of the loud speaker parts; you should assure yourself that the diaphragm is firmly mounted on its seating, and also that the base of the horn is properly secured.

Effects similar to those described are sometimes traced to the fact that a piece of loose metal is resting on the upper surface of the diaphragm, or that there is insufficient clearance between the diaphragm and the pole-pieces. A tendency of your receiver to over-emphasise certain frequencies might be a contributory cause.

The Wireless World

AND
RADIO REVIEW
(16th Year of Publication)

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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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A PAGE OF ANNOUNCEMENTS.

THE topic of conversation in wireless circles at the present time is, of course, the Olympia Radio Show, which opens on Saturday, September 22nd. *The Wireless World* is making special arrangements to report the Show in three special Show numbers. The issue of next week, September 19th, will comprise a Guide to the Show and will include a comprehensive forecast of outstanding features which will be on view, with a pictorial plan showing stand numbers. Our issue of September 26th will review in detail exhibits of every Stand, whilst our third Special Show Number of October 3rd will review the Show as a whole and comment on the trend of progress. All three numbers will be very much enlarged, so that the inclusion of pages devoted to the Exhibition will not replace space usually devoted to other matter.

As in past years, readers will find that these three Show numbers of *The Wireless World* will provide them with a comprehensive record of all new products of the season, and they will serve as a work of reference for a considerable time to come.

B 9

OLYMPIA SHOW COMPETITION.

IN connection with the Olympia Show this year, *The Wireless World* is conducting a Competition, the purpose of which will be to decide what, in the opinion of readers, are the best products showing at the Exhibition. Next week's issue will contain the entry form for the Competition, and a full announcement as to the manner in which the form should be completed. Readers are invited to contribute their views to a vote, and it is believed that the result of the ballot will provide information not only of great interest to our readers, but which will also prove valuable for the help and guidance of the manufacturers themselves, who will welcome the opinion of those more technical sections of the public who comprise the readers of *The Wireless World*, and for this reason the Competition has the official recognition of the Radio Manufacturers' Association, the organisers of the Exhibition. We hope that every reader will fill in the Entry Form and forward it to us so as to participate in the objects of the ballot.

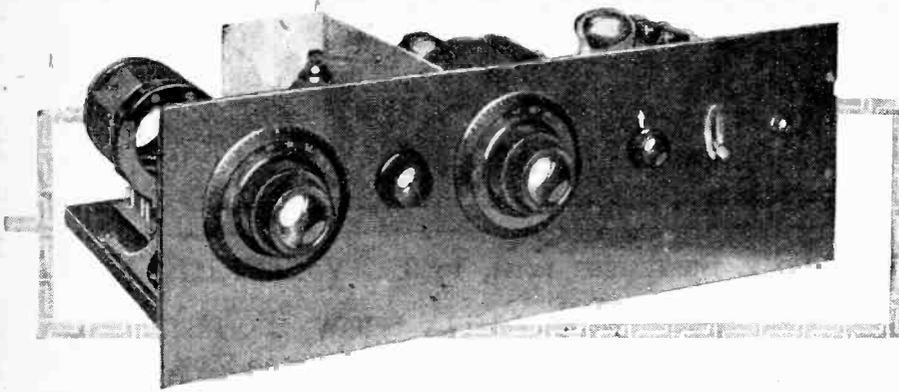
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NEW RECEIVERS.

IN this issue a theoretical description is given of a new receiver which we have named the "Megavox Three," and next week full constructional details for building the receiver will appear.

The receiver is fully up to date and employs a screened grid valve, detector and a Pentode for the output stage, making full use of the extraordinary performance of which the Pentode is capable. We have no hesitation in describing the properties of this receiver as remarkable, and we anticipate that it will become the most popular three-valve receiver so far produced. The receiver may be described as ideal, even for the exacting requirements of reproduction with moving-coil loud speakers, whilst the receiver has the further advantages that for a single stage of H.F. amplification the selectivity and distance-getting properties are exceptional. It is, perhaps, not commonly recognised as yet that with 150 volts available the Pentode, in conjunction with coil-drive loud speaker, will give a performance which, for quality, leaves very little to be desired in comparison with arrangements employing much higher anode voltages.

Another receiver described constructionally in this issue will meet the needs of a very large number of our readers, who have asked for an efficient long- and short-wave receiver which will allow of the change of wavelength range without interchange of coils.



A NEW RECEIVER

By

N. W. McLACHLAN, D.Sc.,
M.I.E.E., F.Inst.P.

The Design of a Screened Grid and Pentode Three.

IN the issue of *The Wireless World* for July 25th, 1928, I described a high-quality three-valve receiver under the title "The Pentode Quality Three," the receiver employing a pentode in the output stage. Constructional details for building the receiver were not given, but in the present article it is proposed to describe the design of a receiver embodying the circuit given in the previous article, but with several modifications, viz., the aerial coil, position of volume control, and the detector circuit. The complete arrangement with these modifications incorporated is shown diagrammatically in Fig. 1, whilst Fig. 2 illustrates the receiver in experimental form.

Combining the characteristics of the triode, tetrode and pentode, the receiver design given here embodies many new features of outstanding interest. Only three valves are employed, yet the performance both as regards range and quality will be found so remarkable as to set a new standard in receiver design.

Full constructional details of a receiver built to this design—the "Megavox Three"—will appear in next week's issue.

Next week a complete constructional article will appear describing how to build the receiver. The present communication is intended to give an outline of the principles of design of this receiver, which will be known as the "Megavox Three."

The circuit diagram given in Fig. 1 has been divided into two parts, one above the earth line and the other below. The components above the line constitute the receiver proper, whilst those below the line represent the battery feed and filter arrangements. This method of drawing the diagram is a personal preference, as it seems to me a better method than showing battery filter condensers and resistances

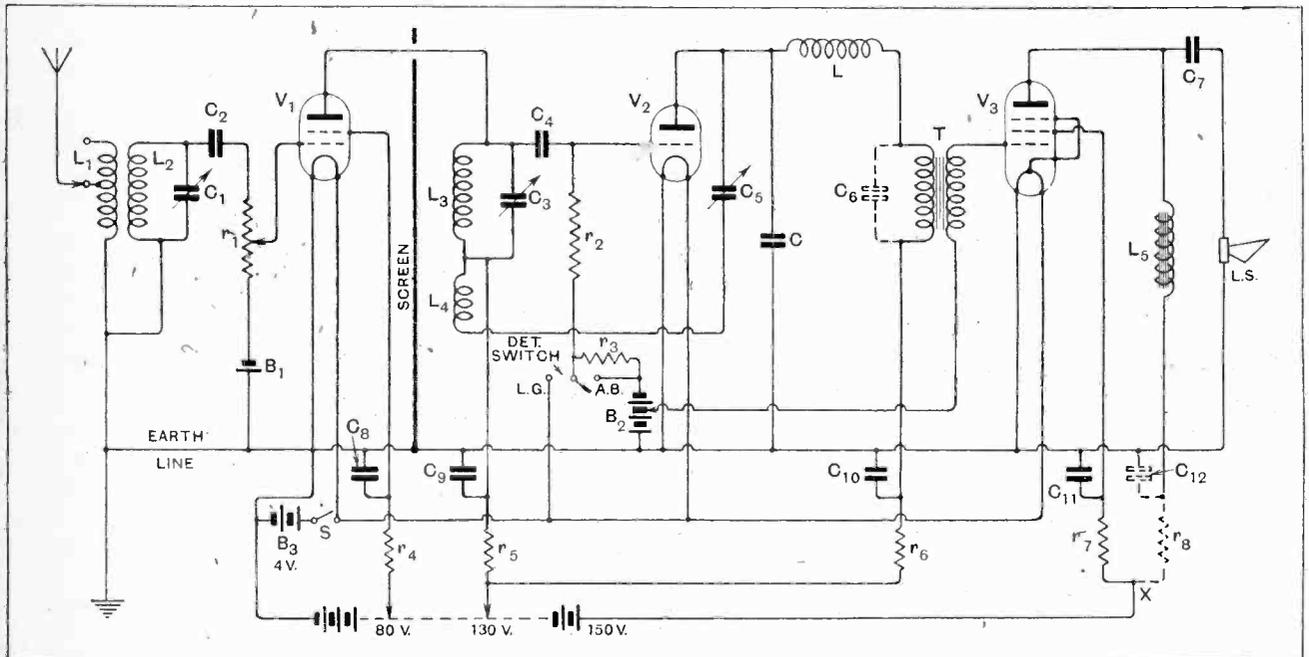


Fig. 1.—The circuit diagram. The values for all components will be given next week in a constructional article describing the "Megavox Three."

A New Receiver.—

mixed up with tuning condensers and coils. Referring to the diagram, Fig. 1, it will be seen that the aerial is transformer-coupled (auto or otherwise) to the tuning coil and condenser, which in turn is connected to the grid and filament of a high-frequency screened valve via a volume control. The anode circuit of the screened valve is joined to the grid and filament of the detector by means of a condenser and grid leak. The detector anode circuit is electromagnetically back-coupled to the grid, thereby obtaining reaction. This is conveniently done by using a Dubilier Toroid, which has a closely coupled internal winding.

Provision for Reaction.

To secure the requisite reaction control, a variable condenser is connected from the primary winding of the toroid to the anode of the detector. Adequate H.F. voltage is obtained on the anode by inserting a suitable radio-frequency choke, whilst a condenser is connected from anode to earth to make the reaction less critical and severe. This condenser also serves as a H.F. bypass when reaction is absent. To reduce capacity coupling to a minimum, the reaction coil is coupled to the zero potential end of the toroid. Rectification of the radio-frequency signals can be effected by either leaky grid or anode bend, a switch being inserted to change over from one method to the other. Provision is made to obviate the grid bias being removed from the detector during the transit of the switch, thus avoiding the passage of a heavy plate current through the primary of the transformer. The coupling unit between the detector and the pentode is a transformer of high primary inductance, giving a 3.5:1 step-up. A complete battery filter system is incorporated, so that the A.C. is confined almost entirely to its proper place, namely, in the receiver components.

One of the prerequisites in a modern receiver is a volume, intensity, or loudness control, so that the output from the loud speaker can be regulated to suit the

personal requirements of the listener. Various positions have been tried from time to time, viz., a rheostat in the filament circuit of a H.F. valve, a potentiometer in the anode circuit of the detector, or in the grid circuit of one of the L.F. valves. These methods are illustrated pictorially in Fig. 3. Personally, I find something to criticise in all three methods, and have, therefore, devised another scheme.

Readers of this journal are well aware that the voltage input to the detector valve must be neither too much nor

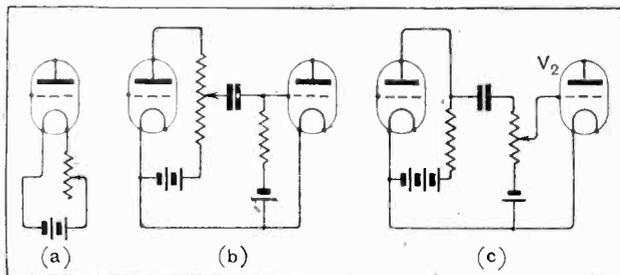


Fig. 3.—Three orthodox volume control schemes. (a) Rheostat in filament circuit of H.F. valve. (b) Tapped potential divider in plate circuit of detector. (c) Potentiometer in grid circuit of L.F. valve.

too little. In particular, to secure the best results with grid leak detection, the input should be confined within certain limits. This clearly points to a control which will permit variation in the voltage applied to the detector. For this, and other reasons given below, the control potentiometer is operated on the grid of the high-frequency valve, as shown in Fig. 4(a).

Low Loss Coils and Screened Grid Valves.

As I showed previously,¹ the simultaneous use of low-loss coils in the grid and anode circuits of a screened valve results in oscillation. This is due to the magnitude of the residual grid to anode capacity, i.e., with low-loss coils the capacity is not negligible. Now the receiver has for simplicity been staged to operate on an open aerial, and there are only two tuned circuits. The valve capacity imposes a limit to the efficiency of the coils, so that we must design for the maximum amplification and selectivity concomitant with stability. To get an absolutely stable combination, a solid wire toroid, as used in "Pentode Quality Three," meets the case. On the short-wave broadcast band no screen is then necessary to separate the grid and anode circuits of the H.F. valve. But I find that, although the

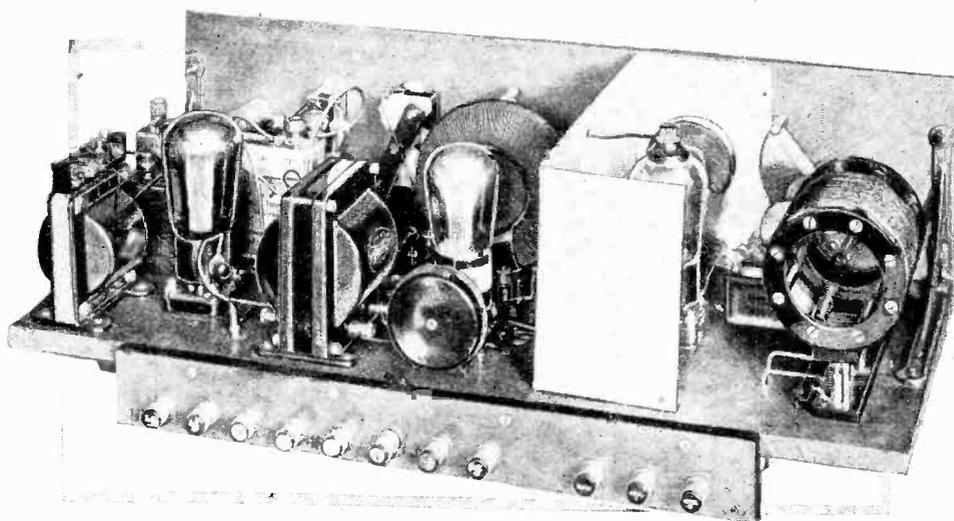


Fig. 2.—Rear view of the experimental receiver. The "Megavox Three" in final form as it will be described next week is identical in principle and circuit details.

B I P

¹ *The Wireless World*, August 31st and September 7th, 1927.

A New Receiver.—

toroid is satisfactory on long waves, it has too high a resistance on short waves. Moreover, the aerial coil resistance has been kept as low as permissible consistent with avoiding oscillation, and an earthed screen has been introduced to reduce the coupling between the grid and anode circuits of the H.F. valve.² Without this screen³ oscillation will occur.

The short-wave aerial coil is 27/42 stranded wire coupled to the aerial as shown at L_1 , L_2 in Fig. 1. The selectivity is improved and the tendency to oscillate lessened by using a 0.0005 condenser and reducing the coil inductance. This arrangement is, therefore, adopted in the present design. The long-wave coil is No. 30 solid wire wound in sections and auto-coupled to the aerial as shown in Fig. 5.

Operation of the Volume Control.

To receive distant stations, reaction is introduced in the detector circuit. This causes the resistance of the anode coil of the H.F. valve to decrease. Under certain conditions the resistance may be small enough to cause oscillation of the H.F. valve due to the feed-back through the residual valve capacity. This is quelled by (1) reducing the reaction condenser, (2) inserting a re-

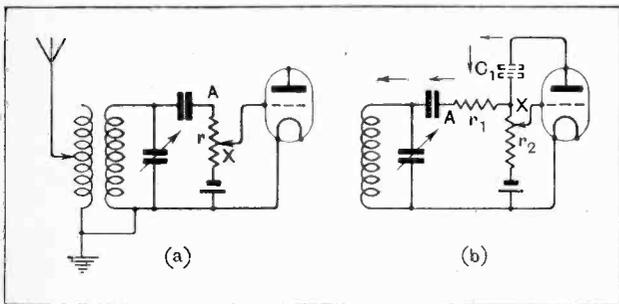


Fig. 4.—(a) The volume control takes the form of a 500,000-ohm potentiometer across the grid and filament of the H.F. valve. No alteration in selectivity is produced by moving the slider. In (b) C_1 is residual anode to grid capacity of valve. Note that the feed-back due to the valve passes through the resistance r_1 which is in series with C_1 . This prevents oscillation when using critical reaction on the detector.

sistance in series with the H.F. grid. The present volume control effects this latter operation in addition to its function as a potentiometer on the valve grid. As the grid tap point in Fig. 4(a) is brought down from A, a resistance AX is inserted in series with the grid-to-anode capacity C_1 of the screened H.F. valve (see Fig. 4(b)). This resistance can be increased until oscillation ceases. Although the resistance of AX can be varied, the damping resistance across the tuned circuit remains constant at 0.5 megohm. When there is no reaction on the detector unit (condenser at its minimum reading) this damping resistance is hardly necessary except perhaps for the lower wavelengths, where the dynamic resistance of the tuned circuit is higher and the valve capacity more prone (due to lower impedance) to promote oscillation. There is, of course, the aerial damping which increases with decrease in wavelength, and this may (according to the class of aerial and the degree of coup-

ling to the tuned circuit) be adequate to prevent oscillation.

Without a knowledge of the H.F. resistances of aerial, aerial coil, anode coil, the degree of aerial coupling and the valve capacity, a calculation of the stability of the system is out of the question. Moreover, the matter resolves itself into an experimental issue which can be tested quite easily. Broadly speaking, the 0.5 megohm resistance prevents the dynamic resistance of the tuned circuit from becoming unduly high, whilst its effect on selectivity and signal strength is of little consequence compared with its stabilising property. The various resistances associated with the tuned circuit are depicted in Fig. 6. In Fig. 7 the complete circuit of the H.F. valve is given. There are two oscillatory circuits, 1 and 2, interconnected by a condenser C equal to the grid-to-anode valve capacity. Assuming r_2 is zero, there may be sufficient feed back through C to cause oscillation of the complete system. By manipulating the potentiometer a resistance r_1 is joined in series with C. This causes a loss which can be made large enough to suppress oscillation. In actual practice, tested on various aerals, stability was complete on both long and short waves.

Leaky Grid v. Anode Bend.

In this receiver readers will have the opportunity—by means of a change-over switch—of testing the merits of the debatable question of anode bend versus leaky grid for detection. There are, however, several alterations in working conditions, which take place automatically in connection with this change-over. Since these cause a variation in the character of the reproduction—quite apart from the action of the detector—it is advisable to indicate what they are. (1) The damping of the

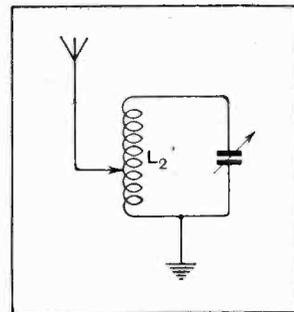


Fig. 5.—The long-wave aerial coil is wound with solid No. 30 S.W.G. wire, and is auto-coupled as shown here.

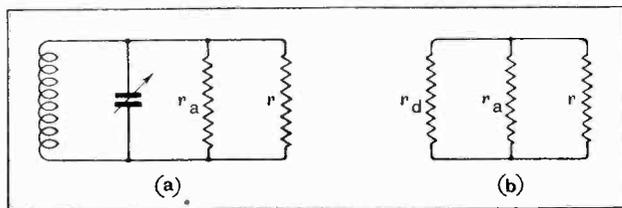


Fig. 6.—Diagram illustrating damping of aerial and potentiometer on a low loss coil. In (a) r_a is resistance equivalent to aerial damping; r is potentiometer of 0.5 megohm. In (b) r_d is dynamic resistance of coil and condenser at tune point. The effective dynamic resistance is the combined resistance of r_d , r_a and r in parallel. It is less than r_d .

leaky grid causes a slight change in tuning. Moreover, in switching over from leaky grid to tuned anode, the anode condenser⁴ may have to be increased slightly.

² In other words, we have deliberately sailed fairly near the wind.

³ If the screen is disconnected from earth, oscillation ensues,

⁴ When using reaction the two tuned circuits affect one another due to coupling through the valve capacity. Both may require a slight readjustment.

A New Receiver.—

Since the tuning with leaky grid is relatively flat, the proper procedure is to tune in on anode bend and then switch over to leaky grid. The switching can then be carried on as often as one likes. (2) The internal resistance of the detector is about 12,000 ohms with leaky grid detection, the anode feed current being about 4 mA.⁵ The result is to give the transformer a rising characteristic which will improve the upper audio frequencies and compensate for H.F. selectivity. With anode bend detection the feed current is reduced to a fraction of a milliampere, whilst the internal valve resistance is much greater than 12,000 ohms. This greater resistance will reduce the lower frequencies to an extent, and possibly cause a drop in the transformer characteristic at the upper audio frequencies. Moreover, with anode bend there will be a loss in brilliance as compared with leaky grid. Also, the greater selectivity with this mode of detection (due to absence of grid damping) will tend to accentuate this difference.

Practical Observations.

The results in practice corroborate these deductions. Up to the working limit, the leaky grid—even with a fair degree of reaction—gives a stronger upper register than anode bend. When working on the local station, this contrast can be reduced by mistuning both H.F. circuits if using anode bend.

To obtain the best results, the anode voltage should be higher for anode bend than for leaky grid. The voltage is regulated automatically when switching over, by using a resistance of 20,000 ohms (r_a in Fig. 1) in the battery filter circuit. With leaky grid the feed current is between 3 and 4 mA., thereby giving a drop of 60 to 80 volts in the resistance and leaving 70 to 50 on the valve. On the other hand, the feed current with anode bend is in the neighbourhood of 0.5 mA., which leaves 120 on the valve. The change-over from one to the other will permit a fair comparison of sensi-

tivity (using the same valve), but the quality will be affected as explained above.

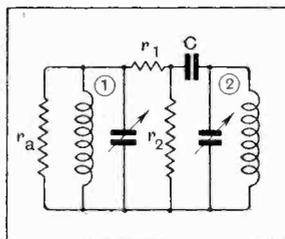


Fig. 7.—The complete H.F. valve circuit. (1) is tuned circuit on grid. r_a is aerial damping. $r_1 + r_2 = r =$ potentiometer. C is anode to grid capacity. (2) is the tuned anode circuit; the coupling condenser C_2 of Fig. 1 is large enough to be reckoned as a short circuit in comparison with C. r_1 suppresses oscillation by introducing r loss.

aerial, resistance and effective height, locality, valves, etc., etc. However, it may serve as a useful guide to know that big and little Daventry can be received with the aid of reaction at comfortable loud speaker strength in the heart of the metropolis on roof of wire. So far as loud speakers are concerned, the reader will do well to digest my recent remarks on the subject,⁷ but he will get adequate output on any type of loud speaker. For super-output, a moving coil of 2,500 turns of 48 enamelled wire should be used in a strong magnetic field.⁸ With 1/7th the input voltage to the pentode, the intensity will be approximately equal to that obtained with an LS5A fully loaded, using a coil of 1,000 turns and 300 volts H.T., i.e., double that applied to the pentode.⁹

⁵ I have in mind a station, say, 50 miles from the receiver, so that this volume control can be used to advantage, i.e., the pentode can be overloaded if desired.

⁷ *The Wireless World*, July 18th, 25th, 1928.

⁸ See remarks on field strength in *The Wireless World*, July 25th, 1928.

⁹ This estimate depends upon the internal resistance and magnification factor of the pentode.

⁵ The direct current through the primary should not exceed 4 mA. or the inductance will be on the low side. This was shown in *The Wireless World*, July 14th, 1926, p. 46. See curve of Fig. 5.

Revised "Q" Code.

The note on page 254 of our issue of August 29th was written before we had seen the complete text of the International Radiotelegraph Convention of Washington, which was issued by H.M. Stationery Office about ten days ago, and we find we were in error in attributing the modifications to American amateurs.

Under the terms of the Convention the old "Q" code will be revised and considerably extended; in fact very few of the original "Q" signals will retain their old meanings. Space does not permit of our printing the new code, which will, presumably, come into operation in January, 1929, but it may be found in Appendix I of the Radio Telegraphic Regulations approved at the Washington Conference. There are 67 "Q" abbreviations available for all ser-

TRANSMITTERS' NOTES AND QUERIES.

vices as compared with 52 in the present code and, in addition, 25 for use especially in aircraft service, and 54 miscellaneous abbreviations consisting of one, two, or three letters.

Transmitters and listeners to morse signals will be well advised to obtain a copy of the International Radiotelegraph Convention and the General Regulations annexed thereto, which is published by H.M. Stationery Office, for 2s. 6d. net.

International Prefixes.

With reference to the provisional list of International Prefixes recommended

at the Washington Conference, which was published in our issue of June 6th (page 598), we learn from the Washington "Radio Service Bulletin" that typographical errors were made in the original list as published, and that the prefixes for Chile and Honduras should have been shown as CA and HR respectively in place of CI and HP. Also that prefix VE is the only one assigned to Canadian amateurs, the prefix CF not being used at present. These prefixes are, in fact, merely the first, or first two, letters of the official call-signs allotted to each country.

The "R.S.B." also points out that this list is only tentative, and that the Radio Division of the U.S. Department of Commerce has not been officially advised that these prefixes will be used by the various countries concerned.

IMPRESSIONS of the BERLIN SHOW



By Our Representative Visiting the Exhibition.

THE fifth annual Radio Exhibition in Berlin opened on August 31st with a great flourish of trumpets. This phrase is literally as well as metaphorically true, for not only are there extensive advertisements in the Press, and on hoardings and advertisement pillars all over Berlin, but the opening ceremony itself, at which many personages well known in wireless circles were present, began with the playing of Mendelssohn's Trumpet Overture by the Radio Orchestra of Berlin.

The Exhibition itself is arranged in a very spacious style, and is spread out over three large halls which open into one another. Plenty of space is left between the stands, and the stands themselves are in most cases very large, so that it is possible to accommodate, without overcrowding, a very great number of visitors. When it is added that the stands of all the more important firms are very generously staffed, it will be seen that the facilities offered to the visitor seeking information are as great as could reasonably be expected.

First Impressions.

The Englishman entering the exhibition, if he is comparatively unfamiliar with the apparatus on the German market, receives at first the impression that every stand is crammed with new apparatus, and that there is almost nothing in the whole exhibition that will not be of absorbing interest. Closer examination reveals a few components and receivers that can be found in the shops of British dealers, and the bulk of the remaining apparatus, though

not identical with that with which the Englishman is familiar, has in most cases very close counterparts on the British market.

Complete Receivers.

Turning first to complete receivers, one is considerably impressed by the fact that an unexpectedly large proportion of the more expensive sets are designed and built in such a way as to dispense altogether with batteries, both anode and filament current being obtained from the mains. There is practically no maker of sets who does not show several such receivers, and on quite a number of stands there are no battery-driven receivers at all on view. It must be remembered, of course, that the predominance of "all-mains" sets at an exhibition is no true reflection of the state of affairs

actually in being at the moment, for it is certain that in Germany, as in England, the bulk of the receivers in daily use all over the country employ batteries of one kind or another for supplying the energy that they require. That this conclusion is true is borne out by the fact that the makers of batteries and accumulators are well represented, and that many eager enquirers are to be found at their stands. One must rather look upon the predominance of mains-driven receivers at the exhibition as a prophecy for the future, for the replacement of the receivers now in use cannot take place in a day.

If one may judge from the tendency of the last year or so, the most prominent type at Olympia this season will be the portable set, which has been steadily gaining in popularity for some time past. The almost complete absence of this type from the German market is therefore particularly noticeable; the writer can only remember seeing one receiver of this kind in the whole show. The reason for this is probably bound up with the extreme popularity of mains-driven sets, which, since they restrict the user to indoor reception, are hardly worth making up in portable form.

A Popular Set.

There is on show at nearly all the stands a receiver of a type that is practically unknown, at least as a commercial article, in England. It consists of grid detector with reaction, followed by one low-frequency amplifier and an output valve, resistance-coupling being used throughout. For the detector and L.F.



Fig. 1.—A popular three valve set.

Impressions of the Berlin Show.—

stage high-impedance valves with an amplification factor in the neighbourhood of 30 are used; the output valve is a small power valve of some 8,000 ohms impedance. The whole is mounted on a shallow box decidedly smaller in size than a page of *The Wireless World*, and sells complete with valves, for a little over £2. Of the many receivers of this type, one, made by Roland Brandt of Berlin, is illustrated in Fig. 1.

An equivalent set, employing the Loewe multiple valve in place of three separate valves, and therefore still smaller in size, is also available at about the same price; it is expected that this will shortly be seen on the English market.

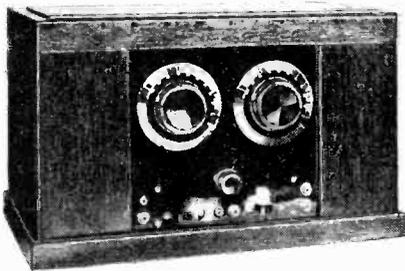


Fig. 2.—A Loewe frame aerial receiver.

Of more ambitious receivers there is a very large choice. Low-frequency amplification, especially in the more powerful sets, is in most cases achieved by the use of transformers, many of which are of small enough bulk, even in expensive receivers, to warrant the suspicion that the quality of reception would leave something to be desired. Where resistance coupling is used the favourite design is that using very high anode resistances with high-impedance valves, the aim clearly being to emulate the high amplification per stage that is attained when using transformers.

H.F. Amplification.

High-frequency amplifiers of all types are to be seen incorporated in the various receivers. One set was noticed that was advertised as suitable for all wavelengths from 10 to 1,700 metres; the amplification at high frequency was provided by a single resistance-coupled stage. In the majority of cases in which the ordinary three-electrode valve is used for the high-frequency stages, the high-frequency transformers consist either of solenoids wound with fine wire or of a

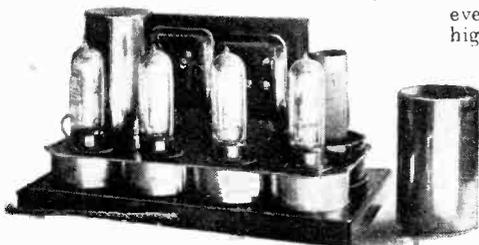


Fig. 3.—The Loewe frame set assembly with screen; box removed to show coil.

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number of basket coils coupled together. In the former type there is generally some screening by big metal cylinders round the coils, while in the latter case screening is more usually omitted and the basket coils are "staggered," as in the original neutrodyne receiver of Hazeltine, to minimise the coupling between successive stages.

Interest in the Screened Grid.

Owing to the fact that high-frequency amplification with ordinary three-electrode valves has not reached so high a state of development in Germany as in England, the screened-grid valve is calling forth more interest than on its appearance at Olympia last year, and great claims are being made for it. It is freely stated that an amplification of 150 times can be attained in a single stage, with the implication that several such stages can be used in a single receiver without any fear of instability. A number of receivers employing this valve are shown; the coils which they contain are in most cases clearly designed to ensure complete freedom from oscillation rather than to extract the maximum degree of amplification from the valve.

The widespread employment of gang control is very noticeable; there is hardly a receiver containing more than two tuned circuits in which the tuning condensers are not operated by a single knob, and the majority even of sets with but two tuned circuits are also ganged. Independent fine adjustment for the individual tuned circuits is, in general, incorporated. In addition to the usual modes of achieving this, one set was seen in which the fine adjustment was obtained by arranging for the movement through a small arc of the "fixed" plates of the condenser. Grid detection with reaction is almost universally used, even when as many as three stages of high-frequency amplification precede the detector; this use of reaction probably accounts for the need for the individual control of the tuned circuits, on account of the sharpening of tuning that it introduces.

At least one firm has developed single-knob control for a multi-stage high-frequency amplifier sufficiently to equip their receivers with a dial accurately calibrated in wavelengths, and bearing the names of all the principal broad-

casting stations of Europe. One of these receivers—or, rather, part of one—is illustrated in Fig. 4, half only of the panel being included in order to show the dial more clearly. This particular receiver is made by the Nora Radio Co., of Berlin, and provides for reception on both the broadcast bands of wavelengths, all three tuned circuits being changed from long to short waves and *vice versa* by turning a single switch. This latter feature is usual on sets of this general type, the mechanism commonly consisting of several separate switches, one for each tuned circuit, all of which are controlled by a single knob.

Fig. 5 shows a still further development in the direction of extreme simplicity of control as applied to a broadcast set. With this receiver, which employs the Kramoln Auto-selector system, the receiver is tuned one and for all to some twenty stations by a corresponding number of fixed condensers, each of which can be switched into circuit as required by pressing its

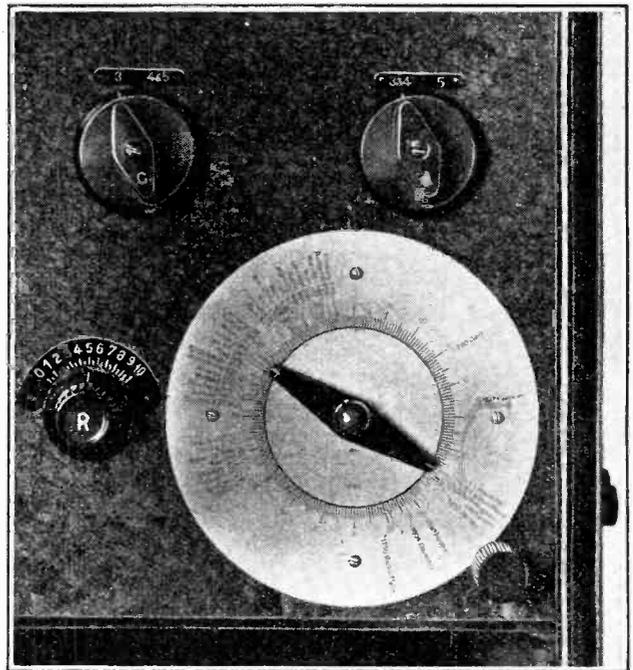


Fig. 4.—A receiver with single tuning dial.

own particular knob. Thus, to tune in any of the stations on the receiver's repertoire there is nothing to do but to connect the set to the mains by inserting a plug into a wall socket, and press the button that corresponds to the station it is desired to hear. If one wishes to listen to a station for which no button is provided, the single-control drum in the centre of the panel may be used as in any ordinary set.

Although this receiver has but one tuned circuit, it is claimed that quite good selectivity is obtainable through the use of an ingenious perversion of the superheterodyne principle, the tuned circuit being that belonging to the oscil-

Impressions of the Berlin Show.—lator. The intermediate frequency employed is 460 kilocycles, corresponding to a wavelength of 650 metres; the range of wavelengths over which reception is possible is either from 200 to 600 metres or from 1,000 to 3,000 metres.

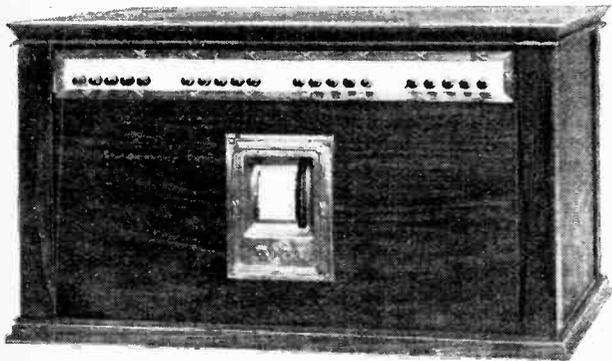


Fig. 5.—An auto-selector set pretuned to various stations.

A schematic diagram as issued with the set, showing the broad outlines of the circuit, is reproduced in Fig. 6.

Loewe Multiple-Valve Sets.

Most English readers will be acquainted, by hearsay at least, with the Loewe multiple valves, which consists of a complete multi-stage amplifier, using resistance-coupling, in a single evacuated bulb. A further development has taken place in this direction, resulting in the design of a very effective long-range frame-aerial receiver employing three two-stage high-frequency valves of an improved type. Resistance coupling is used throughout, and there are no tuned

circuits other than the frame aerial and the grid circuit of the detector. Adequate selectivity is obtained by making the coupling to each of these tuned circuits very loose, and by making use of the directional properties of the frame aerial. By the courtesy of the designer

of this receiver, Baron v. Ardenne, whose name is already well known in connection with aperiodic high-frequency amplification, we are enabled to illustrate this receiver in Figs. 2 and 3. The three double valves provide an aperiodic amplification of about 10,000 times on the broadcast band, with stability and freedom from loss of sidebands. The low initial and upkeep cost of the receiver, and the ease with which it can be adopted to reception on any range of wavelengths by employing interchangeable coils, are other advantages which are not otherwise to be found in conjunction with so high a degree of amplification at high frequency. Internal arrangements of the valves are shown in Fig. 7.

In addition to receivers of the normal type, and the special receivers that have been mentioned, there are on many of the stands power amplifiers using up to 20 watts or more in the output stage, these being designed to operate large loud speakers for public address systems and gramophone reproduction. Without exception, these amplifiers are arranged

for direct connection to the mains. Some of them contain in addition a turntable and electric motor for the records, others contain either a loud speaker or a complete receiver. A few contain all these, thus making an entirely self-contained apparatus for both wireless and gramophone music, no external connections of any sort, other than a single flexible wire to the mains, being needed for their operation.

Accessories.

There is an extensive array of components on show, but among these there

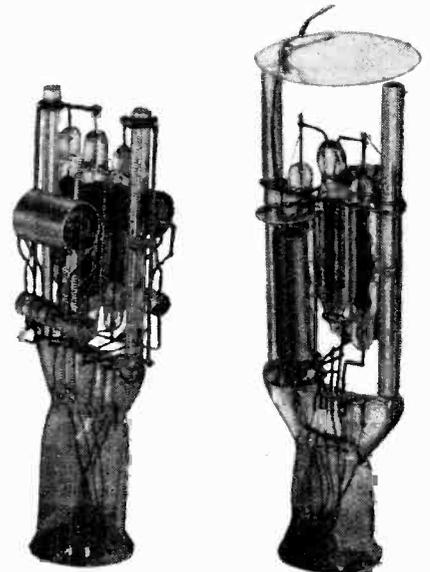


Fig. 7.—The internal connections of the Loewe valves.

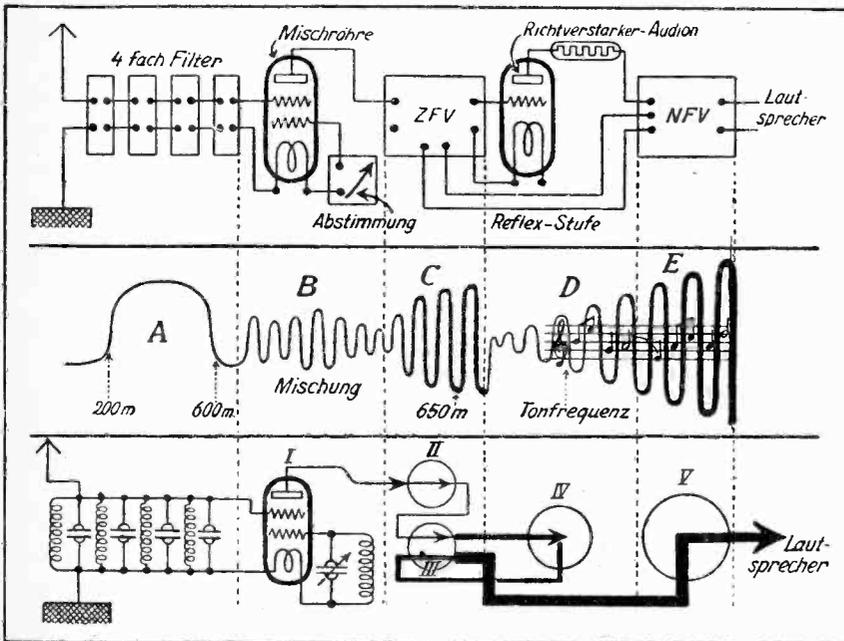


Fig. 6.—Schematic diagram of the auto-selector set.

is very little of any interest or novelty. Apart from a kind of triple valve-socket arranged to plug into the last valve-holder of the receiver to allow of the use of several output valves in parallel without rewiring the set, there is nothing that has not a well-known counterpart in England.

The dry-contact rectifier and the electrolytic condenser of high capacity for smoothing filament circuits are appearing in Germany; no doubt they will also be prominent at Olympia this year.

The moving-coil loud speaker appears to be a complete novelty, and the two or three that are on show are attracting considerable attention. Up to now its place has largely been taken by the electrostatic type of loud speaker, of which several models have been made for some time and which has up to now been, apart from the Siemens "Blatthaler" speaker, the standard German instrument for any public address system. In the rest-room at the Berlin Exhibition, for example, continuous musical entertainment is provided by four of the Reisz electrostatic loud speakers. The quality of reproduction struck the writer as poor, but, so far as he could judge by ear, this appeared to be attributable either to overloading of the amplifier feeding it or to the use of inadequate intervalve trans-

Impressions of the Berlin Show.—formers rather than to the loud speaker itself.

The "Oszilloplan" Speaker.

The writer did not hear, anywhere in the Show, better reproduction than that given by the "Oszilloplan" electrostatic loud speaker, marketed by Hans Vogt, of Berlin, which is illustrated, without its baffle, in Fig. 8. For this type of speaker a polarising voltage is necessary, that for the model in question being provided from the mains, through a tiny rectifying valve, with some 700 volts. To provide protection for the valve, a high resistance is connected in series with each of the high-voltage leads, as shown in the schematic diagram of Fig. 9. The impedance to speech-frequencies of the loud speaker, which has a capacity of less than 0.001 mfd., is naturally very high, so that it takes its watts in the form of a small current at a very high voltage, instead of the high current at a much lower voltage that is required by loud speakers of more familiar type. If it were connected, through the usual choke-filter output device, in the plate

It is interesting to note that another means of supplying the polarising voltage is used with the "Reisz electrostatic speaker. In this case a part of the audio-frequency signal is stepped up to a high voltage by a special small high-ratio transformer, and is then rectified by a

wi. out at least some mention of the valves that are there available, for the valve is, after all, the heart of the receiver.

German Valves.

Like our own valves, those in use in Germany may be divided into three classes, according to the mode of filament-heating that is employed. In the accumulated-heated class, which includes the vast majority of the valves at present in use, it is immediately noticeable that the 4-volt type is predominant in Germany. None of the makers list more than one or two 6-volt valves (and those are for special purposes), and all seem to regard the 2-volt valve with mild contempt.

Taking as a standard of comparison the list of English valve characteristics published in our issue of August 29th, we find that there is on the whole but little to choose between the productions of the two countries. The most noticeable difference, perhaps, is that while the usual anode voltage specified by English makers as the maximum for their products is 120 or 150 volts, the corresponding German valves are usually rated for 150 or 200 volts. Whether this indicates a more robust construction or a less regard for valve life is a matter on which a visitor to Germany can only speculate.

An interesting feature is the existence of a number of double, and even triple valves, which consist of two or three independent valves enclosed within the same bulb. (These must not be confused with the Loewe multiple valves, which contain, in addition to the valves themselves, all the necessary coupling elements to make a practically complete receiver.) The possibility of the introduction of unwanted capacity effects is a disadvantage which may perhaps be compensated by the cheapness, as compared with separate valves, that this system permits. Otherwise there would seem to be no advantage gained by this mode of construction, except perhaps when it is desired to use the two parts of a double valve as the two valves in a push-pull system—for which, indeed, some of the double valves are specifically designed.

There is a slightly bigger choice of output valves in Germany than in England, including one that would be of the very greatest value for operating large loud speakers with the somewhat re-

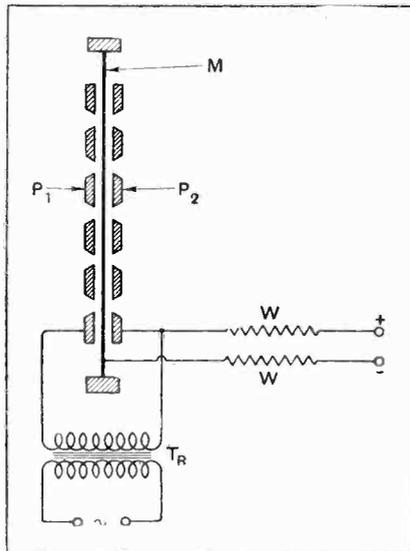


Fig. 9.—Circuit of the "Oszilloplan" speaker. M—membrane of aluminium foil, P₁, P₂—perforated aluminium plates, Tr—special step-up transformer for connecting to plate-circuit of output valve, W—protective resistance in H.T. (polarising) circuit.

valve, smoothed, and applied to the plates of the loud speaker. This has the advantage that the speaker can be operated by a receiver running from batteries of direct-current mains, for which the "Oszilloplan" is not adapted.

Valves.

No review of the wireless apparatus on the German market would be complete

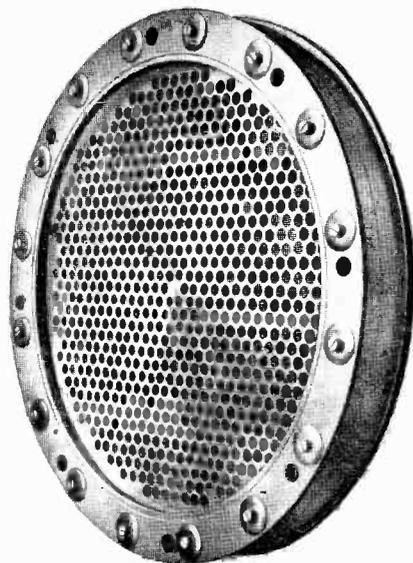


Fig. 8.—The "Oszilloplan" loud speaker.

circuit of a conventional output valve, the signal voltage developed across it would be too small to produce any audible sound, and it is therefore necessary to interpose between it and the last valve of the set a step-up transformer of high ratio. By this means the high audio-frequency voltages, of the order of 500 volts and over, that this speaker requires for satisfactory operation, can easily be obtained. The makers suggest the use in the last stage of two 10-watt valves, such as those of the LS5 class, connected in push-pull. It would appear from this that the loud speaker in question requires decidedly more power to operate it than a properly designed moving-coil instrument, though there would appear to be little to choose between the two in quality of reproduction.

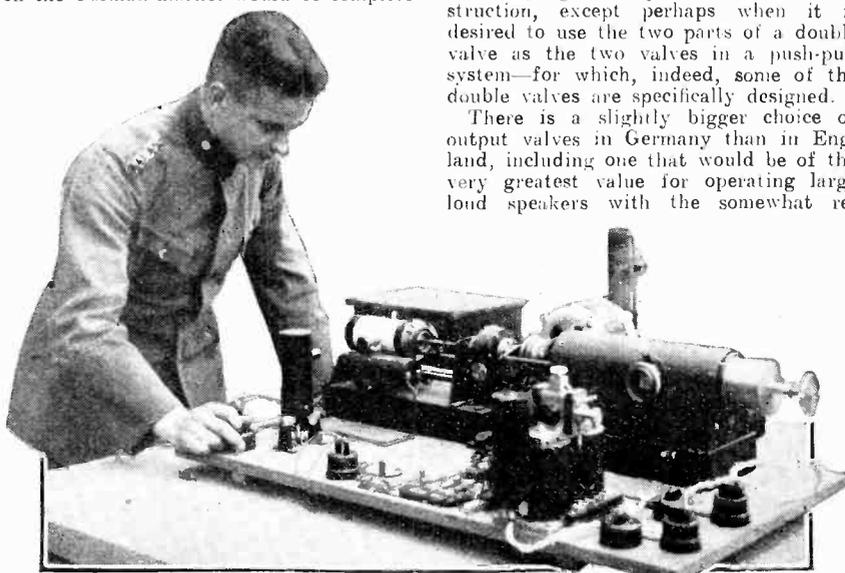


Fig. 10.—Police exhibit of picture transmitting apparatus.

Impressions of the Berlin Show.—stricted voltages obtainable from direct current mains. It is peculiar as having an impedance of no more than 1,000 ohms, and can be permitted to dissipate 12 watts at an anode voltage not exceeding 200 volts. It would seem that this valve might be welcome in England, especially as its filament current (0.65 amp. at 4 volts) is quite moderate when its large output is taken into consideration.

Pentodes and Screened Grid.

The pentode and screened-grid valves have their counterparts in Germany, the latter being constructed on American lines, with a terminal at the top of the bulb for the anode as in the new English types. The double-ended English construction has not been adopted.

When we come to valves designed for heating, through a transformer, from alternating-current mains, we find well represented both the older indirectly heated type and the new low-voltage type in which the emitting surface is heated directly. In addition to a very full range of three-electrode valves, there are available in the former class three different screened-grid valves for high-frequency amplification, with impe-

dance varying from a million down to 60,000 ohms, so that the most suitable valve can be chosen for whatever type of tuned circuit it may be desired to use.

In the directly heated series of mains valves there is in Germany, as in England, a good series of three-electrode valves and a screened-grid valve. In addition, the new pentode is available in this form. Every maker issues a warning against using this type of valve as a detector, owing to the danger of the introduction of hum; for this purpose the valves with indirectly heated cathode must be used.

Reviewing the broadcasting equipment as a whole, one is left with the impression that the development of mains-supply has proceeded much further in Germany than in England, while neither the efficiency of the high-frequency amplifiers nor the quality of reproduction with which the Germans appear to be content is up to the best standards of English practice.

Other Exhibits.

In addition to the exhibits directly concerned with ordinary broadcasting, there are others offering information on other points. There is, for example, an illuminated map showing the network of

wireless transmitters used by the police in tracing criminals, it being possible not only to pass to all stations a description in words of the wanted man, but also to send out copies of his photograph and reproductions of his fingerprints if they are available, together with a sample of his handwriting. For this the Lorenz-Korn system of picture-transmission seen in Fig. 10 is used. The value of wireless in assisting aircraft and in assuring their safety is also well demonstrated, as are the uses to which wireless is put by the German Post Office.

Picture Transmissions.

Several imposing pieces of complicated apparatus show the progress that has been made towards the goal of television, while the Fultograph picture transmitter, of which the readers of *The Wireless World* have already heard, is busily at work all day long transmitting photographs from one stand to another.

Of the non-wireless exhibits perhaps the most interesting is the Tri-Ergon Talking Films, which can be seen and heard at stated hours. This process has quite evidently developed very far beyond the purely experimental stage, and it is hoped to give further details of it later.

MAINS UNITS, AND ELECTRICITY SUPPLY COMPANIES.

A Legal Interpretation of the Position.

THE question of the position of users of wireless apparatus connected to the electric mains when the supply may be changed from direct to alternating current was first raised in *The Wireless World* a considerable time ago, and the subject has since attracted wide attention.

As a result, the British Broadcasting Corporation have approached their legal advisers for an authoritative summary of the legal position created by the Electricity Supply Acts, 1882-1926, and the regulations which have been issued from time to time by the Electricity Commissioners.

With permission of the B.B.C., we reproduce below the legal summary of the position obtained from their legal advisers:—

1. An Authorised Electric Supply Undertaker cannot refuse to allow a consumer to connect wireless or any other form of electrical equipment to the Undertaker's system; provided that the consumer is in a position to demand a supply. But the consumer may not use any equipment which is likely to interfere with the supply to other consumers, nor may he increase his maximum load without due notice.

2. Subject as stated in paragraph 1 it is not necessary for the consumer to obtain the consent of the Undertaker before installing any particular type of apparatus such as wireless apparatus.

3. When an authorised electricity Undertaker wishes to change the system of the supply, the Undertaker has to obtain the consent of the Electricity Commissioners or in certain cases of the local authority (as for instance the L.C.C. in the London area). The Commissioners and the local authority have power to attach conditions to the consent; the consent is usually given subject to the Undertaker replacing any of the consumer's apparatus, which would include wireless equipment, affected by the change.

It is, therefore, the Undertaker's responsibility to bear the cost of the necessary alterations to all household apparatus, including wireless equipment. If the Undertaker refuses to make good the change-over of the wireless equipment, or disputes the cost of it, the consumer (listener) can take the matter to arbitration in accordance with the conditions of the consent,

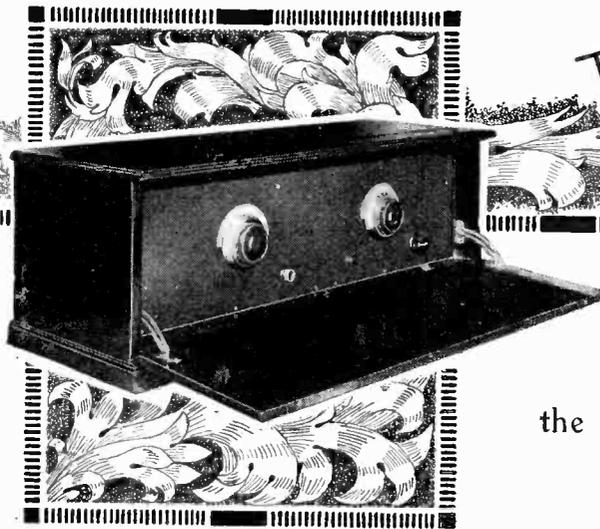
which usually prescribe this course; and it is understood that it is within the power of the arbitrator to award that the cost of the arbitration shall be borne by the party against whom the award is given. It is further understood that under the form of consent now issued by the Electricity Commissioners the Undertaker is relieved of the responsibility for replacing consumer's apparatus, of whatever kind, installed after notice (six months) of the change-over has been given to the consumer. But it is believed that the responsibility for making good wireless equipment installed, *bona fide*, before notification of the change-over of a supply is given, rests upon the Undertaker.

4. The Electricity Commissioners (or the consenting local authority) have power to vary the conditions governing the consent for the change in supply. It is not thought, however, that the Electricity Commissioners will exclude wireless equipment from the household apparatus which requires to be replaced because of the change in the supply, except as stated in paragraph 3.

5. It should be noted that the foregoing paragraphs state the legal position regarding authorised Electric Supply Undertakers only—that is to say, those Undertakers who have undertaken to supply electric current under the provisions of the Electricity Supply Acts, 1882 to 1926, and to them only. There are a few comparatively unimportant undertakings which have been set up independently of those Acts, and over whom the Electricity Commissioners have no control. It must therefore be clearly understood that the above-mentioned Acts in no way apply to them, and the rights of the consumers in such cases will have to be a matter of bargain between them and the Undertaking concerned.

The B.B.C. has, in addition, suggested that in the event of any difficulty arising as between listeners and Electricity Supply Companies, before considering taking a dispute to arbitration, if full particulars of the case are first communicated to the B.B.C., it may be possible to give some assistance. The B.B.C. emphasises that they are extremely anxious that the rights of their listeners in matters such as this should be satisfactorily established.

TWO RANGE FOUR



A Constructional Article giving the more Important Facts in Receiver Design and Operation.

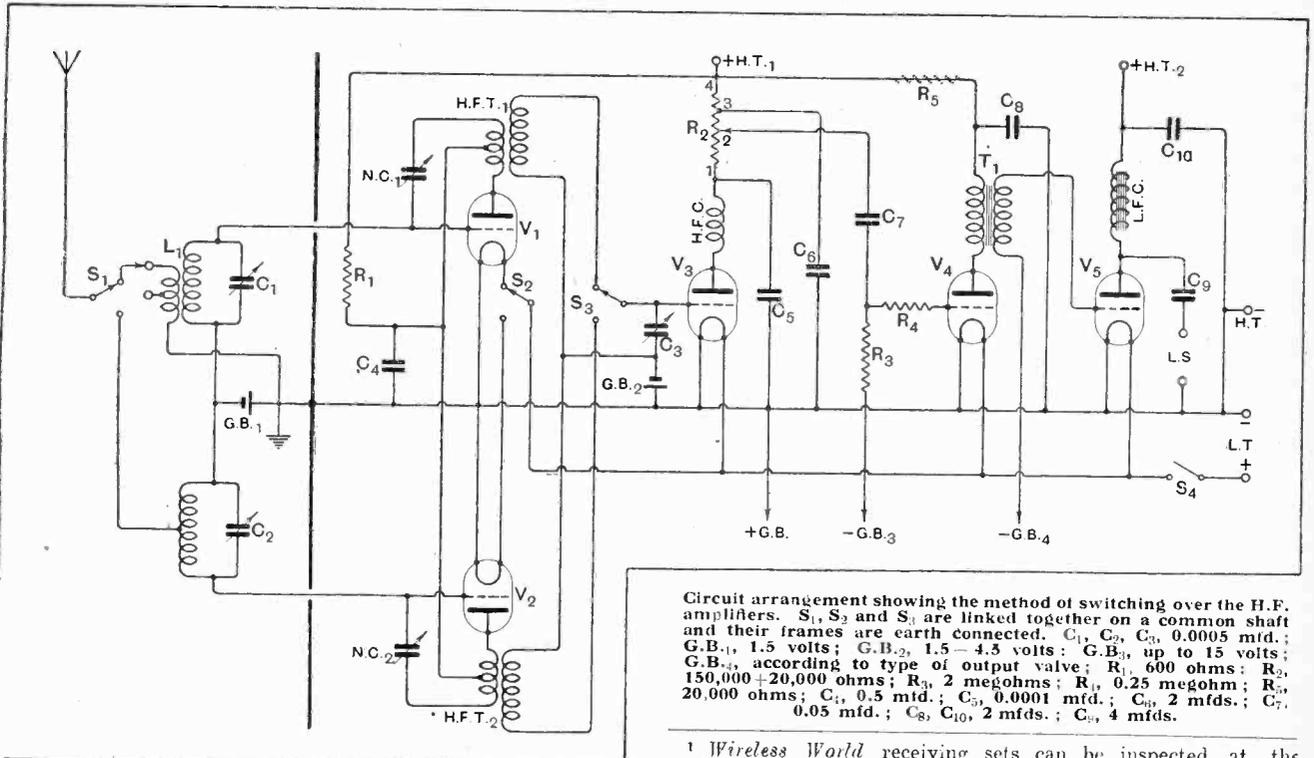
By F. H. HAYNES.

TWO lines of argument present themselves in describing the design of a receiver—one, the reason for the set, and the other to contrast with alternatives points in the arrangement adopted. The reason for the set which is introduced here is that readers are persistently asking for it. Primarily, they want a long-range receiver of good selectivity with two-dial tuning and volume control and tunable to long and short wavelengths by the action of a plunger switch as against the need for interchanging somewhat fragile coils. A flat baseboard layout is employed with all components screwed to its face, while the vertical front panel carries

the two tuning dials symmetrically arranged about the centre rather than cramping them within small space to the left-hand side.¹ All components are standard, reliable and well tried.

New Method of Switching.

Novelty of design attaches only to the method of wave-range changing. Here, three special switches have been devised, which, when linked together, transfer the aerial lead between long- and short-wave aerial transformers, complete the filament circuit of the H.F. valve which is duplicated, and transfer the grid lead of the



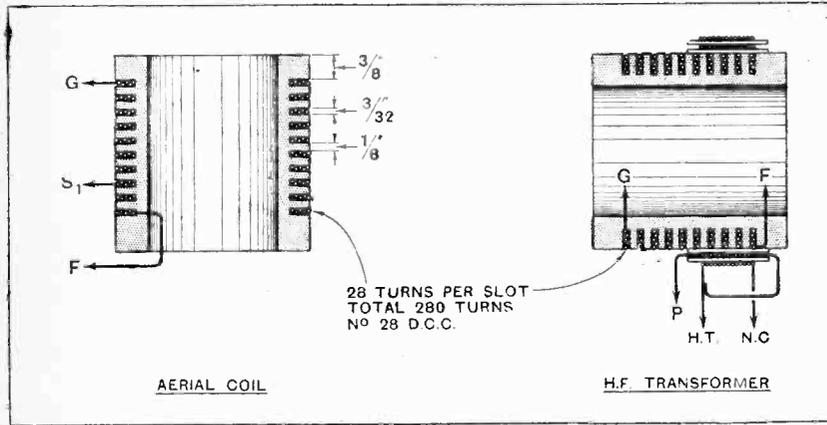
Circuit arrangement showing the method of switching over the H.F. amplifiers. S_1 , S_2 and S_3 are linked together on a common shaft and their frames are earth connected. C_1 , C_2 , C_3 , 0.0005 mfd.; G.B.-1, 1.5 volts; G.B.-2, 1.5-4.5 volts; G.B.-3, up to 15 volts; G.B.-4, according to type of output valve; R_1 , 600 ohms; R_2 , 150,000+20,000 ohms; R_3 , 2 megohms; R_4 , 0.25 megohm; R_5 , 20,000 ohms; C_4 , 0.5 mfd.; C_5 , 0.0001 mfd.; C_6 , 2 mfd.; C_7 , 0.05 mfd.; C_8 , C_{10} , 2 mfd.; C_9 , 4 mfd.

¹ Wireless World receiving sets can be inspected at the Editorial Offices, 116, Fleet Street, London, E.C.4.

Two Range Four.—

detector valve. These switches have been specially designed to avoid losses by way of extended wiring, or within themselves. They consist of small blades with Bakelite mounting rings. They are baseboard-mounted at the most convenient position for direct wiring, and coupled

To switch over a single condenser between the two coils calls for a number of dangerous H.F. carrying leads, as does also any attempt to switch over a single valve between the five connections coming from each of the transformers of the neutralised H.F. amplifier. The effects of minute stray capacities in such a case become a matter of chance. They may create undesired couplings, produce strange and inconsistent oscillation, or, should they happily produce back couplings with a phase relationship tending towards stability, such effects would not be uniform over the wide tuning range.



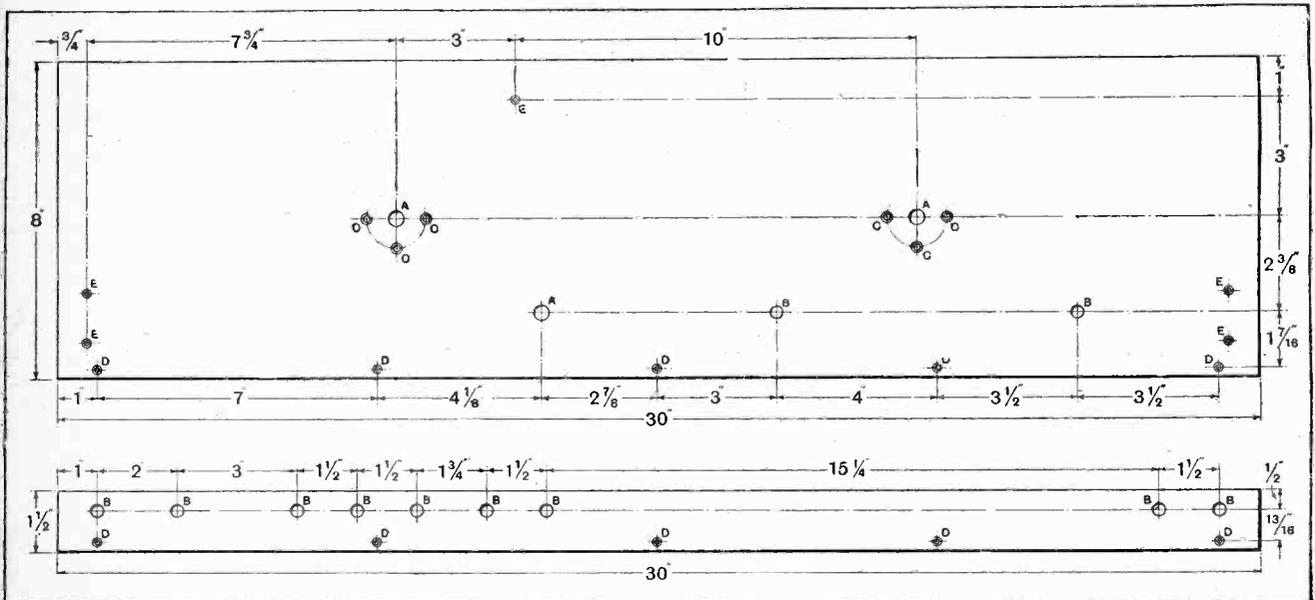
Making the long wave coils. Blank slotted formers are purchased or the slots may be filed or turned on the ribbed ebonite cylinder. The primary and neutralising windings each consist of 50 turns of No. 38 D.C.C. wound with turns touching.

together at their centres by brass rods. Tracing the circuit through from the aerial the first switch will be seen to change over the aerial between two complete tuned circuits comprising separate coils and transformers. A simple wiring layout, so important in H.F. circuits, demands that the condensers, like their associated coils, shall stand one behind the other, and as only one circuit is tuned at a time, the use of a two-section condenser on a common shaft at once suggests itself. By this means we still retain the advantage of only one dial appearing on the panel for aerial tuning.

need for one precaution does, however, arise, for it will be seen that, with the long wave coil in circuit, earthing of the aerial short-circuits the cell—a condition which commonly occurs and passes unobserved.

Why Set Performance Varies.

Standard intervalve couplings are made use of in our H.F. stage associated with the duplication of the valve as well as the neutralising condenser. The two groups are wired up as independent stages, picking up their input from the two wires passing from the double aerial



Drilling of panel and terminal strip. A, 3/8in.; B, 5/16in.; C, 5/32in., and countersunk for No. 4 B.A. screws; D, 1/8in., and countersunk for No. 4 wood screws; E, 1/8in. and countersunk for No. 6 B.A. screws.

Two Range Four.—

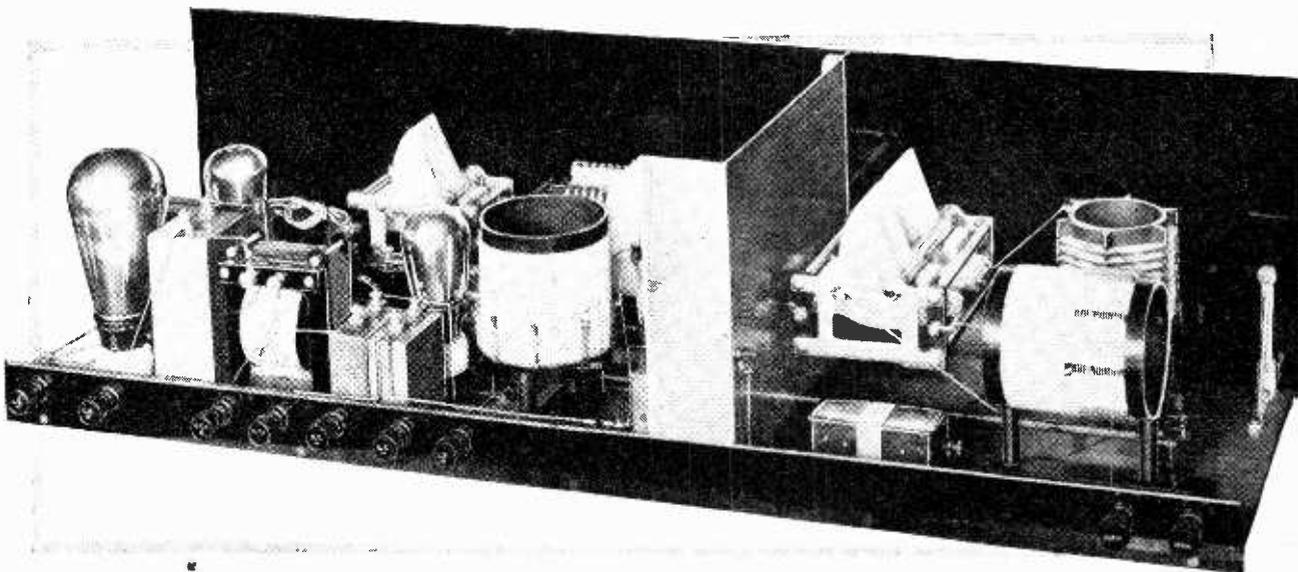
condenser, while the two output leads pass on to the detector valve switch. There is no need to duplicate the condenser which tunes the H.F. stage, as it is obviously associated with the input to the detector valve. To prevent, as far as possible, H.F. currents circulating in the anode current supply circuit, a combination of resistance and condenser is used, the reactance of the latter being many times less than that of the former, even on the longest wavelengths. A point of interest arises here, in that it has been the experience of set builders using this form of H.F. transformer to find that, whereas one set may be highly efficient, another may appear to be flatly tuned and less sensitive on distant stations: This is probably due to the generation within the H.F. stage of powerful oscillations of the order of, perhaps, 5 to 50 metres tending to modify the performance of the detector valve by the H.F. voltages thus applied to its grid. The problem is one requiring investigation, though it is usually avoided by completely rewinding the pri-

be effected. Readers are, in general, aware of this, but prefer the greater H.F. gain obtainable with the neutralised triode. Tuning is sharper with the customary neutralised triode, and yet not too narrow to ruin quality with a moving-coil loud speaker, and for the very best reproduction, which is only, of course, obtainable from a local station, one substitutes L.F. valves both for H.F. amplification as well as for anode-bend detection, making the necessary adjustment to the grid bias.

This article has been compiled in answer to the many requests for a receiver of good range-getting properties and possessing reasonable selectivity. Its tuning range covers the long as well as the normal broadcast bands. It is fitted with an effective volume control while the design is easily adaptable for moving coil loud speaker operation. Many problems of receiver design and operation are discussed, from which the reader may usefully devise modifications to modernise his existing set.

Problem of Volume Control.

Volume control, which, at first thought, might be considered the easiest of devices to provide, is one of the difficulties in receiver design. Its purpose, as well as modifying the amount of sound emitted by the loud speaker to a pleasing level, is to prevent valves being overloaded by too great a voltage swing being applied to their grids. Regulation of signal voltage by a volume control device must therefore come early in the train of valves. To incorporate it in the H.F. stage might lead to serious inefficiency in a re-



Considerable spacing has been given to the H.F. equipment in order to avoid the dangers of capacity couplings. The L.F. apparatus on the other hand is cramped and if a moving coil loud speaker is to be operated with high anode voltage the output stage would then be associated with the loud speaker.

mary and neutralising turns in the reverse direction. The writer's experience in the use of an H.F. amplifier of this type is to roughly build upon a piece of wood the two tuned circuits up to and including the detector valve and testing them for performance before going further.

Certain precautions are necessary in the H.F. wiring to prevent stray couplings, and these are indicated in the practical wiring diagram. Confidence can be placed in the switches and their attachment on to the tuned circuits will be found in no way to impair the efficiency. It is admitted that the principal merit of the screened grid H.F. valve, when connected as a tuned anode amplifier, is the facility with which wave-range change can

be effected. Readers are, in general, aware of this, but prefer the greater H.F. gain obtainable with the neutralised triode. Tuning is sharper with the customary neutralised triode, and yet not too narrow to ruin quality with a moving-coil loud speaker, and for the very best reproduction, which is only, of course, obtainable from a local station, one substitutes L.F. valves both for H.F. amplification as well as for anode-bend detection, making the necessary adjustment to the grid bias.

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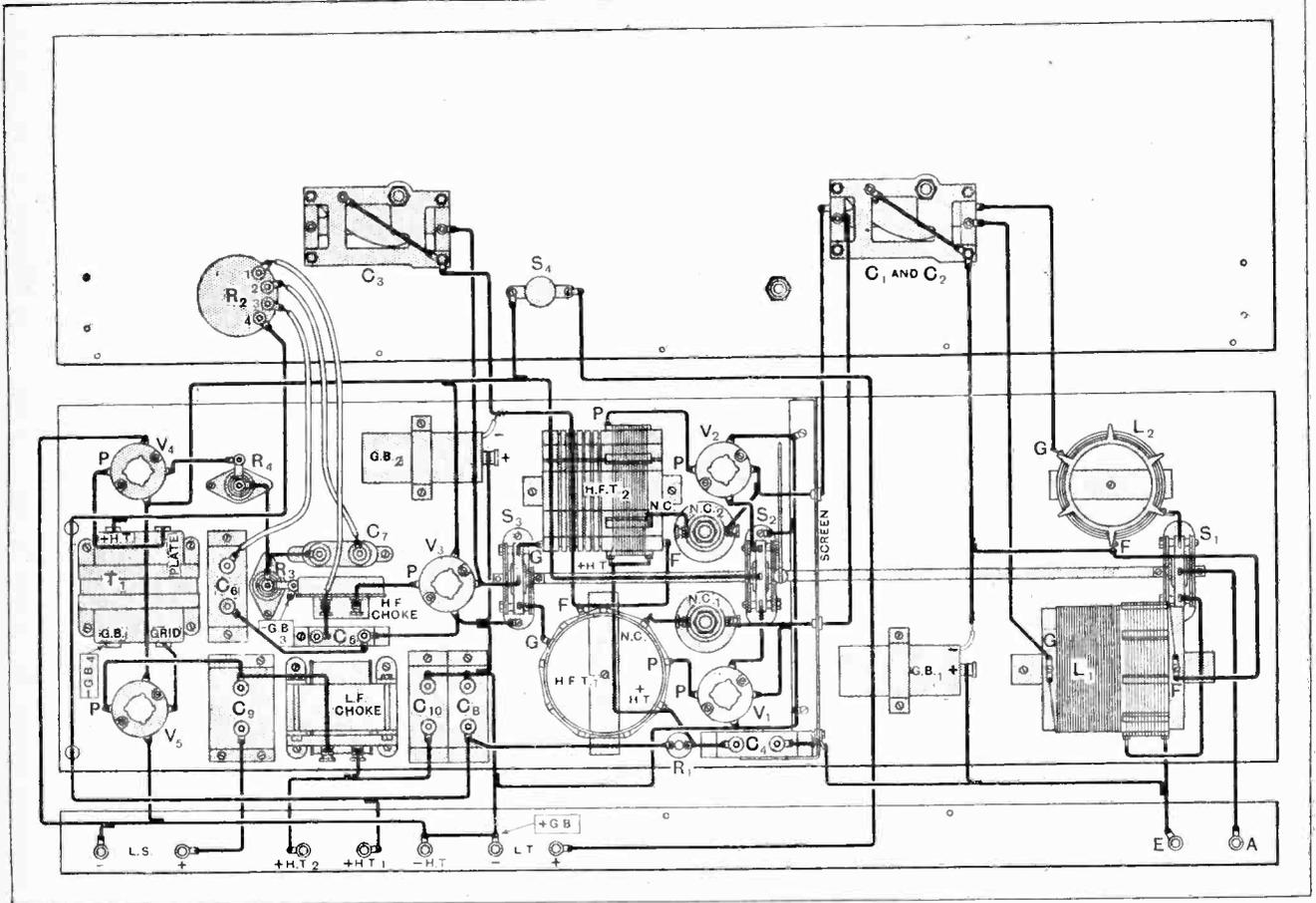
ceiver of this class, where no reaction is introduced to overcome losses. Dimming of the filament of the H.F. valve produces an effect far from linear, in that a point is somewhat suddenly reached where volume falls off and distortion sets in, though overloading of the detector valve is avoided by such a method. Wire-wound resistances of the high values required for use in H.F. circuits are not available and would probably possess high capacity and much bulk.

We thus come to the use of a potential divider in the anode circuit of a resistance-coupled detector valve. Such a resistance has been made up, and its wire-wound spool incorporates the winding now required for

Two Range Four.—

the points of earthing, as well as the connections to the filament circuit, should be followed. The filament wiring is in contact with the baseboard, and the majority of the leads are run with the front panel removed. Both No. 18 and No. 20 tinned wire are used at discretion, while certain of the short elevated leads and, in par-

detector is to be avoided a valve of some 8,000 ohms to 10,000 ohms impedance may be substituted. For maximum sensitivity an R.C. valve, impedance about 60,000 ohms, and critically biased, is required for detection. An ordinary H.F. valve is recommended as an anode bend detector for working a moving-coil loud speaker providing it gives sufficient volume. The



The actual arrangement of the leads in the L.F. amplifier is of small importance though in the H.F. stage the wiring has been arranged to avoid stray couplings as far as is reasonably possible.

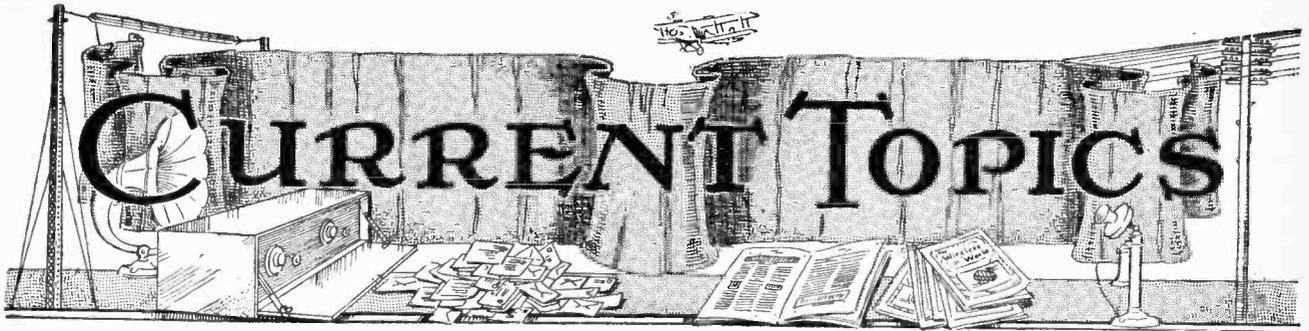
ticular, all those associated with the volume control and the grid leaks, are made with fine rubber-covered flex terminating on tags. Covered stiff wiring is used for certain of the long baseboard leads to avoid short circuits.

Careful Choice of Valves Essential.

Successful receiver performance depends entirely upon the valves employed. Step-by-step construction and test with the valves to hand is the only method of assuring best possible performance. Six-volt valves give better performance than two-volt valves, and they should be selected by reference to the valve tables given on pages 263 to 267 of the issue of August 29th last. So far as possible, choose valves of high conductance. A valve of 20,000 ohms to 30,000 ohms impedance should be used for H.F. amplification, although for local station reception where flatness of tuning is required for quality and overloading of the

writer commonly uses an L.F. valve in this position biased nearly to bottom bend. The L.F. valve is of the 5,000 ohms variety, and the output valve 1,500 to 3,000 ohms, all operated and biased according to maker's instructions. If the use of a pentode is considered, one must be especially careful not to overload, while articles in this journal have emphasised its particular suitability for moving-coil loud speaker work with a modest anode voltage. A special output transformer is required, or a modified loud speaker winding, such as about 2,500 turns of No. 48 enamelled wire giving a D.C. resistance of some 4,800 ohms.

In fulfilling readers' requirements by describing this set, it is hoped that points have arisen bearing upon receiver construction in general. It possesses the merits well known to be found in receivers of its class, and for the number of stages employed it is doubtful if its range-getting properties can be excelled in association with the practical requirements of selectivity.



Events of the Week in Brief Review.

SEPTEMBER 22nd.

Preparations for the National Radio Exhibition, which opens at Olympia on Saturday, September 22nd, are now reaching an advanced stage. The number of firms exhibiting constitutes a record, the figure now being 220, as compared with about 170 last year.

THE NEW YORK SHOW.

America's annual wireless show—known as the Radio World's Fair—opens at the Madison Square Garden, New York, on Monday, September 17th, and runs until the following Saturday.

WAVELENGTHS OF WEALTH.

A claim that he can discover precious metal deposits by wireless is put forward by a Roman Catholic priest who, according to a Paris message, hopes to find large quantities of gold, platinum and silver in the Pyrenees. It is stated the priest's instrument locates the deposits by means of their "wavelength."

SUPPRESSING IGNITION NOISE.

A shielded spark plug which, it is claimed, completely suppresses ignition interference with radio reception on aeroplanes has been developed by the U.S. Bureau of Aeronautics in collaboration with a commercial firm. It is believed that the use of the new plug will double the range of aircraft receivers.

Many readers will sigh for an invention that will cut out the other sort of spark interference

PORTABLE TRANSMITTERS IN THE ANTARCTIC.

Five portable transmitters with batteries encased in wool-lined boxes are to be included in the equipment which Commander Byrd, the American explorer, will take on his forthcoming expedition to the Antarctic. To avert the possibility of disaster, Commander Byrd has devised a system whereby each of the exploring parties, whether travelling by aeroplane or by dog sledge, will remain in constant radio communication with the base and the supply ship. The five sets designed for this arduous work, possibly at temperatures as much as 75° below zero, have been built by the Burgess Laboratories at Madison, Wisconsin. They will derive power from dry batteries.

HOSPITAL WIRELESS.

The London Metropolitan Asylums Board has accepted a tender for £598 for the installation of wireless equipment in Grove Park Hospital.

INDIAN CRITICISM OF WIRELESS AND CABLES MERGER.

Strong criticism of the Imperial wireless and cables merger was expressed in the Indian Assembly at Simla on Wednesday last, and a motion was carried in favour of an investigation of the merger from the standpoint of India's financial interests. Mr. K. C. Roy contended that India had been inadequately represented at the Imperial Wireless and Cables Conference.

POLYTECHNIC WIRELESS COURSE.

Evening courses in wireless and high-frequency engineering open at the Polytechnic, 307-311, Regent Street, London, W.1, on September 24th. Enrolment dates are from September 17th to 21st.

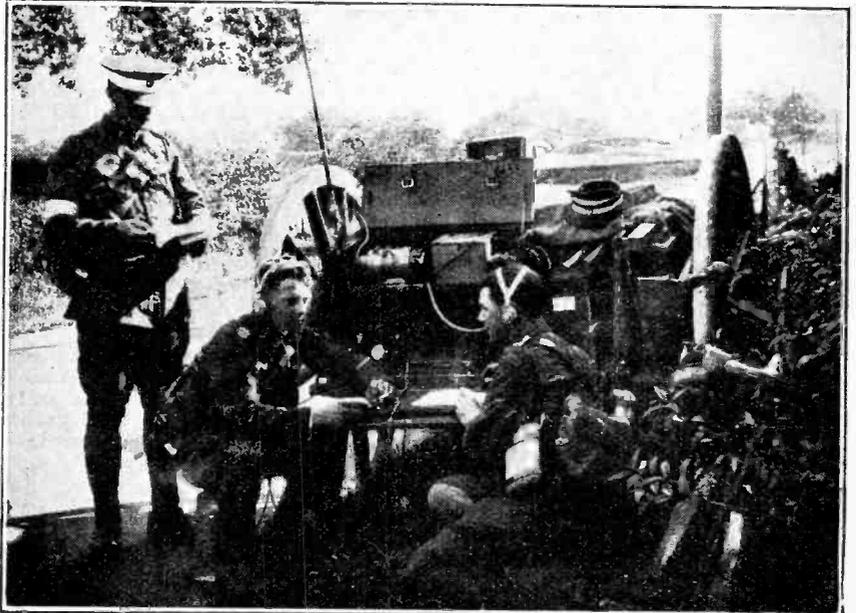
The courses, which extend over a

period of five years, are intended to give a thorough training in the principles and technique of these subjects. The school possesses a new main laboratory equipped with modern apparatus for experimental work, a transmission laboratory (6RA), and electrical engineering laboratories. The fee per session for the full course is 30s. Further particulars can be obtained from the Head of the Wireless Section, Mr. W. H. Date, B.Sc., A.M.I.E.E., at the above address.

MARCONI CO. AND ROYALTIES DECISION.

Marconi's Wireless Telegraph Co., Ltd., announce that it is their intention to appeal from the two recent decisions given by the Comptroller-General of Patents upon applications for compulsory licences made by the Loewe and Brownie Companies.

The Marconi Company wish it to be known that if the Comptroller-General's decision in the Loewe Radio Company's case is affirmed, other manufacturers will,



WIRELESS ON ARMY MANŒUVRES. A section of the 2nd Division Royal Corps of Signals photographed last week during operations near Pulborough, Sussex. The collapsible aerial mast can be seen on the left.

so far as the Marconi Company's patents are concerned, be given licences upon application to the Marconi Company, as from the date of such affirmation, on the same terms as those which the judge grants to the Loewe Company.

Similarly, if the Comptroller-General's decision in the Brownie case is affirmed, it is the intention of the Marconi Company to grant to their existing licencees, on request, new licences, as from the date of such affirmation, on the same terms as those granted to the Brownie Company.

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POLITICS WITH MUSIC.

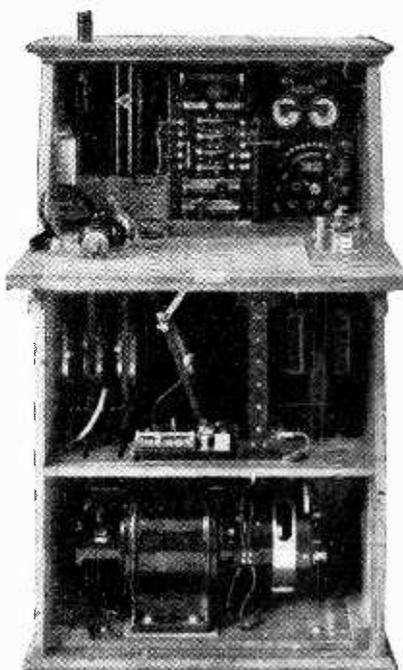
The Republican Party in America has chartered the twenty stations of the Columbia Broadcasting Company for three nights a week, during which election speeches will be transmitted, interspersed with musical items.

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INTERNATIONAL WIRELESS CONGRESS.

Many problems which still confront the world of wireless are to be discussed at the Third International Wireless Congress to be held at Rome from October 1st to 6th next. Among the subjects tabled for discussion are: Interference to wireless transmission and the protection of international radio communication; regulations for the use of wireless in connection with land, sea, and air transport; the resolutions of the Washington Conference, and the progress of radio research.

Time will also be given to the question of broadcast copyright.



"PITCAIRN CALLING." A 1kW spark transmitter and crystal receiver presented by the Marconi Company to the inhabitants of Pitcairn Island, in mid-Pacific, for communication with passing ships.

PHANTOM STATION HOAX.

A little town in Ohio has recently been greatly troubled over the affair of PDQ,

the phantom radio station, and one of the most successful leg pulls in the history of broadcasting. A small group of Ohio jesters (says the *Manchester Guardian*) rigged up a private wire to the loud speaker belonging to the town club, telephoning into it at appropriate moments extremely personal banter and railery concerning the bootlegging arrangements of eminent citizens then present. PDQ came to be a perfect nightmare to the local pillars of society. The practical jokers did not confess until the Federal Government sent out a test car.

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CANADA'S BROADCASTING PROBLEM.

A Federal Radio Investigation Committee has been appointed in Ottawa to examine the present state of broadcasting in Canada. The main question under consideration is whether broadcasting should continue under private ownership as it present, or whether the Dominion should copy the monopoly example of Great Britain.

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RADIO FOR FOREST PROTECTION.

A chain of five wireless stations is to be erected by the Royal Canadian Corps of Signals to link up the scattered patrol bases of aeroplanes used for forestry protection in Northern Saskatchewan. The principal stations will be at Prince Albert, Saskatchewan, smaller stations being installed at Ladder Lake, Ile à La Crosse, Lac la Rouge, and Waskegan Lake. Later, says *Canada*, there will be another station at Snake Island, on Lake Winnipegosis.

NEW CONDITIONS FOR EXPERIMENTAL LICENCES.

Approved Wavemeters a Necessity.

THE General Post Office has issued a memorandum showing the principal points of the revised conditions applicable to experimental sending and receiving stations in Great Britain, based on the Agreement embodied in the International Radiotelegraph Convention, 1927.

Amateur transmitting licences under the revised conditions will be issued during the period from October to December, and in no case can a licence be allowed to continue in the old form after January 1st, 1929.

Accurate Wavemeter Essential.

Every holder of an existing transmitting licence who wishes it renewed under the new conditions must furnish to the Secretary, G.P.O., not later than October 1st, precise details of the apparatus which he possesses or proposes to obtain for measuring the frequency of the waves he desires to use. The tuning must, under the new conditions, always be as accurate as possible, and for this purpose every licensee of a transmitting station must possess a wavemeter of the piezo-crystal or other approved type, and must take all practical steps to maintain its accuracy.

Wavelengths Allowed.

Sending will ordinarily be limited to the following bands of frequencies: 1740-1970 kC. (172.3-152.2 metres), 7050-7250 kC. (42.53-41.35 metres), and 14060-14340 kC. (21.32-20.91 metres), but under special circumstances one or both of the following wavebands will also be allowed:—

28100-29900 kC. (10.67-10.03 metres) and 56150-59850 kC. (5.34-5.01 metres). The wavelength allowed under the existing licences will be withdrawn.

System of Transmission.

Ordinary transmissions will be limited to pure C.W. and telephony. Transmission by I.C.W. and tonic train will only be permitted where special justification is shown. The use of unrectified A.C. current will be forbidden.

Communication Allowed.

Transmitters will be allowed to send messages relating to their experiments to any station in this country which is co-operating in these experiments and to co-operating stations abroad unless the Administration of the foreign country has prohibited communication of this kind. Personal messages of an unim-

portant character will also be allowed within certain limits. (The acceptance and transmission of messages for third parties or of any message on payment, in cash or kind, is expressly forbidden.) It will be essential, however, that this concession shall be used with discretion, as abuse of it may render its modification or withdrawal unavoidable.

All messages must be in plain language, but recognised abbreviations such as the "Q" code may be used.

Nationality Prefix.

The nationality index "G" (GI for Northern Ireland) must always be prefixed to the call-sign, whether transmission is taking place to a station in this country or abroad.

"CQ" and "Test" Calls.

The use of the general "CQ" call will be forbidden, but no objection will be raised to the reasonable use of the general call "Test" followed by the call-sign of the licensee's station.

General Conditions.

The existing conditions as regards power, fees, times of sending, Morse qualifications and inspection will remain unaltered.



PROGRAMMES

FROM ABROAD

BARCELONA (Radio Barcelona). Call EA11 (344.8 metres); 1.5 kW.—6.0, Exchange Quotations. 6.10, Sextet Selections: Charleston, Bournemouth (Alvarez Cantos); Selections from Lakmé (Delibes); Waltz, Lotus (Balart); Jota (Mayral); Selection from Los Cadetes de la Reina (P. Luna). 8.30, Lesson in Morse. 8.45, Wireless Telegraphy Lesson. 9.0, Exchange Quotations, News and Fortnightly Report of the Board of Health. 9.5, Orchestral Selections: Joyeuse Marche (Chabrier-Rudd); Tango, Primavera (Sentis); Selection from Lohengrin (Wagner); Waltz from The Dollar Princess (Fall); Sérénade (d'Ambrosio); El viaje imprevisto—Schottische (Cotó). 10.0, Chinese, and Weather Report. 10.5, Programme relayed from Madrid, EA17.

BERGEN (370.4 metres); 1.5 kW.—7.0, Programme for Children. 7.30, Talk for Girls. 8.0, Concert: Polonaise, Waltz, Polka, Mazurka, Rheinländer, Waltz, Schottische, Lancers. Two-step, Argentine Tango, Gallop. 9.0, Talk: A Norwegian Faust Character. 9.30, Concertina Concert. 10.0, Weather Report, News and Time Signal. 10.15, Dance Music relayed from the Hotel Norge. 12.0 Midnight (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 4 kW.—4.0, Talk by Prof. Lampe. 4.30, Talk by Herr Falkenberg. 5.0, Concert from Hamburg. 6.0, Chess Talk by Wolfgang Schumann. 6.30, Elementary Spanish Lesson. 6.55, Herr Knapstein, Talk: The Chamber Orchestra. 7.20, Prof. Minde-Pouet, Talk: Goethe's Influence up to the Present Day. 8.0, Programme from Hamburg, followed by Programme from Voxhaus.

BERLIN (Voxhaus) (484 metres); 4 kW.—10.10 a.m., Market Prices. 10.15 a.m., Weather Report, News, Sports Notes, and Time Signal. 11.0 a.m., Programme of Gramophone Records. 11.30 a.m., Exchange Quotations. 12.55, Time Signal. 1.30, Weather Report and News. 3.0, Exchange Quotations. 3.10, Agricultural Prices and Time Signal. 3.30, Programme of Gramophone Records. 4.0, Dr. Paul Frank, Talk: Medical Hygiene. 4.30, Sports Talk, by Major Frank Breithaupt. 5.0, Orchestral Concert: Overture to Ruy Blas (Mendelssohn); Waltz, Autumn Melodies (Waldteufel); First Petite Suite (De Michel); Unter den Fichten (Fosse); Kleines Wiegenlied (Billi); Recitations, Rigaulon from Dardanus (Rameau); Czardas (Delibes); Selections from Rose Marie (Friml), Announcements. 7.0, Leopold Lehmann, Talk: The Government Economic Advisory Committee. 7.30, Dr. Ernst Rothe, Talk: The Power of Suggestion—Concentration and Sleep. 8.0, Prof. Lutz Korodi, Talk: On the High-roads through South-west Europe. 8.30, Concert: Two Swiss Marches (Heusser); Overture to The Nuremberg Doll (Adam); Arab Sérénade (Lanzey); Selection from La Bohème (Puccini); African Fantasia (Percy); Two American Marches (Souza); Rhapsody on Hungarian National Themes (Reindel); Krakowiak aus Österreich (arr. Voigt); Waltz, Les Cloches de Corneville (Métra); Two German Marches (Perner and Schwartz), Weather Report, News, Time Signal, and Sports Notes. 10.30, Dance Music by Marek Weher and his Orchestra. 12.30 a.m. (approx.) (Sunday), Close Down.

BERN (411 metres); 1.5 kW.—8.0, Time Signal and Weather Report. 8.5 (approx.), Humorous Readings. 9.30, Yodel Songs and Accordion Duets by Herr and Frau Bühler. 9.30, Orchestral Selections, News and Weather Report in the Interval. 10.35, Dance Music. 12.0 Midnight (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—4.0, Review of Books. 4.30, Concert: Overture to The Merry Wives of Windsor (Nicolai); Cavatine (Raff); Ein Bizet-Denkmal (Schäfer); Sérénade Siciliana (Bocce); Crescendo (Lasson); Two Selections (Rubinstein); Overture to Prince Carnival (Blasius); Katzenjammer (May); Waltz from The Circus Princess (Kulman); Ernst-August Marsch (Blankenburg). 6.0, Georg Hallama, Talk: From Reichenstein to Landeck. 6.20, Esperanto Talk by Elsa Koschate. 6.30, Sketches of Upper Silesia by Heinrich Koitz, relayed from Gleiwitz (329.7 metres). 7.25, Dr. Alfred Wolf, Talk: Political Training. 7.50, Geörg Lichey, Talk: At the Turning Point of World History. 8.15, "The Last Waltz," Operetta (Oscar Straus), followed by News 10.30, Concert and Dance Music, relayed from Gleiwitz. 12.0 Midnight (approx.), Close Down.

SATURDAY, SEPTEMBER 15th.

All Times are reduced to British Summer Time and are p.m. except where otherwise stated.

BRÜNN (441.2 metres); 3 kW.—6.0, Time Signal and German Transmission. 6.25, Programme of Talks. 7.0, Humorous Selections. 8.15, Comedy by Semberk. 9.0, Exhibition Programme. 10.0, News from Prague. 10.20, Exhibition Programme.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Dance Music from the St. Sauveur Palais de Danse. 6.0, Selected Readings. 6.15, M. Mortier, Talk: The Desert of Gobi. 6.30, Trio Concert: Qui veut un Baïser? (Frings); Moonbeams (Reeves); The Three Masks (de Larra); Entr'acte and Réverie (Fourdrain); Sérénade de L'Amant Jaloux (Grétry); Selection from Hamlet (Thomas); Selection from The Judgment of Midas (Gluck); La Mascotte (Audran); Selection from Alceste (Gluck); Intermezzo (Mandl). 7.30, "Radio-Chronique." 8.15, Gramophone Selections. 8.30, Selections from Manon (Massenet). 9.0, Topical Events Talk. 9.5, Orchestral Selections. Gavotte and Minuet. 9.25, Selections from Manon (Massenet). 10.15, News and Announcements. 10.30 (approx.), Close Down.

BUDAPEST (555.6 metres); 35 kW.—4.45, Time Signal and Weather Report. 5.0, Talk: Political Economy. 5.30, Gramophone Selections. 6.30, American Impressions. 7.15, Concert of Military Music. 8.30, Charlotte Fedak Programme. 9.35, Time Signal, News and Racing Notes. 10.0, Trio Selections. 10.30, Weather Report. 11.0, Recital of Hungarian Folk Songs.

COLOGNE (283 metres); 4 kW.—12.10, Programme from Langenberg. 1.5, Orchestral Concert: March of the Priests from Athalia (Mendelssohn); Overture to Der Korsar (Berlioz); Waltz, Flattergeister (Strauss); Selections from Lohengrin (Wagner); Solos, Largo from the Fifth Symphony (Dvorák); A Wedding Day on Troldhaugen (Grieg); Potpourri, Offenbachiana (Conrad). 2.30, Hints for the Housewife. 3.40, Herr Britz, Talk: Impressions of the Berlin Wireless Exhibition. 4.10, Programme from Langenberg. 4.30, Programme from Königswusterhausen. 5.0, Programme for Women. 5.25, Programme from Langenberg. 5.45, Mandoline Concert. 7.15, Talk for Workers. 7.45, Prof. E. I. Müller, Talk: Music. 8.15, Variety Programme. 10.30 (approx.), News, Sports Notes, Commercial Announcements, Orchestral Selections and Dance Music. 1.0 a.m. (approx.) (Sunday), Close Down.

CRACOW (566 metres); 1.5 kW.—5.0, Programme from Warsaw. 5.25, Talk by Mme. St. Wintuschka. 6.0, Programme from Warsaw. 7.0, Miscellaneous Items. 7.30, Talk by Mr. J. Regula. 7.55, Agricultural Report. 8.5, News. 8.15, Programme from Warsaw. 10.30, Concert from a Restaurant. 11.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—1.30, Weather Report and Concert of Gramophone Selections. 7.20, News. 7.30, Recitations by May Pitchford. 7.45, Irish Lesson by Seamus O'Duinnín. 8.0, Selections by the Augmented Station Orchestra; Three Irish Dances (Ansell); Three Scottish Dances (Wright). 8.30, Soprano Solos by Hilda Roberts. 8.45, Selections by the Station Orchestra: From India to Egypt, An Indian Legend (Baron); Indian Wedding Festival (Baron); Egyptian Suite, (a) In the Harem, (b) In Cairo, (c) Fata Morgana, (d) By the Pyramids, (e) Desert Storm. 9.20, Soprano Solos by Hilda

Roberts. 9.30, The Art Studio Club. 9.45, The Station Orchestra, The Little Clock on the Mantel. 10.30, News and Weather. 10.45 (approx.), Close Down.

FRANKFURT (428.6 metres); 4 kW.—1.0, Concert of Gramophone Selections. 3.5, Programme for Children. 3.55, Hints for the Housewife. 4.35, Concert of Old Operetta Music: Overture to Zehn Mädchen und kein Mann (Suppé); Waltz from a Thousand and One Nights (Joh. Strauss); Song, Potpourri from Der Bettelstudent (Millocker); Waltz from Der Probekuss (Millocker); Song, Potpourri from Die Fledermaus (Joh. Strauss); March from Simplicius (Joh. Strauss); In the Interval, Wireless Announcements. 6.10, Reading by O. W. Stadtmann On Two Planets (Kurd Lasswitz). 6.30, Answers to Queries. 7.0, O. Krauss, Talk: Water Plants. 7.30, "The Marriage of Figaro," Opera (Mozart), relayed from the Opera House, followed by Programme from Voxhaus.

HAMBURG, Call HA (in Morse) (394.7 metres); 4 kW.—10.15 a.m., News. 11.0 a.m., Programme of Gramophone Records. 12.10, Weather Report. 12.15, Exchange Quotations. 12.30, Concert from Hanover (297 metres). 12.45 (in the interval), Shipping Forecast. 12.55, Time Signal. 1.10, News. 2.40, Exchange Quotations. 3.30, Book Review. 4.0, Labour Exchange Report. 4.15, Illustrated Music Talk by Dr. W. Heintz. 5.0, Concert, a Jazz Review: Fox-Trot, Get out and get under the Moon; Fox-Trot, Play of the Waves; Fox-Trot, Polly; Tango, La Comparsita; Fox-Trot, Dolly Dimples; Oh, Bridget please orler an ice; Boston Waltz, Sendero de Amor; Fox-Trot, Wenn die Sternlein gehn zum Rendezvous; Fox-Trot, Oh, Ya, Ya; Fox-Trot, Forget me not; Tango, Noce en la Voiga. 6.0, Request Programme. 7.0, Karl Minor, Talk: The Origin of German Idioms. 7.30, Kurt Siemers, Talk: Some Poets' Graves on the Northern Coasts—Holger Drachmann and Jens Peter Jacobsen. 7.55, Weather Report. 8.0, "Mona Lisa," Opera (Max Schillings), followed by Weather Report, News and Sports Notes. 10.30 (approx.), Concert from the Café Wallhof.

HILVERSUM (1,071 metres); 5 kW.—11.40 a.m., Police Announcements. 12.10, Concert of Trio Music. 1.40, Concert, relayed from the Tuschinski Theatre, Amsterdam. 5.40, Time Signal. 5.42, Orchestral Concert: Overture to The Nuremberg Doll (Adam); A Wedding Trip through Scandinavia (Frederiksen); Violin Solos, (a) Romance (Svendsen), (b) Nocturne (Sibelius), (c) Valse triste (Sibelius); Selection from Martha (Flotow); Violin Solos, (a) Minuet in D Major (Mozart), (b) Romanza andaluzza (Sarasate), (c) The Bee (Schubert); Sous la feuille (Thomé); Selection from Gasparone (Millocker); Fox-Trot, Rhapsody in Minor (Spoliansky); Finale. 7.25, Police Announcements. 7.40, Programme, arranged by the Workers' Radio Society—Concert and Talk. 11.15 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Relays on 1,870 metres from 5.40 p.m. 12.10, Concert of Trio Music. 5.10, Gramophone Selections. 7.25, Talk by M. Smeets. 7.40, News and Announcements. 7.55, Concert and "Le Châlet," Opera-comique (Adam).

JUAN-LES-PINS (Radio L.L.) (434 metres); 1.5 kW.—1.0, Concert. 9.0, News, Weather Report, Talk for Women by Mme. La Comtesse de Trémeuge, and Concert. 10.30, Dance Music.

KALUNDBERG (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres)—7.30 a.m., Morning Gymnastics. 11.0 a.m., Weather Report. 12.30, Relay from the Tivoli on the Occasion of the Opening of the Wireless Exhibition. 3.0, Programme for Children. 3.30, Instrumental Concert: Overture to Orpheus in the Underworld (Offenbach); Valse Militaire (Waldteufel); Selection from La Tosca (Puccini); Salut d'amour (Elgar); Fantasia on Danish Soldier's Songs (Nielsen); Sangen om Kløvnen (Schroder); Piano-forte Solos (Schumann), (a) Papillons Op. 2, (b) Aufschwung Op. 12; Selection from Die Fledermaus (Joh. Strauss); Tonerne (Sjøberget); Sérénade (Toselli); Entr'acte-Gavotte from Mignon (Thomas); Waltz, Amélie (Lumbwe); Polka Pepita, (Lumbwe); Tivoli March (Fahrbach). 6.20, N. M. Jensen, Talk: Teaching the Deaf and

Programmes from Abroad.—

Dumb. 6.50, Weather Report. 7.0, News and Exchange Quotations. 7.15, Time Signal. 7.30, Talk: Marie Bregendahl. 8.0, Climates from the Town Hall. 8.2, Experimental Transmission from the Studio in Axelborg: Solo and Orchestral Concert, followed by News. 10.30, Dance Music. 12.0 Midnight, Chimes from the Town Hall. 12.15 a.m. (approx.) (Sunday), Close Down.

KATOWITZ (422 metres): 10 kW.—5.25, Concert. 6.0, Programme for Children. 7.0, Announcements. 7.30, Talk by Mr. E. Rybacz. 7.55, Agricultural Report. 8.15, Concert: Trio in E Flat Major (Brahms); Song, Trio in B Minor (Reger). 10.0, Time Signal, Weather Report, and News. 10.30, Dance Music.

KAUNAS (2,000 metres): 7 kW.—6.30, Announcements. 7.0, Time Signal, Weather Report and News. 7.30, Vocal and Orchestral Concert. 9.30, "The Bear," One-Act Play (Tschekov). 10.0, Dance Music and Variety Selections.

LAHTI (1,522.8 metres): 35 kW.—6.15, Duets from Operas and Operettas; Talk in the Interval. 7.0, Dramatic Selection. 7.50, Orchestral Selections: Tukki-lauhja (Kauppi); Selection from Katja, the Dancer (Gilbert); Selection (Krausz). 8.45, News in Finnish and Swedish. 9.15, Dance Music. 10.0 (approx.), Close Down.

LANGENBERG (468.8 metres): 20 kW.—Programme also for Aix-la-Chapelle (400 metres). Cologne (283 metres) and Münster (230 metres)—12.10, Gramophone Selections. 1.5 to 4.10, Programme from Cologne. 4.10, Adolf Uzarski Readings from Düsseldorf. 4.30, Programme from Königswusterhausen. 5.0, Programme from Cologne. 5.25, A. Lübke, Talk: Modern Traffic Problems, from Münster. 5.45 to 1.0 a.m. (Sunday), Programme from Cologne.

LEIPZIG (365.8 metres): 4 kW.—4.30, Concert: Overture to The Water Carrier (Cherubini); Clock Symphony in D Minor (Haydn); Suite for Flute and String Orchestra (von Bartels); in the Interval, Wireless Announcements. 6.0, Technical Talk. 6.15, Taxation Talk. 6.30, Programme from Königswusterhausen. 7.0, Herr Fraenkel, Talk: The Importance of Former Legislation with regard to the Protection of the Worker. 7.30, Dr. Hans Maier, Talk: Ocean Flights in Olden Days. 8.0, Weather Report and Time Signal, followed by Wireless Announcements. 8.15, Lina Carstens reads from the Novel, Figuren (Paul Wiegler), in commemoration of the Author's 50th Birthday. 9.0, Concert by the Leipzig Symphony Orchestra: Champagne Overture (Bausnern); Suite (Dvorák), (a) Pastorale, (b) Polka, (c) Minuet, (d) Romance, (e) Finale; Hungarian Rhapsody, No. 6 (Liszt); Prelude to Act III of Kunihild (Kistler); Carnival March (Kistler); Intermezzo from Monna Lisa (Schillings); Waltz, Op. 39 (Brahms). 10.15, News and Sports Notes. 10.30, Programme from Vohaus.

LILLE, Call PTT (264 metres): 0.5 kW.—7.0, Market Prices. 7.10, Concert. 8.20, Miscellaneous Items. 8.30, Concert arranged by the Wireless Association of North France; News.

MADRID (Union Radio), Call EAJ7 (375 metres): 3 kW.—7.0, Sextet Selections: Three Preludes (Debussy), (a) La Fille aux Cheveux de Lin, (b) La Cathédrale Engloutie, (c) Bruyères; Las Hornigas Suite (Alvarez); Selection from Fédora (Giordano); Interlude by Luis Medina. 8.0, Dance Music. 9.45, Market Prices. 10.0, Time Signal. 10.2, Symphony Concert: Orchestral Selections, (a) The Bartered Bride (Smetana), (b) Pavane pour une Infante défunte (Ravel), (c) Marche Joyeuse (Chabrier); El Amor Brujo (de Falla); Musette, Tambourin and Minuet (Rameau-Mottl); Albumblatt in E Flat (Wagner); Persian Dances (Moussorgsky), followed by News. 12.0 Midnight, Dance Music. 12.30 a.m. (approx.) (Sunday), Close Down.

MILAN, Call IMI (549 metres): 7 kW.—8.35, Time Signal, Talk and News. 8.50, Variety Concert: Orchestral Selections, (a) Symphony in G Minor (Mozart), (b) Intermezzo from William Ratcliff (Mascagni); Baritone Solo from Don Carlos (Verdi); Soprano Solos (Parelli); Bass Solo from Dejanice (Catalani); Trio Serenata, Op. 8 (Beethoven); Talk: The History and Aesthetics of Music; Soprano Solo from Don Carlos (Verdi); Bass Solo from Ernani (Verdi); Quartet Selections, (a) Träumerei (Schumann) (b) Canzonetta (Mendelssohn); Baritone Songs (Rotali and Tirindelli); The Ride of the Valkyries (Wagner); News. 11.0, Orchestral Concert from the Hotel Majestic, Diana. 11.45 (approx.), Close Down.

MOTALA (1,380 metres): 30 kW.—Programme also for Stockholm (454.5 metres); Boden (1,190 metres), Göteborg (416.5 metres). Malmö (260.9 metres),

Saturday, September 15th.

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where otherwise stated.

Ostersund (720 metres), **Sundsvall** (545.6 metres)—5.0, Concert of Light Music. 6.0, Programme for Children. 6.30, Talk: The Furrier. 6.45, Soprano Song. 7.0, Talk: The Lofoten Islands. 7.30, Accordion Recital from Göteborg. 8.15, Talk on Topical Events. 8.30, Cabaret Programme. 10.30, Concert of Dance Music. 12.0 Midnight (approx.), Close Down.

NAPLES, Call INA (333.3 metres): 1.5 kW.—5.0, Variety Concert. 5.30, Time Signal. 5.35, Foreign Report by R. Lotto. 8.20, Wireless Notes. 8.30, Government Report. 8.40, Time Signal and News. 8.48, Harbour Notes. 8.50, Concert: Recital of Proverbs in Verse (Martini); Overture to The Magic Flute (Mozart); Soprano Solo from Giannini e Bernadone (Cimarosa); Bass Solo from The Queen of Golconda (Donizetti); Recital of Sonnets by the Author, Murolo; Duet from The Brewer of Preston (Kieci); "The Last Romance," Comedy (Sabatino Lopez); Bass Solo from The Northern Star (Meyerbeer); Soprano Solo from The Marriage of Figaro (Mozart); Talk by E. Murolo; Soprano and Bass Duet from Le Educande di Sorrento (Usciglio); Orchestral Selection, Overture to La Parte del Diavolo (Auber); Topical Talk. 10.50, News. 10.55, Calendar and Announcements. 11.0 (approx.), Close Down.

OSLO (461.5 metres): 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrunn (500 metres) and Rjukan (448 metres)—6.30, Programme for Children. 7.15, Weather Report, News and Market Prices. 7.30, Dr. Ernst W. Selmer, Talk: An Introduction to the Study of Languages. 8.0, Time Signal. 8.2, Autumn Revue 1928, relayed from Le Chat Noir Cabaret. 9.30, Weather Report and News. 9.45, Topical Talk, followed by Dance Music from the Grand Hotel. 12.0 Midnight (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres): 0.5 kW.—6.30, Radio Journal de France. 8.0, Sports Notes. 8.30, Concert arranged by the Association Générale des Auditeurs de T.S.F., followed by Dance Music from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres): 5 kW.—6.45, "Le Journal Parlé." 8.10, Weather Report. 8.30, Concert: Scènes alsaciennes (Massenet); Les danses de chez nous (Jacquet); Le Papillon (Irene Berger); Complainte bretonne (Odette Vargues); Bouton d'Or (Pierne); Air de Ballet (Nivard); Chanson de nague (Vargues); La route du village (Moudret); Annie celui qui t'aime (Bruggemann); Song (Franck); Selection (Messager).

PARIS (Petit Parisien) (340.9 metres): 0.5 kW.—8.45, Gramophone Selections, Talks, News and Announcements. 9.0, Concert: Le But de l'Errant (Sippé); Selection from The Queen of Sheba (Gounod); Cou moto moderato from the Italian Symphony (Mendelssohn); Passages français (Pierne); Second Suite from the Tales of Hoffmann (Offenbach); Nuit à Lisbonne (Saint-Saëns); March from La petite Bohème (Hirschmann), News in the Intervals.

PARIS (Radio Paris), Call CFR (1,750 metres): 6 kW.—12.30, Concert of Gramophone Selections, News in the Intervals. 1.50, Market Prices and Religious Announcements. 3.45, Dance Music, News in the Intervals. 8.0, Agricultural Report. 8.15, Talk on Rural Trades, followed by Exchange Quotations and Theatre Notes and News. 8.30, Concert: Symphony Concerto; Songs, News in the Intervals.

POSEN (344.8 metres): 1.5 kW.—7.0, Programme of Talks. 8.0, Economic Report. 8.30, Concert of Light Music. 10.0, Time Signal, News, Weather Report and Sports Notes. 10.20, Miscellaneous Items. 10.40, Dance Music from the Palais Royal Café. 12.0 Midnight, Concert from La Maisen Philips. 2.0 a.m. (approx.) (Sunday), Close Down.

PRAGUE (348.9 metres): 5 kW.—4.30, Puppet Play. 5.0, Concert. 6.0, German Transmission. 7.0, Popular Programme. 8.15, Orchestral Selections: Orpheus in the Underworld (Offenbach); The Bonbon King (Provažnik); Songs (Hasler); Mary Suite (Vojtech); Mah-long Blanca (Denes); Florentine March (Fucik). 9.0, Programme from the Exhibition at Brünn. 10.0, Time Signal, News and Orchestral Music.

RIGA (526.3 metres): 4 kW.—6.0, Programme of Talks. 7.0, Concert: Overture to Ilka (Doppler); Waltz, Künslerleben (Joh. Strauss); Fantasia on La

Navarraise (Massenet); Spanish Dances Nos. 2 and 5 (Moszkovsky); Songs; Violin Solo; Songs; Recitation; Overture to The Huguenots (Meyerbeer); Potpourri from Der Bettelstudent (Müllöcker); Vision (Lumby); Swedish Wedding (Södermann). 10.0, Weather Report and News, followed by Dance Music from the Café de l'Opera. 12.0 Midnight (approx.), Close Down.

ROME, Call IRO (447.8 metres): 3 kW.—8.10, Time Signal, Wireless News and Government Report. 8.30, Sports Notes, News, Exchange Quotations and Weather Report. 8.47, Topical Talk and Time Signal. 9.0, "La Gioconda"—Acts 2, 3 and 4 (Ponchielli), in the Intervals, Art and Literature Review and Topical Events Talk. 11.5, News. 11.30 (approx.), Close Down.

SCHAERBEEK (230 metres): 1.5 kW.—8.30, Gramophone Selections. 9.0, Orchestral Concert from the Théâtre Caméo, Brussels. 11.0, News. 11.5, Dance Music from the Caméo Club, Brussels. 12.0 Midnight, Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres): 30 kW.—11.55, Baseball Announcements. 12.0 Midnight, Statler's Pennsylvanians, directed by Johnny Johnson, from New York. 12.30 a.m. Sunday, Concert from the Hotel Sagamore, Rochester. 1.0 a.m., Programme arranged by the Waldorf Systems, Inc. 1.30 a.m., Time Signal. 1.32 a.m., The New York Philharmonic Orchestra conducted by Willem Van Hoogstraten, from the Lewisohn Stadium. 3.20 a.m., Organ Recital by Robert Berentzen from Rochester. 4.0 a.m., Dance Music relayed from Buffalo. 5.0 a.m. (approx.), Close Down.

STAMBOUL (1,200 metres): 5 kW.—6.15, Concert of Turkish Music. 8.30, Weather Report and Time Signal. 8.40, Concert: Selection from The Mute of Portici (Auber); Tribu de Zamara (Gounod); Song; Selections, Ballet Music from Don Juan (Mozart). 10.0, News and Close Down.

STUTTGART (379.7 metres): 4 kW.—5.0, Tea Concert from the Pavillon Excelsior. 6.0, Time Signal and Weather Report. 6.15, Friedrich Herzfeld, Talk: The Sound Effects of Orchestral String Instruments, relayed from Freiburg (577 metres). 6.45, Dr. Wolff, Talk: Book-keeping. 7.15, Dr. Schairer, Talk: The Language of Autumn, followed by Time Signal, Weather Reports, and Sports Notes. 8.15, Chamber Music: Chaconne for Violin (Bach); String Trio in E Minor (Beethoven), followed by Cabaret Concert: March, Unter dem Grillenbanner (Lindemann); I'd like to be a Butterfly (d'Albert); Burchard (Kandler); Operetta Songs, Mädel von Rhein (Palm); Wine, Women and Song (Strauss); "First Class," Farce (Thoma); Temptation Rag (Lodge); Songs; Juvano (Amadei); Lieber Mond, du gehst fort (Rust); Waltz from Countess Maritza (Kälmin); Couplet; Song; Schön ist das Leben (Netski); Jetzt trink ngr noch a Flascher Wein (Lorenz), followed by News, Dance Music from the Kurhaus, Baden-Baden, and First Night Concert from Freiburg.

TOULOUSE (Radiophonie du Midi) (391 metres): 3 kW.—12.45, Concert: Peer Gynt Suite (Grieg); Dance Music. 8.0, Exchange Quotations and News. 8.30, Choral and Orchestral Selections; Briäl Chorus from Lohengrin (Wagner); Kermesse from Faust (Gounod); Selection from Carmen (Bizet); Chorus and Triumphant March from Aida (Verdi). 8.45, Instrumental Selections: Accordion Solo, La Java blanche (Lenoir); Cinema Organ Solo, Russian Lullaby (Berlin); Violin Solo, Spanish Dance (de Falla); Pianoforte Solo, Evening in Vienna (R. Strauss); Hawaiian Guitar Solo, Waltz, Always love you (Jaccovacci); Violin Solo Sérénade (Drlla). 9.20, 9.5, Four Selections from Masquerade (Lacôme). 9.20, French Songs: Les roses blanches, Chanson rustique, Les Montagnards, L'âme des roses, La Marche Lorraine, Le père la Victoire, Le bonhomme Noël, Parisette. 9.40, Orchestral Programme: Two Selections from L'Enfant Prodigue (Debussy); Four Selections from El amor brujo (de Falla); Valse triste (Sibelius); Sérénade (Volkmann); Scherzo, The Flight of the Dumble-bee (Rimsky-Korsakoff). 10.5, American Tangos. 10.15, North African News.

VIENNA (577 and 517.2 metres): 1.5 and 115 kW.—4.15, Orchestral Concert. 6.0, Jens Friedrich, Talk: Wonders of the South Seas. 7.0, Concert of Instrumental and Vocal Music. 8.20, "Duckerpott's Heirs," Comedy in Three Acts (Grötzsch), followed by Orchestral Selections and Dance Music.

WARSAW (1,111 metres): 10 kW.—5.25, Talk: 6.0, Programme for Children. 7.0, Miscellaneous Items. 7.30, Wireless Talk by Dr. M. Stepowski. 7.55, Agricultural Report and News. 8.15, Orchestral Concert, News in French during the Interval. 10.0, Time Signal, Aviation Notes, Weather Report and Sports Notes. 10.30, Dance Music from the Restaurant Oaza. 11.30 (approx.), Close Down.

SUNDAY, SEPTEMBER 16th.

All Times are reduced to British
Summer Time and are p.m. except
where otherwise stated.

Programmes from Abroad.—

BARCELONA (Radio-Barcelona), Call EAJ1 (344.8 metres); 1.5 kW.—12.0 Noon, Chimes from Barcelona Cathedral, followed by Meteorological Service for Spain, Weather Forecast for Europe, and Aviation Report. 1.30, The Iberia Trio in Popular Selections with Gramophone Records at Intervals. 2.45 to 6.0, No Transmission. 6.0, Agricultural Prices. 6.15, Vocal and Instrumental Concert: Tenor Solos by Pascual Pastor, (a) Romance from Maruxa (Vives), (b) Romance from Act 1 of La Generala (Vives). 9.0 (approx.), Close Down.

BASLE (1,010 metres); 1.5 kW.—No transmission.

BERGEN (370.4 metres); 1.5 kW.—10.30 a.m., Morning Service relayed from the Korschurch, Address by Pastor Oskar Grasmo. 12.30, Weather Report, and News Bulletin. 8.0, The Station Orchestra. 9.30, Concert. 10.0, Weather Forecast, News Bulletin and Time Signal. 10.15, Orchestral Music relayed from a restaurant. 12.0 Midnight (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—8.55 a.m., Relay of Chimes from the Potsdam Garrison Church. 9.0 a.m., Sacred Concert relayed from Voxhaus, with Address and Chimes from the Berlin Cathedral. 11.15 a.m. (approx.), Concert of Orchestral Music, from Voxhaus. 2.0, Children's Corner from Voxhaus. 3.30, Three Talks from Voxhaus. 5.0, Orchestral Concert from Voxhaus. 6.30, Emil Bischoff, Talk: Helpless People—Children. 7.0, Talks followed by relay of an outside German programme, Press News and Dance Music. 12.30 a.m. (approx.) (Monday), Close Down.

BERLIN (Voxhaus) (484 metres); 4 kW.—8.55 a.m., Relay of Chimes from Potsdam. 9.0 a.m., Vocal and Instrumental Recital of Sacred Music, Religious Address, and Cathedral Chimes. 11.15 a.m. (approx.), Orchestral Concert. 2.0, Children's Corner by Funk-Heinzelmann (Hans Bodenstedt). 3.0, Shorthand lesson—arranged by the Hans Bredow School. 3.30, Practical Hints in Agriculture. 3.45, The Weekly Market and Weather Report. 3.55, Talk. 5.0, Orchestral Concert. 7.0, Two Talks. 8.15, (approx.), Concert of Instrumental Music, followed by Weather Report, Time Signal, and Sports and General News. 10.30, Dance Music. 12.30 a.m. (approx.) (Monday), Close Down.

BERN (411 metres); 1.5 kW.—No transmission.

BEZIERS (158 metres); 0.6 kW.—8.15, General News Bulletin and Sports Notes. 8.30, Orchestral Concert of well-known Symphonies. 9.0, Popular Selections of Dance Music. 10.0 (approx.), Close Down.

BLOEMENDAAL (265 metres); 45 kW. 9.40 a.m. Divine Service. 4.40, Divine Service.

BRATISLAVA (300 metres); 1 kW.—9.0 a.m., Sacred Recital. 10.0, News Bulletin. 10.20, Orchestral Concert.

BRESLAU (322.6 metres); 4 kW.—8.45 a.m., Chimes from Christ Church, Breslau. 11.0 a.m., Vocal and Orchestral Morning Concert. 12.0 Noon, Instrumental Concert followed by Talk. 2.35, Hints for Chess Players by Adolf Kramer. 3.0, Children's Corner by Friedrich Reinicke. 4.15 (approx.), Instrumental Concert and Talks. 8.30, Concert or Play. 10.0, General News Bulletin. 10.30, Orchestral Selections. 12.0 Midnight (approx.), Close Down.

BRÜNN (441.2 metres); 3 kW.—9.0 a.m., Morning Recital followed by Agricultural Talk. 11.0 a.m., Orchestral Concert. 12.0, Musical Programme. 3.0, Programme relayed from the Exhibition. 4.0, Popular Concert. 6.0, German Transmission. 7.0 (approx.), Concert. 10.0, Time Signal, News Bulletin and Musical Selections.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Outside Relay of Dance Music. 6.0, Children's Corner by the Clowns, Bonzo and Sylvia, of the Théâtre des Enfants, Brussels. 6.30, Concert by the Station Orchestra. 7.30, La Radio-Chronique of Radio-Belgique. 8.15, Orchestral Concert with Solos. Duet from the first Act of Lakmé (Delibes) by Mademoiselle Vida Soprano and M. Rubeau (Tenor). 9.0 (approx.), Vocal and Instrumental Concert. 10.15 (approx.), Press News. 10.30 (approx.), Close Down.

UDAPEST (555.6 metres); 35 kW.—9.0 a.m., Press News and Beauty Hints. 10.0 a.m., Morning Service and Address, followed by Time Signal and Weather Report. 3.30, Talk. 4.0 (approx.), Children's Corner, followed by Musical Programme. 7.30 (approx.), Concert. 10.20, Zigeane Orchestra.

Forecast. 9.15, Orchestral Concert. 10.0, Dance Music Selections by the Orchestra of the Municipal Casino. 10.30 (approx.), Close Down.

KALUNDBORG (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres).—10.0 a.m., Divine Service, relayed from a Copenhagen Church. 11.30 a.m. (Kalundborg only), Weather Report and Forecast from the Copenhagen Meteorological Institute. 5.0, Relay of Evening Service from a Copenhagen Church, followed by Children's Programme. 6.50 (Kalundborg only), Weather Report from the Meteorological Institute. 7.0, General News Bulletin. 7.15, Time Signal. 7.30, Talk. 8.0, Chimes from the Copenhagen Town Hall. 10.0, Concert of Orchestral Selections from the Suite Le Bal Costumé (Rubenstein), (a) Berger et bergère, (b) Toreador et Andalouse, (c) Royal tambour et vivandière. 11.0 (approx.), Dance Music Programme; in the interval at 12.0 Midnight, Chimes from the Town Hall. 12.30 a.m. (approx.) (Monday), Close Down.

KATOWITZ (422 metres); 10 kW.—6.50, Talk. 7.45, Talk. 8.15, Concert, relayed from Warsaw. 10.0, Time Signal, Weather Report and Press and Sports News. 10.30, Dance Music. 11.30 (approx.), Close Down.

KAUNAS (2,000 metres); 7 kW.—12.0 Noon, Chimes followed by Time Signal and Weather Forecast. 12.10, Concert. 1.0, Programme for Children. 5.0, Talk. 5.25, Musical Selections. 5.35, Agricultural Talk. 8.45, Concert of Violin, "Cello and Pianoforte Music.

KÖNIGSBERG (303 metres); 4 kW.—Programme relayed by Danzig (272.7 metres).—9.0 a.m., Morning Recital with Instrumental Solos and Selections under the direction of Ernst Maschke. 11.0 a.m. (Königsberg only), Weather Forecast, followed by Concert of Orchestral Music. 12.55, International Time Signal, relayed from Nauen. 3.0, Chess Problems by P. S. Leonhardt, followed by Talks. 4.45 (approx.), Concert by the Station Orchestra. 8.5, "Euryanthe," Opera in Three Acts by Weber, directed by Kurt Lesing, with Music by the Station Orchestra and preceded by an introductory talk on the opera. 10.30 (approx.), Programme of Dance Music; in the interval at 11.0, Sports News. 12.15 a.m. (approx.) (Monday), Close Down.

LAHTI (1,522.8 metres); 35 kW.—Programme also for Helsingfors (375 metres).—9.0 a.m., Morning Service in Finnish. 10.50 a.m., Press News. 11.5 a.m., Musical Recital. 11.59 a.m., Time Signal and Weather Report. 12.0 Noon, Divine Service in Swedish. 5.57, Time Signal and Weather Report, followed by Orchestral Programme. 8.45, Late News Bulletin, given in Finnish and Swedish. 10.0 (approx.), Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres). Cologne (283 metres), and Münster (250 metres).—9.0 a.m., Evangelical Morning Service, followed by Programme of Talks. 1.0, Orchestral Concert, followed by Talks and Musical Selections. 7.0, Transmission for Workers: A series of talks on Proletarian Writers. This Week: Maxim Gorki. 7.45, Programme relayed from Cologne, General News Bulletin and Sports Notes, followed by Orchestral Concert and Dance Music. 12.0 Midnight (approx.), Close Down.

LAUSANNE (650 metres); 1.5 kW.—8.30, Protestant Address, followed by Gramophone Records. 10.0 Close Down.

LEIPZIG (365.8 metres); 4 kW.—8.30 a.m., Organ Recital, relayed from the University Church in Leipzig. 9.0 a.m., Vocal and Instrumental Concert, followed by Talks. 11.0 a.m. (approx.), Musical Selections. 2.30, Concert, relayed from the Jahresschau, Dresden. 4.30, Improvisations on the Pianoforte by Doctor Alf Nestmann, who will improvise on themes sent in by listeners; listeners are invited to send in short themes to the studio to be handed to Dr. Nestmann just before the recital. 7.30, Orchestral Concert. 10.15, Sports Notes. 10.30, Programme of Dance Music, relayed from Voxhaus. 12.30 a.m. (approx.) (Monday), Close Down.

LILLE, Call PTT (264 metres); 0.5 kW.—1.35, Prices of Motor Oils. 8.30 (approx.), Orchestral Concert, followed by General News Bulletin.

LYONS (Radio Lyon) (291 metres); 1.5 kW.—11.0 a.m., Sacred Concert arranged by the Maison Rabut. 12.0 Noon to 7.30, No Transmission. 7.30, Le Journal Parlé, General News Bulletin, News from the Press, and Current Topics, followed by Sports Notes. 8.0, Orchestral Concert: Compositions by Dubois, (a) Suite brève, (b) Xavière. 9.15, Old and New Dance Tunes. 10.0 (approx.), Close Down.

COLOGNE (283 metres); 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (468.8 metres) and Münster (250 metres).—9.0 a.m., Evangelical Morning Service, including Choral and Soloist Items, followed by Talks. 1.0, Concert of Orchestral Music, conducted by Herr Eysoldt, followed by Talks and Concert. 7.45, "Das Nachtlager von Granada," Opera by Kreutzer, followed by Sports Notes, Late News Bulletin, Concert of Light Music and Selections of Dance Music. 12.0 Midnight (approx.), Close Down.

CORK, Call 6CK (400 metres); 1.5 kW.—8.30, Instrumental Concert, with Contralto Solos (A. Gibbings) and Traditional Violin Solos (Fear gan ainn). 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

CRACOW (566 metres); 1.5 kW.—10.15 a.m., Morning Service, relayed from one of the Polish Cathedrals. 12.0 Noon, Fanfare from the Tower of Notre Dame, Cracow, followed by Time Signal and Weather Report. 4.0, Agricultural Talks and the "Chronique Agricole," by Dr. St. Wasniewski. 5.0, Relay from Warsaw. 6.30, Variety Items. 6.50, Talk. 8.0, Fanfare from Notre Dame and Sports News. 8.30, Vocal and Instrumental Concert: Songs by Mademoiselle F. Günther, (a) Air from Hérodiade (Massenet), (b) Air from Antar (Dupont), (c) Nocturne (César Franck), (d) Air from Salambo (Reyer); Transmissions from Warsaw. 10.30, Concert Programme, relayed from a Restaurant. 11.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—8.30, to 11.15 (approx.), Programme relayed from Cork: Concert by the Station Sextet, with Soprano Solos by Hilda Roberts and Baritone Solos by S. Fox. 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

FRANKFURT (428.6 metres); 4 kW.—8.0 a.m., Morning Recital, followed by Talk and Musical Programme. 1.0, The Report of Wiesbaden Institute of Agriculture, followed by Young People's Hour. 6.15 (approx.), Rhein-Main Educational Programme, followed by Sports News. 8.30, Orchestral Concert, followed by probable Relay of Dance Music from Berlin. 12.30 a.m. (approx.) (Monday), Close Down.

HAMBURG, Call HA (in Morse) (394.7 metres); 4 kW.—Programme relayed by Bremen (272.7 metres), Hanover (297 metres) and Kiel (254.2 metres).—8.25 a.m., Time Signal, followed by Weather Report and News Bulletin. 9.0 a.m., Legal Talk. 9.15 a.m., Morning Recital. 10.55 a.m. (for Kiel only), Relay of Divine Service from the Kiel University Church. 11.0 a.m. (for Hamburg, Bremen and Hanover), Talk. 12.55, Time Signal from Nauen. 1.0 (for Hamburg and Kiel), Orchestral Concert. 1.0 (for Bremen), Concert of Orchestral Selections. 1.0 (for Hanover), Selections of Gramophone Records. 2.0, Songs and Stories for Children, arranged by Hans Bodenstedt. 4.0 (approx.), Talk, followed by Orchestral Concert, relayed from the Café Wallhof. 7.30, Talk, arranged by the School of Physical Training. 7.40, Sports News. 7.55, Weather Forecast. 8.0 (approx.), Concert or Play. 9.30 (approx.), Weather Forecast, General News Bulletin and North Sea and Baltic Weather Report; Concert from the Café Wallhof (for Hamburg and Kiel) and Relay of an Outside Orchestra (for Hanover and Bremen). 11.0 (approx.), Close Down.

HILVERSUM (1,071 metres); 5 kW.—12.40 to 2.10, Concert by the Station Orchestra. 2.40, Instrumental Concert. 7.40, Weather Report and General News Bulletin. 7.45, Concert, relayed from the Concert Hall, Amsterdam, conducted by Pierre Monteux. 10.40 (approx.), Close Down.

HULZEN (340.9 metres); 4 kW.—Programme on 1,870 metres from 5.40. 8.10 a.m. to 9.10 a.m., Religious Address, Songs and Musical Programme. 12.10, The "Winkels" Trio, of Amsterdam, followed by Talks and Concert. 5.30 (approx.), Divine Service, relayed from S-Gravenhage, with Address by Pastor P. J. Molenaar, Organ Solos and Pralms, followed by a Concert of Instrumental Music. 10.0 (approx.), Choral Epilogue under the direction of Mr. Joseph Pickers. 10.40 (approx.), Close Down.

JUAN-LES-PINS (Radio L.L.), (434 metres); 1.5 kW.—1.0 to 2.0, Concert of Light Music, followed by Children's Corner with Talk by "Radiolo" (Marcel Laporte). 9.0, General News Bulletin and Weather

Programmes from Abroad.—

MADRID (Union Radio), Call EAJ7 (375 metres); 3 kW.—Programme relayed by **Salamanca**, EAJ22 (405 metres)—2.0, Concert by the Union Radio Orchestra. 3.30 to 7.0, No Transmission. 7.0, Children's Corner with Luis Medina and the Station Sextet. 8.0, Popular Dance Music by the Station Sextet. 8.30 to 10.0, No Transmission. 10.0, Chimes and Time Signal. 10.5, Concert by the Union Radio Orchestra, *Scheherazade* (Rinski-Korsakoff). 10.45, Concert relayed from the "Paseo de Rosales," by the Municipal Orchestra, directed by Señor Villa, followed by Dance Music by the "Palermo en Rosales" Orchestra. 12.30 a.m. (approx.) (Monday), Close Down.

MILAN, 1MI (549 metres); 7 kW.—10.30 a.m., Sacred Concert. 11.15 a.m. to 12.30, Interval. 12.30, Time Signal. 12.32, Concert by the Station Quartette. 1.30 to 4.0, No Transmission. 4.0, Vocal and Instrumental Concert. 5.25, Agricultural Talk. 5.30, Orchestral Selections relayed from the Majestic Hotel Diana. 6.0 to 8.25, No Transmission. 8.25, Opening Signal and Topical Talk followed by Time Signal. 8.45, Sports News. 8.50, "The Barber of Seville," Opera by Rossini; Talk in the Interval between Acts 1 and 2; Late News Bulletin and Sports News at the end of Act 2. 11.45 (approx.), Close Down.

MOTALA (1,380 metres); 30 kW.—Programme also for **Stockholm** (454.5 metres), **Boden** (1,190 metres), **Göteborg** (416.5 metres), **Malmö** (200.0 metres), **Ostersund** (720 metres) and **Sundsvall** (545.6 metres).—11.0 a.m., Morning Service relayed from a Stockholm Church. 12.35, Weather Forecast. 12.55, Time Signal. 5.0, Programme for Children. 5.55, Relay of Town Hall Chimes. 6.0, Divine Service relayed from a Stockholm Church. 7.15, Dramatic Programme followed by Instrumental Concert. 9.15, General News Bulletin. 9.30, Weather Report; The Results of the Swedish Parliamentary Elections will be broadcast every half hour during the evening programme and until 3 a.m. (Monday).

MUNICH (535.7 metres); 4 kW.—Programme relayed by **Augsburg** (506 metres), **Kaiserslautern** (277.8 metres) and **Nuremberg** (241.9 metres).—11.0 a.m., Chimes from the Munich Town Hall. 11.15 a.m., Transmission of Wireless Weather Chart for Bavaria. 11.45, Time Signal. 1.0, Weather Forecast and Programme Announcements. 4.0 (approx.), Orchestra Concert by the Radio Trio. 7.0, Vocal and Instrumental Concert—Artists: Maria Kiesel (Soprano) and Richard Staab (Pianoforte). 8.0 (approx.), Concert or Opera, followed by General News Bulletin and Musical Programme.

NAPLES, Call INA (333.3 metres); 1.5 kW.—10.0 a.m., Sacred Recital of Vocal and Instrumental Music. 4.45, Children's Corner. 5.0, Concert of Orchestral Music with Soprano Solos by Signora Carla Spinelli. 5.30, Time Signal. 8.20, Current Topics. 8.40, Time Signal. 8.48, Report from the Harbour of Naples. 8.50, Concert of Vocal and Instrumental Music: Selections from the works of Donizetti, (a) Faust Symphony, (b) Don Sebastian, (c) Polinto, (d) La Favorita. 10.0, Sports News. 10.55, Calendar and Programme Announcements. 11.0 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by **Fredrikstad** (434.8 metres), **Hamar** (555.6 metres), **Notodden** (411 metres), **Porsgrund** (500 metres), **Rjukan** (448 metres).—10.30 a.m. (approx.), Chimes and Morning Service relayed from an Oslo Church. 7.30, Concert. 8.0, Time Signal. 8.15, Orchestral Programme. 9.30, Press Notes and Weather Report. 9.45, Topical Talk followed by Dance Music from the Hotel Bristol. 12.0 Midnight (approx.), Close Down.

PARIS (Ecole Supérieure), Call F.P.T.T. (548 metres); 0.5 kW.—Programme relayed at intervals by the following stations: **Bordeaux P.T.T.** (275 metres), **Eiffel Tower** (2,650 metres), **Grenoble** (416 metres), **Lille P.T.T.** (264 metres), **Limoges** (285 metres), **Lyons P.T.T.** (476 metres), **Marseilles** (303 metres), **Rennes** (280 metres), **Toulouse P.T.T.** (260 metres).—8.0 a.m., General News Bulletin. 10.25 a.m., International Time Signal and Weather Forecast. 12.0 Noon, Concert of Instrumental Music. 1.0, Economic Report. 1.30, Orchestral Concert under the auspices of the General Association of French Wireless Listeners. 3.0, Concert of Symphony Music from the "Concours Spépine." 6.30, Programme of Le Radio-Journal de France. 8.30, Vocal and Orchestral Concert, followed by News Bulletin and Programme of Dance Music relayed from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call F.T. (2,650 metres); 5 kW.—8.56 a.m., Time Signal on 32.5 metres. 10.26 a.m., Time Signal on 2,650 metres. 6.45, Le Journal Parlé par T.S.F., Talks by regular Contributors: MM. Marc Frayssinet, André Delacour, George Delanare, Pierre Descaves, etc. 8.10 to 8.20, Meteorological Report. 8.30, Mario Cazes and his Orchestra. 8.56,

Sunday, September 16th.

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Time Signal on 32.5 metres. 11.28, Time Signal on 2,650 metres. 11.30 (approx.), Close Down.

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Selections of Gramophone Music. 8.50, Talk. 8.55, News from the Press. 9.0, Orchestral Concert. 9.25, General News Bulletin. 9.30 to 10.0, Concert of Symphony Selections: The First Movement of the Second Symphony in D by Beethoven. 10.0, General News Bulletin. 10.15, Popular Orchestral Concert. 11.0 (approx.), Close Down.

PARIS (Radio L.L.) (370 and 60 metres); 1 kW.—12.30, "Radio Liberté" Transmission, Musical Programme, Current Topics, and General News Bulletin. 3.0, Programme of Popular Dance Music.

PARIS (Radio-Paris), Call CFR (1,750 metres); 6 kW.—8.0 a.m., News Bulletin. 12.0 Noon, Religious Address, Sacred Concert by "La Vie Catholique," followed by News Bulletin. 12.45, Popular Selections by the Albert Locatelli Orchestra. 4.30, Dance Music by the Grand Vatel Orchestra and News Bulletin in the Interval. 8.0, Agricultural and Press News. 8.15, Radio Paris Circus, (a) Bilboquet's Parade, (b) Entrée Comique, (c) La Noce de Macaron, (d) Retraite. 8.45, Programme of Orchestral Music, directed by M. Eugène Bigot, with Press News in the intervals.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—9.0, Relay of Church Service. 7.0, Rox's Stroll Programme, relayed from WJZ, New York. 9.45, Relay Church Service. 11.0, Telechron Time Signal, Baseball Scores, and Instrumental Concert. 11.30, Concert of Orchestral Music. 12.0 Midnight, Time Signal and Baseball Scores, followed by Continuation of Concert. 1.0 a.m. (Monday), A Drama. 1.45 a.m., The Whittall Anglo-Persians from WJZ, New York, followed by Variety Programme and Time Signal. 3.0 a.m., Baseball Scores and Telechron Time. 3.30 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—10.15 a.m., Morning Service, relayed from a Polish Cathedral. 12.0 Noon, Time Signal. 5.0, Orchestral Concert, relayed from **Warsaw**. 6.30, Reports from the League of Polish Youth. 6.50, Talk. 7.15, Mr. B. Busiakiewicz in "Silva Rerum." 7.45, Talk, relayed from **Warsaw**. 8.30, Concert of Light Music, Vocal Recital by Mademoiselle A. Krupowiczouna (Soprano) and M. A. Karpacki (Baritone), Russian Songs. 10.0, Time Signal, General News Bulletin, Weather Report and Sports News. 10.20, Variety Items. 10.40, Programme of Dance Music, relayed from the "Palais Royal" Restaurant in Posen. 12.0 Midnight (approx.), Close Down.

PRAGUE (348.9 metres); 5 kW.—9 a.m. (approx.), Morning Recital, followed by Agricultural Notes and Musical Programme. 1.20, Current Topics. 6.0, German Programme, followed by Evening Concert. 10.0, Time Signal, General News Bulletin, and Concert of Orchestral Selections.

RABAT, Call P.T.T. (416 metres); 2 kW.—1.30, Concert by the Station Orchestra. 9.0, Sports Talk. 9.15, "Le Journal Parlé" and General News Bulletin. 9.30, Concert of Light Music by the Station Orchestra. 11.30, Orchestral Concert, relayed from the Jardin d'Éte in Rabat. 12.0 Midnight (approx.), Close Down.

RIGA (526.3 metres); 4 kW.—10.15 a.m., Relay of Morning Service. 1.0, Children's Programme of Music and Tales. 4.0, Concert of Orchestral Music, under the direction of Arved Parups. 5.0 to 7.0, Programme of Talks. 7.0, Orchestral Concert, with Songs and Violin Solos. 9.0, Weather Report. 9.30 (approx.), Dance Music from the Café de l'Opéra. 11.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—10.15 a.m., Opening Signal. 10.20 a.m. to 11 a.m., Vocal and Instrumental Concert of Religious Music. 11.0 a.m. to 1.0, No Transmission. 1.0 to 2.0, Selections by the Radio Trio. 2.0 to 5.0, No Transmission. 5.0, Opening Signal. 5.5, Studio Concert. 6.0 to 6.30, Dance Music, relayed from the Casinetta. 8.0, Opening Signal and General News Bulletin. 8.20, Agricultural Topics. 8.30, Sports Notes and News Bulletin. 8.45, Topical Talk. 8.59, Time Signal. 9.0, Concert by the Grand Symphony Orchestra: "Hansel and Gretel" (Humperdinck), (a) Mystical Pantomime (b) The Witch's Ride, in the Interval. Review of Reviews. 11.5, Late News Bulletin. 11.15 (approx.), Close Down.

SAN SEBASTIAN (Union Radio), Call EAJ8 (335 metres); 0.5 kW.—10.0 to 12.0 Midnight, Concert of Orchestral Selections, relayed from the Casino of San Sebastian. 12.0 Midnight (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—4.0, Relay of Service from the Unitarian Church in Schenectady. 10.30, Concert by the Ballad Singers, relayed from New York. 11.0, The American Legion Band in the "Stetson Parade" Programme, from Boston, Mass. 12.0 Midnight, Concert relayed from New York. 12.30 a.m. (Monday), Programme from the Capitol Theatre, New York. 2.0 a.m., Address by David Laurence on The Government of the United States, relayed from Washington, D.C. 2.15 a.m., Atwater Kent Programme from New York. 2.45 a.m., Dramatic Programme, relayed from New York. 3.15 a.m., Television Signals—Experimental Transmission. 3.30 a.m. (approx.), Close Down.

SEVILLE (Union Radio), Call EAJ5 (434.8 metres); 1 kW.—2.0, Orchestral Concert, with Gramophone Records in the Interval. 10.0, The Station Orchestra in Light Music, followed by Flamenco Songs by well-known artistes and Dance Music Selections by the Orchestra. 12.0 Midnight (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—4.30, Concert of Orchestral Music. 5.30, Stock Exchange and Prices of Cereals. 6.15, Turkish Music. 8.30, Weather Report and Time Signal. 8.40, Concert. 10.0, Late News Bulletin. 10.30 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—11.0 a.m. (approx.), Vocal and Instrumental Recital. 2.0, Funkhelfenmann's Programme for Children, relayed from Berlin, followed by Talk and Instrumental Concert. 6.0, Time Signal and Sports News. 6.15, Talk. 8.0 (approx.), Orchestral Concert, followed by News Bulletin, and Outside Relay.

TALLINN (408 metres); 2.2 kW.—8.30 a.m., Relay of Divine Service. 6.0 (approx.), Concert of Vocal and Instrumental Solos. 8.0, Agricultural Talk. 8.30, News of the Press. 8.45 (approx.), Close Down.

TOULOUSE (Radiophonie du Midi) (391 metres); 3 kW.—12.30, Weather Forecast, Local Market Prices and Stock Quotations. 12.45, Orchestral Concert. 1.0, Chimes. 1.45, Press News from "Le Télégramme," "L'Express" and "Le Midi Socialiste." 8.0, News of the Day. 8.30, Concert of Popular Selections. 9.0, Concert arranged by the "Association des Commerçants Radio Electriciens," of Toulouse: Pelléas and Mélisande (Debussy), (a) C'est au bord d'une fontaine, (b) Vous ne révez pas, (c) Ah! tout va bien, (d) Il fait beau cette nuit, (e) Je le tiens dans les mains, (f) Ah! je respire enfin, (g) Maintenant que le père, (h) Une grande innocence, (i) Nous sommes venus, (j) Quel est ce bruit? 10.15, The North African "Journal sans Papier." 10.30 (approx.), Close Down.

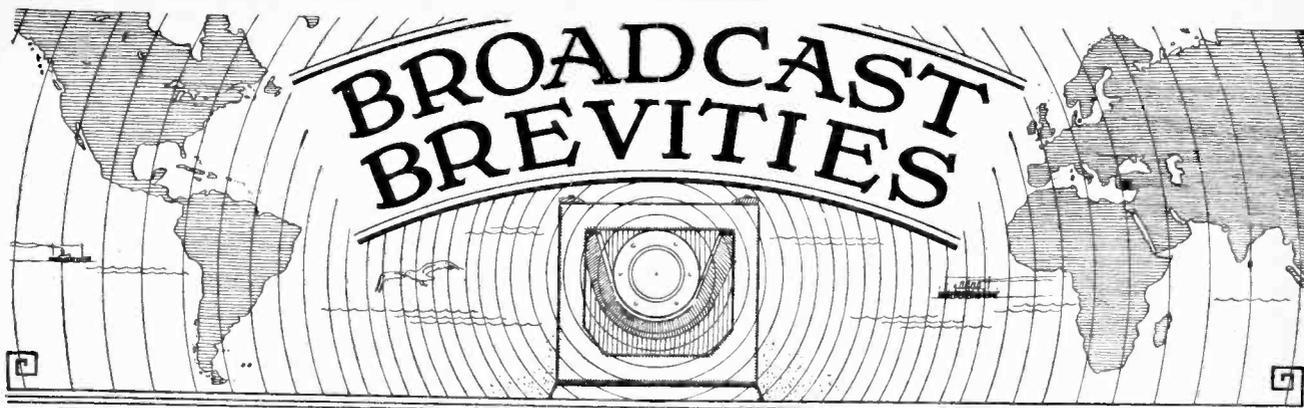
VILNA (435 metres); 1.5 kW.—12.0 Noon, Time Signal and News Bulletin, relayed from **Warsaw**. 6.30, News Bulletin. 8.15 (approx.), Concert, followed by Time Signal and General News Bulletin, relayed from **Warsaw**. 10.30, Dance Music. 11.30 (approx.), Close Down.

VIENNA (577 and 517.2 metres); 1.5 and 15 kW.—Programme relayed by **Graz** (357.1 metres), **Innsbruck** (294.1 metres), **Klagenfurt** (272.7 metres) and **Linz** (254.2 metres).—11.0 a.m., Programme by the Vienna Symphony Orchestra. 4.0, Concert of Orchestral Selections. 6.15 (approx.), Instrumental Concert. 8.10, "Die Fäschingsie," Operetta in Three Acts, by A. Willner and K. Osterreicher, Musical Setting by E. Kalman. 11.0 (approx.), Close Down.

WARSAW (1,111 metres); 10 kW.—10.15 a.m., Sacred Service, relayed from a Polish Cathedral. 12.0 Noon, Time Signal and Fanfare from the Tower of Notre Dame Church in Cracow; Aviation and Weather Report. 12.10 to 3.55, No Transmission. 3.55, Weather Report. 4.0 to 5.0, Three Talks on Agriculture. 5.0, Concert by the P.R. Orchestra, under the direction of J. Oziminski: Soprano Solos by Madame Proniak, (a) Les Astres (Noskowski), (b) La Chanson (Kratzer), (c) Les Rêves d'une Jeune Ville (Zelenski). 6.30, Variety Items. 6.50, Historical Talk. 7.15 to 7.45, Interval. 7.45 to 8.10, Talk. 8.15, Vocal and Instrumental Concert. 10.0, Time Signal, Aviation Route Report and Weather Forecast. 10.5, General News Bulletin. 10.20, Police News and Sports Notes. 10.30, Programme of Dance Music, relayed from Oaza Restaurant, Conductor, W. Koczowski. 11.30 (approx.), Close Down.

ZAGREB (309.2 metres); 0.7 kW.—11.30 a.m., Concert by a Military Orchestra. 8.0, Relay of an Opera from the Zagreb National Theatre.

ZURICH (588 metres); 1 kW.—11.0 a.m. (approx.), Orchestral Concert. 7.30, Religious Address. 8.0, Instrumental Concert, with Selections from Bach's Cantatas by Hermann Ernst (Baritone), E. Gilbert (Violin) and the Zollikon Choir. 10.0, Weather Report; Late News Bulletin and Close Down.



By Our Special Correspondent.

B.B.C. at Olympia.—Historic Apparatus.—New Talks Programme.—Winter Symphony Concerts.—A Piano for Broadcasting.

Romance at Olympia.

This year the organisers of the B.B.C. stand at Olympia appear to have been influenced by the romantic side of broadcasting. Tableaux depicting musical entertainment through the ages will combine with a display of historic apparatus to give a glamour of the past to an exhibition which is primarily concerned with the present and the future.

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Music Through the Ages.

The tableaux will consist of eight scenes portraying (i) the dawn of musical sense, i.e., cave men listening to the song of birds; (ii) early Chinese making music with gongs and drums; (iii) Grecian girls dancing to the lute and the lyre; (iv) a travelling minstrel in an English baronial hall; (v) Beethoven and his circle; (vi) mechanical music, first provided by a musical box; (vii) an early phonograph in use; and (viii) a modern broadcast receiver delighting the hearts of the watchers in a lightship.

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The Hertzian Wave.

I am told that we shall also see an attempt at symbolising the Hertzian wave in statuary. This piece of work, carved in wood, takes the form of a beautiful maiden, with long wavy hair, reclining upon a wave-swept rock. The figure was recently exhibited at the Paris Salon and is the work of Miss Mabel White.

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Historic Gear.

Among the historic apparatus on view will be a number of microphones used at different stages in the progress of broadcasting. We shall see the first microphone designed by Captain Round and a Post Office carbon microphone, with handle, of the type used by solo artists when 2LO had one cramped little studio in Marconi House. The Western Electric carbon microphone will also be exhibited, together with specimens of the Magneto-phone and Reinz instruments.

Other apparatus will include the suitcase amplifier first used for relaying the song of the nightingale, and also the gear used in broadcasting the boat race.

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Straight from Geneva.

To-morrow (Thursday) and on September 20th and 27th, at 9.15 p.m., "The Way of the World" talks, which have been a feature of 2LO's programmes for some time past, will be relayed to 2LO and other stations from a special studio

Newcomers in the Talks Studios.

From a perusal of the new "Talks and Lectures" booklet just issued by the B.B.C., it is evident that the Talks Department are bent on extracting the utmost from the time allotted to them between now and the end of December. The programme includes a variety of new items, and several names which are new to the microphone if not to the public eye.

Among the celebrated newcomers will be Lord Melchett and Sir Herbert Samuel, who are to discuss "Tendencies in Modern Industry To-day," and Mr. Ernest Newman, the eminent music critic, who will deal on Saturdays with "Next Week's Broadcast Music." Another speaker who has not been heard before will be Signor S. Breglia, who will conduct a new series of Italian talks on alternate Mondays.

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Theatrical Producers and their Plans.

The regular critical talks will be continued, with Mr. Desmond MacCarthy and Mrs. M. A. Hamilton on new books, Mr. James Agate on the theatre, Mr. Francis Toye on opera, ballet, and musical comedy, Mr. Percy Scholes on music, and Mr. G. A. Atkinson on films.

On Tuesdays Sir Walford Davies will continue his talks with musical illustrations, and on Wednesdays, well-known theatrical managers and producers, including Sir Nigel Playfair, Sir Barry Jackson, Miss Lilian Bayliss, and Mr. Basil Dean will explain to listeners their "aims in the theatre."

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A Broadcast Serial.

There is to be an experiment on Saturdays, when a detective story, "The Brentwardine Mystery," will be broadcast in four instalments on September 29th, October 6th, 13th, and 20th, by Mr. and Mrs. G. D. H. Cole, the joint authors, who are well known as the writers of such thrillers as "The Brooklyn Murders" and "The Man from the River." Other Saturday features will be topical talks and literary competitions.

FUTURE FEATURES.

London and Daventry (5XX).

SEPTEMBER 18TH.—"The Greater Power," a thriller.

SEPTEMBER 19TH.—"The Great Dressing-gown Tragedy," a waistcoat pocket musical comedy.

SEPTEMBER 22ND.—A Popular Operatic Programme.

Daventry Experimental (5GB).

SEPTEMBER 16TH.—A Military Band Programme.

SEPTEMBER 20TH.—A Summer Symphony Concert.

SEPTEMBER 21ST.—Promenade Concert, relayed from the Queen's Hall, London, Cardiff.

SEPTEMBER 20TH.—A Concert by the Carnarvon Choral Society.

SEPTEMBER 22ND.—"At Piveways," a sketch with songs and orchestra.

Manchester.

SEPTEMBER 18TH.—Promenade Concert, relayed from the Queen's Hall, London.

SEPTEMBER 22ND.—"Both Sides of the Microphone," by L. du Garde Peach.

Newcastle.

SEPTEMBER 18TH.—Opening Ceremony of Heaton Secondary Schools by the Rt. Hon. The Viscount Grey of Fallodon.

SEPTEMBER 21ST.—A Municipal Orchestral Programme from Whitby.

Glasgow.

SEPTEMBER 18TH.—Ladies' Variety Programme.

SEPTEMBER 19TH.—A Programme of the Fighting Songs of Scotland.

Aberdeen.

SEPTEMBER 20TH.—A Special Irish Programme, arranged and announced by Mr. John M. McQuitty.

Belfast.

SEPTEMBER 18TH.—A Shakespeare Programme.

SEPTEMBER 22ND.—"The Marchioness," an operetta adapted from Charles Dickens, by B. W. Findon. Music by Edward Jones, arranged by Robert Chignell.

at Geneva. This arrangement has been made to enable authorities on current affairs who will be in Geneva for the League of Nations Assembly to report for listeners the progress of international affairs

Winter Symphony Concerts.

The B.B.C. has wisely abandoned the adjective "national" in connection with the winter season of symphony concerts. Although the word was intended to indicate that the concerts were broadcast throughout the country, people who did not grasp this fact often wondered why "national concerts" should be so international in scope.

The conductors, for the approaching season at the Queen's Hall will include Sir Thomas Beecham, Sir Henry Wood, Franz von Hoerslin, Ernest Ansermet, Albert Wolff, and Granville Bantock. The concerts will probably be "S.B." through nearly all stations and will be given at the rate of two a month. The first will be conducted by Sir Thomas Beecham on October 12th.

A Programme by Listeners.

Bristol listeners have formed a Listeners' Club, the members of which will visit Cardiff station on September 29th, when they will give "Our Programme." The artists will include Hilda Eager (soprano), Reginald Bussell (bass), E. U. Ridgway and Frances Gayton (entertainers), together with the Bristol Banjo Quartet.

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A Real Thrill.

Could Edgar Wallace devise a more sensational situation than that which, according to a New York report, actually occurred in a Texas broadcasting studio a few days ago?

It appears that listeners were enjoying a piano solo when the announcer heard what he thought was the bursting of a

Generation," by Stanley Houghton; "Young Imeson," by James R. Gregson; and "The Optimist," by Vincent Douglass. Some of the plays will be relayed to all stations of the northern grouping.

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Why He Wanted the Tuning Note.

It is rather surprising to hear that Savoy Hill has received only four letters of protest against the discontinuance of the tuning note. As a rule a step in any direction on the part of the broadcasting authorities provokes a flood of protest. Although there are always a good many people dissatisfied with the existing order, it is only when a change is made that the B.B.C. realises what a lot of folk were perfectly satisfied with things as they were.

One of those who asked for the restoration of the tuning note made his plea on the ground that it enabled him to hear from the end of his garden when the news bulletin was about to begin.

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Solving the Pianoforte Difficulty.

Listeners to Radio Toulouse have not been altogether satisfied of late with the transmission of pianoforte music. Technical adjustments having failed to give the desired results, the station officials have adopted an ingenious compromise in the shape of a patent piano invented by M. Basiaux. This instrument, which has been specially designed for broadcasting purposes, produces the effect at the receiving end of uniform response at all frequencies. I hear that the experiment has met with complete success and that several of the leading gramophone companies are interesting themselves in the invention.

Such an instrument may sound very delightful on the loud speaker, but it seems probable that the actual sounds produced in the studio may be rather disconcerting to the sensitive musician.

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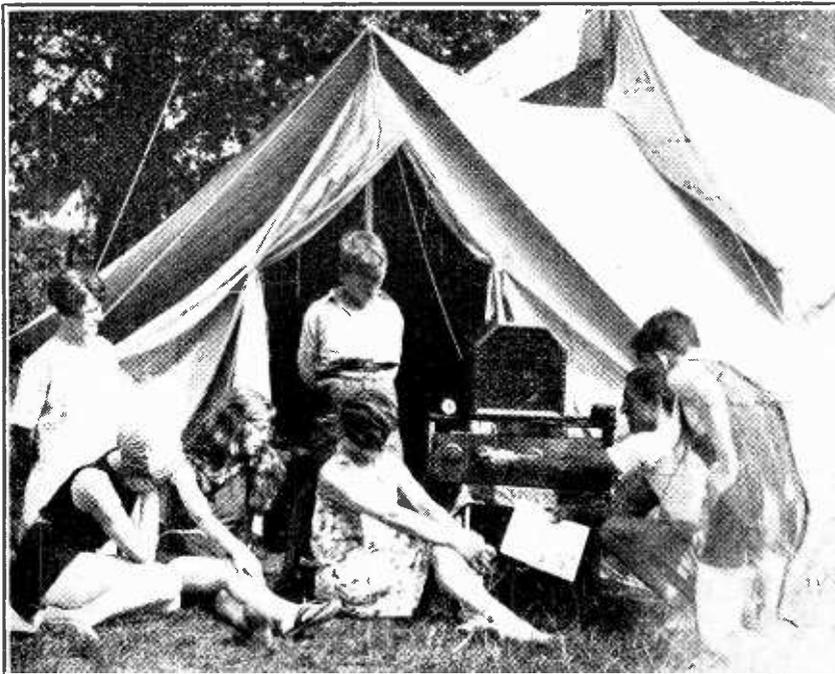
Back to Winter Time Schedule.

The B.B.C. announces that, beginning on Monday, September 24th, the following changes will be made in the timing of familiar features in the programmes broadcast from 2LO, 5XX, and all stations except 5GB:—

PRESENT TIMING.	TIMING FROM SEPTEMBER 24th.
6.30 p.m.—First General News Bulletin.	6.15 p.m.—First General News Bulletin.
6.45 p.m.—Musical Interlude and/or Bulletins.	6.30 p.m.—Musical Interlude and/or Bulletins.
7 p.m.—Talk.	6.45 p.m.—Foundations of Music.
7.15 p.m.—Foundations of Music.	7 p.m.—Talk.
7.25 p.m.—Talk.	7.15 p.m.—Musical Interlude.
	7.25 p.m.—Talk.

In the case of 5GB, the Children's Hour, which is at present broadcast from 5.45 p.m., will be put forward on September 24th to 5.30 p.m., and the first general news bulletin will be read at 6.15 p.m.

The timing of the main evening programmes from all stations will remain unchanged.



CAMPING JOYS. A motoring family photographed at their camp at Walton-on-Thames while listening to a broadcast programme. A wireless set is becoming recognised as a necessary item of camp equipment.

Any More Suggestions?

A correspondent asserts that it is high time the B.B.C. found a single short word to replace the cumbersome expression "running commentary." He suggests "microport."

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Two Sea Plays.

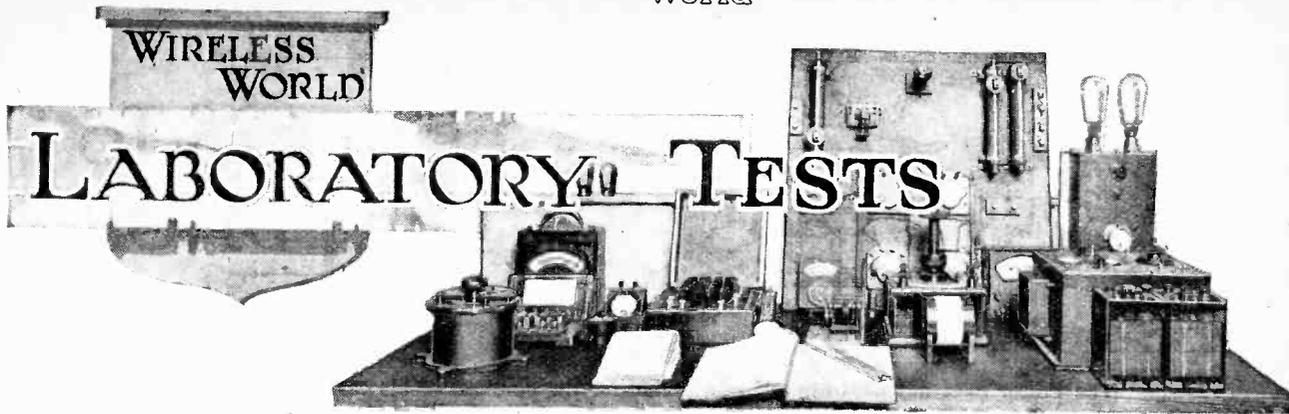
A "Southern Seas" feature will be heard by listeners to 5GB on September 20th, in which two plays dealing with the tropics will be broadcast. The first is "Sea Silence," a play of terror on the high seas, by Edwin Lewis. The second is a comedy, "Natural Causes," by Ian Hay, specially adapted for broadcasting. The Midland Pianoforte Trio will provide the incidental music.

motor tyre. He looked out of the window, and the music stopped while he described what he saw in the street below. A local bank manager was staggering down the street, pursued by a man who fired bullet after bullet until the bank official dropped. A few moments later the announcer was able to tell listeners that the assailant had been arrested.

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Broadcast Drama from Manchester.

A series of plays to be broadcast from Manchester during the forthcoming season will include the following: "Tall Chimneys," by James Lansdale Hodson, a Manchester dramatist; "Dealings in Futures," by Harold Brighouse; a hitherto unperformed play by Allan Monkhouse; either "Hindle Wakes" or "The Younger

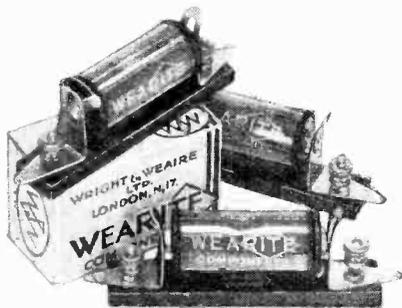


A Review of Manufacturers' Recent Products.

WEARITE WIRE-WOUND CONDENSER.

In these condensers the capacity is formed by concentric layers of insulated wire. The wire is No. 28 S.W.G. and the covering double green silk.

The advantage of this form of construction is that the capacity can be adjusted to any required value. On the other hand, the dielectric is likely to be



Wearite wire-wound fixed condensers and holders.

variable, and care must be taken to exclude moisture. In the Wearite condensers the wire is dry and no wax or varnish is used. The condenser is not hermetically sealed, but the wire is protected by a layer of thin sheet celluloid.

Specimen condensers were tested and their capacities found to be as follows:—

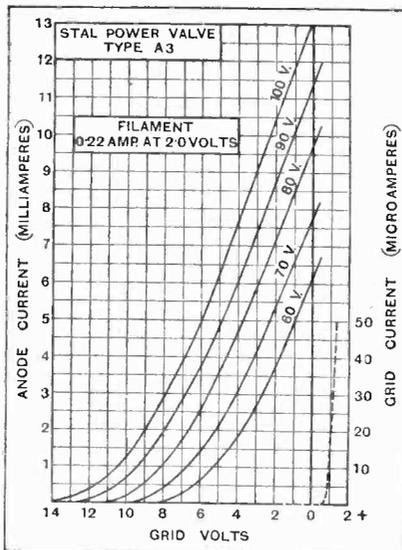
Nominal capacity. (mfd.).	Measured capacity. (mfd.).
0.0001	0.000137
0.0002	0.000215
0.0003	0.000292
0.0005	0.000523
0.001	0.000723

The power factor does not appear to be appreciably less than the conventional mica condenser, and all condensers are tested at 340 volts A.C. (peak) before despatch.

The overall length is 1 1/2 in. and taper contacts are fitted for fixing in clips of the grid leak type. The price of the condenser is 1s. 3d. and the holder 6d., the makers being Messrs. Wright and Veaire, Ltd., 740, High Road, Tottenham, London, N.17.

STAL VALVES.

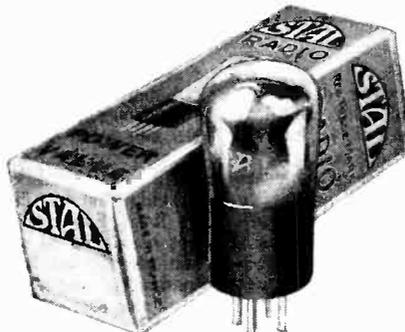
Stal valves are made in France and distributed in this country by Messrs.



Characteristic curves of the Stal 2-volt power valve, Type A3.

Lester and Co., Ltd., 45, Fore Street, Moorgate, London, E.C.2. Two valves were submitted for test with 2-volt filaments: Type A1, a general-purpose valve, and type A3, a power valve.

The general-purpose valve is described



Stal 2-volt power valve.

as a "micro" valve, i.e., the nominal filament consumption is 0.06 amp. The actual specimen tested had an even lower consumption, the filament current being only 45 mA at 2 volts. The characteristics for so small a filament current are quite good, the amplification factor being 10 and the A.C. resistance 19,000 ohms, giving a mutual conductance of 0.55 mA/volt.

The filament consumption of the type A3 power valve is naturally higher, being 0.22 amp. at 2 volts. The average characteristics calculated from the accompanying curves are as follows:—

A.C. resistance, 6,250 ohms.

Amplification factor, 8.3.

Mutual conductance, 1.33 mA/volt.



Colvern six-pin coil base.

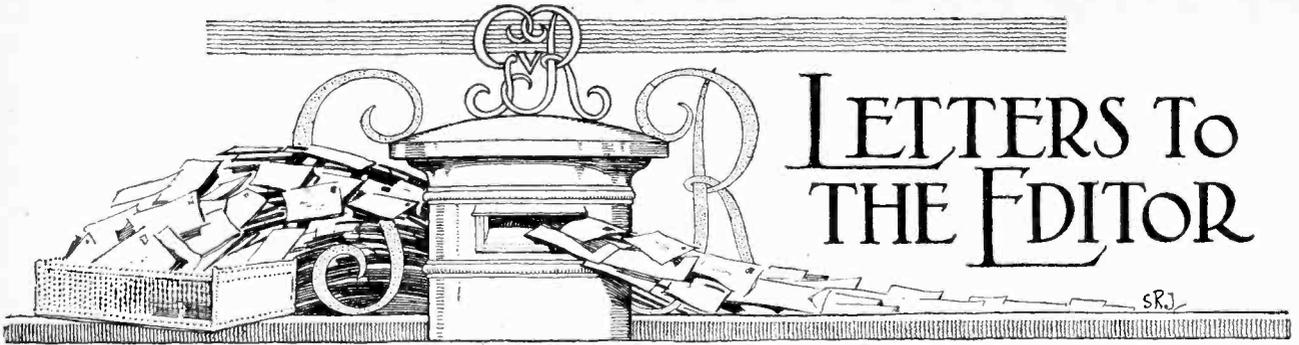
Both valves are suitable for H.T. voltages between 60 and 90 volts, and at 100 volts no trace of reverse grid current could be detected.

The price of the Type A1 valve is 5s. 9d., and the A3 power valve 7s. 9d.

COLVERN SIX-PIN BASE.

The sockets in this unit are embedded in bosses in the moulded base to prevent short circuits while inserting the coil pins. Terminals are provided for each socket and arrows on the top of the moulding clearly indicate the connections which are made under the base with pressed brass strips.

The price is 2s., and supplies are available from Messrs. Colvern, Ltd., 150, King's Cross Road, London, W.C.1.



The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor "The Wireless World," Dorset House, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.

MOVING COIL REPRODUCTION

Sir,—I am very interested in the correspondence in *The Wireless World* on the subject of moving coil loud speakers.

I have my original one, made up from parts supplied by Star Engineering, and it gives me full satisfaction.

Speech is like speech, bottom notes are all there without accentuation, top register quite natural; I have no trouble with suspension, three pieces of ordinary string to three terminals and it goes along without trouble.

I can hear the scrape of the bow on the double-bass strings, and I do not get the piano rattle so many people complain of.

There is nothing abnormal about the speaker; the cone is doped drawing paper mounted on chamois leather, and the pot magnet takes 0.5 amp. at 6 volts.

The receiving set is a simple H.F. Dimic coil coupled screened valve of the original 625 type, which will not go off the deep end, as the so-called neutralised H.F. valves do, but which appears to have no other redeeming feature.

There is no reaction at all; the detector is leaky grid with the return to a pot-meter across the L.T., with a Marconi Ideal for first L.F. coupling and Ferranti push-pull for the second, with a one-to-one output transformer (Ferranti) to the high-resistance coil drive.

I use an L.S.5a in each leg of the push-pull, and these together use 80 milliamps at about 450 volts, with approximately 100 volts grid bias, free style.

A Partridge and Mee transformer supplies the H.T. and G.B., and the filament current for the two B.T.H. rectifiers and the L.S.5a's, which are heated by raw A.C.

The H.T. for the H.F., detector and first L.F. comes from a Marconi transformer, using double-wave rectification, and the output has 100 volts accumulators floating across to give theappings for the various valves—maybe a queer idea, but fairly efficient.

My conclusions are that reaction of any kind is not permissible with this type of speaker (especially when on A.C. mains), and one must have a generous supply of H.T. Below 200 seems to be hopeless, and I do not see how anybody can get realism using D.E.5a or similar valves. What I am looking for is a valve better than an L.S.5a. LOUIS J. WOOD.

August 21st, 1928.
Halifax.

Sir,—Since moving-coil loud speakers and their associated amplifiers are occupying a substantial portion of your technical and correspondence columns, it may be of some little interest to you to hear yet another point of view on these matters.

Having weekly devoured *The Wireless World* for many years (and on a few occasions spent what has seemed an empty Wednesday when I have been unable to obtain it abroad), I am one of those who has graduated from a D.E.5 with horn-type speaker, via D.E.5As with cone-type (balanced armature) speaker, to one of the moving-coil variety using two L.S.5As in parallel, and with a wattage dissipation which I hesitate to mention. The process has naturally occupied some years, and at this juncture I am seriously asking myself:

"Is it worth while? Shall I go on, converting by present anode supply into mere grid-bias, and look elsewhere for an even more stupendous H.T. supply?" May I, then, present the case as it seems to apply in this particular district?

It is quite useless to use my present equipment on 6BM, the Bournemouth station, when the latter is S.B. from London. The quality transmitted is below the standard of the receiver, since frequent blasting occurs, and there is land-line noise, apart from which the quality is at times far from good. (This is not a castigation of the B.B.C.; I am unaware what difficulties they have to contend with in regard to this particular station.)

As 5GB fades and distorts after dusk, and is somewhat interfered with by spark traffic on a receiver which is necessarily fairly flatly tuned in the interests of quality, I have to fall back on 5XX as the sole station from which really good quality is obtainable. (Foreign stations are not, of course, worth while obtaining in the majority of instances, on the ground of quality and ultra-sharp tuning required to eliminate spark traffic.)

After a short period of enjoying the aforesaid really good quality from 5XX, the performance is marred by a high-pitched morse heterodyne. Again, if a musical item is being reproduced at a strength which is comparable with the actual studio performance, the ensuing announcement of the next item is gargantuan in its intensity, to say nothing of including considerable mush from the B.B.C. amplifier during the announcement. To counteract this defect, it is necessary to have one's own volume control, and use it in direct opposition to the gentleman performing a similar function at Savoy Hill throughout the evening; this, you will appreciate, becomes wearisome.

In consideration of the foregoing, and answering my own question, I have decided that it is *not* worth while. Purely from the *entertainment* point of view (i.e., in the sense of enjoying a B.B.C. item), I must admit that I derived greater pleasure from the D.E.5A (with 150 volts) and armature-driven speaker, though the quality and strength from that equipment was not comparable with that obtaining now.

I find that I have reached the stage of being too critical, and the slightest imperfections mar items which I should until recently have enjoyed. I find, furthermore, that I have developed a type of loud-speaker deafness, in that I am unable to concede that the old D.E.5A with 150 volts is anything but weak and lacking in fullness, while others, who have not listened to the high-power equipment so frequently find the former ample, "the best they have ever heard," and so on. On the other hand, my hearing is, I think, quite normal in other respects.

An additional drawback in using a high-power amplifier in this district is the preponderance of atmospherics during at least five out of the twelve months; these are naturally not nearly so distressing with the D.E.5A equipment, although the proportion must remain the same; and the latter conveniently ignores many other little impurities, or at least does not stress them to the same extent.

Although I must admit that the continual betterment of my equipment has afforded me endless and infinite pleasure,

Moving coil
 (OF GREAT BRITAIN & IRELAND), LTD.
 BRANCH OF THE IMPERIAL TOBACCO CO.
JOHN PLAYER & SONS
 ISSUED BY

th, 1928.

Wireless World

Place transfer in water for about a minute. Then remove it, and having shaken off surplus water, lay the picture upon the article which you intend to decorate, and apply pressure gently with the palm of the hand. After a few seconds slide or peel off paper very carefully while it is still wet.

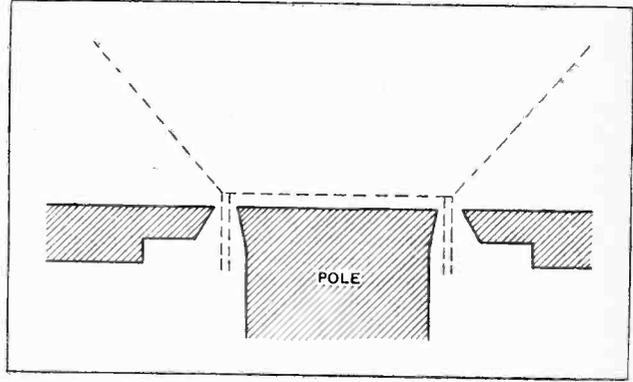
It has been worth while in the sense of the beholder's and my own enjoyment of the fact that I lived within five miles of the station might be different. I feel like putting up my anode voltage upon another L.S.5A. Why? The leave to your imagination, but I would not give any explanation, known or unknown of that very excellent periodical, *The Wireless World*. It is not what it is!

R. BRIGGS-BURY.

to clarify the present position, perhaps you will be good enough to publish this letter in your columns.
 Leigh-on-Sea. E. K. COLE, LTD.
 August 28th, 1928. W. S. Veddells, Managing Director.

MOVING COIL LOUD SPEAKERS—DESIGN OF THE ELECTRO-MAGNET.

Sir,—With reference to Mr. Lee's letter in your August 22nd issue, proposing a reduction in length of the moving coil and of the gap in a M.C. speaker, I would like to call attention to a fact which may have been overlooked, namely, that if the coil is reduced to half its length, with a proportionate increase in the number of layers of wire, the windings alone will be doubled in width, while the coil former and the clearance on either side of the coil may remain the same. It will be seen, therefore, that a gap halved in length will by no means need to be doubled in width.



For instance, taking a high-resistance coil in a narrow gap of 5-64 in. x 3/8 in. in length (about 2 mm. x 10 mm.), dimensions on a cross section will be:—

Clearance between coil and magnet	0.8 millimetres.
Windings on coil	0.5 "
Coil former (3 layers paper 4 mils thick)	0.3 "
Clearance between coil and pole	0.4 "
Total	2 millimetres x 10 millimetres, giving a cross section of 20 sq. mm.

The above dimensions are derived from "Moving Coil Loud Speakers," page 7. If the length of the gap is halved the foregoing dimensions may be altered to:—

Clearance between coil and magnet	0.8 millimetres.
Windings on coil	1.0 "
Coil former	0.3 "
Clearance between coil and pole	0.4 "
Total	2.5 mm. x 5 mm., giving a cross section of 12.5 sq. mm.

Thus, by halving the length of the coil, a reduction of some 35 per cent. of the space required to operate it in may be obtained, and since the flux density in the gap is, for a given number of ampere turns, proportionate to the length as well as the width of the gap, it would seem that in a pot designed for a low-power field, where saturation of the narrower cross section is not to be feared, the ratio of flux density to current consumption may be increased to a corresponding degree. Obviously the gap may be made still shorter until saturation point is approached, or until the construction of the coil adopted for the purpose becomes impracticable.

The proposed design would, incidentally, greatly facilitate centring in a narrow gap, since the difficulty will become far less acute with a shorter coil. With regard to this question, it might be a further improvement to make the rear of the gap, where the coil is more likely to touch, slightly wider than the front, where it is under observation, and its deviation from a true piston motion is easily controlled (the best way to do this will no doubt be to bias both the lip of the gap and the pole itself, so that both sides of the coil may benefit by the increased freedom).

Garches (S. & O.).
 August 30th, 1928.

F. D. HARRIS.

"POULTRY"
 A SERIES OF 50 TRANSFERS DIRECTIONS

BM/BAQW in your August 15th issue that I had just the same difficulty over one of my valves. As insulating tape and cotton wool had no effect. I concluded that the vibration reached the valve via the spring holder. I cured the trouble by strapping a horseshoe-shaped strip of 1/4 in. x 4 in. sheet lead over the top of the wool padding. This loads the valve holder springs and prevents vibration from the loud speaker from reaching the valve itself, which will not now set up a howl even when shut up in a cupboard with a fairly powerful coil-drive loud speaker.

H. R. POLLOCK.

A SUBSTITUTE FOR ACCUMULATORS?

Sir,—A crying need to-day is an efficient substitute for that primitive anachronism the L.T. accumulator. It is not necessary to explain why; words could not do it. Is there any hope, or must we go on suffering? Moreover, there must be many thousands of country people debarred from wireless because of this difficulty. Where are the inventors? E. KAYE.
 West Ealing.
 August 29th, 1928.

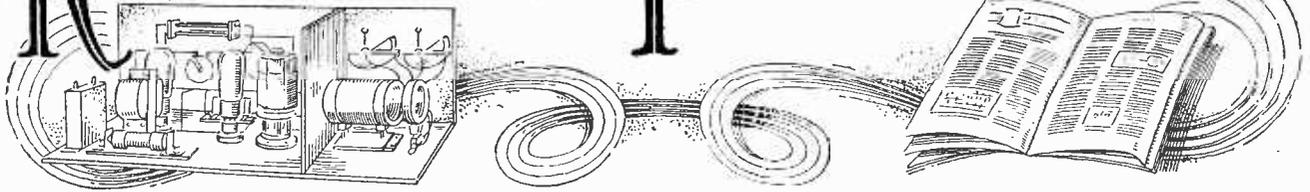
NON-CORROSIVE FLUX.

Sir,—Referring to the letters recommending a solution of resin in ether which have recently appeared in your columns, it is quite unnecessary to use ether for this purpose. I have for years used resin dissolved in warm spirit of turpentine to the consistency of thin treacle as a flux. The resin can, of course, be dissolved in cold turpentine, but this takes longer to effect solution. Another excellent non-corrosive flux is made as follows: Syrupy lactic acid, 1 part; glycerine, 1 part; water, 8 parts. I have tested joints made with this flux in No. 47 S.W.G. copper wire over prolonged periods without detecting any sign of deterioration. MEADE J. C. DENNIS (Col.).
 Baltinglass, Co. Wicklow.
 September 1st, 1928.

ALVE CURRENT FROM SUPPLY MAINS.

Sir,—We have read with interest the leader in your issue dated August 22nd entitled, "Valve Current from Electric Supply Mains." As pioneers in this country of the manufacture of Mains over Radio Devices we would thank you for the publicity you are giving this most important subject, and which should give a considerable help to the general public in realising that the attitude adopted by a certain few supply companies is a "lamp." As you state that you "rather wonder what is the position a manufacturer who sells such a piece of apparatus, unless warns the purchaser that it is liable to become useless to the moment the nature of his electric supply is changed," I would point out that this company provided for such an eventuality as far back as some twelve months ago by marketing the "EKCO" Rectifier Units, Models R.20 and R.60, so that when a D.C. supply is changed over to A.C., or the owner res from a D.C. to an A.C. district, an "EKCO" D.C. set in conjunction with a Model "R." is still of service. As you state in your last paragraph that it is of the utmost importance for the manufacturer of such apparatus to endeavour

READERS' PROBLEMS



"The Wireless World" Supplies a Free Service of Technical Information.

The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.

Amplification to the Limit?

I have so far failed to obtain stability with two H.F. stages, using screened grid valves, in spite of having taken all the precautions against inter-circuit coupling which have been put forward from time to time, and would welcome your advice.

The valves are coupled by H.F. transformers which are presumed to be highly efficient, as the magnification obtainable from a single stage is very high. Is it possible that I am obtaining more amplification than is compatible with stability; if so, how should I set about reducing it to controllable limits?—A. R. P.

There is a distinct upper limit to the H.F. amplification obtainable with screened grid valves, and, if your transformers are well designed, it is possible that you have exceeded it. In this case we think you would be well advised to remove turns (a few at a time) from each primary winding until stability is achieved. Before doing this, however, you should assure yourself that the set cannot be improved by introducing further safeguards against undesirable inter-circuit coupling; if you care to send us a circuit diagram showing these details, it is just possible that we may be able to make some suggestion which will enable you to avoid sacrificing amplification.

Improving Selectivity.

Guided by a suggestion published in your journal, I have been endeavouring to narrow down the band of the local station interference by replacing my "20,000-ohm" H.F. amplifier valve by one of 65,000 ohms impedance and an amplification factor of 40. I have had a measure of success, but am in difficulty with the question of grid bias. Working with a single dry cell, selectivity is good, but signals are noticeably weaker than with the previous valve, while with a zero grid bias the amplification is greater but tuning is less sharp. It seems that an intermediate voltage is necessary; do you recommend me to fit a potentiometer, and if so, how should it be connected?

S. T. M.

Unless the applied H.T. pressure is considerably in excess of the usual 120

volts, it would be better to bias the grid of the high-magnification valve to something less than the voltage of a single dry cell, and you will certainly improve results by using a potentiometer, which

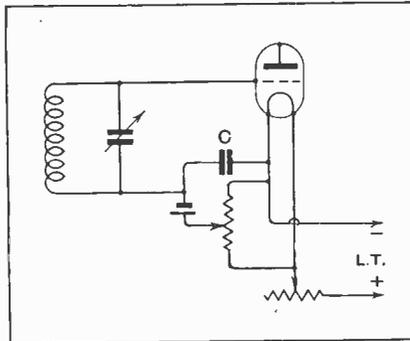


Fig. 1.—A small negative grid bias (up to 1½ volts) may be applied to a high-impedance H.F. amplifier by a potentiometer and dry cell.

should be connected as in Fig. 1. This addition is quite simple; all you have to do is to join the winding across the valve filament terminals and the slider to the positive side of the present grid cell. The by-pass condenser C may have a capacity of about 0.01 mfd.; its value is not critical.

Very possibly, however, there is a still easier solution of your problem; if the particular type of H.F. valve in use gives

RULES.

- (1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."
- (2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.
- (3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.
- (4.) Practical wiring plans cannot be supplied or considered.
- (5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.
- (6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers. Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

sufficient emission with an applied filament voltage less than that of the L.T. battery, you can obtain a small "free" negative grid potential by connecting the rheostat in the negative lead and joining the return wire to the L.T.—bus-bar.

Screening Still Necessary.

With reference to the article on "Scientific Wiring" in your issue of April 25th, I should like to know if the adoption of the plan discussed would render unnecessary the fitting of screens in a H.F. amplifier.

C. W. S.

By wiring the circuits of a receiver in the manner described in the article to which you refer, we do not in any way lessen the magnetic coupling between the various coils of a receiver. Consequently, metallic screening between these coils is almost always necessary when the circuits are lightly damped. However, in practice, an appreciable reduction of that form of inter-circuit coupling which is brought about by common resistances or impedances often allows the constructor to use less complete screening than would otherwise be necessary.

Lost Signal Strength.

My four-valve receiver, which follows closely the lines of several "Wireless World" sets, has recently developed a fault; its sensitivity is so considerably reduced that, instead of being able to receive many Continental stations in daylight, I can hear nothing but the local transmission. Although the adjustment of the neutralising condenser was originally quite critical, it is now possible to turn its control knob through several revolutions before producing oscillation. Is this symptom of a fault?

T. S. S.

We fear that your description does not convey sufficient information to enable us to state definitely what is wrong, but it appears likely that there is a considerable amount of damping one of the H.F. circuits; this may be due either to leakages or high-resistance connections. Furthermore, the effect might be ascribed to a faulty H.F. valve or to the fact that it is being supplied with insufficient filament or H.T. voltage.

The Wireless World

AND
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(16th Year of Publication)

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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

OLYMPIA 1928



RECEIVERS will be shown in which, by simply moving a switch, any one of six stations can be brought in (p. 339).

The Amplion Company are to be congratulated on having evolved a loud speaker which is an outstanding advance in design (p. 339).

It is significant that the Burndept Company are using screened grid valves almost exclusively in their new receivers for the purposes of H.F. amplification (p. 340).

Among the complete receivers, the new "Dominion Three" should not be missed (p. 340).

One looks forward to examining (and hearing) the "Cubist" moving-coil instrument, of which full particulars are not yet available (p. 340).

To make provision for short-wave reception, as well as covering the normal broadcast band and the exclusion of Daventry, is a feature of a set of novel design, meeting the requirements of the Colonial listener (p. 340).

A pedestal cabinet for mounting a moving coil loud speaker (p. 341).

A transformer with a silver primary and nickel secondary (p. 349).

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POINTS FROM OUR FORECAST

Metal cabinets form an interesting new departure in receiver design (p. 341).

Receivers fitted with screened grid H.F. amplifiers and the pentode output stage (pp. 341, 343, 348, 349, 350).

A new portable receiver, with alternative mains operation (p. 342).

For compact set construction, a small logarithmic condenser with spindle projecting at both ends (p. 349).

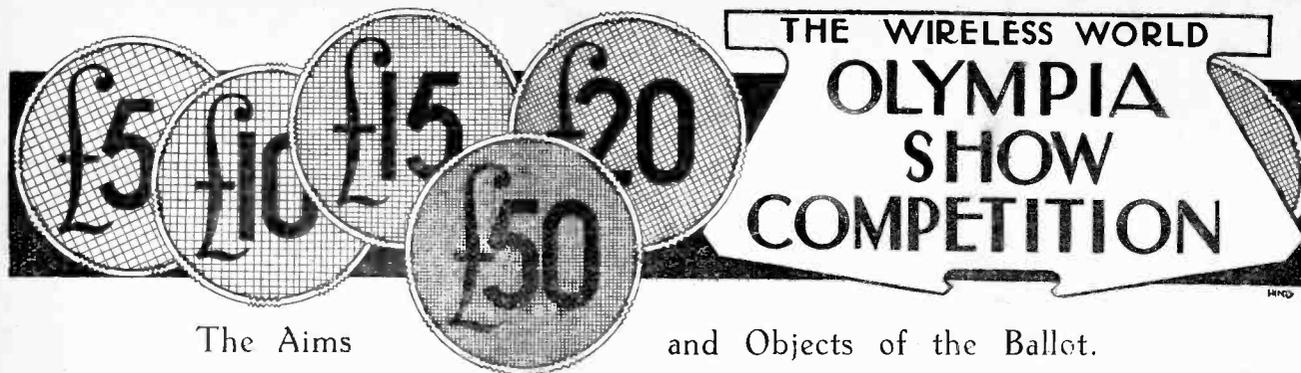
A device that varies the effective length of the aerial as a means of controlling selectivity (p. 349).

Some new type wall jacks for loud speaker extension and house wiring system (p. 343).

A triple condenser, controlled by three drums sufficiently close together to allow of simultaneous or independent control (p. 343).

A.C. ammeters, voltmeters, and milliammeters incorporating dry metal-oxide rectifiers (p. 345).

A number of changes have taken place in existing Gecophone sets and some new designs have been prepared for the coming season. The development of the screened grid valve has helped considerably in simplifying the control of these receivers (p. 345).



The Aims

and Objects of the Ballot.

THE annual Radio Exhibition now held at Olympia becomes every year of greater importance as the occasion upon which the manufacturers present to the public the result of the year's improvements and concentrated effort on their part to produce the most up-to-date apparatus both in complete sets and components.

Almost every visitor to the Exhibition who is interested in wireless, and many more amongst those who are unable to attend the Exhibition personally, endeavour to sort out from amongst the vast number of new products those items which they consider themselves to be the best in their class. Every reader of *The Wireless World* probably decides for himself what he considers to be the outstanding feature of the Exhibition as a whole, and to this choice he adds what he regards as the best set, the best loud speaker, and so forth.

Object of the Competition.

We believe that it would be of very great interest to our readers to have a means of contributing their views to a vote to decide what, in the general opinion, were the best products, the readers of *The Wireless World* to compose the electorate. It is with this object in view that *The Wireless World* has decided to run a competition with the co-operation of its readers, and with the official recognition of the Radio Manufacturers' Association, the organisers of the Exhibition. It is believed that this competition will produce a result not only of very great interest to the readers, but one which will also provide valuable information for the help and guidance of the manufacturers themselves, who

Entry forms to be sent in after Wednesday, October 3rd, and not later than Monday, October 8th.

will welcome the opinion of those more technical sections of the public who comprise the readers of *The Wireless World*.

We have organised the competition on the basis that every reader of *The Wireless World* should be entitled to one vote for what he considers to be the outstanding single exhibit at the Show, whether a complete set, a component or a valve. To reduce or avoid ties each competitor is also required to vote for one piece of apparatus in each of several classes into which we have divided the exhibits as a whole.

Classification of Exhibits.

Our classification of the exhibits is as follows:

- (1) Complete receivers of five valves or more; that is to say, receivers exclusive of loud speaker and batteries, unless these should happen to be incorporated as a part of the receiver.
- (2) Complete receivers or amplifiers of four valves or less, similarly defined.
- (3) Batteries of all kinds, including accumulators for both high tension and low tension.
- (4) Mains supply units, both D.C. and A.C., and including those which provide filament heating circuits.
- (5) Loud speakers of all types.
- (6) Valves.
- (7) Other component parts, including transformers, fixed and variable condensers, tuning coils,

valve-holders, resistances, aerial equipment, etc., etc.

Details of the competition are given on the entry form to be found in the advertisement pages of this issue, and only this entry form may be used in entering for the competition.

The Prizes.

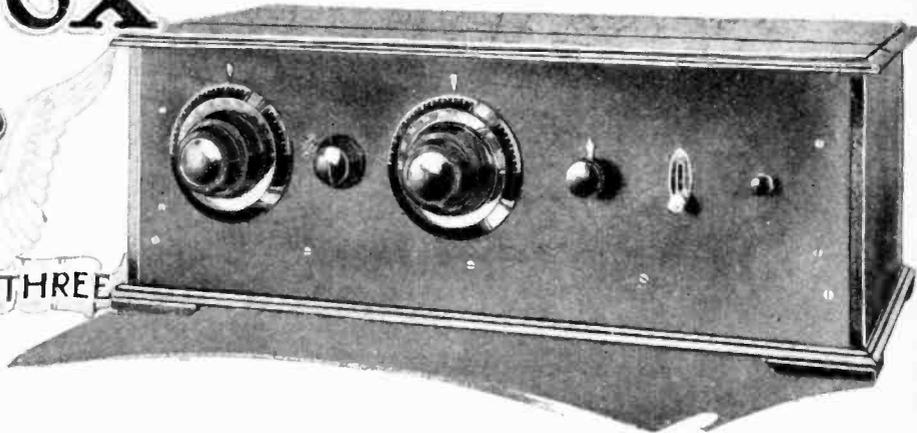
A cash first prize of £50 will be awarded by *The Wireless World* to the competitor whose vote agrees with the opinion of the majority in the selection of the outstanding single exhibit and also in the largest number of classes. In addition, 2nd, 3rd, 4th and 5th prizes to the total value of a further £50 in the form of vouchers for the purchase of apparatus will be presented. Details of these are to be found on the entry form.

Our Show Numbers.

It is believed that the published reports of the Exhibition which appear in this, and will also be found in two further special Show Numbers of *The Wireless World*, to be dated September 26th and October 3rd, will be found by readers to be very helpful in assisting them in their choice, and for this reason it has been arranged that entry forms need not be sent in until after the appearance of the issue of *The Wireless World* for October 3rd.

Only apparatus exhibited at the Olympia Show may be included in the votes. In choosing apparatus in each class the competitor should be guided in his choice principally by the consideration of the value of the apparatus at the price asked for it, thus ensuring that the low-priced apparatus will stand an equal chance with apparatus for which a high figure is asked.

THE MEGAVOX



Constructional Details of a Long-range Three-valve Tetrode-triode-pentode Combination giving remarkable Volume and Quality.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P., and W. I. G. PAGE, B.Sc.

IT is somewhat refreshing to be able to deviate from the path of orthodox design and evolve a receiver which is capable of superlative volume and quality with a reduction in the usual number of valves and couplings. For such is the case with the *Megavox-Three*. The circuit is straight, the set is stable and easy to handle, and its range propensities all that can be desired.

To obtain considerable volume with a moving-coil loud speaker, it is usually necessary to employ two stages of low-frequency amplification, the last valve being of the L.S.5A type with, say, 300 volts anode potential. In the receiver under discussion only one L.F. stage is used, and the last valve—a pentode—has a filament consumption of 0.15 ampere at 4 volts, and an anode consumption of about 19 mA. at 150

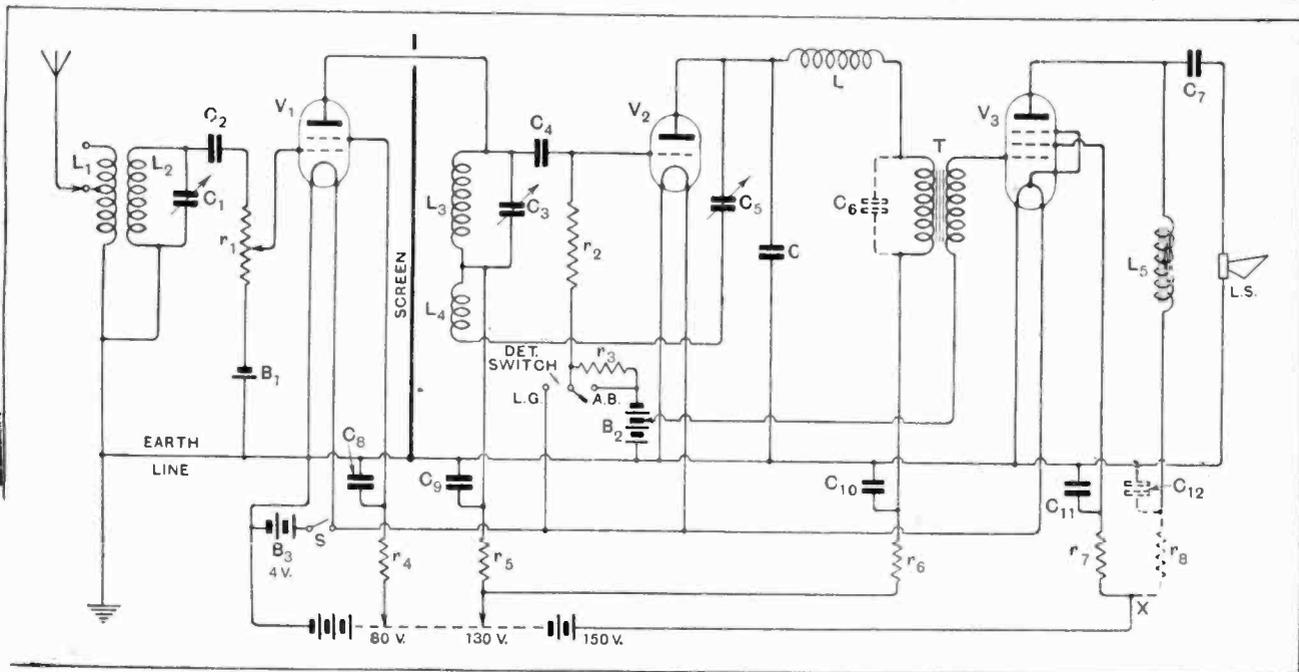


Fig. 1.—The theoretical circuit diagram. The values are as follows: C, 0.0001 mfd.; C₁, 0.0005 mfd.; C₂, 0.001 mfd.; C₃, 0.0005 mfd.; C₄, 0.00025 mfd.; C₅, 0.0001 mfd.; C₆, 2 mfd.; C₇ and C₈, 0.1 mfd.; C₁₀ and C₁₁, 2 mfd.; C₁₂ (optional), 2 mfd.; L, H.F. choke; L₁, L₂, aerial transformer for short waves; L₃, L₄, Toroid coil with reaction winding; L₅, L.F. choke; r₁, 500,000 ohm potentiometer; r₂ and r₃, 2 megohms; r₄ and r₅, 600 ohms; r₆, 20,000 ohms; r₇, 5,000 ohms; r₈, 20,000 ohms; T, 3 volts; B₁, 1½ volts; B₂, 9 volts; B₃, 4 volts; X, 1 L.F. transformer.

The Megavox—an Olympian Three.—

volts. Its performance with a moving-coil loud speaker is equal to that from the more elaborate L.F. amplifier already mentioned, provided that the speech coil is wound to suit the higher internal resistance of the pentode.

Elsewhere in this issue will be found a description of how to wind a moving coil with 2,500 turns suitable for pentode output. It is no exaggeration to say that with a coil wound to the specification given, the re-

Fig. 2. There are thirteen grooves in the long-wave former, and each is wound with fourteen turns of No. 30 gauge D.C.C. wire, making a total of 182 turns. The last turn of the fourth and sixth grooves from the earthed end are brought out to the two aerial terminals, making the tappings at the fifty-sixth and eighty-fourth turns. In the case of both coils, when the aerial is connected to the tapping nearest to the earth end (terminal marked "Aerial" on terminal strip) the selectivity is greater and the volume less than when it is

joined to the other tapping (terminal marked "Aerial 1"). The number of turns on each coil has been so adjusted that the two 0.0005 mfd. tuning condensers C_1 and C_3 remain practically in step for resonance throughout their range.

The condenser C_2 prevents the grid cell B_1 from slowly discharging through the 0.5 megohm potentiometer r_1 . This position for the H.F. grid bias battery is more satisfactory than when it is interposed in the earth line, since in the latter position it prevents the negative filaments from being earthed direct. The

volume control r_1 has already been dealt with at some length, and it is only necessary to state here that the contention that its logical position should be at the input of a receiver is fully justified in practice by the smooth signal strength control it confers without impairing selec-

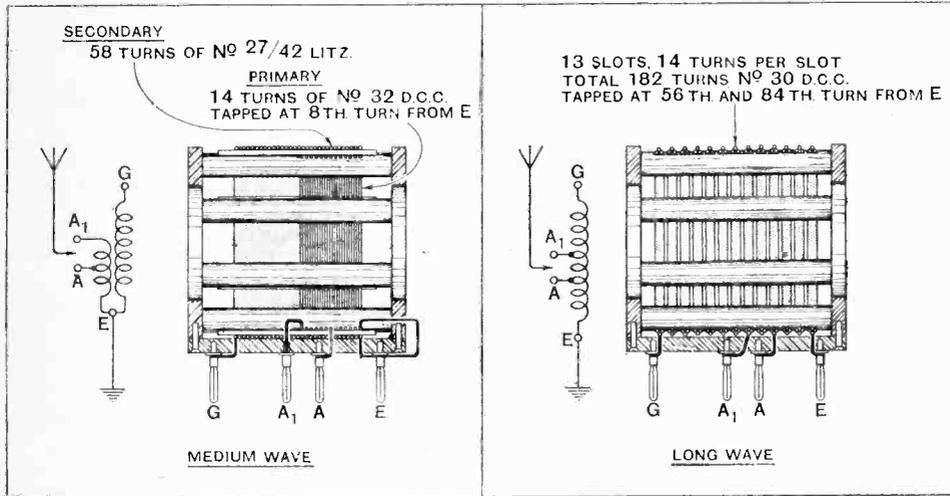


Fig. 2.—Winding data for the short- and long-wave aerial coils. The mean diameter of turns is 3in.

ceiver will give sufficient output to fill a hall of moderate size. For those who wish to use cone or horn loud speakers, ample volume and satisfactory quality is obtainable.

The Tuning Inductances.

The theoretical considerations involved in the design of the *Megavox-Three* were given in last week's issue under the title, "A New Receiver." It is, therefore, only necessary in this article to give full constructional details. Taking the set stage by stage from the aerial to the output of the last valve, we must first of all consider the short- and long-wave aerial coils. These can be purchased ready wound, as will be seen from the list of parts, but should a reader desire to wind them himself he must obtain the necessary formers from the same manufacturer, together with 20 yards of 27/42 Litz, 1 oz. of No. 32 gauge D.C.C. wire, and 4 oz. of No. 30 gauge D.C.C. wire. The winding data are given in Fig. 2. The primary of the short-wave coil is space-wound (sixteen turns to the inch) with fourteen turns No. 32 gauge D.C.C. wire tapped at the sixth turn from the aerial end. The low potential end of the primary is connected to the low potential end of the secondary, which is joined to the earth pin of the coil. The secondary is overwound in the same direction and contains fifty-eight turns of 27/42 Litz with turns touching. The primary is thus protected.

The actual circuit arrangement of the short-wave aerial transformer is in accordance with Fig. 1 (L_1L_2), but the long-wave coil is auto-coupled as shown in

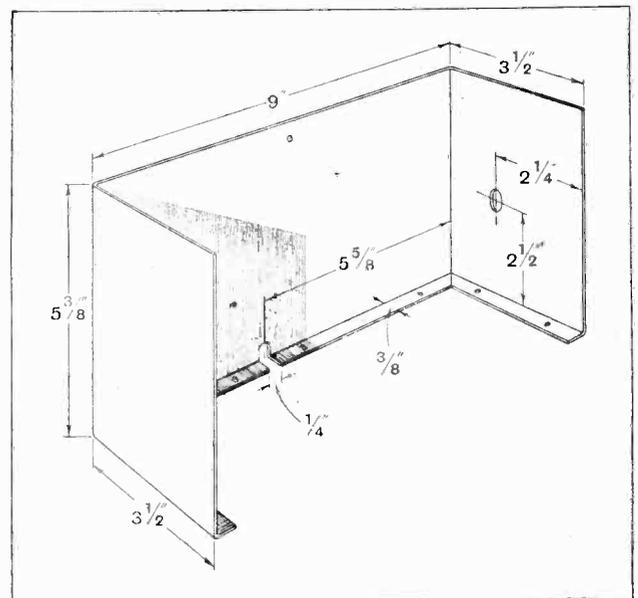


Fig. 3.—Dimensions of the 18 gauge earthed aluminium screening plate. It is drilled to take the spindle of the volume control and the insulated flex lead to the anode of the H.F. valve.

The Megavox—an Olympian Three.—

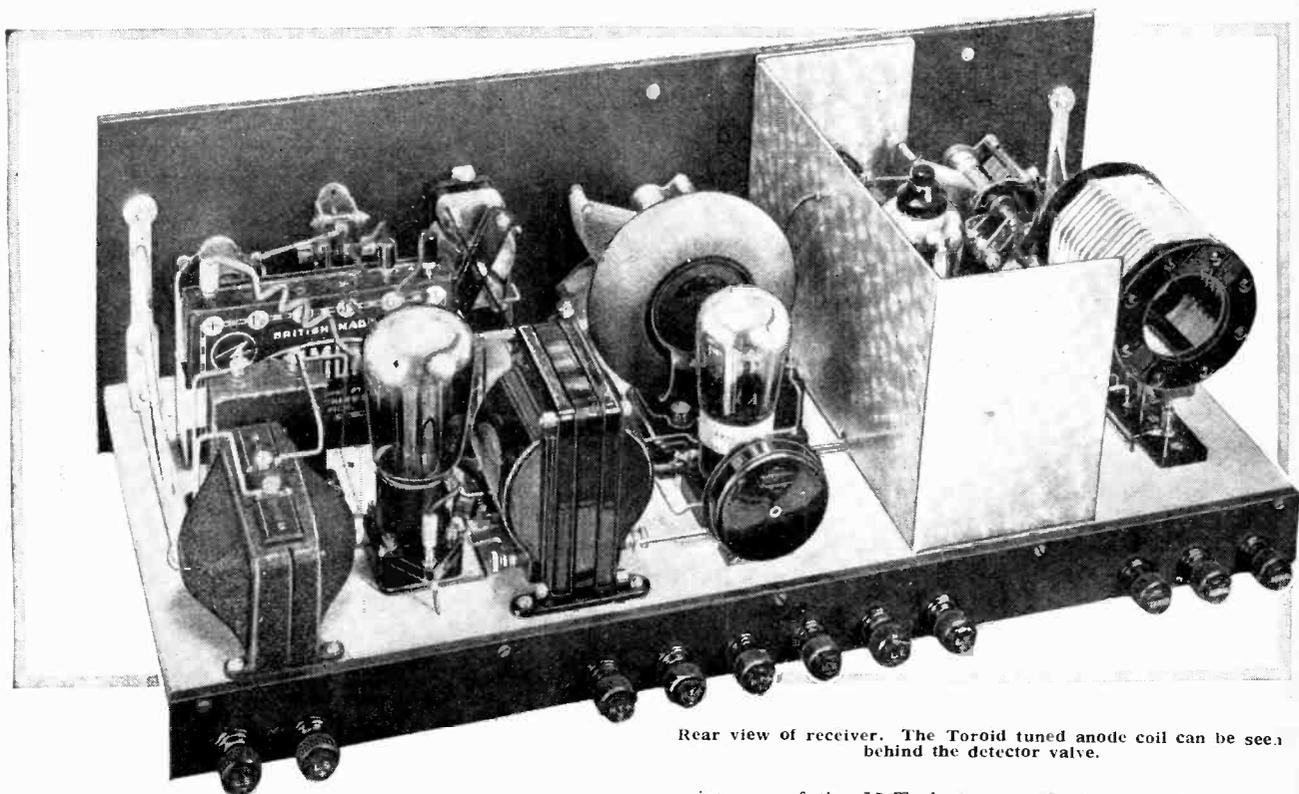
tivity. Furthermore, the input to the detector, which must neither be too small nor too large, is kept at a critical amplitude while still retaining the critical tune point of a local station which would otherwise cause serious overloading.

The plug-in short- and long-wave Dubilier toroid coils (L_3L_4) have a very small external field, necessitating only the minimum of magnetic screening (see Fig. 3). The screen is to prevent capacity coupling. These coils contain an internally wound separate primary winding, L_4 , which has been used in the receiver as a reaction coil connected to the low potential end (to

Entirely unorthodox in design and incorporating many new features, the three-valve receiver described in the accompanying article gives an overall amplification hitherto only obtainable with four-valve sets using super-power valves with an anode voltage of the order of 300. Where battery economy is a consideration the modest H.T. and L.T. demands of this receiver will undoubtedly appeal. A summary of outstanding points in design will be found at the end of the article.

between the detector and the pentode output valve is effected by a Ferranti A.F.5 transformer (the 0.0003 mfd. condenser C_6 is incorporated within the body of this component). The detector bias is changed from positive to negative by the panel switch, and the anode feed resistance r_6 (20,000 ohms) causes an automatic correction of anode voltage for the two types of detection by dropping a different number of volts in accordance with the different

currents passed by the detector anode. As both the low- and high-frequency stage gains in this set are large, effective steps have been taken to prevent any A.C. from circulating through the common



Rear view of receiver. The Toroid tuned anode coil can be seen behind the detector valve.

minimise capacity effects) of the tuned anode coil (secondary of the toroid). It is important to see that a lead connects together the terminals marked P_2S_2 on the coil holder. Magnetic reaction is controlled by the panel-mounted variable condenser C_5 (0.0001 mfd.), the two stators of which are joined in parallel.

A single-pole double-throw anti-capacity panel switch allows either leaky grid or anode-bend detection to be used. A 2-megohm protective resistance, r_3 , stops the grid of the detector from becoming free during the transit of the switch, and thus prevents a sudden excessive anode current. The two grid leaks r_2 and r_3 are held vertically in a new type of holder, which economises space on the baseboard. The coupling

resistance of the H.T. battery. Resistances have been put in four of the H.T. supply leads, and in the fifth and most important—the anode circuit of the last valve—is included an iron-cored choke, L_5 , whose inductance does not fall below 20 henrys with the passage of 20 mA. D.C. Associated with this choke and the four resistances which act as high impedances to A.C. are alternative low-resistance paths to earth through suitable by-pass condensers C_7, C_8, C_9, C_{10} , and C_{11} .

The reader may enquire why there are five H.T. battery filter circuits with only three valves. The answer is, of course, that the screened grids of V_1 and V_3 each contain A.C. components under working conditions, and precautions to prevent back-coupling must be taken with them also. The values of r_4, r_5, r_6 , and r_7 are

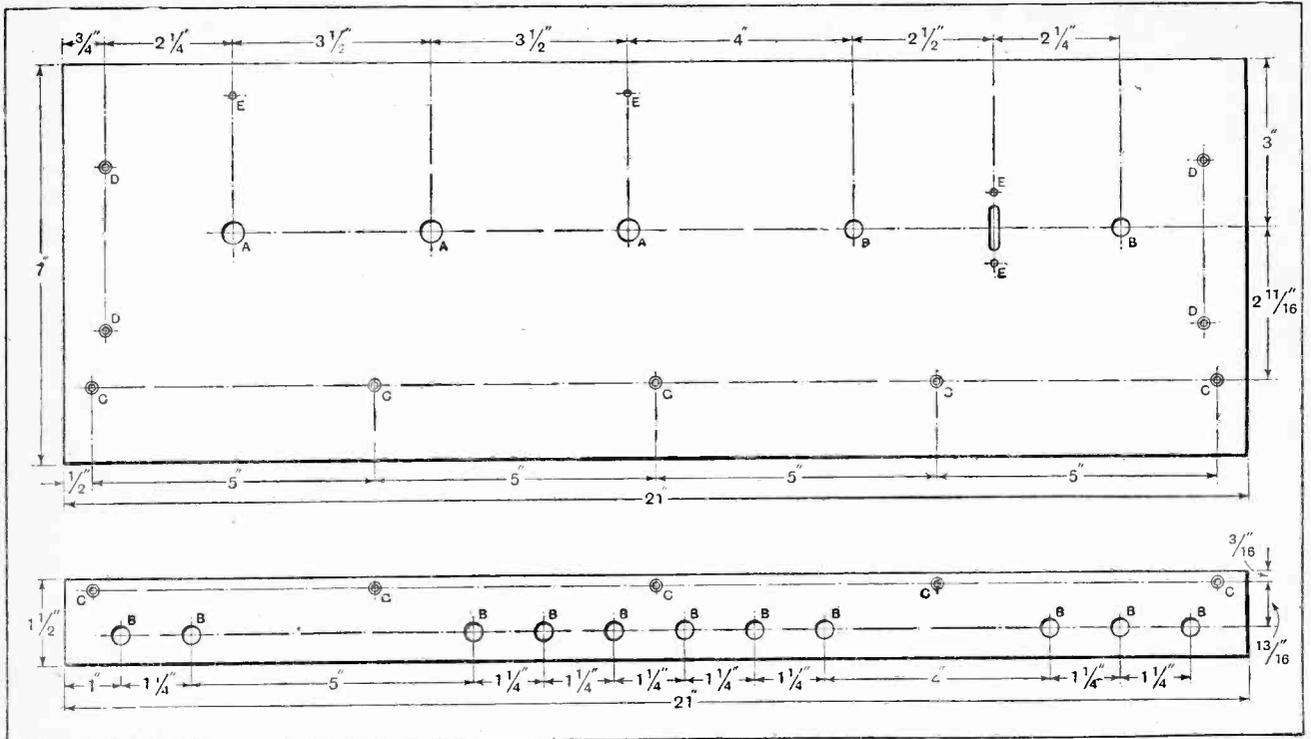


Fig. 4.—Dimensions and drilling data for the ebonite panel and terminal strip. A = 3/8in. dia.; B = 7/16in. dia.; C = 1/8in. dia. and countersunk for No. 4 wood screws; D = 1/8in. dia. and countersunk for No. 6 BA screws; E = 1/8in. dia.

respectively 600 ohms, 600 ohms, 20,000 ohms, and 5,000 ohms, their values being chosen as suitable not only for A.C. filtering purposes, but also for creating a voltage drop where the anode voltage would otherwise be too high for the purpose to which the valve

was being put. The anti-coupling resistances and condensers are housed beneath the baseboard (see Fig. 6 and photograph). Metal-cased condensers are used, as their depth is no more than that allowed by the 1 1/2 in. terminal strip required for the standard sized cabinet.

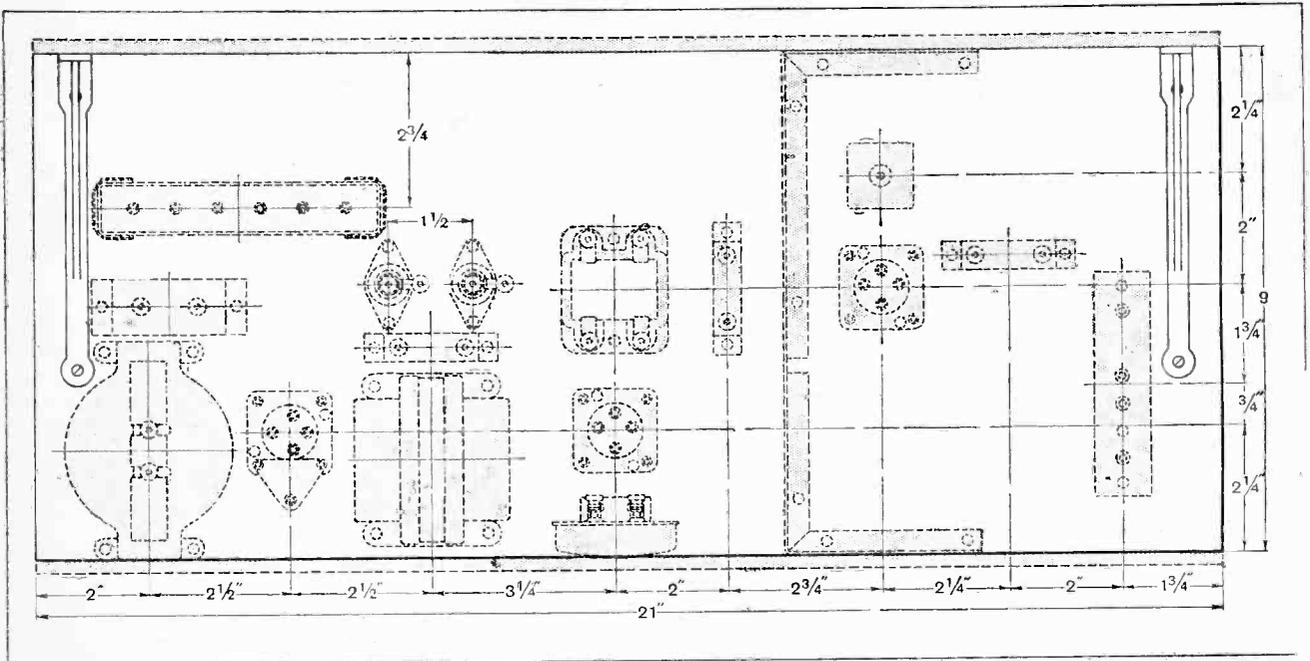


Fig. 5.—The baseboard layout.

The Megavox—an Olympian Three.—

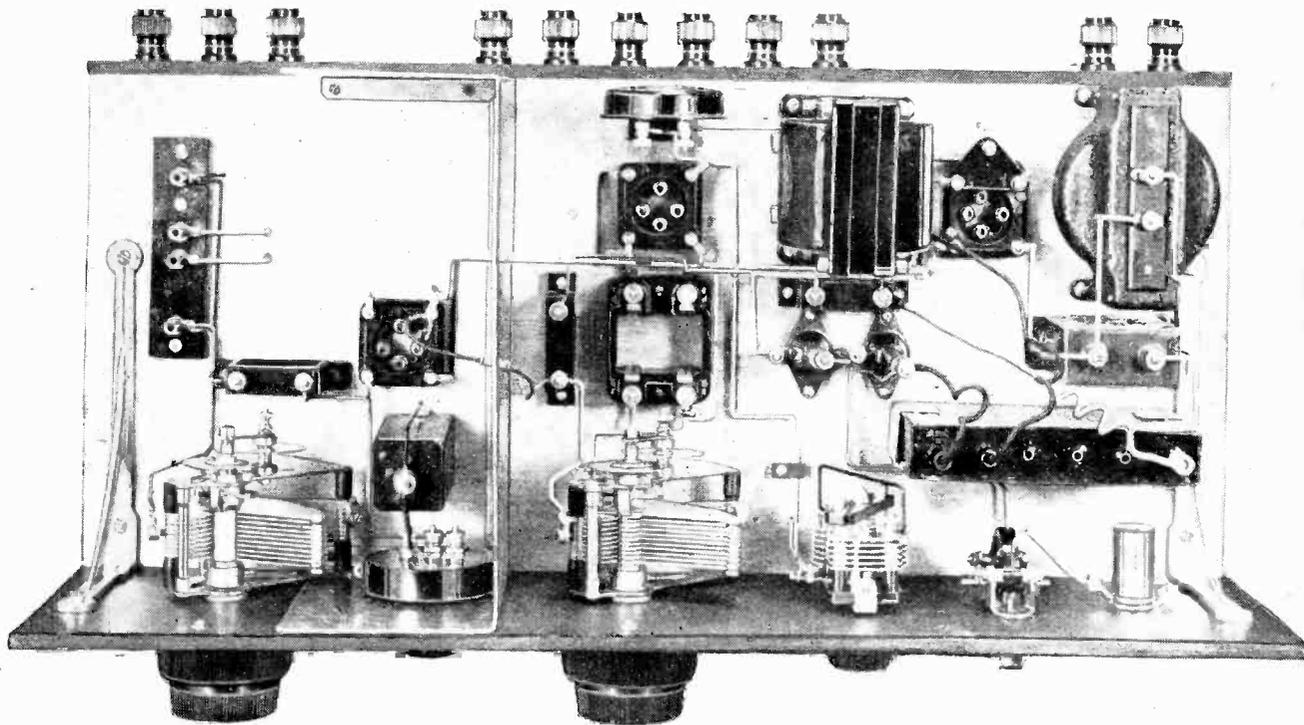
Certain makes of moulded case condensers would require deeper battens and the baseboard raised above the present level.

Scientific Wiring with Insulated Pairs.

If the reader has, for instance, a 200-volt H.T. supply available, it is essential to increase r_7 and to insert a resistance at r_8 , so that the pentode has no more than the maximum 150 volts on its screen and plate. The value of r_8 (plus the resistance of L_5) is obtained by dividing the volts to be dropped by the normal feed current (in amperes) of the pentode, less the resistance of L_5 .¹ With 200 volts, therefore, $r_8 + L_5$ would be $50 \div 0.02 = 2,500$ ohms. The value of r_7 is about 5 times

separate H.F. or speech currents are taken to a short, stout busbar attached to the earth terminal, and are not carried through a common conductor containing perhaps grid and anode currents of more than one circuit. This accounts for the number of wires which can be attached to the earth terminal in the two sub-baseboard illustrations.

This desirable form of wiring, involving the close running of parallel conductors, cannot satisfactorily be carried out with bare wire, and therefore "Glazite" insulated wire has been used. Return wires to L.T. -, earth wires, and H.T. - leads are black; L.T. + leads, yellow; H.T. + and anode leads, red; grid leads, green; aerial leads, white; and screened grid leads of both the H.F. valve and the pentode, blue. Circuit differentia-



Plan view of the receiver without coils and valves.

$r_8 + L_5$. The by-pass condenser C_{12} is only essential when a resistance is being used at r_8 . When the latter is omitted, as is the case in the set photographed in this article, C_{12} becomes a H.T. battery shunt condenser, and can be left out with impunity. A lead, of course, must be taken from X to one electrode of C_{12} if r_8 is not required. C_{12} has not been included in the list of parts.

The customary spaced wiring—using bare wires—leads in the aggregate to effects which may cause instability through feed-back. It has therefore been the aim to produce a set in which such couplings are, as far as possible, absent. This is achieved by running "go" and "return" wires in close parallel pairs to prevent inductive loops. Also return leads carrying

tion by coloured wires is of great assistance in tracing fields, and helps the constructor in obtaining the best layout of components. This should at once dispel the thought that the colours have been playfully introduced as a scheme to match the blue and red toroids and the green Litz aerial coil.

Valves with Special Characteristics.

The *Megavox-Three* has been built around special valves. If the reader deviates in his choice from those specified, he will be well advised to see that their characteristics are substantially similar. The P.M.14 screened grid valve V_1 is of the new type, in which the anode terminal is brought out at the top of the valve. The screened grid voltage should be about 75. Accordingly, an 80-volt tapping from the H.T. battery is taken to H.T. +1 to allow for the small drop through r_4 .

¹ $L_5 = 750$ ohms.

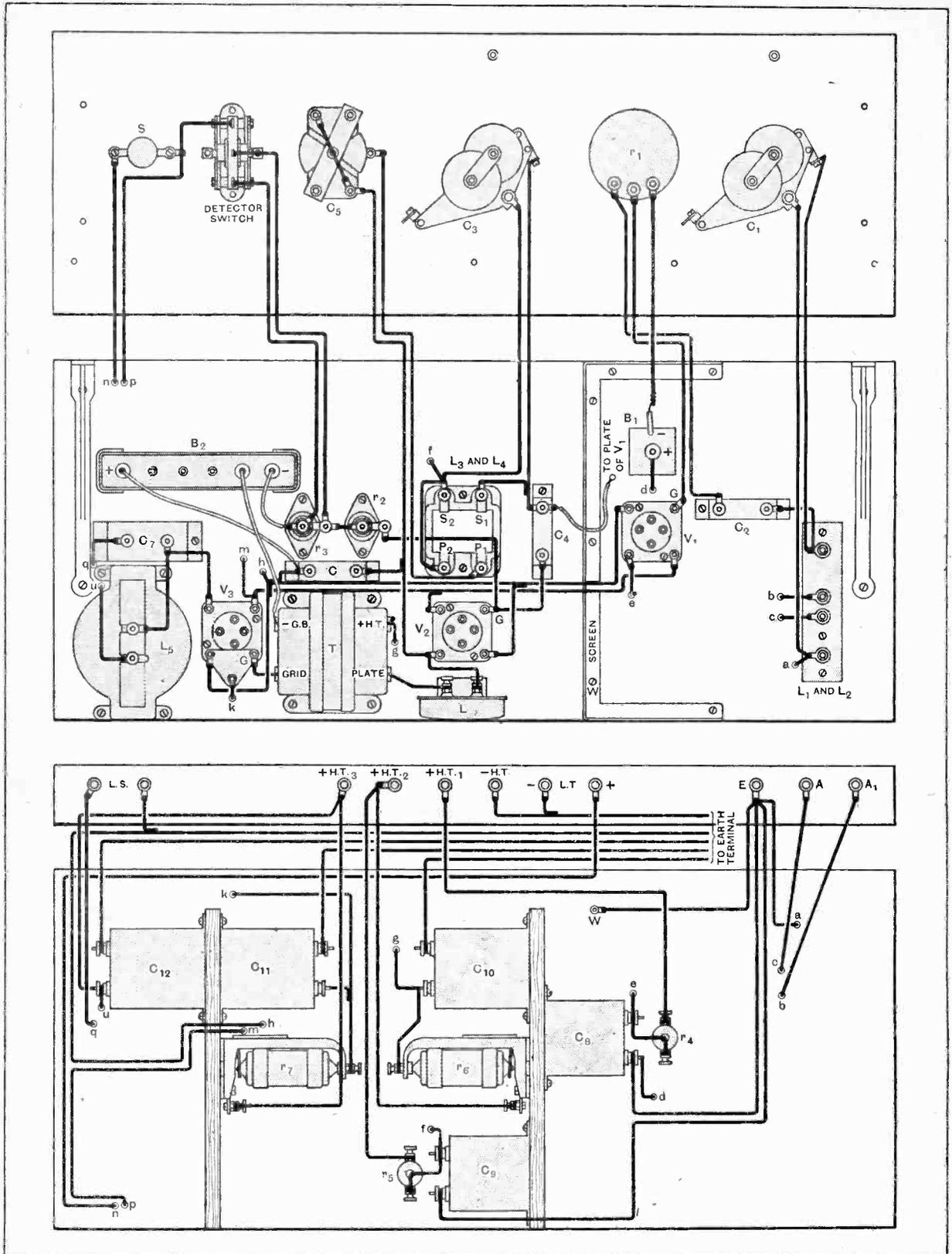


Fig. 6.—Practical wiring plan of panel, baseboard and sub-baseboard. Note the de-coupling wiring scheme involving the use of close parallel pairs of insulated leads.

The Megavox—an Olympian Three.—

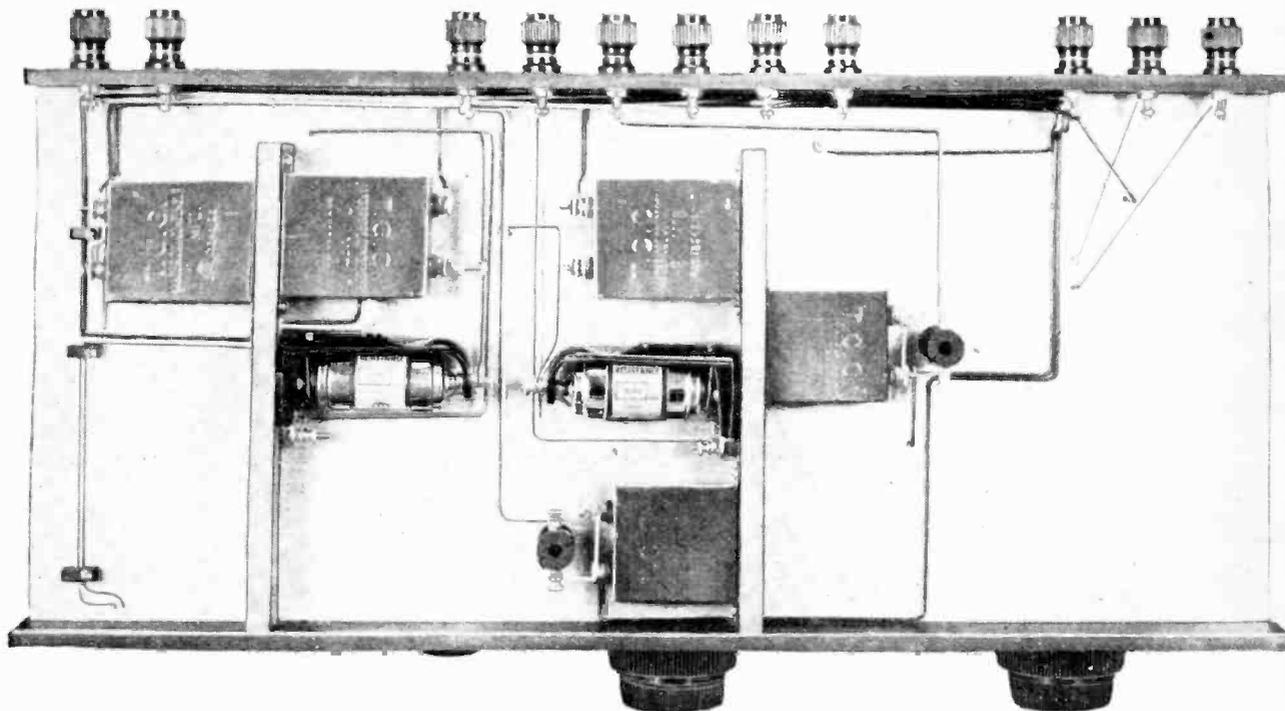
The control grid of V_1 is biased to $1\frac{1}{2}$ volts negative by B_1 , whilst the anode potential is just below 130 volts, the latter being the tapping for the terminal H.T. +2. The grid of the detector V_2 (P.M.4D valve) is biased to minus 9 volts, or given a positive potential by being connected to L.T. +, according to whether the switch is set for anode bend or leaky grid. The presence of r_6 adjusts the detector anode voltage to approximately 60 or 120, these figures being satisfactory for leaky grid and anode bend respectively.

Working Voltages.

The signal strength from the loud speaker may be adequate to cause acoustic reaction in the detector valve. It is advisable, therefore, to separate the loud

2-volt cells being quite adequate, as the total current consumption is under $\frac{1}{3}$ ampere. The filament switch is in the L.T. + lead at S, and rheostats are not used, as they have been considered unnecessary. Taking the valves in the order V_1 to V_3 , their respective conductances are 0.87, 2.1, and 2.3, and their magnification factors 200, 12.5, and 62. These figures, taken in conjunction with the nature of the intervalve couplings, should give some clue as to why the overall amplification is very considerable.

One of the features of the receiver is its comparatively low total anode current of about 26 mA. This falls within the discharge capabilities of a super-size dry-cell battery, and is quite a normal load for H.T. accumulators. When examining this statement it must not be forgotten that the large output from the loud



The sub-baseboard containing the four H.F. and L.F. de-coupling resistances and their associated condensers.

speaker and receiver by a suitable distance. The P.M.4D has a well-defined lower bend and a steep straight portion to its anode characteristic, thus exhibiting essential rectification properties. Its magnification factor is 12.5, and its impedance at zero grid volts 6,000 ohms. The pentode V_3 (P.M.24 valve) is accommodated by a special valve holder containing an extra plug and socket contact for the screened grid terminal at the side of the valve base. The bias for the control grid is $7\frac{1}{2}$ volts negative obtained from B_2 . The H.T. potential applied to the screened grid and anode of the pentode should be about the same. The H.T. tapping at 150 volts (H.T. +3) is therefore taken to r_7 and L_{r5} , the respective D.C. resistances of which are 5,000 and 750 ohms, so that, with about 4 and 19 mA., the voltage drop is about the same.

The L.T. supply must be 4 volts (B_3), two small

speaker has hitherto only been possible with costly high-voltage mains equipment.

The disposition of the wiring and the general layout of the components can be easily followed from the wiring diagrams and the photographs, and it only remains to give a few hints on operation.

Operating the Receiver.

Having completed the construction of the set and seen that the H.T. +tappings are correct, attach the aerial lead-in to the terminal marked "Aerial-1"; switch on the filament current and raise the lever of the detection switch to the anode bend position. Turn the reaction condenser about 20° to 30° , and slowly rotate the two tuning condensers in step. The local station will be found almost immediately, and further manipulation of the tuning dials will give resonance and probably very

LIST OF PARTS.

- | | |
|--|--|
| <p>2 0.0005 mfd. variable condensers, log. scale, slow mot. (J. B.).
 1 500,000 ohm potentiometer ("Centralab," Rothermel Radio Corp. of
 Gt. Britain, Ltd., 24/26, Maddox Street, London, W. 1).
 1 Midget variable condenser, 0.0001 mfd. (R149 Ormond).
 1 0.001 fixed condenser (Type 620, Dubilier).
 1 0.0001 fixed condenser (Type 620, Dubilier).
 1 0.00025 fixed condenser (Type 620, Dubilier).
 2 2-megohm grid leaks (Diametohm, Dubilier).
 2 Grid leak holders, new vertical type (Dubilier).
 1 Short-wave Toroid coil with base (Dubilier).
 1 Long-wave Toroid coil with base (Dubilier).
 1 1½-volt grid cell ("T" type, Siemens).
 1 9-volt grid battery (Standard type 1½-volt tappings).
 2 Grid battery clips ("Deckorem," A. F. Bulgin & Co., 9/11, Cursitor
 Street, Chancery Lane, London, E.C.4).
 1 "T" cell clip ("Deckorem," A. F. Bulgin & Co., 9/11, Cursitor
 Street, Chancery Lane, London, E.C.4).
 2 Dial indicators ("Deckorem," A. F. Bulgin & Co., 9/11, Cursitor
 Street, Chancery Lane, London, E.C.4).
 1 H.F. choke (Igranic).
 1 L.F. choke, 32 henrys (No. 658, Pite).
 1 Single-pole double-throw switch (new type "Utility" anti-capacity,
 W.190/1, Wilkins & Wright, Ltd., Utility Works, Holyhead Road,
 Birmingham).
 1 On-and-off switch ("Utility" W.188, Wilkins & Wright, Ltd.,
 Utility Works, Holyhead Road, Birmingham.)
 1 5,000 ohm resistance and holder (R. I. Varley).
 1 20,000 ohm resistance and holder (R. I. Varley).
 2 600 ohm resistances (Wright & Weare, Ltd., 740, High Road,
 Tottenham, London, N.).</p> | <p>2 Valve holders ("Whiteline," Bouyer-Lowe).
 1 Pentode valve holder ("Whiteline," Bouyer-Lowe).
 3 2 mfd. fixed condensers, metal case type (T.C.C.).
 2 0.1 mfd. fixed condensers, paper dielectric (T.C.C.).
 1 3½ : 1 L.F. transformer (A.F.5, Ferranti).
 1 P.M. 11 valve (screened grid).
 1 P.M. 10 valve.
 1 P.M. 24 valve (Pentode).
 1 Short-wave aerial coil (B. & J. Wireless Co., 2, Athelstane Mews,
 Stroud Green Road, London, N.4).
 1 Long-wave aerial coil (B. & J. Wireless Co., 2, Athelstane Mews,
 Stroud Green Road, London, N.4).
 1 Base-mounting coil holder for aerial coils (B. & J. Wireless Co., 2,
 Athelstane Mews, Stroud Green Road, London, N.4).
 11 Terminals: aerial, aerial 1, earth, L.T.+, L.T.-, H.T.-, H.T.+1,
 H.T.+2, H.T.+3, L.S.+, L.S.-, ebonite shrouded (Belling Lee).
 1 Metal screen, 16 × 5½ in., 18 gauge aluminium, shaped and drilled
 (White Bros & Jacobs, Ltd., 46, Chalk Farm Road, London, N.W.1).
 7 Coils, "Glazite" wire: 1 coil each, yellow, red, green, white and
 blue, and 2 coils black (Leucos).
 1 Cabinet, 21 × 7 × 9 in. (Camco).
 1 Pair 6 in. panel brackets (Camco).
 1 Ebonite panel, 21 × 7 × ½ in.
 1 Ebonite terminal strip, 21 × 1½ × ½ in.
 1 Baseboard, 21 × 9 × ¾ in.
 2 Wooden buttons for sub-baseboard, 8 × 1 × ¾ in.
 3 Wandier plugs, 1 red and 2 black, also a short length of flex, wool
 screws, etc.
 Approximate cost (excluding cabinet, aerial coils and valves)
 £10 17s. 6d.</p> |
|--|--|

In the "List of Parts" included in the descriptions of THE WIRELESS WORLD receivers are detailed the components actually used by the designer, and illustrated in the photographs of the instrument. Where the designer considers it necessary that particular components should be used in preference to others, these components are mentioned in the article itself. In all other cases the constructor can use his discretion as to the choice of components, provided they are of equal quality to those listed and that he takes into consideration in the dimensions and layout of the set any variations in the size of alternative components he may use.

considerable overloading of the pentode. Retain the tuning at resonance, return the reaction control to zero, and turn the volume control anti-clockwise until the desired loud speaker volume is obtained. For distant stations the detection switch can be depressed for leaky grid, and more reaction can be employed, always remembering that during searching operations the volume

control should be at its maximum clockwise position. In localities where greater selectivity is required the aerial can be connected to the terminal marked "Aerial." Searching for distant stations by heterodyning is permissible, as aerial reradiation is negligible due to reaction being applied between the screened-grid valve and the detector.

SUMMARY.

1. **The overall amplification** of this receiver with a complement of only three valves is unique. The volume obtained from the pentode when using a suitably wound moving-coil loud speaker is sufficient to fill a hall of moderate size, and, with only 150 volts H.T., is approximately equal to that obtained from a fully loaded L.S.5A valve with 300 volts H.T., which requires seven times the input grid swing. With cone and horn loud speakers powerful signals of good quality can be obtained.

2. **Battery economy.**—The total filament consumption at 4 volts is under ⅓ ampere, whilst the H.T. demand is about 26 mA. at 150 volts, which is within the capabilities of a super-sized dry cell battery.

3. **The selectivity** with only two tuned circuits is adequate for all practical purposes. It can be reduced for "quality" on local stations, or enhanced by means of a *reaction control* when searching for distant stations. The heterodyning of distant carrier waves with negligible aerial reradiation is of great advantage with this receiver.

4. **The volume control** represents a new method of controlling the aerial input without impairing selectivity. Moreover, the correct input voltage to the detector can be maintained with both circuits in tune, thereby minimising interference.

5. **Detection** by anode bend or leaky grid can be effected by a throw-over switch. Automatic correction

of the H.T. voltage for the two forms of detection is made by a resistance in the anode feed.

6. **A complete battery anti-coupling scheme** is employed in the five H.T. feeds to the three anodes and the two screened grids. Distortion and incipient oscillation due to the common resistance of the H.T. battery are thereby entirely prevented.

7. **An improved form of wiring** which inhibits instability is used. As far as possible, close parallel pairs of insulated leads are employed to prevent inductive loops. Return wires carrying separate speech currents are each taken to earth and not to a common conductor, as is usually the case with spaced wiring using bare leads.

8. **The three types of valve** employed have been chosen for their remarkable characteristics. Their respective conductances are 0.87, 2.1, and 2.3, and the magnification factors 200, 12.5, and 62.

9. **The construction of the receiver** is easy and can be undertaken with the simplest tools. There is no complicated slotting of metal or ebonite, and every component can be obtained commercially.

This receiver will be available for inspection by readers at "The Wireless World" Stand at the Olympia Exhibition, and afterwards at the editorial offices of this journal, 116-117 Fleet Street, London, E.C.4.

GUIDE to the SHOW



A FORECAST OF
OLYMPIA,
with Special Reference
to Outstanding Exhibits.

AMPLION.

A focal point of the exhibition will undoubtedly be the Amplion "Lion" range of loud speakers. We have been afforded an opportunity of listening to a demonstration of these speakers and we can say with assurance that a definite advance has been made in the technique of reed-driven cones, whereby a more natural and better proportional rendering of the bass and, in fact, the whole musical scale has been achieved.



The new Amplion "Lion" loud speaker which gives remarkable quality of reproduction and is capable of handling large outputs.

The "Lion" cone assemblies are made in two sizes, 14 inches and 18 inches, and are sold housed in cabinets of various finishes and sizes, from approximately 13in. x 13in. x 10in. (as shown in the illustration) to elaborate pedestal cabinets containing a mains-driven wireless receiver and gramophone. Besides the extreme fidelity of reproduction, a point that

strikes the listener at once is the large volume that can be handled without any signs of distress from overload. It is claimed that the 18in. cone unit will handle an anode dissipation of no fewer than 25 watts, which, viewed from the standpoint of the average capabilities of cone loud speakers, is enormous. The brilliance of high notes, the absence of any resonances, and the crispness of rendering are brought about by attention to reduction of diaphragm inertia and modified shape of reed, which together tend to solve the problem known as "attack," and to prevent the rounding off of transients. The Amplion Co. are to be congratulated on having evolved a loud speaker which is an outstanding advance in design, and which vies in performance with the moving-coil instrument without the disadvantage of a field winding which has to be energised.

A range of horn and cone type speakers at extremely modest selling prices will be kept on the market, as will also the Amplion Vivavox gramophone pick-up with volume control incorporated.

Stands Nos. 30 and 31. — GRAHAM AMPLION, LTD., 25/26, Savile Row, Regent Street, London, W.1.

ATLAS.

For the forthcoming season this firm is specialising in H.T. eliminators, both for A.C. and D.C. mains; the range of models for the latter type of supply is particularly complete, and includes instruments with both fixed and variable output voltages.

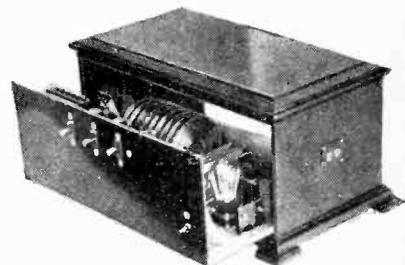
A transformer for supplying current at low voltage to the heaters of A.C. valves will be exhibited, as well as a large assortment of insulating tubes in Pirtoid, which is a bakelised product particularly well suited for use in the construction of high-frequency transformers, inductance coils, etc.

Stand No. 161.—H. CLARKE & Co. (Manchester), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester.

AUTOMATIC RADIO.

Although to the amateur, experimenter, and the home constructor wireless appeals mainly as a hobby rather than as a source of musical entertainment, it must not be forgotten that there is a large and ever-growing section of the community to whom it appeals solely as a source of entertainment, the electrical means by which it is brought into their homes being of little or no importance. The latter have in the past usually been compelled to confine their reception to the local station and the Daventry high-power stations using a receiver with two tuning circuits, either of which could be brought into use by a switch.

Such people will seek an early opportunity of visiting this stand, where they will find that a special effort has been made to cater for their needs. Receivers will be shown in which, by simply moving a switch, any one of six stations can be brought in, no further adjustment being made. Other models enabling a larger



The "Elliot" automatic Radio Exchange.

number of stations to be heard will be shown, in which a tuning dial is available for tuning in stations which may not be already available by moving one of the switches. The expert amateur interested mainly in "how it is done" will also find an examination of the exhibits well worth while.

Stand No. 274.—AUTOMATIC RADIO MANUFACTURING Co., Gosford Road, Beccles, Suffolk.

Guide to the Show.—

BENJAMIN.

A new anti-microphonic valve holder to be known as the Benjamin "Vibro-holder" will be shown. The base is a one-piece bakelite moulding, and improved one-piece springs are used for the valve sockets. The well-known "Clearer Tone" valve holder is to be retained, and in future all soldering tags will be supplied ready tinned.

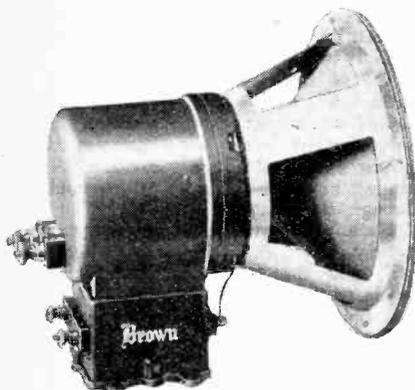
Another new product is a double-pole battery switch, provided either with soldering tags or with terminals for easy wiring.

The present range of filament rheostats and other Benjamin products will be continued, but the Majestic battery eliminator is to be withdrawn when the present stocks are exhausted.

Stand No. 171.—BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, London, N.

BROWN.

All the well-known loud speakers manufactured by this firm are to be shown, as well as several notable additions. In particular, one looks forward to examining (and hearing) the "Cubist" moving-coil instrument, of which full particulars are not yet available. It is believed to



A Brown moving-coil loud speaker unit.

contain several novel features. An L.F. intervalve transformer is to be introduced for the first time.

Stand Nos. 155 and 156.—S. G. BROWN, LTD., Western Avenue, North Acton, London, W.3.

BROWNIE.

Among the complete receivers on this stand the new "Dominion Three" should not be missed. It is a detector and two L.F. receiver covering a wave-band of 200-2,000 metres, with provision for the use of a gramophone pick-up, and is to be sold at an attractive price. The cabinet is of solid mahogany, and space has been allowed for both H.T. and L.T. batteries.

A new and attractive slow-motion dial constitutes the principal control of this receiver and is to be sold separately. The gear ratio is 12 to 1, and the moulded case is made both in black and mahogany bakelite.

A third item of interest is the new Brownie anti-phonic valve holder, with air-spaced moulded parts.

Stand No. 83.—BROWNIE WIRELESS Co. OF GREAT BRITAIN, LTD., Nelson Street Works, Mornington Crescent, London, N.W.

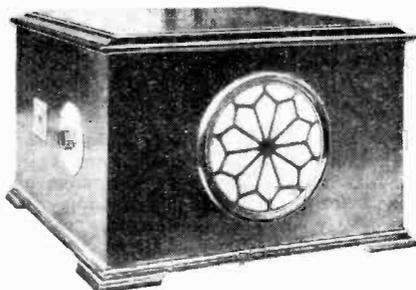


The new Brown "Cubist" moving-coil loud speaker.

B.T.H.

Many of the new B.T.H. nickel filament valves—now sold under the well-known trade name of "Mazda"—have characteristics which would have been considered as impossible of achievement a year or so ago. Of particular interest are the super-power valves, among which may be instanced the P.227, which consumes 0.27 amp. at 2 volts and has an amplification factor of 4 with an impedance of only 2,900 ohms. Another useful product is the P.615, taking 0.15 amp. at 6 volts. The A.C. resistance is 2,600 ohms, which is accompanied by the relatively high voltage factor of 6. A new valve for operating moving-coil loud speakers is the P.X.650 (filament volts 6, consumption 0.5 amp., amplification factor 3.5, impedance 1,750 ohms).

The R.K. loud speakers are already familiar to readers, who will be interested to learn that a new junior model will be



The B.T.H. Junior R.K. loud speaker, with self-contained amplifier.

exhibited. An amplifier is included in its cabinet, and provision is made for the connection of a gramophone pick-up; this latter device is also being manufactured by the B.T.H. Co. in a form which includes several unusual features. It is mounted on a telescopic tone-arm by

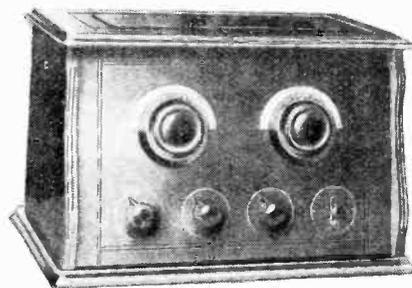
means of which the pressure of the needle on the record may be adjusted.

Among other sound-reproducing apparatus is a new cone loud speaker driven by a balanced armature movement.

Stand Nos. 86 and 101.—THE BRITISH THOMSON-HOUSTON Co., LTD., Crown House, Aldwych, London, W.C.2.

BURNDIPT.

The visitor from overseas who proposes to take a receiver with him on his return would do well to consider carefully the Empire Screened Four Receiver, which seems particularly suitable for his requirements. It appears that the designer, in arranging to cover the two wavebands between 20-48 and 220-560 metres, has provided the best possible kind of set for the foreign and colonial listener. In the first place, it is now generally accepted that short waves provide the most consistent reception at great distances, and, secondly, broadcasting outside Europe is carried on almost exclusively on the 250-500-metre band. The set should thus provide programmes with some reliability from the numerous short wave stations, even in the most remote places, while any local transmissions which may be available would be received on the medium band. It is most unlikely that the inability to tune up to the long waves



Designed for ultra-short and medium broadcast wavelengths, the Burndipt Empire Screened Four is primarily intended for Overseas users.

would ever be any real disadvantage under the conditions for which the set is obviously intended.

It is significant that the Burndipt Company are using screened grid valves almost exclusively in their new receivers for purposes of H.F. amplification. Exhibits which will be examined with keen interest are the three-valve "Screened Ethophone," which makes use of a pentode in the output stage, and the "Screened Portable."

One of the most important additions to the range of accessories and components is a series of cabinet cone loud speakers.

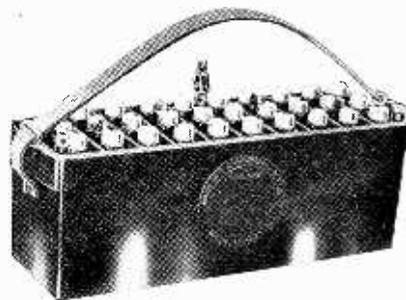
Stand Nos. 112 and 113.—BURNDIPT WIRELESS (1928), LTD., Blackheath, London, S.E.3.

BURNE-JONES.

Several new productions are being added to the range of Burne-Jones components. Four new receivers are, however, of particular interest. Both a three- and a four-valve receiver incorporates a stage of

Guide to the Show.—

screened grid H.F. amplification. In the former the aerial and H.F. coils are embodied in a single unit to facilitate wave range changing, and, in the latter, a pair of switches achieve this purpose. A receiver called the "Magnum 1929 Screened Five" employs two stages of neutralised H.F. followed by resistance-coupled, and then, transformer-coupled L.F. stages. Screened H.F. transformers are interchangeable. A really up-to-date feature is that tuning is effected by a drum dial gauged condenser. A novel switching device cuts out the H.F. stage for local



Hard moulded insulating material is used for the container of the new C.A.V. 60-volt H.T. accumulator unit.

reception. This set is also supplied as a constructional kit.

Stand No. 96.—BURNE-JONES & Co., LTD., Magnum House, 288, Borough High Street, London, S.E.1.

BURTON.

Small components make a strong appeal to the set builder, and he will, with interest, scrutinise the new range of Burton products. In particular, the attractive variable condensers are low priced, and other interesting components are the new types of friction dials, resistors, panel mounting rheostats, plugs and sockets, and a complete range of small brass parts. Metal cabinets, almost an entirely new departure, are to be marketed by this firm.

Stands Nos. 184 and 185.—C. F. & H. BURTON, Progress Works, Bernard Street, Walsall, Staffs.

CANTOPHONE.

Receivers of high-class finish and good workmanship, together with sound technical design, are among the leading features to be shown by this firm. In particular visitors to the stand should not fail to see the combined gramophone and wireless receiver, which operates entirely from household supply mains. The gramophone requires no winding. In addition, enthusiasts should not miss the "Portable Five" and the small "Portable Two," both of which should make a great appeal.

Stand No. 253.—THE CANTOPHONE WIRELESS Co., Remo House, 310, Regent Street, London, W.1.

CARBORUNDUM.

As in previous years, carborundum crystal detectors and fused carborundum grid leaks and anode resistances will be

the principal exhibits. Units incorporating these components, such as the Carborundum Stabilising Detector Unit complete with dry cell and potentiometer, and the Carborundum R.C.C. unit, will also be shown.

Stand No. 130.—THE CARBORUNDUM Co., LTD., Trafford Park, Manchester.

CARRINGTON.

A pedestal cabinet for mounting a moving-coil loud speaker and a "popular" pedestal cabinet of unusually solid construction with separate receiver and battery compartments are outstanding features in a wide range of cabinets for portable and permanent receivers of all types.

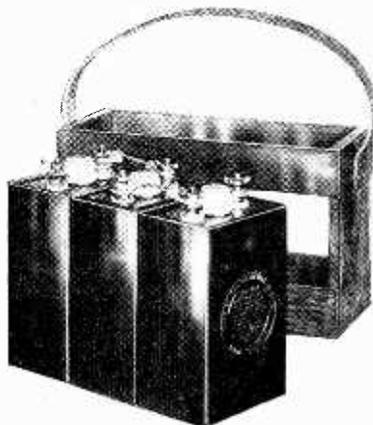
Stand No. 107.—CARRINGTON MANUFACTURING Co., LTD., Camco Works, Sanderstead Road, South Croydon.

C.A.V.

The type H.M.6 accumulator H.T. battery is a new product, the cells being mounted in a convenient case moulded in hard insulating material. This form of assembly has obvious advantages in cases where it is necessary to move the battery for charging purposes. It is supplied in 60-volt units.

A wide range of other accumulators for all wireless purposes will be exhibited. The use of a special solidified electrolyte in the non-spillable cells is a new departure.

Stand No. 114.—C. A. VANDERVELL & Co., LTD., Warple Way, Acton, London, W.3.



C.A.V. low-tension battery in moulded containers.

C.D.M.

One of the most interesting exhibits on this stand will consist of cabinets and panels finished in a manner which is most aptly described by the word "Piano-forte." This finish is obtained by an entirely new process exclusive to the firm. It is applicable as much to aluminium as to ebonite, and wood, and various colours are available as well as a granite finish.

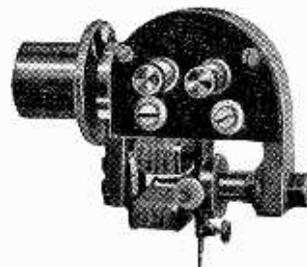
Among the actual components to be shown is an instrument known as an intensifier which, it is claimed, will increase signal strength and selectivity. Needless to add, the well-known fixed condensers

manufactured by this firm will also be in evidence, together with H.F. chokes of the "clip-in" and more ordinary types. Readers will not fail to appreciate the usefulness of the former type.

Stand No. 240.—C. D. MELHUSH, 8, Great Sutton Street, London, E.C.1.

CELESTION.

Various examples of this company's well-known cone type of loud speaker will be on view. These range from the small model C.10 with a 12 in. reinforced diaphragm to the "de luxe" model C.24



The special design of the Celestion-Woodroffe gramophone pick-up greatly minimises wear on records.

fitted with a 24 in. cone mounted in a handsome cabinet and supported on four legs. The model C.14, two types of which will be on view, one with a 750 ohms resistance unit, and the other a high-resistance type of 2,000 ohms, responds to a very wide range of frequencies and incorporates a special magnet system enabling the diaphragm to give the greatest response for the electrical input.

Gramophone users cannot fail to be interested in the "Celestion" Woodroffe "pick-up" which is extremely light and owing to the special damping arrangement should not lead to excessive wear on the records. It can be supplied in various types to fit different size tone-arms.

Stands Nos. 19 and 20.—THE CELESTION RADIO Co., 29-31, High Street, Hampton Wick, Kingston-on-Thames

CHAKOPHONE.

The complete receivers to be shown on this stand are up to date and include screened grid H.F. and pentode output valves. Probably the most interesting model is the cabinet de luxe receiver, which is entirely self-contained, requires no external aerial or earth, and operates a coil-driven loud speaker housed in the lower part of the cabinet.

There will also be two new loud speakers, one a balanced armature cone and the other a coil-driven instrument, both being specially suitable for use with pentode output valves.

Stand No. 139.—THE EAGLE ENGINEERING Co., LTD., Eagle Works, Warwick.

CLIMAX.

The majority of last year's components will again be seen on this stand, but with many alterations and additions.

The Climax earths will be fitted with an improved cap and a new folding frame aerial will replace the original CT 300

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series parallel model. In the loud-speaker range a new cabinet model will replace the "Puritan" model. Two new I.T. units for A.C. and D.C. mains, a trickle charger and a new "Autobat" transformer will be shown for the first time.

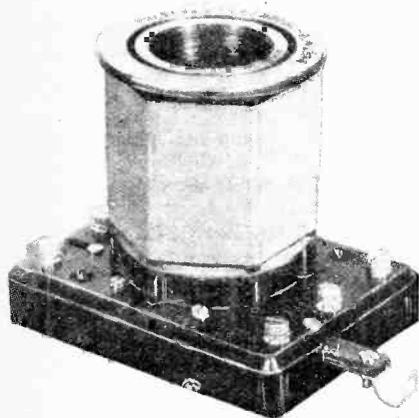
A new portable receiver with alternative mains operation will also be introduced at a competitive price.

Stand No. 80.—CLIMAX RADIO ELECTRIC, LTD., Quill Works, Quill Lane, Putney, London, S.W.15.

CLIX.

In addition to their large number of useful and cleverly designed "gadgets" shown in previous years, this firm have several new devices to interest the prospective visitor. Everybody has at some time or another experienced annoyance when disconnecting an accumulator to find that the wires from the set are badly corroded. This difficulty is completely overcome by the special Clix accumulator knobs. A special bracket for adapting Clix plugs to any terminal, an entirely new connector for wire extensions, are also features which should not on any account be missed. Considerable time could be profitably spent at this stand, since it is the small connectors and similar devices which the set builder usually finds lacking when he is desirous of putting the finishing touch to his installation. An excuse for the untidy appearance of so many sets no longer holds good.

Stand No. 236.—LECTRO LARK, LTD., 254, Vauxhall Bridge Road, Westminster, S.W.1.



Colvern Dual-range Coil.

COLVERN.

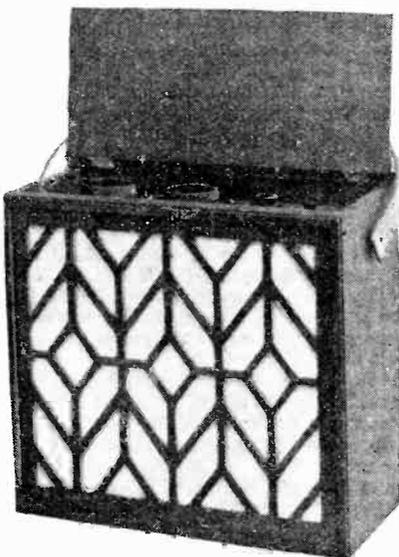
For interchangeable coils the Colvern products are probably unsurpassed in the precision of their windings and mouldings, ingenuity of design and dielectric properties. As they form part of so many amateur-constructed sets, much interest will be shown in the new Colvern dual-range coil to be released on September 22nd. It covers both normal broadcast and 5XX wavebands, the switch is incorporated in the coil and has wiping contacts which cannot get out of order. The circuit con-

nections are enclosed within the coil, which is accurately spaced wound. Three types will be available, a universal model, another with a split primary, and a third for use in the Reinartz circuit.

Stand No. 91.—COLVERN, LTD., Mawneys Road, Romford, Essex.

COOK'S WIRELESS.

A large number of receivers to suit the needs of almost every wireless user will be shown. Two-, three- and four-valve receivers will appear in various models,



The Cook "Portable Five" receiver, in which a horizontal arrangement of controls is used to facilitate adjustment when the receiver is stood on the ground.

ranging from the inexpensive "popular" type, through the standard models to the de luxe instruments with revolving shutter fronts. Perhaps the most interesting model of all that is to be shown, however, will be the complete five-valve model, which has special features designed for ease of operation.

Stand No. 254.—COOK'S WIRELESS CO., LTD., "C.W.C." Works, 23, St. Helen's Street, Ipswich, Suffolk.

COSSOR.

In addition to a wide range of new and improved valves (including pentode and screened grid valves), a revised version of the "Cossor Melody Maker" is to be exhibited. The firm has also produced a trickle charger and H.T. eliminator, of which it is hoped to publish full descriptions in the Show review number of this journal.

Stands Nos. 116, 117, 231 and 250.—A. C. COSSOR, LTD., Highbury Grove, London, N.5.

CURRY'S.

At this stand receivers will be shown which combine technical soundness with pleasing appearance. There is, apart from what may be termed the standard model, a de luxe model in a Jacobean pedestal cabinet. Special attention has been paid to the horn from the point of

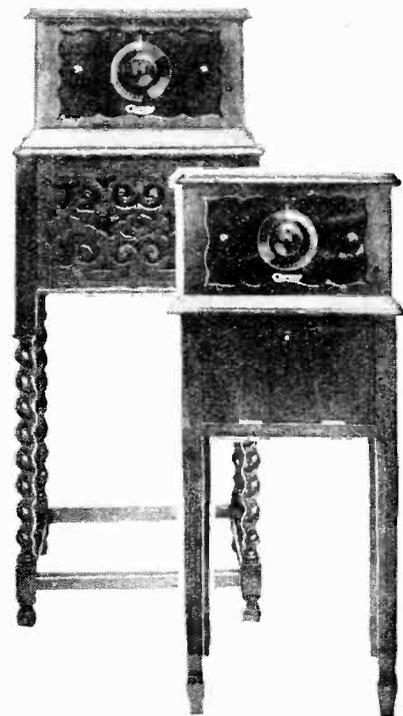
view of correct acoustic design. Yet another receiver is of the console type, and contains a complete gramophone unit. A unique feature is that it is possible to use it with an ordinary sound-box as well as with an electrical pick-up device, the specially designed horn coming into play in either case.

Stands Nos. 275, 276 and 277.—CURRY'S (1927), LTD., 24/28, Goswell Road, London, E.C.1.

DAY.

A great feature of interest on this stand will undoubtedly be the new Miller gramophone pick-up, which is of entirely new design. Nobody interested in the electrical reproduction of gramophone records should fail to pay an early visit to this stand. In addition, the firm are showing their new motor generator, which supplies both H.T. and L.T. from the mains, and a fine assembly of parts for the construction of a moving coil loud speaker.

Stand No. 248.—WILL DAY, LTD., 19, Lisle Street, London, W.C.2



Two typical receivers developed by Curry's Ltd.

DECKO.

In addition to their usual range of small components, visitors to this stand will be able to examine a large number of new types, all having the same high-class finish which one has come to associate with these products. Apart from such devices as switches of various types, pilot lamps for illuminating the scales of both the ordinary and the drum-controlled condenser, there will be shown a direction locator, a control zero ammeter, and a special flat top embossed telephone

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plug, together with some new type wall jacks for loud speaker extension and house wiring systems.

Stands Nos. 203 and 204.—A. F. BULGIN & Co., 9/11, Cursitor Street, Chancery Lane, London, E.C.4.

W. DIBBEN & SONS, LTD.

The receivers manufactured by this firm range from the "Monarch III T" table model three-valve set at £4 15s. to the "Cromwell V" portable set at 24 guineas, the latter being a five-valve set incorporating a pentode valve and balanced armature loud speaker. The loud speaker may be purchased separately; two types are available, the "Grand" and the smaller type, the "Boudoir."

Another interesting receiver to be seen on this stand will be the "Gramophone-cum-Receiver," which may be fitted either with a moving coil or parabolic reflector type loud speaker.

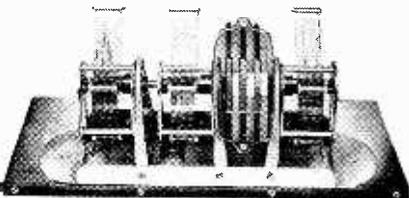
Stand No. 109.—WILLIAM DIBBEN & SONS, LTD., St. Mary's Road, Southampton.

DUBILIER.

Short-wave enthusiasts will be interested to know that four new coils have been added to the present Toroid range. The wavelengths are 22.5 to 45 metres, 44 to 90 metres, 65 to 175 metres, and 140 to 275 metres. The external fields produced are small, a property which militates against instability, especially at very high frequencies.

Messrs. Dubilier have made a special study of the application of lighting mains to wireless receivers, and are marketing four types of filter units from a simple two-valve equipment, with an output of 12 mA to an elaborate unit having six adjustable tappings and giving 50 mA at 180 volts.

Where baseboard space is a consideration (e.g., in portable sets), the new vertical "Dumetohm" grid-leak holders are likely to have considerable appeal. Separate clips are provided for the top and bottom of the leak, so that the glass is not handled when making a change in value. Hitherto the somewhat rough usage entailed in fingering the glass containers may have altered the leak value.



Dubilier triple-gang condenser with three drum controls.

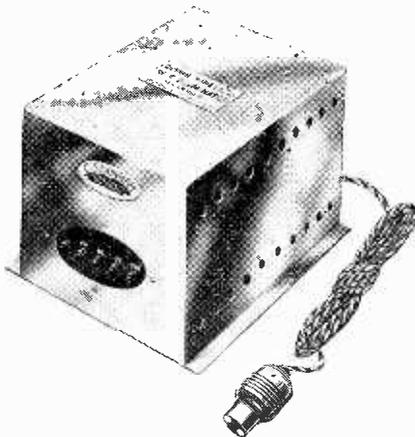
Besides the K-C condenser, which can now be obtained in two capacities—namely, 0.0003 mfd. and 0.0005 mfd., two new drum-control models have been introduced. The first is an ordinary single K-C condenser with two drums, one for coarse and one for fine adjustment, and the second a triple condenser

controlled by three drums sufficiently close together to allow simultaneous or independent control. A neutralising condenser having a capacity from 5 to 50 micromicrofarads will be listed at 3s. 6d. Anti-interference units for connection across the terminals of the motor causing the disturbance will be shown.

Stands Nos. 102 and 103.—DUBILIER CONDENSER Co. (1925), LTD., Ducon Works, Victoria Road, North Acton, London, W.3.

DUNHAM.

Apart from their usual array of high-efficiency receivers, this firm will be exhibiting complete sets of parts, including



The Dunham battery eliminator, which is totally enclosed.

blue print for the benefit of the home constructor, and are devoting considerable attention to the production of thoroughly sound battery eliminators for both A.C. and D.C. mains.

A noteworthy feature is the fact that they are totally enclosed, thus preventing, as far as is humanly possible, all risk of accident due to careless handling by completely non-technical people. Various types of instrument are to be exhibited to suit all purposes and purses.

Stand No. 257.—C. S. DUNHAM, Elm Works, Elm Park, Brixton Hill, London, S.W.2.

EDISON BELL.

Seven receivers of entirely new design will be shown, in addition to a full range of Edison Bell components, such as plugs and jacks, dials and other parts employing moulded bakelite. The new receivers include two portable sets, a pedestal receiver, and some new three-valve sets of compact design.

One of the new components is a pick-up arm which can be fitted to any gramophone, and enables an electrical pick-up to be used without disturbing the existing sound-box. Its price is 3s., and it should prove a most useful addition to any radio-gramophone equipment.

Stand No. 129.—EDISON BELL, LTD., Edison Bell Works, Glengall Road, Peckham, London, S.E.15.

EDISWAN.

A new range of valves will be shown, including the "M" type for A.C. fila-

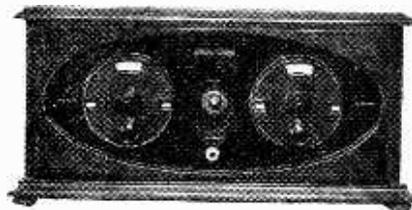
ment heating with a consumption of 1 ampere at 4 volts. The Ediswan R.C. Threesome—the well-known constructor's set—has a number of improvements embodied. The tuning inductance and reaction windings for both long and short waves are mounted in one unit, so that by a simple push-pull switch a rapid wave change is made. The L.F. transformer, type W.L.600, has a ratio of 3½ : 1 and a high primary inductance, so that it can be preceded by a valve of moderately high impedance. The N.P.L. curve for this transformer shows a linear response from 200 to 3,000 cycles, after which there is a dropping off in amplification. The "Loten" accumulator is supplied in glass containers, and special attention is drawn to the absence of separators which are often the means of inducing injurious foreign matter to the accumulator. With a capacity of 20 actual ampere hours the price at 10s. 6d. is moderate.

Stand No. 43.—EDISON SWAN ELECTRIC Co., LTD., 123, Queen Victoria Street, London, E.C.

EFESCA.

New Efescaphone receivers will be shown including a self-contained portable fitted with a screened H.F. amplifier and a pentode output stage. Four valves in all are used, and wave range change is effected by a switch. Another receiver of particular interest, showing the very recent trend of design, includes a screened grid H.F. stage with a pentode output. Reaction, which is such a desirable feature, is provided without reradiation. Wave change is accomplished by interchangeable coils.

Stand No. 127.—FALK, STADELMANN & Co., LTD., 83, Farringdon Road, London, E.C.1.



Efesca "Screen Three."

"EKCO."

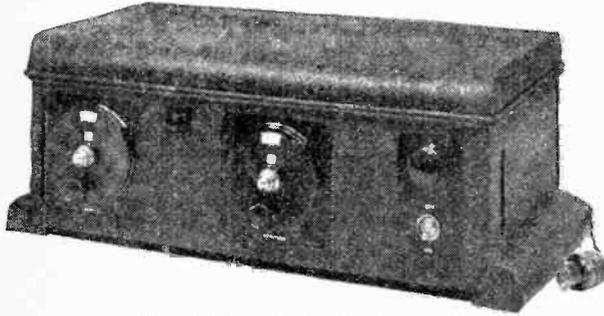
Messrs. E. K. Cole have always been recognised as intensive specialists in the production of mains power radio devices, and their new season models deserve the closest attention. All models are now enclosed in metal cabinets, and conform strictly to the recent I.E.E. specifications for battery eliminators. The new containers are attractively finished with dark brown crystalline enamel.

High-tension units of all types, incorporating valve, Raytheon tube, and Westinghouse metal rectifiers, will be shown together with a trickle charger for use with A.C. mains and an "All Power" unit supplying H.T., L.T., and grid bias from D.C. mains

Guide to the Show.

Finally, this stand should not be passed by until the "Mains Drive" three-valve receiver has been examined. This is entirely self-contained, and derives all power through a single lamp socket adaptor and twin flex. There are two models for A.C. and D.C. mains at 21 guineas and 19 guineas respectively.

Stands Nos. 48, 49 and 50.—E. K. COLE, LTD., "Ekco" Works, London Road, Leigh-on-Sea.



"Ekco" Mains-Drive 3-valve receiver.

ELECTRAMONIC.

The conflict that was anticipated in some quarters between the gramophone and wireless trades when the latter was in its embryonic stage has never materialised; in fact, it can be said with confidence that the one has assisted the other, and instances are by no means scarce in which the two instruments are combined together. The Electramonic series of radio and gramophone self-contained cabinet sets range in price from £36 for the simple hand-wound, battery-operated set, to £175 for an elaborate all-mains, duplicate-turntable device with electrically driven motor. The L.F. amplifiers incorporated have a sharp cut-off at 5,000 cycles so as to eliminate needle scratch.

Stand No. 44.—THE ELECTRAMONIC CO., LTD., Bear Gardens, Park Street, Southwark, London, S.E.1.

EMPIRE.

On this stand will be shown a feature which it can be confidently predicted will attract universal attention, namely, a five-valve portable receiver using screened grid valves in the H.F. stages. Not only its excellent design, but its appearance also, is highly attractive.

Stand No. 247.—EMPIRE ELECTRIC CO., 10, Fitzroy Square, London, W.1.

EUREKA.

The new Eureka "Ortho-Dyne 3," a portable set with a screened grid H.F. amplifying valve, is likely to be one of the most interesting exhibits at this stand. Another self-contained set, on similar lines, but with a fourth valve, will also be exhibited.

Stand No. 144.—PORTABLE UTILITIES CO., LTD., Eureka House, Fisher Street, London, W.C.1.

EXIDE.

There are a large number of listeners, who although they have lighting mains,

prefer to use H.T. accumulators to avoid uncertainty with regard to back-coupling and mains hum. An eliminator built to give a perfect performance on one set may easily fail to function properly if used on another set; this disadvantage does not exist with H.T. accumulators.

To relieve the user of any anxiety whatsoever concerning the maintenance of these batteries (except for occasional topping-up) a range of Exide H.T. and L.T. trickle chargers has been put on the market for use with A.C. mains. The Westinghouse dry metal oxide rectifier has been used in all models.

The principle underlying their design is that the batteries shall be on permanent "trickle charge" the whole time, day and night, except when reception is actually in progress. The charging plates, which can be controlled, are so adjusted that the capacity taken out of the batteries during the average daily reception time (say 3 to 5 hours) is fully restored during the remaining daily non-reception time (which would then be 21 to 19 hours), plus ample margin to allow for losses and abnormal periods of reception. The batteries are thus always "fully up" literally. Neither does it matter if, over a period, the set is used less than usual, for the charging rates are not high enough to do the batteries any harm from over-charging.



The new Exide H.T. trickle charger. The tapping switch gives various outputs.

Besides the well-known Exide L.T. and H.T. accumulators there will be a range of unspillable cells for portable sets and a new H.T. accumulator of 10,000 mA. hours capacity.

Stands Nos. 33, 40 and 241.—CHLORIDE ELECTRICAL STORAGE CO., LTD., 217/229, Shaftesbury Avenue, London, W.C.

FERRANTI.

Most readers will appreciate the pioneer work which has been done by

this company in connection with the prevention of back-coupling in battery and mains-driven receivers. Filter circuits in eliminators and anode feed schemes for H.T. battery involve the use of chokes, wirewound resistances and large-capacity condensers, all of which must conform



Ferranti broad rolled foil condenser in which the rated capacity is effective at high frequency.

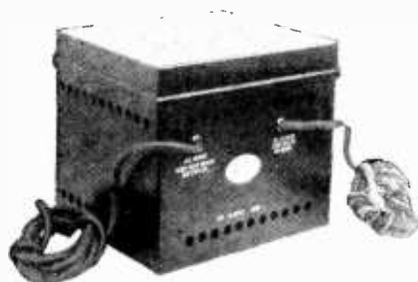
to a high standard of efficiency if satisfactory results are to be obtained. Ferranti chokes are wound on a core of liberal cross section and are made to several specifications as regards current-carrying capacity and henrys inductance, and it is noteworthy that a curve is supplied in each case giving the drop in inductance with increase of D.C. load; with the advent of new power output valves and pentodes this information is essential. Wirewound anode feed resistances from 100,000 to 2,000 ohms guaranteed in value to ± 5 per cent. with specified current-carrying capacities will be shown, while special attention has been paid to the manufacture of large-capacity condensers suitable for work with batteries and battery substitutes. It can be shown that the internal resistance of a condenser containing many convolutions of a narrow paper strip with metal deposited upon it provides a possible source of back-coupling, if the fluctuating currents of more than one circuit are passed through it. Accordingly this company has produced a series of broad rolled metal foil condensers of very low internal resistance, but with a guaranteed insulation resistance of not less than 200 megohms measured at 500 volts. The C1 type condenser is suitable for battery eliminators with working voltages up to 400; the test voltage is 1,000. The C2 type has a working voltage of 200, and is tested at 500 volts, giving a large margin of safety which is necessary when dealing with voltage surges. Attention has been paid to dielectric losses, which have been reduced to a negligible quantity, and the rated capacity is effective at high frequency, a point to which sufficient attention has not been paid in the past.

Readers will look forward with interest to three new output transformers which have been put on the market to give still more ratios for the matching of

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the impedance of the loud speaker to the output valve. There will be a 2:1 ratio transformer for the use of the man who changes over from two valves in parallel to the same two valves in push-pull.

A new Ferranti valve tester will intrigue the reader who wishes to test *in situ* a valve characteristic under working conditions when it is in the receiver. The tester contains an instrument having a resistance of 1,000 ohms per volt, while a multi-way switch and four-pin adapter for plugging in to the valve-holder concerned completes the necessary equipment. A new meter which will read accurately in high-frequency circuits as well as in D.C. and A.C. circuits and consists of an ordinary moving coil instrument in conjunction with a thermo-couple mounted in vacuo will undoubtedly appeal to the more serious worker. A.C. ammeters, voltmeters and milliammeters incorporating dry metal-oxide rectifiers are an innovation of importance. It is claimed that they are more reliable than similar instruments which depend on valve rectifiers for their accuracy. Besides the well-known L.T. trickle charger there will be a new instrument for H.T. trickle charging and two A.C. H.T. eliminators using the well-known Ferranti series anode feed resistance scheme in each plate tapping whereby "motor boating"



Ferranti H.T. eliminator incorporating a metal oxide rectifier. The anode feed resistance scheme is employed.

is entirely eliminated. The Westinghouse metal rectifier is incorporated in these units, and the respective outputs are 220 volts 100 mA. and 220 volts 60 mA. The well-known AF3, AF4 and AF5 intervalve transformers which have gained such popularity among amateurs and manufacturers alike will be shown, as also will be the standard output and push-pull transformers. There will be in addition a new range of A.C. mains transformers.

Stands Nos. 84 and 85.—FERRANTI, LTD., Hollinwood, Lancs.

FORMO.

The so-called "double-impedance" method of L.F. coupling, in which iron-core chokes are inserted in both anode and grid circuits, is steadily gaining ground. Last year the Formo Company produced special chokes for this purpose; these have now been embodied in a unit enclosed in a moulded case which contains the necessary coupling con-

denser, with the result that the connections are made as easily as when stages are coupled by means of a transformer. The system is discussed at some length in a booklet issued by the firm.



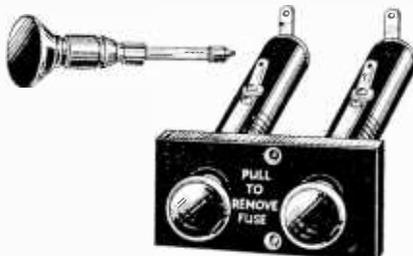
Compactness is a feature of the Formo two-stage L.F. coupler.

Another novel device is a two-stage coupler contained in a similar moulded case, which embodies the popular combination of resistance and transformer coupling. Terminals are fitted, and the unit is complete, so, as far as the L.F. side of a set is concerned, nothing but valves is required. A circuit diagram with arrows pointing towards the appropriate terminals is mounted on the container; thus there is little excuse for making incorrect connections.

Stand No. 140.—THE FORMO COMPANY, Crown Works, Cricklewood Lane, London, N.W.2.

GAMBRELL.

Mains drive receivers will be an important feature of this stand, and two models in particular should receive more than usual attention, viz., the "Table-Model Two," which is of extremely simple and neat design, and the "Table-Model Four," with screened grid valve. The latter model includes thumb-control tuning, provision for a gramophone pickup and a volume control operating both for radio and gramophone reproduction.



Gambrell twin fuse holder and fuse unit.

An A.C. mains unit known as the "Combinator" will also be shown. This comprises a combined H.T. and grid bias eliminator, together with a trickle charger for 2-, 4- or 6-volt L.T. batteries.

Two new components will be added to the usual range of coils, neutralising condensers, etc. One is a new continuously variable volume control known as the "Voluvernier," and the other a twin fuse unit for insertion in both leads of the mains. Spare fuses for this unit cost only 6d. each, and the fusing current is adjusted to afford protection to the house lighting fuses as well as to the radio apparatus itself.

Stands Nos. 27 and 108.—GAMBRELL RADIO, LTD., Buckingham House, Buckingham Street, Strand, London, W.C.2.

G.E.C.

A number of changes have taken place in existing Geophone sets, and some new designs have been prepared for the coming season. The proposed Regional scheme which the B.B.C. hope to put into operation in the near future has considerably influenced the design of these new sets in so far as a high degree of selectivity has been deemed necessary. The development of the screened-grid valve has helped materially in simplifying the control of these receivers and valves of this type have been adopted, therefore, in all sets fitted with H.F. amplifiers.

The Screened Grid Four-Valve Model incorporates two H.F. amplifiers with S625 screened-grid valves, a three-electrode detector valve and a super-power output valve. The tuned circuits are gang-controlled, this being facilitated by the use of a frame in place of the usual outdoor aerial.



The Gambrell "Table Model Two" mains receiver.

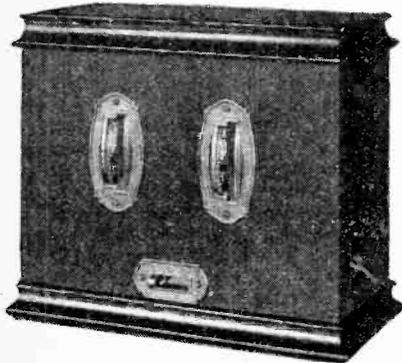
Another interesting model is the BC2930, this being extremely compact and enclosed in a black crystalline-finished metal case. The set is primarily intended for local reception, but nevertheless possesses ample sensitivity to give a choice of alternative programmes. The waveband covered is 200 to 2,000 metres, this being achieved in three stages by means of a three-position switch.

Among the new accessories introduced this season is an H.T. battery eliminator for A.C. supply mains, giving an output of 50 milliamperes at 180 volts maximum. In addition to one fixed voltage tapping, two variable intermediate voltages are available. A complete range of improved Osram valves will be shown, all types possessing a higher mutual conductance than hitherto achieved, and in addition a number of new valves are to be on view for the first time. The S215,

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a two-volt screened-grid valve, gives an amplification of 170 with an impedance of 200,000 ohms. It is fitted with a 4-pin base of the usual type to which is brought out the filament, control grid and screened-grid, the anode terminating at a terminal attached to the top of the glass bulb.

The five-electrode output valve, or pentode, has an amplification factor of between 60 and 80, according to the type, and will undoubtedly revolutionise the design of receivers in the near future. This also fits the standard 4-socket base, the screened-grid being brought out to a terminal on the side.



Compactness and simplicity of control are the outstanding features of this G.E.C. 3-valve receiver.

Some new A.C. valves have been developed with directly heated cathodes, this having been made possible by the use of a special thick filament. These are known as the "Point 8" type, and are available as high impedance, medium impedance or low impedance valves. It is recommended that a potentiometer of about 300 or 400 ohms should be connected across the filament and all grid return leads brought to the slider, the object being to "pick-up" the centre point of the filament. If this precaution is not taken, an objectionable hum might arise due to the fact that the filament is fed with "raw" A.C. The filament rating of these valves is 0.8 ampere at 0.8 volt.

Stands Nos. 28, 29, 46, 47 and 225.—GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

GOODMAN.

Undoubtedly the leading feature of this firm will be the "Centrex" moving-coil loud speaker which is of entirely new design, and should not on any account be missed. Another new feature of great interest apart from the cone type of loud speaker for which this firm is noted is a gramophone pick-up of unique design.

Stand No. 269a.—GOODMAN'S, 27, Farringdon Street, London, E.C.4.

HARBRO.

The practice of wiring up several rooms in a house so that a loud speaker can be taken from room to room as desired has extended very greatly during the past

year owing to the introduction of several types of remote control relays. The chief difficulty lies in obtaining a suitable type of flexible lead for the loud speaker. If any considerable length of the customary lighting "flex" is used, there will be a large capacity across the loud speaker with consequent attenuation of the upper musical frequencies.

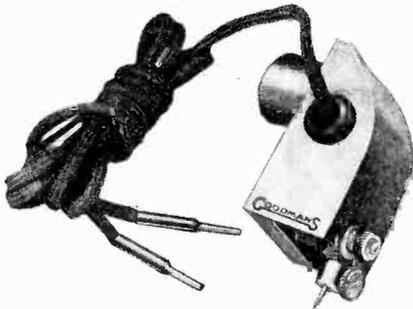
This problem has been tackled by this firm, however, with the result that a flexible extension wire can be obtained which has, length for length, less than half the self-capacity of the more ordinary type of wire. It is mainly intended for attaching to the edge of a picture rail by means of special strong pins which are provided. The wire can be obtained in various colours and shades to harmonise with the furnishing of a room, and the pins (which have large heads like drawing pins) can also be supplied with different coloured heads. In addition, battery cords and various other flexible wire will be exhibited.

Stand No. 215.—HART BROS. ELECTRICAL MANUFACTURING CO., LTD., 4, Queensway, Ponders End, Middlesex.

HART ACCUMULATORS.

The merit of the glass box container now so generally appreciated is realised by the Hart Accumulator Company in their low tension cells. Moving-coil loud speaker enthusiasts will be interested in the high capacity H.T. units rated at 1,250-2,500 milliampere hours. The containers are of glass with grooved bottom rests into which the plates fit. Ebonite lids are sealed to the cells with a special compound, and the connectors are of an alloy of non-corrodible metal. For even heavier anode current consumption another high tension battery is rated at 3,000-6,000 milliampere hours. These cells are in round glass containers with projecting ribs for holding them in position on a perforated tray. High tension units in moulded compartment glass boxes will also be available in the 10-volt size having capacities up to 5,000-10,000 milliampere hours.

Stand No. 95.—HART ACCUMULATOR CO., LTD., Marshgate Lane, Stratford, London, E.15.



This gramophone pick-up by Goodman's is of entirely new design.

HART COLLINS.

Many of the troubles from which broadcast listeners suffer can be traced to re-radiation from near-by aerials and any-

thing that mitigates this evil rightly deserves recognition. Therefore, apart from the great convenience conferred by portable and transportable, self-contained, sets, this point alone should weigh heavily in their favour. To meet the demands of those desirous of installing apparatus of this type, Messrs. Hart Collins, Ltd., have augmented their range of portables by the addition of two new models. The Passport Portable is a five-valve receiver enclosed in an attractive hide suit-case with a cone loud speaker accommodated in the lid. The high frequency stages are choke-capacity coupled, thus restricting the tuning to a single dial, reaction being controlled by means of a condenser. The Passport Transportable embodies a similar circuit, but this model is enclosed in a walnut case with a cone loud speaker built in. In many respects the new sets closely resemble the Tourist models, the same high-class components being used throughout, but by careful design and attention to manufacturing costs it has been found possible to produce these at a considerably reduced price.

Stand No. 15.—HART COLLINS, LTD., 38a, Bessborough Street, London, S.W.1.

HUNT.

As each year goes by the need for accurate meters is more and more realised by the discriminating amateur. They would do well, therefore, to wend their way towards this stand even if only to inspect the meters apart from the other products to be exhibited by the firm. One of the most attractive items to be exhibited is an amateur's testing set consisting of a double-reading voltmeter for testing both H.T. and L.T. batteries, and a double-reading ammeter for registering the charging current of either battery, the two full scale readings of the latter instrument being 0 to 4 amps and 0 to 0.2 amps.

Other exhibits are smoothing condensers, mica condensers, grid leaks, and anode resistances (the latter wirewound), resistance coupling units, rheostats, and potentiometers. In addition there will be shown some extremely interesting telephone plugs and extension connectors.

Stand No. 273.—A. H. HUNT, LTD., "H. A. H." Works, Tunstall Road, E. Croydon.

IGRANIC.

A new dual impedance coupling unit for intervalve L.F. coupling consisting of two iron-cored inductances mounted side by side and a condenser enclosed in a metal case provided with four terminals figures among the new components introduced this year. One inductance is connected in the anode circuit of the valve, and the voltage developed across this is impressed on the grid of the following valve. The second inductance replaces the grid leak which would normally be used with this method of L.F. coupling.

The new type J. low-frequency transformer should appeal, both from the point of view of performance and price, to those who have occasion to use these components. It is made in two ratios, a 6:1 and a 3:1, and both types have a condenser permanently connected across the primary.

Guide to the Show.—

The short-wave enthusiast will find his needs catered for as a special screened variable condenser with a maximum capacity of 0.00015 mfd. and a short-wave choke are included in the new accessories. In the section devoted to complete sets



A new L.F. coupling device: the Igranic Dual-Impedance-Capacity Unit.

the Neutro-regenerative short-wave amplifier kit will be shown built up into three- and four-valve receivers enclosed in handsome mahogany cabinets. Additional aerial and H.F. transformers will be available, thereby enabling the set to be used on the B.B.C. and intermediate wavebands. This is the first receiver of its kind to be developed which employs H.F. amplification as low as 15 metres.

Space only forbids a detailed description of the numerous components and new sets that are to be exhibited this year, but the visitor should not leave this stand without examining the new portable five-valve set with screened grid H.F. stages and the various models of the Neutro-Seven receivers.

Stands Nos. 53, 54 and 75.—IGRANIC ELECTRIC CO., LTD., Bedford.

J.B. CONDENSERS.

The standard J.B. Log and S.L.F. condensers are being fitted this year with heavier brass end plates, and a new midget condenser with one-piece frame and cone and ball bearings is being added to the range.

Three new vernier dials are being shown, two of the conventional friction drive type, and a third having an improved drum control in which the control knob is placed immediately below the scale.

Stand No. 105.—JACKSON BROS., 8, Poland Street, London, W.1.

LAMPLUGH.

A comprehensive range of receivers, loud speakers, and components will be on view at these stands.

The receivers will include the following types: "Popular," "Standard," "Quality," and "Screened Grid." The popular model is housed in a metal case finished in crystalline enamel, the remaining types being housed in high-class cabinets of the table and console types.

Cone-type loud speakers incorporating balanced armature movements will be shown in the form of wall plaque and cabinet models.

An interesting collapsible cabinet in oak and mahogany will appeal to the constructor. It is designed to accommodate the new Lamplugh panel plate tuner unit and baseboard amplifier unit. A new variable condenser fitted with slow-motion control and an ornamental escutcheon plate will be shown, together with a full range of rheostats, chokes, transformers, slow-motion dials, moving-coil loud speaker parts, and H.T. and L.T. batteries.

Stands Nos. 81 and 106.—S. A. LAMPLUGH, LTD., Kings Road, Tyseley, Birmingham.

LANGHAM.

Devotees of portable sets will be interested to know that the popular product of this well-known concern can now be obtained with gramophone motor and turntable incorporated so that records can be electrically reproduced through the L.F. amplifier of the radio set. A volume control is embodied in the set, and there is provision for spare records in a special pocket in the canvas cover. Owners of Langham sets can have their present models modified and fitted with the gramophone unit for 6 guineas.

The portable receiver has been modified by the addition of a mechanical wave-changing scheme which is a great improvement over the plugging-in of



The new Langham portable set, with mechanical wave-change arrangement.

high-frequency transformers hitherto employed. A ball bearing turntable, a cone loud speaker, and a new type of non-spillable accumulator will be shown.

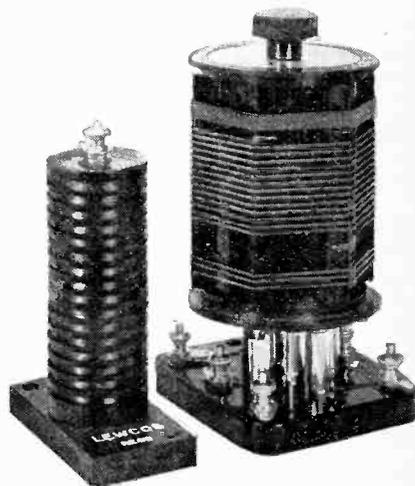
Stands Nos. 55 and 74.—LANGHAM RADIO, 95, Regent Street, London, W.1.

LEWCOS.

First in importance among the new Lewcos products is the section-wound H.F. choke, which has an exceptionally high inductance and is suitable for wavelengths as low as 20 metres and as high as 2,000 metres.

Another interesting component is the short-wave tuner. This is wound on a ribbed ebonite former, and blue silk-covered copper strip is used for the aerial and grid coils. The unit fits into the standard six-pin base and can be used to convert many well-known receivers for short-wave work.

The new Lewcos wavetrapp is made in four models, covering a total wavelength range of 250 to 2,000 metres. The two short-wave units are wound with Litz wire, and should prove of exceptional efficiency.



Lewcos short-wave unit and universal H.F. choke.

In addition to the standard range of plug-in coils, a new series of centre-tapped and double-tapped coils will be shown.

Stand No. 110.—THE LONDON ELECTRIC WIRE CO. AND SMITHS, LTD., Church Road, Leyton, London, E.10.

LISSEN.

It would be difficult to find any component used in an orthodox receiver that is not manufactured by this company.

Among the new products for this season are a range of valves, a five-valve portable set, a new range of the well-known Lissen H.T. batteries, including a heavy-duty type, and combined radio and gramophone equipment.

Demonstrations will be given of how to control a new type of condenser with thumb drive, also the somewhat drastic test of immersing transformers in water to indicate that they are quite impervious to moisture, will be shown.

A panel bracket capable of being fitted at any angle should prove of interest to the constructor.

Stands Nos. 57, 58, 71 and 72.—LISSEN, LTD., Friars Lane, Richmond, Surrey.

LOCK.

A remarkable feature of this stand will be the large display of cabinets for moving-coil loud speakers, and also cabinets for complete receivers and loud speakers. They are to be shown in several types of finish, and are obtainable in the pedestal, the console, and the ordinary type for

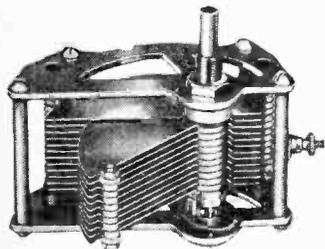
Guide to the Show.—

placing upon a table. In addition will be shown portable set containers, and a large variety of the ordinary "American" type of cabinet of the drop front and the double door type.

Stands Nos. 229 and 230.—W. T. LOCK, LTD., St. Peter's Works, Bath.

LOTUS.

The Lotus valve holder is now supplied in a smaller size than formerly, and occu-

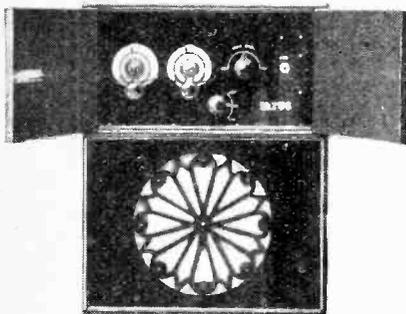


The Lotus log mid-line condenser, with brass vanes.

pies less space on the baseboard; its overall diameter is only 1½ in. New components include a series of all-brass variable condensers, of the log mid-line type, which sell at a low price, and a geared vernier dial with a 14:1 reduction ratio.

Three-valve portable and transportable receivers have been introduced. The circuit arrangement of each is similar; a screened grid H.F. valve is included with a pentode in the output stage.

Stand No. 115.—GARNETT, WHITELEY & Co., LTD., Lotus Works, Broadgreen Road, Liverpool.



The self-contained Lotus transportable receiver with a screened-grid H.F. amplifier.

"LUNMET."

A full range of aerial wires will be displayed on this stand, together with a large variety of metal stampings and screws used by the trade. The aerial wires include copper (plain and enamelled), phosphor bronze, and aluminium stranded cables in 100ft. lengths.

Stand No. 79.—LONDON METAL WAREHOUSES, LTD., Hill Street, Blackfriars Road, London, S.E.1.

MARCONIPHONE.

New Marconiphone receivers are briefly as follows. Pentodes and screened grid valves form a feature of the many

designs. Model 23—two-valve set with pentode output, waverange 250-550 and 1,000-2,000 metres, accomplished without changing coils. Model 34—new three-valve short-wave and universal receiver, 12 to 3,000 metres. Model 35—H.F. detector and L.F. set embodying screened grid H.F. valve and pentode and will probably prove superior to many four-valve receivers, covers both wave ranges without the need for changing coils, may be driven from batteries or the mains. Model 44—two screened grid H.F. stages, anode bend detector and pentode. Tuning dials are calibrated in wavelengths and may be operated from batteries or the mains. Model S.24—an interesting short-wave adaptor—a unit which, when connected in front of a broadcast receiver, permits of reception on 10 to 100 metres. Containing an oscillator, it acts on the super-heterodyne principle. Loud speakers. —Already the Marconiphone



A new portable. The Marconiphone self-contained receiver with edgewise scale tuning dials.

moving-coil loud speaker, owing to its attractive design and low price of 6 guineas, has secured a wide market. These loud speakers in various models and with cabinets in various styles will be worthy of special attention. Components include a wide range of mains transformers, short-wave coils, and coil holders, as well as all the usual apparatus associated with receiver design. The new Marconi valves will, of course, form part of this exhibit. Special demonstrations of broadcast and public address apparatus will be given at 30, West Kensington Gardens.

Stand Nos. 59, 60, 61, 68, 69, 70, 232 and 233.—MARCONIPHONE Co., LTD., 210/212, Tottenham Court Road, London, W.1.

McMICHAEL.

Taking full advantage of recent valve developments, this company has introduced a self-contained four-valve portable set employing two of the new screened-grid H.F. valves and a detector followed by a pentode. Although there are two H.F. stages, it has been found possible to obtain an adequate stage gain

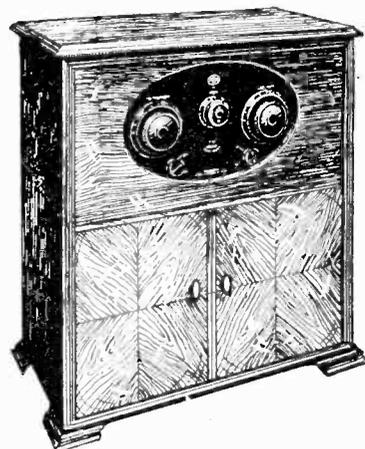
while employing one tuning dial only. Simple switching allows a rapid change from short to long waves. The receiver is housed in an attractive walnut cabinet with Celestion loud speaker built in. Readers will have seen the satisfactory *Wireless World* laboratory report on the battery-driven "Screened Dimic Three." A modified receiver to this design has now been introduced incorporating a mains driven unit with Westinghouse metal rectifier to supply both H.T. and L.T. With a combination of triode, tetrode, and pentode, this set is capable of giving good quality and excellent volume, and the elimination of battery upkeep should be an added attraction. The well-known low-loss Dimic and Unimic coils will be exhibited.

Stand No. 128.—L. McMICHAEL, LTD., Wexham Road, Slough.

METRO-VICK.

The ever-increasing demand for selectivity brought about by the promise of the regional scheme and the present congestion of the ether calls for some device which will electrically lengthen or shorten a broadcast aerial so as to decrease or increase its selectivity. A short aerial will be more selective and give less input than a long aerial, and there are times at which both types will be desirable, but it is hardly possible to erect two or more aerials to cope with the situation.

The Met-Vick elastic aerial unit is designed on the neutrodyne or balancing principle by inserting in the aerial circuit an auto-transformer coil earthed in the centre and from the extreme ends of which voltages 180° out of phase will be developed when signals are received. A variable condenser is incorporated with one rotor and two stators such that when in its mid-position the effective aerial



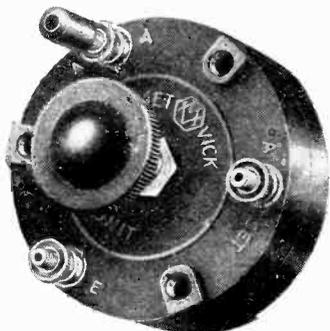
McMichael "Screened Dimic Three" with complete H.T. and L.T. eliminator embodied in the cabinet.

length is almost reduced to nothing. If the coils or earth wire of a set are picking up signals from a near-by station, a position of the condenser can be found to neutralise these, and so perfect a balance can be obtained that a five-valve set with two stages of H.F. can be tuned in from

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maximum to zero by the fraction of a turn.

This device for continuously varying the electrical length of an aerial from a few inches to its normal length to allow of any degree of selectivity should prove of great value to users of multi-valve sets living close to a powerful station.



Met-Vick elastic aerial unit which provides a balancing scheme to change the electrical length of the aerial from a few inches to its normal length, thus giving a control of selectivity.

A new Cosmos battery eliminator, type B, giving H.T., L.T., and bias voltages, will appeal to those who have lighting mains and do not wish to be bothered with any battery upkeep whatsoever. Essentially for those living in the Colonies, a robust ultra-short-wave set has been evolved capable of withstanding tropical conditions.

Stand Nos. 32 and 41.—METRO-VICK SUPPLIES, LTD., 155, Charing Cross Road, London, W.C.

M.P.A.

An exhibit which should attract considerable attention this year is a combined gramophone and five-valve wireless receiver operated entirely from the supply mains. A coil-drive loud speaker is used for reproduction of both radio and gramophone, and all three units are mounted in a handsome oak cabinet supported on four legs. A comprehensive range of electro-magnetic and reed-driven cone loud speakers is also to be on view, and prominent among the last-mentioned type will be seen the new "Popular Plaque" model, an inexpensive but efficient loud speaker.

Stands Nos. 21 and 22.—M.P.A. WIRELESS, LTD., 62, Conduit Street, London, W.1.

MULLARD.

One of the most interesting exhibits will be the pentode valves which have lately appeared on the market for the first time. These five-electrode valves have essentially the characteristics of the now well-known H.F. screened grid valve, but the detrimental negative resistance phenomenon due to secondary emission has been obviated by the addition of a fifth electrode which is internally connected to the centre point of the filament. This results in a power

output characteristic giving a valve of no mean performance, since it can satisfactorily replace not only the two ordinary L.F. stages of a receiver, but two stages in which the last valve is a super-power valve, dissipating perhaps 10 watts at 300 volts H.T. The P.M.22 (a 2-volt pentode) has a mutual conductance of 1.3 and a magnification factor of 32, while the P.M.24 has a mutual conductance of 2.3 and a magnification factor of 62, and the respective filament currents 0.3 amp. and 0.15 amp. must be considered as modest.

The screened grid valves P.M.12 and P.M.14 belong to the type in which the anode is brought out through the glass bulb at the top of the valve; the residual capacity between the anode and grid has a very low value, and the performance of the valve on test is satisfactory.

Besides the well-known 6-volt, 4-volt, and 2-volt series, there is a newcomer—the P.M.4D—with an excellent low bend suitable for rectification and a mutual conductance curve of 2.1 mA. per volt; the magnification factor is 12.5 and the impedance 6,000 ohms. Such a valve makes it perfectly feasible to employ transformer coupling immediately after anode bend rectification, thus gaining a step-up without detriment to quality. The Permacore transformer with nickel and silver windings is a feature of great interest.

Stands Nos. 88, 89, 90, 97, 98, 99, 133 and 267.—MULLARD RADIO VALVE CO., LTD., Nightingale Works, Nightingale Lane, Balham, London, S.W.12.

NEWTON.

Nobody should fail to seize an early opportunity of visiting this stand, which should interest all classes of wireless enthusiasts, for the exhibition will, *inter alia*, consist of a large variety of D.C. generators. Machines of all types will be shown with various input and output voltages. High voltage D.C. generators up to fifteen thousand volts and high-frequency alternators are also made by this firm. An instrument of special interest on this stand, however, will be the double voltage instrument which will give an L.T. output of 12 volts 6 amps., and an H.T. output of 1,200 volts 80 millamps. when mechanically driven.

Stand No. 243.—NEWTON BROS. (DERBY), LTD., 56, Kingsway, London, W.C.

ORMOND.

A pedestal type radio-gramophone set and a new suit case portable have been added to the range of Ormond receivers, and will be available for inspection on this stand.

A new logarithmic condenser of small dimensions for use where space is limited is to be shown. The spindle projects at both ends to facilitate "ganging," and the condenser has been adapted for "one hole fixing," "baseboard mounting," or "along panel mounting." Among other recent products to be seen on this stand will be a new push-pull switch, the

Ormond loud speaker, and the portable set turntable.

Stands Nos. 132, 162 and 163.—ORMOND ENGINEERING CO., LTD., 199/205, Pentonville Road, London, N.1.

PARMEKO.

This stand will attract those interested in the home construction of A.C. battery eliminators. As well as complete battery eliminators of chassis design, a range of special transformers are to be shown to meet all the requirements of running a liberal output stage on A.C. supply. It is known to this journal, only too well, that readers are asking for most unusual forms of transformers and chokes. In this connection Partridge and Mee now issue a tabular form which amateurs can complete to their particular requirements when ordering.

Stand No. 147.—PARTRIDGE & MEE, LTD., 12, Belvoir Street, Leicester.

PETO-SCOTT.

Screened grid and pentode valves figure largely in the new Peto-Scott receivers. The "Triple Two" is a detector-L.F. combination with one of the latter valves in the output position, while the "Screened Grid Three" uses the already popular combination of S.G. H.F. amplifier, triode detector, and pentode L.F. valve. Provision for reception of the ultra-short waves is included. A radio-gramophone receiver, complete with turntable, is also to be shown.

The new components include a universal tuning coil with built-in switch for waveband changing and a winding for capacity-controlled reaction. There is also a drum drive slow-motion gear for thumb-operated condensers and a miniature model of the Keystone Midget reaction condenser.

Stands Nos. 142, 143.—PETO-SCOTT, Co., LTD., 77, City Road, London, E.C.1.



The Mullard high magnification factor pentode output valve and the Permacore transformer with nickel and silver windings.

PHILIPS.

The stand is to be devoted to the many forms of Philips battery chargers and eliminators, the new low-frequency transformer as well as the Philips loud speaker. A novel feature of the loud

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speaker is the provision of a two-way switch, which, by a change in the winding, adjusts volume and quality. Provision has been made to demonstrate Philips apparatus at 32, West Kensington Gardens, where callers will have an opportunity of examining the latest Philips receivers. Of unusual interest is a compact three-valve set, easy of operation, covering a waveband of 200 to 2,000 metres and suitable for working from batteries or mains. The merit of this set is that its radically new design makes use of the P.M.14 screened grid valve, the P.M.4D, a valve of high mutual conductance for the detector and the P.M.24, a pentode, for the output. An opportunity to witness the performance of a receiver of this type is well worth while.

Stands Nos. 94 and 122.—PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2.

POLAR.

The popular "Ideal" and "All Brass" variable condensers will be supplemented by the new types. (1) Drum-control condenser for mounting parallel with the panel, and supplied with separate fast- and slow-motion drums; (2) Slow-motion reaction condenser; (3) Type QJ condenser—a miniature replica of the Ideal condenser with a maximum of 0.00025 mfd.

Two new H.F. chokes of compact design will also be shown.

Stand No. 111.—WINGROVE & ROGERS, LTD., 188/189, Strand, London, W.C.2

PYE.

The already wide range of power and other transformers and chokes is to be extended by the addition of several new components. A small and inexpensive instrument for stepping-down the A.C. mains voltage to a value suitable for metal rectifiers used in L.T. chargers is likely to be popular.

Several heavy-duty chokes are to be shown, including a type designed for smoothing in filament heating circuits; this is intended to handle currents up to 0.5 amp. Published graphs relating to the components for H.T. eliminators show the actual inductance at currents up to 100 milliamps.

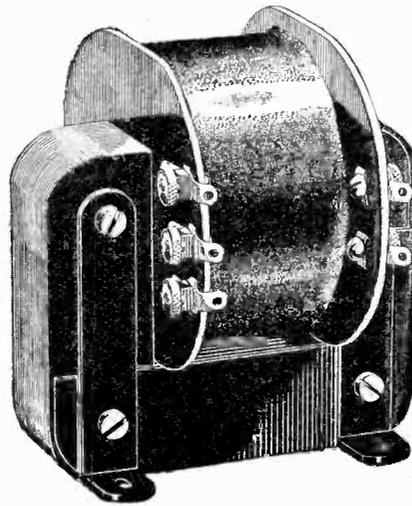
New season's receivers include several instruments for operation on A.C. mains, in which H.T. and L.T. supply is obtained through Westinghouse metal rectifiers. There is also a three-valve set which includes an S.G. high-frequency amplifier and a pentode in the output position. Details of a five-valve portable of improved design will be awaited with interest, as the firm has always specialised in this type of set. It is understood that a new variable condenser, selling at a low price, will be ready in time for the exhibition; its plates are to conform to the logarithmic principle, and a reduction gear of 40:1 is fitted.

Stands Nos. 87 and 100.—W. G. PYE & Co., Granta Works, Montague Road, Cambridge.

REDFERN'S.

Two new and distinctive forms of ebonite panels will be shown. The one described as moire silk is applied to Ebonart sheets and panels, while the new wavy finish is available on the new Redfern's "graven" ebonite panels and sheets in black and mahogany colours. The merit of these new finishes is that they are not easily blemished and are practically scratch-proof. The Redfern's pneumatic valve-holder, constructed from pliable rubber, which has already proved popular, is now reduced in price.

Stand No. 123.—REDFERN'S RUBBER WORKS, LTD., Hyde, Cheshire.



A Pye transformer for L.T. chargers using metal rectifiers.

REES MACE.

As might be expected, this firm, who were among the earliest pioneers in the field of portable receivers in 1923, are showing, in addition to a large variety of other models, two five-valve portables of entirely new design, called the "Five-valve Baby Grand" and the "Five-valve Grand." Those in search of a really good portable receiver should take the earliest possible opportunity of visiting this stand.

Stand No. 268.—REES MACE MANUFACTURING Co., Ltd., 39a, Welbeck Street, London, W.1.

R.I. & VARLEY.

Radio enthusiasts in search of components of new design will pay particular attention to the extensive range of new products to be shown by R.I. & Varley. The apparatus manufactured by this company follows the entire scope of radio interest, and includes receiving sets, eliminators, specialised H.F. equipment, L.F. intervalve couplings, and heavy duty mains gear.

An examination of the new gramophone pick-up reveals many interesting points. It is reasonably light in weight and operates on a differential magnetic system. Pliable rubber cushions are

used to damp the movement of the armature. The air gap in the magnetic circuit is liberal, a condition which experience has revealed to be desirable practice, while the pole ends are tapered off to concentrate the magnetic flux.

Complete tuning units have long formed an important feature among R.I.-Varley products. A new unit is to be shown embodying a design that provides one of the easiest possible methods of converting it into a simple receiving set. It tunes to both wave ranges and is fitted with a totally-enclosed switch. A gear covered dial indicates the reaction setting.

Much has appeared recently in the pages of this journal on the subject of parasitic oscillation and distortion, usually termed "motor boating," arising out of the common resistance in the source of H.T. supply, whether battery or eliminator. This difficulty demands the provision of a feed resistance and condenser in the battery leads of practically all valve stages. The new R.I.-Varley anti-mobo unit meets this requirement, and will undoubtedly find its way into the majority of receiving sets as a means of remedying incipient oscillation. A range of resistance-capacity coupling units are to be available fitted with this device, which has become almost an essential of good receiver design.

A better understanding of the problems involved in the design of low-frequency chokes has led to the production of a new series for intervalve and output purposes, including special models of heavy current carrying capacity. These chokes are totally screened and protected so as to permit of their use in association with high voltage circuits. Each model is definitely rated to possess a stated value of inductance when actually passing a given current. Mains transformers for battery eliminator construction with windings to suit numerous requirements will be available for inspection.

Stands Nos. 56, 73 and 222.—R.I. & VARLEY, LTD., 103, Kingsway, London, W.C.

R.S.V.P.

A new addition to the famous R.S.V.P. family of portable and transportable sets is the R.S.V.P. Screened Four, incorporating a screened grid valve for H.F. amplification. As there are two main tuning controls only the operation is extremely simple, and this is, if possible, made more so by the use of a three-positioned switch, which in the centre position switches off the set and in either of the alternative positions sets the receiver for long or medium wave reception. Enclosed in a polished case with self-contained loud speaker, it exemplifies the workmanship which characterises all this firm's products.

A combined five-valve receiver and gramophone with a loud speaker built into the lid is perhaps the smallest and most compact dual instrument yet produced, measuring as it does only 15½ in. x 18 in. x 9½ in.

There will also be exhibited many dif-

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different kinds of wire for which this company has been well known in the past.

Stand No. 52.—J. L. GOTTILIEB & Co., LTD., 15, Cromer Street, Gray's Inn Road, London, W.C.1.

RUNBAKEN.

One of the chief exhibits to be shown by this firm will be an entirely new form of L.T. trickle charger, for use on A.C. mains, which is provided with an automatic device for putting the battery on charge. The amateur having D.C. supply will also find himself catered for. In addition, several other highly essential devices, such as battery testing apparatus, will be shown.

Stand No. 244.—RUNBAKEN MAGNETO Co., Tipping Street, Ardwick, Manchester.



The R.S.V.P. gramophone 5-valve receiver combines the advantages of radio with the convenience of the gramophone.

SELECTORS.

The Selector Portable receivers have all undergone modification during the quiet season, and in addition to improvements to existing sets new types are to be shown this year. One very interesting addition to the Selector range is an attaché case portable set entirely self-contained, although if desired an external loud speaker can be used. This set is contained in a handsome blue grained leather case with nickel fittings, and measures only 13½ in. x 13 in. x 8½ in.

For short-range reception the "Selector Three" portable should appeal, as this is also entirely self-contained, but provision is made for attachment of an external aerial and earth, thus enabling a considerable increase in the scope of the set when used in the home.

Stand No. 23.—SELECTORS, LTD., 1, Dover Street, London, W.1.

SELHURST.

It is probable that the wider adoption of the moving-coil type of loud speaker is hindered by the fact that energy must be supplied to the field magnet. Although this presents little difficulty when a main electric supply (particularly of

the D.C. type) is available, a consumption of battery energy perhaps equal to that required for the set itself is not an inconsiderable matter, and those to whom



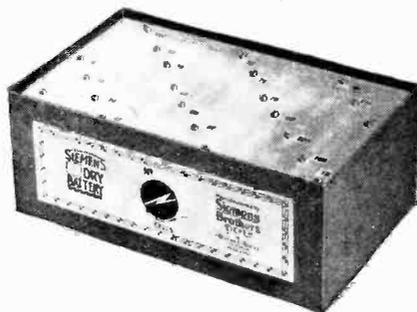
The Selector 5-valve Attache Case Portable is neat, light and compact.

the accumulator problem is an ever-present source of trouble will welcome the efforts of Messrs. Baker's Selhurst Radio. This firm, in addition to components for the more conventional kind of instrument, are to show loud speakers with permanent magnets, both of the bar and horseshoe type. We are also promised a new device to overcome the difficulty of centring a moving coil in a narrow air gap, as well as an improved moving coil wound on a former with a thickness of less than 0.005 in.

Stand No. 172.—A. BAKER, 89, Selhurst Road, South Norwood, London, S.E.25.

SIEMENS.

The principal exhibit will be a full range of the dry cell H.T. batteries, including the well-known "Popular" and "Power" types, and a new high-capacity



Siemens No. 1075 H.T. battery for portable sets.

battery specially designed for portable sets.

A special export section will deal with enquiries for batteries suitable for use overseas, and there will also be sections

devoted to high-grade ebonite and radio testing instruments.

Stands Nos. 164 and 165.—SIEMENS BROS. & Co., LTD., Woolwich, London, S.E.18.

SIX-SIXTY.

A new range of valves will be shown, including screened grid H.F. valves for two- and four-volt accumulators having mutual conductances of 0.9 mA. per volt. Pentode output valves are now available with remarkably high magnification factors and mutual conductances; there are also new power output triodes of low impedance.

The popularity of portable sets has induced this company to market a metal turntable which is 7 in. in diameter and includes a peripheral ball race giving ample thrust surface. The price is 8s. 6d. Another new component to be exploited at a popular price is a cone loud speaker which can be purchased as a separate unit or housed within an attractive cabinet.

Stand No. 42a.—ELECTRON Co., LTD., 122, Charing Cross Road, London, W.C.

STAPLETON.

The wireless enthusiast having D.C. mains is frequently advised that all he need do to charge his accumulator without cost is to connect it in series with any lamp he may be using during the evening, but the practical carrying out of this idea is not quite so simple as is sometimes



Six-Sixty new-type screened grid valve.

suggested. This practical difficulty has, however, now been completely overcome by means of the "Loriadapter," which will be one of the exhibits on this stand. In addition will be shown the well-known "Loriostats" and "Loriometer."

Possibly, however, the most interesting component made by this firm is a tapped anode resistance complete with stud switch and an anode feed resistance mounted in a metal container ready for attachment to the panel in the usual manner. The instrument is for connection in the plate circuit of the detector valve in place of the usual anode resistance, and by means of six tappings on the actual anode resistance, which are carried to the six studs of the switch, a very fine control over volume is had. This is the first instrument of its kind to appear on the market, and fulfils a long-felt need.

On this stand the moving-coil loud speakers made by the Epoch Radio Manufacturing Co. will be exhibited. One model is of entirely new design, and should prove of extreme interest to amateurs.

Guide to the Show.—

A complete set of *Wireless World* coils manufactured by Messrs. Laurence & Hull will also be a prominent feature of the stand.

Stand No. 211.—A. W. STAPLETON, 19a, Lorrimore Buildings, Lorrimore Street, London, S.E.17.

T.C.C.

Fixed capacity condensers for all purposes is obviously the feature of this company. Special attention may, however, be drawn to the new electrolytic condensers, specimens of which will be on view. These condensers will be suitable for working on potentials up to 12 volts, and their obvious application is that of smoothing low-voltage circuits, such as rectifiers, for L.T. and field current supply.

Stand No. 121.—TELEGRAPH CONDENSER Co., LTD., Wales Farm Road, North Acton, London, W.3.

TRIX.

The visitor to this stand cannot fail to be interested in the large number and variety of the exhibits. In particular, the "Portette" lightweight portable re-



The "Portette" single valve set by Eric J. Lever & Co. should be invaluable to invalids and others.

ceiver, which is of Lilliputian dimensions and weight, should be seen, together with the self-contained five-valve portable. Another feature of great interest which will be shown is a cabinet loud speaker which may be obtained in various woods.

In addition, a large number of components will be seen, including both fixed and variable condensers, and various types of switches. An exhibit of some considerable importance will be an entirely new method of simplifying the construction of any receiver; this is called the "Three-Base" system.

Stand Nos. 255 and 256.—ERIC J. LEVER (TRIX), LTD., 8/9, Clerkenwell Green, London, E.C.1.

WATMEL.

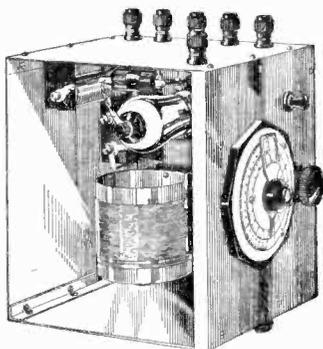
A new pick-up carrier, which obviates the necessity of removing the gramophone sound-box from its tone-arm when reproducing electrically, will be exhibited. Among new components is a double-range tuner with a switch waveband change and a reaction winding. The "Baby Grand," a three-valve receiver with de-

lector and two L.F. stages, is housed in a large cabinet with ample space for batteries of any type or for an eliminator.

Stand No. 157.—WATMEL WIRELESS Co., LTD., Imperial Works, High Street, Edgware, Middlesex.

WEARITE.

This firm has for some time specialised in the commercial production of coils and H.F. transformers as described by *Wire-*



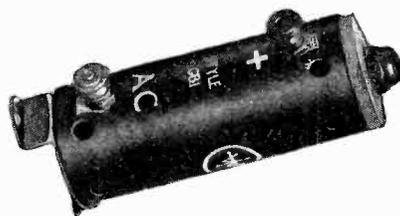
For adding to an existing receiver: the Wearite H.F. amplifying unit.

less *World* contributors, and it is understood that a number of types will be on view. A new balancing condenser, with a capacity range of between 3 and 70 micro-microfarads, has been evolved; it is claimed that short-circuiting is a virtual impossibility. An H.F. unit, intended for attachment to existing detector-L.F. sets, is to be sold either complete or as a set of parts, and there will also be compact 600-ohm de-coupling resistances for use in H.F. circuits.

Stand Nos. 251 and 252.—WRIGHT AND WEAIRE, LTD., 740, High Road, Tottenham, London, N.17.

WESTINGHOUSE.

In view of the widespread changes in mains supplies from D.C. to A.C., unusual attention will be focussed on the range of metal rectifiers displayed on this stand. Large quantities of these units are being used by other manufacturers in the construction of A.C. mains units, and technical enquiries at this stand are likely to be numerous.



Westinghouse grid bias rectifier unit.

A new unit, known as type H.T.2, has been designed for supplying H.T. current to the anodes of L.S.5 output valves, and will deliver 0.1 amp. at 350 volts with an input of 400 volts A.C., and there is a special rectifier (type A.) with an output of 1 amp. at 9 volts for use in L.T. battery eliminators in conjunction with

chokes and electrolytic condensers. These new products will be backed by a comprehensive display of rectifiers of standard types, including an arrangement for operating a coil-drive loud speaker through a type R4-2-1 unit.

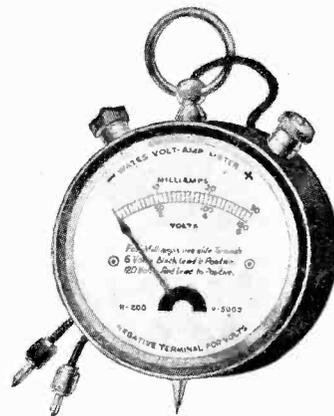
Specimen exhibits of apparatus for use in professional electrical laboratories will include a 1,000-volt 1-amp. rectifier.

Stand No. 78.—WESTINGHOUSE BRAKE AND SANBY SIGNAL Co., LTD., 82, York Road, King's Cross, London, N.1.

WET H.T.

This company has for some time now devoted its energies to developing a battery which, while possessing many of the advantages usually associated with accumulators, can be recharged without having access to a source of electric supply. Batteries of this type should appeal strongly to those who reside in country districts or have not easy access to charging stations for replenishing the cells when they become exhausted.

The Standard wet batteries are built up from a number of primary cells of the sac leclanche type, but a special electrolyte has been developed which practically overcomes the earlier disadvantages inherent with this type, namely, polarisation on long continuous discharge.



The Standard Wet Battery Company's new, low priced, 3-range meter.

For the H.T. supply the small cells are housed in special wooden containers, each holding thirty-two cells and giving a maximum voltage of forty-eight. The trays can be mounted one above the other, thereby enabling a battery of any desired voltage to be assembled in a compact space.

The L.T. batteries prove most economical when the discharge current does not exceed 0.25 amp., and at one charge they should not require attention for about twelve months. Of course, a heavier discharge can be given, but the working life on one charge will be proportionately less.

A new volt-amp. test meter will be exhibited for the first time this year. The instrument has a dead-beat movement and will read 0-150 volts, 0-6 volts, or 0-30 milliamperes.

Stand No. 7.—STANDARD WET BATTERY Co., 184/188, Shaftesbury Avenue, London, W.C.1.

WINDING A MOVING COIL WITH 2,500 TURNS.

Practical Construction of a Coil for the Pentode.

By F. H. HAYNES.

THE fact that the pentode provides the means for operating a moving-coil loud speaker with a modest anode voltage has been appreciated by those readers who have perused in recent issues the articles by Dr. N. W. McLachlan, M.I.E.E., under the title of The Output Stage and the Pentode.¹

The purpose of the present note is to show how to wind a moving coil of 2,500 turns for use in conjunction with the pentode, as used and recommended by Dr. McLachlan, and to summarise some of the observations made by him in the articles referred to above, so as to show the relation between the characteristics of the output valve and the design of the moving coil.

The Output Stage—Briefly Explained.

One should regard the impedance of the output valve or valves, together with that of the moving coil, as representing the impedance of a circuit to which is applied a voltage represented by the voltage swing at the grid of the valve multiplied by the valve amplification factor. Loud speaker output is dependent upon the number of turns of wire composing the moving coil and the current which is passed through it (ampere turns). The current is obviously increased by an increase in the applied voltage, which is determined by the product of input grid swing and the valve magnification factor. It is decreased by the coil and valve impedance.

To obtain maximum output, therefore, with a given grid input voltage, a valve of high magnification is required, with a coil of many turns. A valve of high mutual conductance goes towards meeting this condition, in that its magnification factor is high in relation to its internal resistance. Such a valve is the pentode, which has a magnification factor of 60 and an impedance of 30,000 ohms (P.M.24), giving a mutual conductance of 2 mA. per volt. Compare this with the L.S.5A., in which we have the desired condition of low impedance (2,750 ohms), but with a magnification of 2.2, giving a mutual conductance of 0.8.

To get plenty of sound, therefore, from a moving-coil loud speaker we might proceed to wind its coil with many turns. True, its impedance will increase, and this will tend towards cutting down the value of the current, but we must remember that there is a relatively large value of resistance already in the circuit—the valve resistance—and a little resistance more or less in the coil will be of small consequence if we can effect an appreciable gain in the number of turns.

Were these the only considerations governing the design of the moving coil it would consist of many more turns than are customarily used, but we are involved in the complex problem of uniform response to all note frequencies.

The Quality—Quantity Compromise.

From an analysis of the factors involved, as well as by practical measurement, Dr. McLachlan has shown that the impedance of the moving coil when attached to, and driving, a diaphragm falls off in the region of the middle audio frequencies (200 cycles).² This change in the impedance of the coil is of small importance only so long as the valve impedance is relatively high so as to swamp the effects of its changing impedance with frequency. Although low-valve impedance is needed for high-power output, we cannot increase the turns on the moving coil, so that their impedance becomes too large a factor in relation to the valve impedance, or otherwise the total impedance will appreciably vary with frequency.

An example of the practical limits fixed by this argument is a coil reactance of 4,000 ohms at upper and lower frequencies in conjunction with a valve of 2,500 to 3,500 ohms. Applied to the customary coil of 2in. in diameter, it will consist of 1,000

turns of No. 46 S.W.G., and will possess the approximate reactance of 4,000 ohms and a D.C. resistance of 900 ohms.³ Our problem is now to determine the best winding of moving coil for use with the pentode valve and based upon the valve-coil impedance relationship just stated.

The impedance of the P.M.24 (30,000 ohms) is some nine to twelve times as great as the valve impedance quoted above.

The permissible number of turns, therefore, becomes:

$$\frac{1,000}{\sqrt{\frac{1}{3}}} = \frac{1,000}{\frac{1}{\sqrt{3}}} = 3,000 \text{ turns.}$$

The No. 46 wire given above has a resistance of 5.3 ohms per yard. The resistance of the wire for the coil of 3,000 turns will be $\frac{5.3}{\sqrt{\frac{1}{3}}} = \frac{5.3}{\frac{1}{\sqrt{3}}} = 16 \text{ ohms per yard.}$

The nearest gauge is No. 48 at 12 ohms to the yard. No. 49 is 21 ohms to the yard, and is too fine to take an enamel covering or to wind. No. 48 is also within the limits of the required current-carrying capacity.

² "Output Stage and the Moving Coil." N. W. McLachlan. *The Wireless World*, August 8th, 1928. See also footnote 1.

³ "Loud Speaker Design." N. W. McLachlan, *The Wireless World*, p. 374, March 30th, 1927.

Now that the pentode valve has rendered possible moving-coil loud speaker operation with a modest anode potential of 150 volts there is an obvious demand for information on the method of winding a suitable moving coil.

¹ "The Output Stage and the Pentode." Parts I, II and III. By Dr. N. W. McLachlan. *The Wireless World*, July 11th, 18th and 25th.

Winding a Moving Coil with 2,500 Turns.—

This coil will have a resistance of about 6,000 ohms. Its reactance will be nine times that of the 1,000 turn coil:

$$\text{i.e., } 4,000 \times 9 = 36,000 \text{ ohms.}$$

The total impedance of the valve (30,000 ohms) and coil circuit becomes:

$$\sqrt{(36,000)^2 + (30,000 + 6,000)^2} = 50,000 \text{ ohms.}$$

The current in the moving coil for 1 volt applied to the grid of the valve is $\frac{60 \text{ (valve mag. factor)}}{50,000 \text{ (total circuit impedance)}}$

And the ampere turns $\frac{60 \times 3,000}{50,000} = 3.6 \text{ ampere turns per 1 grid volt.}$

Pentode and L.S.5A. Compared.

Compared with the 1,000 turn coil and an L.S.5A.,

$$\frac{2.2 \times 1,000}{5,000} = 0.45 \text{ ampere turns per 1 grid volt.}$$

Take the case of nine parallel-connected L.S.5A. valves. The coil will consist of 330 turns of No. 42, with a resistance of 100 ohms and a reactance of 450 ohms. The combined valve impedance becomes reduced to 300 ohms, giving a vector sum for the total impedance of 600 ohms. The ampere turns for 1 volt applied to the grid are now 1.4—still less than half the figure obtained for the pentode. For 1 volt applied to the grid, therefore, the pentode gives an appreciably greater output than nine valves of the L.S.5A. type.

Although this is true it scarcely forms a fair comparison, for the maximum permissible grid voltage swing of the L.S.5A. (100 volts) is some ten times that of the P.M.24 (10 volts). Taking each valve, therefore, fully loaded, the comparison becomes:

L.S.5A.	P.M.24.
$\frac{100 \times 2.2 \times 1,000}{5,000}$	$\frac{10 \times 60 \times 3,000}{50,000}$
= 44 ampere turns.	= 36 ampere turns.

Thus a pentode and an L.S.5A. produce equal effects when the latter is provided with an intermediate stage, giving an amplification of about 7, and working with nearly 350 volts applied to its anode, a grid bias approaching 100, and consuming an anode current of more than 30 mA. As to the working conditions of the pentode, it has an anode voltage of 150 only, a bias of some 10 volts, and an anode current of about 20 mA.

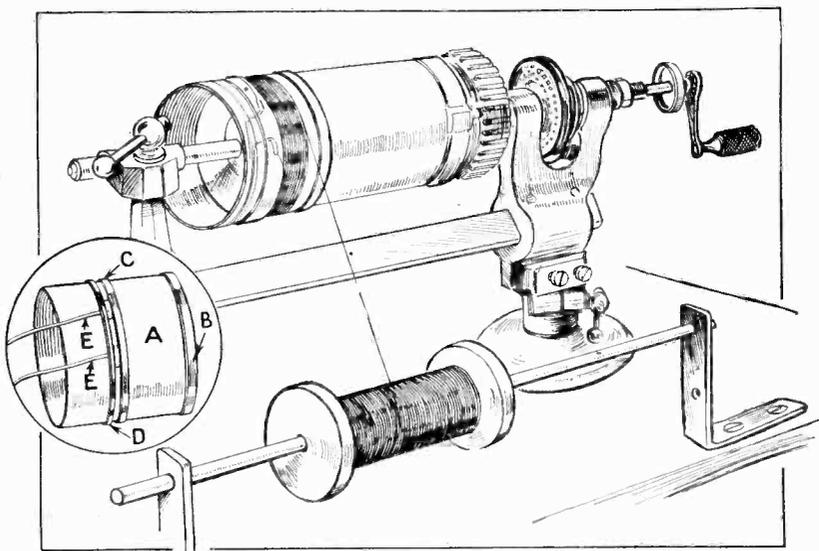
As shown in the previous articles on the pentode and the output stage, the number of turns should be limited to about 2,500.

Making the Coil Former.

In moving-coil loud speaker design, a liberal gap width is sound practice. This demands a high value of

energising watts (about 30), but this is considered to be of no consequence, as a moving-coil loud speaker could not be operated unless mains were available to meet the high potential and current demands of the output stage. The aim, therefore, now becomes that of reducing the gap width to permit of lower field watts, remembering that if 32 watts are required with a gap of $\frac{5}{32}$ in. less than 8 will be required for a gap of $\frac{1}{14}$ in.

A strip of "Detail" paper (No. 70, Drawing Office Supplies, Ltd., 51, Cheapside, London, E.C.2), $1\frac{1}{8}$ in. in width and 18 in. in length, is prepared with perfectly straight and parallel edges, and to prevent subsequent shrinkage is treated on both sides with a very thin covering of diluted shellac varnish. A useful hint is to leave two laterally projecting pieces at one end so as to provide a means for holding the paper tight when winding into a cylindrical former. The pole diameter is $1\frac{3}{4}$ in., and



Winding the moving coil. The former consists of a paper cylinder A with stiffening rings B and C. A third narrow ring D is used for anchoring the ends of the lead out wires as well as forming a clamping point for the diaphragm. The former is rotated on a simple polishing spindle with an improvised means for rotating it slowly by hand.

that of the tunnel zin., leaving a gap width of $\frac{1}{8}$ in. Assuming that the wound moving coil has a thickness of $\frac{1}{16}$ in., a space of $\frac{1}{32}$ in. will remain between it and the sides of the gap. The mandrel size upon which the former is made is therefore $1\frac{13}{16}$ in. exactly, and as the coil thickness is actually just under $\frac{1}{16}$ in. the desirable condition of a slightly greater air gap around its outer than its inner face results.

An absolutely true brass-faced mandrel some zin. in length is needed, and is obtainable from those firms specialising in the supply of loud speaker parts. After the varnish has completely dried, the paper is pulled tightly round the mandrel and the overlapping surfaces treated with "Seccotine" thinly applied with a small camel-hair brush. When thoroughly dry and hard care should be taken to see that there is no free "Seccotine" about, and that the former slides free from the mandrel. Three strips of thin flexible card are then prepared, each $\frac{7}{16}$ in. in length, so as to form ridges on the former and to give support to the leading-out wires. Supple photo-

Winding a Moving Coil with 2,500 Turns.—

graphic mount, $\frac{1}{32}$ in. in thickness, is best for this purpose, and when stuck in position with "Seccotine" the ends are overlapped by a transverse splice made with a razor blade. One of the wider bands is secured to the end of the former, a width of $\frac{7}{16}$ in. is left to accommodate the winding, then the other wide band, followed by the narrow one, after a further interval of $\frac{1}{16}$ in., and used to clamp down two tinned leading-out wires, each of three strands of No. 40 enamelled wire or even very thin copper strip.

The mandrel is set up so that it can be rotated between centres, such as on a cheap pattern polishing head, which can be purchased for a few shillings, or a small jeweller's lathe. A simple form of crank should be attached, made of wood or wire, in order to rotate the mandrel by hand. The fine wire must be absolutely reliable as regards its insulation, and should be purchased on a small reel of about one ounce (P. Ormiston and Sons, Ltd., 79, Clerkenwell Road, London, E.C.). The reel is set up to run free on a rod near to the mandrel, and having run off a length of wire, winding may be commenced by soldering on to one of the leading-out wires. Difficulty will be experienced in remov-

ing the enamel covering, and this is effected with the aid of a piece of fine emery paper (blue-black). Divide the surface to be wound into five sections, so that the voltage drop will be distributed across the coil. Each section consists of 500 turns, and if the wire runs loose and is thought to possess a "kink," or actually breaks, it is better to cautiously remove all the wire and commence again. The finishing end is brought across the winding at the overlap in a layer of protecting paper after having carefully varnished the turns. "Seccotine" is used for the overlap, taking care to avoid the presence of wet varnish at this point. The coil is fixed to the diaphragm in the customary manner by turning over points, as has been so often described.

No centering device is used, and in consequence the outer edge of the diaphragm is mounted not too loosely with the aid of a high-grade split-leather surround. (The Alder Leather Co., 3, Southwark Street, London, S.E.1.) For battery excitation the brass magnet spool, after being carefully covered with card and insulating tape, is wound with nearly 6 lb. of No. 16 enamelled wire. On 6 volts this winding passes 2 amperes, while it works quite satisfactory on 4 volts passing just over 1 ampere.



**CLUB
REPORTS
AND
TOPICS**

For Edinburgh Enthusiasts.

The Edinburgh Radio Society, which opened its new session last week, will hold meetings every Wednesday evening at 8 o'clock at the Club Room, 117, George Street.

Hon. Secretary: Mr. E. J. Robertson, 10, Richmond Terrace. ○○○○

A Visit to Ongar.

The Ongar stations of the Marconi Company were recently visited by members of the Leyton and Leytonstone Radio Society. Special interest was shown in the short-wave equipment.

Hon. Secretary: Mr. E. Boatright, 265, Murchison Road, Leyton, E.10. ○○○○

Wireless Classes in London.

Beginners in the London area who are anxious to increase their knowledge of wireless are specially catered for by a number of classes to be held this winter under the auspices of the London County Council. The lecturer is Captain Jack Frost, late of the Royal Corps. of Signals. The nominal fee for the course, which runs from September to July, is 6s., and membership is open to both sexes. The following classes have been arranged:—

Every Monday at the Holloway Secondary School, Hilldrop Road, Camden Road, N.

Every Tuesday at the Tooting Bec Secondary School, Beechcroft Road, S.W.17.

Every Wednesday at the Putney Secondary School, West Hill, S.W.16.

Every Thursday at the Peckham Secondary School, Peckham Road, S.E.15.

Every Friday at the John Woolman Institute, Islington, E.

The classes begin at 7.30 p.m.

The course opens during the week ending September 29th, but enrolments will be made during the previous week.

The programme will include lantern lectures on B.B.C. stations, and visits to many places of interest, such as B.B.C. studios and the factories of wireless manufacturers. ○○○○

A Speed Test.

The speed with which a portable receiver with an ordinary aerial (not frame) could be put into action was the subject of an interest-

Secretaries of Local Clubs are invited to send in for publication club news of general interest. All photographs published will be paid for.

ing competition held on the occasion of the recent annual field day of the Radio Experimental Society of Manchester at Chinley.

For the purpose of the competition the transmitter—a low-powered instrument—sent out a series of signals to be picked up by a number of portable sets in various localities, the object being to determine which group was quickest in rigging up a receiver and recording the signals. Messrs. Tulme and Levy came first, and Messrs. Stott and Woods second.

The Society will begin the winter activities at the end of this month.

Joint Hon. Secretary: Mr. J. Levy, 19, Lansdowne Road, West Didsbury, Manchester. ○○○○

A Flourishing Concern.

The Institute of Wireless Technology is now drawing up an interesting and attractive programme for the 1928-29 session. A review of

the past year's activities indicates a flourishing state of affairs, and this is reflected in the Institute's Journal. Membership continues to grow and applications have been received from many distant parts of the world.

Those interested are invited to communicate with the Hon. Secretary, Mr. Harrie J. King, 71, Kingsway, London, W.C.2. ○○○○

CATALOGUES RECEIVED.

Mullard Wireless Service Co., Ltd., Mullard House, Denmark Street, London, W.C.2. Leaflets V.T.31 and V.T.32, giving full particulars of the S.W.3 and S.W.1 short-wave transmitting valves.

Rowland Edwards and Co., Ltd., 317, High Holborn, London, W.C.1. Revised price list of non-spilling accumulators.

C. B. Dickeson and Son, Ltd., 3, Tower Royal, Cannon Street, London, E.C.4. Folder dealing with portable sets handled by this firm. ○○○○

TRADE NOTES.

Changes of Address and New Premises.
The Wet H.T. Battery Co., to 186, Shaftesbury Avenue, London, W.C.2. ○○○○

Hart Bros. Electrical Manufacturing Co., Ltd., London Stores and Warehouse at 8-9, Gray's Inn Passage, Red Lion Street, W.C.1. ○○○○

Oldham and Son, Ltd., London depot at 40, Wicklow Street, King's Cross, London, W.C.1.

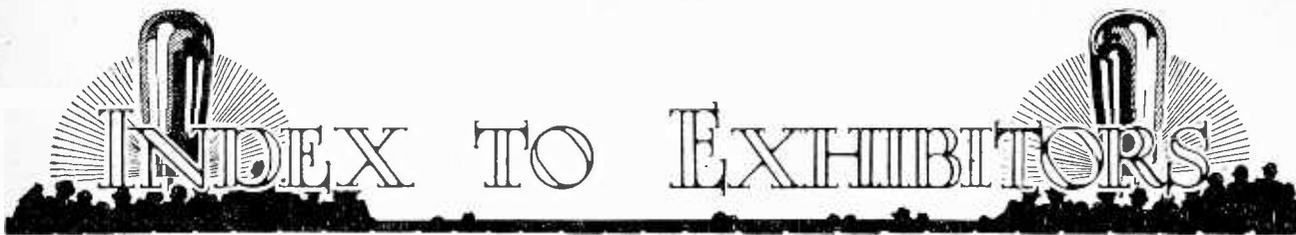
FORTHCOMING EVENTS.

WEDNESDAY, SEPTEMBER 19th.

Edinburgh and District Radio Society.—At 8 p.m. At 117, George Street. Lecture: "Direction Finding," by Mr. Alex. M. Robertson.

THURSDAY, SEPTEMBER 20th.

Kensington Radio Society.—At 136, Holland Park Avenue. Lecture: "Valves and Distortionless Amplification," by Mr. Burgess, of the Mullard Wireless Service Co., Ltd. Stretford and District Radio Society.—At 7.30 p.m. At 6a, Derbyshire Lane. Annual Auction Sale.

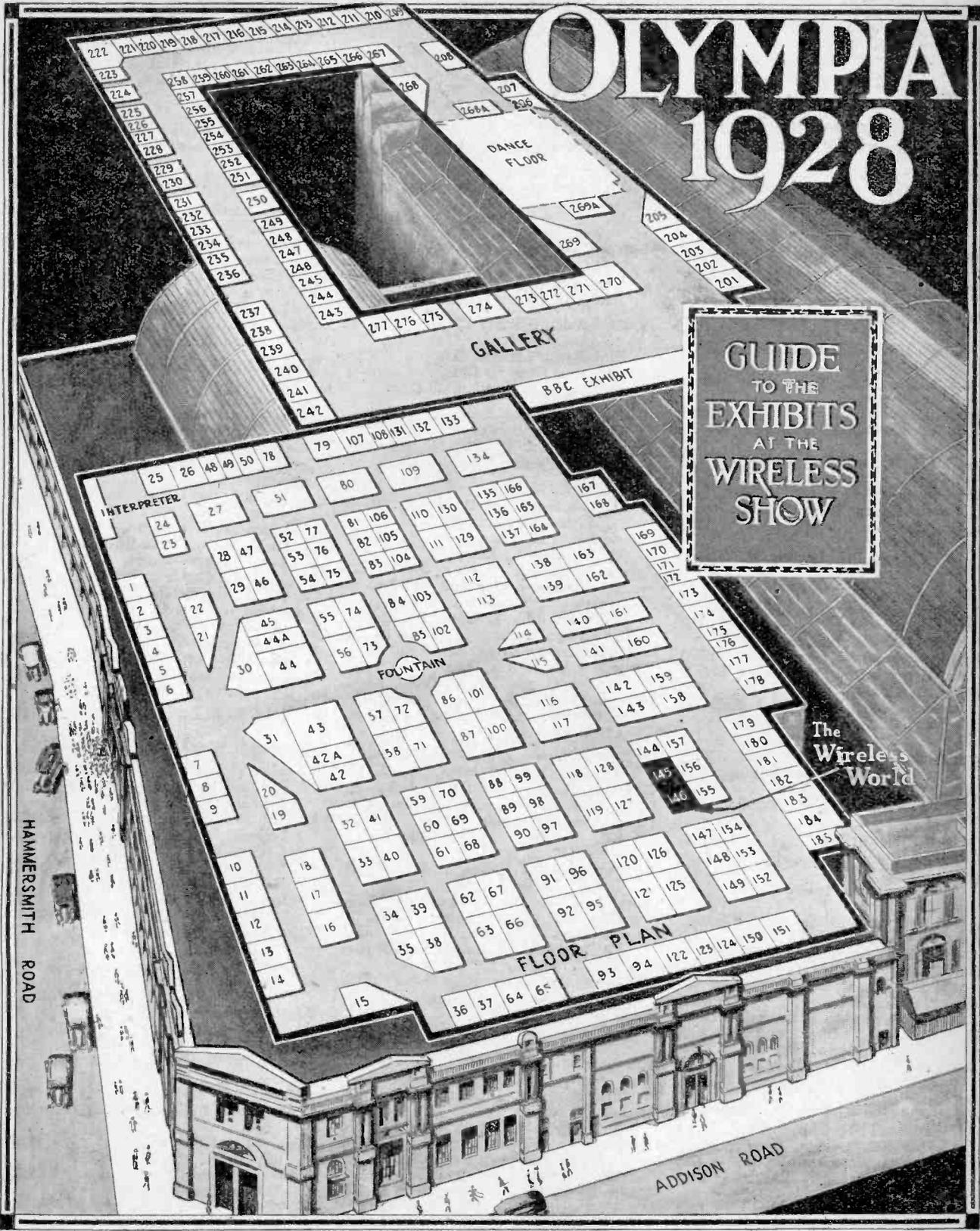


INDEX TO EXHIBITORS

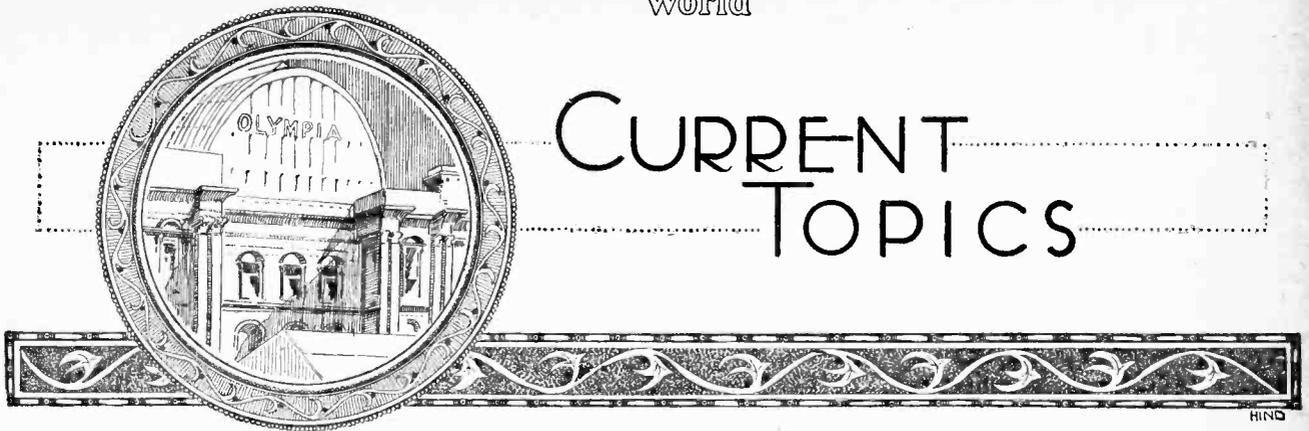
- A**DEY Wireless, Ltd., (176)
99, Mortimer St., London, W.1.
- Aeonic Wireless Co., Ltd., (92)
32-36, Coventry House, South Place,
London, E.C.2.
- Atlanta, Ltd., (271)
1-3, Brixton Rd., London, S.W.9.
- Atkinson, C. Creswick, (6)
35B, High St., Bedford.
- Automatic Coil Winder & (150 & 151)
Elec. Equipment Co., Ltd.,
Winder House, Rochester Row, Lon-
don, S.W.1.
- Automatic Radio Mfg. Co., (274)
Gosford Rd., Beccles, Suffolk.
- Axuel Time Switches, Ltd., (263)
45E, The Mall, Ealing, London, W.5.
- B**AIRD Television De- (11, 13, & 14)
velopment Co., Ltd.,
133, Long Acre, London, W.C.2.
- Baker, A., (172)
-89, Selhurst Rd., London, S.E.25.
- Bakelite, Ltd., (160)
68, Victoria St., London, S.W.1.
- Beaver Electrical Co., The, (2)
5, Great Chapel St., Oxford St.,
London, W.1.
- Bedford Electrical & Radio Co., (35)
22, Campbell Rd., Bedford.
- Belling & Lee, Ltd., (220 & 221)
Queensway Works, Ponders End,
Middlesex.
- Benjamin Electric, Ltd., (171)
Brantwood Works, Tariff Rd., Tot-
tenham, London, N.
- Bird & Sons, Sydney S., (159)
Sarnesfield Rd., Enfield Town, Mid-
dlesex.
- Bowerman, Ltd., George, (213)
10 & 12, Ludgate Hill, London, E.C.4.
- Bowyer-Lowe Co., Ltd., The, (51)
Radio Works, Letchworth, Hants.
- Brandes, Ltd., (118)
Cray Works, Sidcup, Kent.
- British Ebonite Co., Ltd., (38)
Nightingale Rd., Hanwell, London.
- British General Mfg. Co., Ltd., (10)
Brockley Works, Brockley, London.
- British Radio Corporation, Ltd., (141)
Elm Grove Rd., Weybridge, Surrey.
- British Thomson-Houston Co., (86 & 101)
Ltd., The,
Crown House, Aldwych, London.
- Brown Ltd., S. G., (155 & 156)
Western Av., North Acton, London.
- Brown Bros., Ltd., (177 & 178)
Great Eastern St., London, E.C.
- Brownie Wireless Co. of G.B., Ltd. (83)
Nelson St. Works, Mornington Cres-
cent, London, N.W.
- Bulgin & Co., A. F., (203 & 204)
9-11, Cursitor St., Chancery Lane,
London, E.C.4.
- Bullphone, Ltd., (42)
38, Holywell Lane, Great Eastern
St., London, E.C.
- Burndep Wireless (1928), Ltd., (112 & 113)
Blackheath, London, S.E.3.
- Burne-Jones & Co., Ltd., (96)
Magnum House, 288, Borough High
St., London, S.E.1.
- Burton, C. F., & H., (184 & 185)
Progress Works, Bernard St., Walsall.
- C**ARBORUNDUM Co., Ltd., (130)
Trafford Park, Manchester.
- Carrington Mfg. Co., Ltd., (107)
Canco Works, Sanderstead Rd.,
South Croydon.
- Catesbys, Ltd., (25)
64-67, Tottenham Court Rd., Lon-
don, W.1.
- Cantophone Wireless Co., (253)
Remo House, 310, Regent St., Lon-
don, W.1.
- Celestion Radio Co., (19 & 20)
29-31, High St., Hampton Wick,
Kingston-on-Thames.
- Chloride Electrical Storage (33, 40 & 241)
Co., Ltd.,
217-229, Shaftesbury Av., London.
- Clarke & Co. (M/C), Ltd., H., (161)
Atlas Works, Eastnor St., Old
Trafford, Manchester.
- Cliffophone & Records, Ltd. (82)
95, Park St., Southwark, London.
- Climax Radio Electric, Ltd., (80)
Quill Works, Quill Lane, Putney,
London, S.W.15.
- Cole, Ltd., E. K., (48, 49 & 50)
Ekeo Works, London Rd., Leigh-on-
Sea, Essex.
- Colvern, Ltd., (91)
Mawneys Rd., Romford, Essex.
- Cooks Wireless Co., Ltd., (254)
23, St. Helens St., Ipswich.
- Cossor, Ltd., A. C., (116, 117, 231 & 250)
Cossor House, Highbury Grove, Lon-
don, N.5.
- Curry's, Ltd., (275, 276 & 277)
24-28, Goswell Rd., London, E.C.1.
- D**ETEX Distributors, Ltd., (153)
125-129, Rosebery Ave., London.
- Day, Will, Ltd., (248)
18-19, Lisle St., London, W.C.2.
- De la Rue & Co., Ltd., Thos., (235)
90, Shernhall St., London, E.17.
- Dew & Co., A. J., (181 & 182)
33-34, Rathbone Place, London, W.1.
- Dibben & Sons, Ltd., William, (109)
St. Mary's Rd., Southampton.
- Dionoid Battery Co., Ltd., The, (245)
Victoria Works, Prince of Wales Rd.,
Darnall, Sheffield.
- Donotone Loud Speakers, (216 & 217)
40, Furnival St., London, E.C.4.
- Dubilier Condenser Co. (1925), (102 & 103)
Ltd.,
Ducon Works, Victoria Rd., North
Acton, London, W.3.
- Dunham, C. S., (257)
Elm Works, Elm Park, Brixton Hill,
London, S.W.2.
- D.X. Coils, Ltd., (223)
542, Kingsland Rd., London, E.8.
- Dyson, J., (1)
2, Coleman St., London, E.C.2.
- E**AGLE Engineering Co., Ltd., (139)
Eagle Works, Warwick.
- East London Rubber Co., (167 & 168)
29-33, Gt. Eastern St., London, E.C.
- Eastick and Sons, J. J., (218 & 219)
Felex House, Bunhill Row, London.
- Econasign Co., The, (242)
94, Jermyn St., Piccadilly, London.
- Edison Bell, Ltd., (129)
Edison Bell Works, Glengall Rd.,
Peckham, London, S.E.15.
- Edison Swan Electric Co., Ltd., (43)
123, Queen Victoria St., London, E.C.
- Electramonic Co., Ltd., (44)
Bear Gardens, Park St., Southwark,
London, S.E.
- Electron Co., Ltd., (42A)
122, Charing Cross Rd., London, W.C.
- Ellison and Hillman, (169 & 170)
123, Albion St., Leeds.
- Empire Electric Co., (247)
10, Fitzroy Square, London, W.1.
- Enterprise Mfg. Co., (237 & 238)
Elec. House, 83, Merton Rd., Wimbie-
don, London, S.W.
- Ever Ready Co. (G. B.), Ltd., (44A)
Hercules Place, Holloway, London.
- F**ALK Stadelman and Co., Ltd., (127)
83, Farringdon Rd., London, E.C.1.
- Fellows Mfg Co., Ltd., (36, 37, 64 & 65)
Cumberland Av., London, N.W.
- Ferranti, Ltd., (84 & 85)
Hollinwood, Lancs.
- Fermo Co., The, (140)
Crown Works, Cricklewood, London.
- Forster, G., (3)
Carlton House, Lower Regent St.,
London, S.W.
- Fuller Accumulator Co. (1926), Ltd., (158)
Woodland Works, Chadwell Heath,
Essex.
- G**AMAGE, Ltd., A. W., (148 & 149)
Holborn, London, E.C.
- Gambrell Radio, Ltd., (27 & 108)
Buckingham House, Buckingham St.,
London, W.C.
- Garnett, Whiteley and Co., Ltd., (115)
Lotus Works, Broadgreen Rd., Liver-
pool.
- General Electric Co., Ltd., (28, 29, 46,
Magnet House, Kingsway, 47 & 225)
London, W.C.2.
- Goodmans, (269A)
27, Farringdon St., London, E.C.
- Gottlieb and Co., Ltd., J. L., (52)
15, Cromer St., London, W.C.1.
- Graham and Co., R. F., (212)
45, Cambridge Rd., Kingston-on-
Thames.

OLYMPIA 1928

**GUIDE
TO THE
EXHIBITS
AT THE
WIRELESS
SHOW**



- Graham Amplion, Ltd., (30 & 31)
25-26, Savile Row, Regent St., London, W.1.
- Graham-Farish Mfg. Co., (119)
17, Masons Hill, Bromley, Kent.
- HALCYON** Wireless Co., (16, 17 & 18)
Ltd.,
313-319, Regent St., London, W.1.
- Hart Accumulator Co., Ltd., (95)
Marshgate Lane, Stratford, London.
- Hart Collins, Ltd., (15)
38a, Bessborough St., London, S.W.1.
- Hart Bros. Electrical Mfg. Co., (215)
Ltd.,
4, Queensway, Ponders End, Middx.
- Henderson and Co., Ltd., W. J., (258)
351, Fulham Rd., London, S.W.10.
- Hobday Bros., Ltd., (173 & 174)
21-27, Great Eastern St., London.
- Houghton-Butcher (Gt. Britain), (136 & 137)
Ltd.,
88-89, High Holborn, London, W.C.
- Hunt, Ltd., A. H., (273)
H.A.H. Works, Tunstall Rd., East Croydon.
- Huntly, Norman. (264)
35, Clerkenwell Green, London, E.C.1.
- IGRANIC** Electric Co., Ltd., (53, 54 & 75)
Bedford.
- Iliffe and Sons, Ltd., (145, 146)
Dorset House, Tudor St., London.
- Incorporated Radio Society of Gt. Britain. (227)
53, Victoria St., London, S.W.1.
- J.R.** Wireless Co., (228)
6 and 8, Rosebery Av., London, E.C.1.
- Jackson Bros., (105)
8, Poland St., London, W.1.
- Jewel Pen Co., Ltd., (201)
21, Great Sutton St., London, E.C.1.
- Junit Mfg. Co., Ltd., (93)
Napier House, 24-27, High Holborn, London, W.C.
- K.T.B.** Mfg. Co., Ltd., (239)
210, Hammersmith Rd., London, W.6.
- Kalisky (Aldgate), Ltd., S., (132)
75, Aldgate High St., London, E.1.
- LAMPLUGH**, Ltd., S. A., (81 & 106)
King's Rd., Tyseley, Birmingham.
- Langham Radio, (55 & 74)
96, Regent St., London, W.1.
- Lectro Linx, Ltd., (236)
254, Vauxhall Bridge Rd., London.
- Lever (Trix), Ltd., E. J., (255 & 256)
8-9, Clerkenwell Green, London.
- Lissen, Ltd., (57, 58, 71, & 72)
Friars Lane, Richmond, Surrey.
- Lithanode Co., Ltd., (226)
190, Queen's Rd., Battersea, London.
- Lock, W. and T., Ltd., (229 & 230)
St. Peter's Works, Bath.
- London Electric Stores, Ltd., (208)
9, St. Martin's St., Leicester Square, London, W.C.2.
- London Electric Wire Co. and Smiths, Ltd., The (110)
Church Rd., Leyton, London, E.10.
- London Metal Warehouses, Ltd., (79)
Hill St., Pocock St., Blackfriars Rd., London, S.E.1.
- London Radio Mfg. Co., Ltd., (209)
Station Rd., Merton Abbey, & 210)
London, S.W.
- McMICHAEL**, Ltd., L., (128)
Wexham Rd., Slough.
- M.P.A. Wireless, (21 & 22)
62, Conduit St., London, W.1.
- Mainten Mfg. Co., (200)
126, Portland Rd., Hove.
- Marconiphone Co., Ltd., (59, 60, 61, 68, 69, 70, 252 & 253)
210, Tottenham Court Rd., London, W.1.
- Melhuish, C. D., (240)
8, Great Sutton St., London, E.C.1.
- Metro-Vick Supplies, Ltd., (32 & 41)
155, Charing Cross Rd., London.
- Mic Wireless Co., (9)
White Horse Place, Market St., Wellingborough.
- Mullard Radio Valve Co., (88, 89, 90, 97, 98, 99)
Ltd.,
Nightingale Works, 133 & 267)
Nightingale Lane, Balham, London.
- NEW** London Electric Works, (45)
Ltd.,
East Ham, London, E.6.
- Newton Bros. (Derby), Ltd., (245)
56, Kingsway, London, W.C.2.
- OLDHAM** and Son, Ltd., (125 & 126)
Denton, Manchester.
- Ormond Eng. Co., Ltd., (138, 162, 163)
199-205, Pentonville Rd., London.
- PAROUSSI**, E., (272)
10, Featherstone Buildings, High Holborn, London, W.C.1.
- Partridge and Mee, Ltd., (147)
12, Belvoir St., Leicester.
- Peto and Radford, (67)
50, Grosvenor Gardens, London.
- Peto Scott Co., Ltd., (142 & 143)
77, City Rd., London, E.C.1.
- Philips Lamps, Ltd., (94 & 122)
145, Charing Cross Rd., London.
- Portable Utilities Co., Ltd., (144)
Eureka House, Fisher St., London.
- Pye and Co., W. G., (87 & 100)
Granta Works, Montague Rd., Cambridge.
- R.I.** and Varley, Ltd., (56, 73 & 222)
103, Kingsway, London, W.C.2.
- Radi-Arc Electrical Co. (1927), Ltd., (6)
Bennett St., Chiswick, London, W.4.
- Radio Service (London), Ltd., (207)
105, Torriono Av., Camden Rd., London, N.W.5.
- Redfern's Rubber Works, Ltd., (123)
Hyde, Cheshire.
- Rees Mace Mfg. Co., Ltd., (268)
39a, Welbeck St., London, W.1.
- Regent Radio Supply Co., (62)
21, Bartlett's Buildings, Holborn Circus, London, E.C.4.
- Reid and Co., Louis H., (214)
32, Victoria St., London, S.W.1.
- Reproduction, Ltd., (131)
5-7, Dysart Rd., Finsbury Sq., London, E.C.2.
- Rialton Radio (Prop. H. and S. (268A)
Scott, Ltd.),
21a, Barbican, London, E.C.1.
- Ripaults, Ltd., (24)
1, King's Rd., St. Pancras, London.
- Rolls-Caydon (Hoare and (39 & 104)
Jagels, Campbell and Addison).
77, Rochester Row, London, S.W.
- Rooke Bros., Ltd., (76, 77)
55, Cardington St., London, N.W.1.
- Runbaken Magneto Co., (244)
Tipping St., Ardwick, Manchester.
- SEL-EZI** Wireless Supply Co., (12)
6, Greek St., London, W.1.
- Selectors, Ltd., (23)
1, Dover St., London, W.1.
- Selfridge and Co., Ltd., (269, 270)
Oxford St., London, W.1.
- Sells, Ltd., (246)
168, Fleet St., London, E.C.4.
- Siemens Bros. and Co., Ltd. (164 & 165)
Woolwich, London, S.E.18.
- Standard Wet Battery Co., (7)
184-8, Shaftesbury Av., London.
- Stapleton, A. W., (211)
19a, Lorrimore Buildings, Lorrimore St., London, S.E.17.
- Stratton and Co., Ltd., (34)
Balmoral Works, Bromsgrove St., Birmingham.
- Sun Electrical Co., Ltd., (179 & 180)
118, Charing Cross Rd., London.
- Sylvex, Ltd., (175)
41, High Holborn, London, W.C.1.
- TELEGRAPHII** Condenser Co., Ltd., (121)
Wales Farm Rd., North Acton, London, W.
- Telsen Electric Co., Ltd., (5)
207, Aston Rd., Birmingham.
- Tonex Co., The, (266)
Walker St., Blackpool, Lancs.
- Trader Publishing Co., Ltd., (26)
St. Bride's House, Salisbury Sq., London, E.C.4.
- Trelleborg Ebonite Works, Ltd., (224)
Union Place, Wells St., London, W.
- Triumph Cabinet Works, Ltd. (205)
(T. H. Cossor and Sons),
548, Holloway Rd., London, N.7.
- Truphonic Wireless Co., (134 & 260)
121, Rosebery Av., London, E.C.
- Tudor Accumulator Co., (249)
2, Norfolk St., London, W.C.2.
- Turner and Co., (234)
54, Station Rd., London, N.11.
- VANDERVELL** and Co., Ltd., (114)
C. A.,
Warple Way, Acton, London, W.3.
- WALKER** Bros., (154)
St. Joseph's Works, Bramley, Guildford.
- Watmel Wireless Co., Ltd., (157)
Imperial Works, High St., Edgware, Middlesex.
- Webb Condenser Co., (124)
42, Hatton Garden, London, E.C.1.
- Western Wireless Co., (262)
9, High St., Ealing, London, W.
- Westinghouse Brake and Saxby Signal Co., Ltd., (78)
82, York Rd., King's Cross, London.
- Whiteley, Boneham and Co., Ltd., (120)
Nottingham Rd., Mansfield, Notts.
- Whittingham, Smith and Co., (4)
110, Kew Green, Kew, Surrey.
- Wilkins and Wright, (152)
Utility Works, Holyhead Rd., Birmingham.
- Williams and Moffat, Ltd., (265)
Ladypool Rd., Sparkbrook, Birmingham.
- Wingrove and Rogers, Ltd., (111)
188, Strand, London, W.C.2.
- Wireless Retailers' Association of Great Britain. (259)
70, Finsbury Pavement, London.
- Wright and Weaire, Ltd., (251 & 252)
740, High Rd., Tottenham, London.



Events of the Week in Brief Review.

OLYMPIA SHOW DESCRIBED.

A short talk on the National Radio exhibition will be broadcast by Sir William Bull from 2LO and other stations on Friday next at 9.10 p.m.

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AMATEUR TELEVISION TESTS IN U.S.

It is expected, says QST, that the Federal Radio Commission will shortly authorise amateurs to experiment with picture and television transmission on wavelengths of 160 and 5 metres.

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OUR WIDE-AWAKE SCHOOLS.

Mr. J. C. Stobart, Educational Director of the B.B.C., told the British Association that in four years the number of schools equipped with wireless receivers had increased from 100 to 5,000.

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SHORT WAVES FROM THE CONGO.

A short wave station is to be erected at Leopoldville, in the Belgian Congo, for direct communication with Belgium. Telegraphy will be used at first, but a telephony installation will follow.

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HAVE YOU HEARD XC51?

A new broadcasting station, claimed to be "powerful enough to be heard all over Europe," has just been established at San Lazara, a suburb of Mexico City. Call sign, XC51; wavelength, 44 metres.

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POLICE WIRELESS IN PARIS.

The Paris police frustrated an intended demonstration of the Communist Party at Saint-Denis last week with the aid of a wireless van, which enabled headquarters to keep in touch with the police units.

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MANUFACTURERS AND THE ROYALTY.

At a meeting of the Radio Manufacturers' Association on Wednesday last at the Hotel Cecil, the manufacturers decided to act at once upon the decision given by the Comptroller-General of Patents regarding royalties on wireless sets. Prices are therefore being lowered in accordance with the reduced royalty payable on valve-holders.

TOO LATE.

A wireless "pirate" fined at Smethwick was stated to have taken out a licence at the nearest post office while the postal officials were examining his set.

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MEDICAL CONSULTATIONS BY WIRELESS.

A wireless marine medical code is now being tested on Atlantic liners. The object of the code is to assist captains of ships which do not carry doctors to obtain diagnosis and advice from doctors in other ships.

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GRID BATTERIES FREE.

Every purchaser of a Ripaults self-generative H.T. dry battery is presented, on application, with a 9-volt battery for grid bias. We understand that the offer is open until Saturday next, September 22nd.

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RUNNING COMMENTARY ON RECORD AIR TRIP.

While making the first flight from Australia to New Zealand last week—a distance of 1,200 miles—Captain Kingsford-Smith transmitted reports of his progress, and these were relayed by New Zealand broadcasting stations.

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"FIELD DAYS" IN THE ANTARCTIC.

Twenty-five men who will take part in Commander Byrd's forthcoming South Pole expedition are attending daily wireless classes to enable them to operate portable transmitters and receivers. The sets will be used on aeroplanes and sledges.

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A RADIO "PEACE PACT."

An interesting "peace" gathering of Canadian, Cuban, Mexican, and United States radio officials took place in Washington recently, when preliminary discussions took place for the allocation of frequencies throughout the American continent to prevent interference. The discussions have opened up additional problems for the U.S. Federal Radio Commission, which has been labouring for a year in an endeavour to "sort out the ether tangle" in its own country.

ROBOT ORATORY.

An all-steel Robot made the inaugural "speech" at the Model Engineer Exhibition which opened at the Horticultural Hall, Westminster, on Saturday last. The speech flowed from a concealed loud speaker in the Robot's mouth.

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WIRELESS FOR BOUVET ISLAND.

Bouvet—a remote island in the Southern Ocean, which has recently been claimed both by Great Britain and Norway—is to have a wireless station. The venture is being financed by a Norwegian, M. Lars Christensen, who believes that Bouvet Island is admirably suited for the collection and dissemination of Antarctic meteorological information.

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PRIZES FOR AMATEUR CRAFTSMANSHIP.

Prizes amounting to 250 guineas in cash are offered by the Manchester *Evening Chronicle* for the best wireless sets with cone type loud speakers constructed by amateurs. The competition is organised in connection with the Manchester Radio Exhibition, which will be held in the City Hall from October 22nd to November 3rd.

Entry forms, along with details of the classes and full information for competitors, may be obtained on sending a self-addressed envelope bearing a 3d. stamp to the Radio Editor, *Evening Chronicle* Offices, Withy Grove, Manchester.

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PLAY BY TELEVISION.

On Wednesday last the General Electric Company of America transmitted a two-character play, "The Queen's Messenger," the audience hearing the actors and seeing them on a screen three inches square. Although the actors and audience were in the same building, the signals actually travelled eight miles, being transmitted from the aerials at Schenectady, four miles away. The performance was broadcast on three wavelengths—by television on 279.5 and 21.4 metres, and by telephony on 31.96 metres.

USEFUL DATA CHARTS. (No. 9.)

The D.C. Resistance of Copper Wire.

THE resistance of a cubic inch of pure copper, such as is used for instrument wires and wireless components, is 0.667 microhms at 60° F. The resistance of a wire is proportional to its length and inversely proportional to its cross-section and the working

the formula $a/b=c^2$, which is the same thing as $b=a/c^2$, the relation of which we want to express.

In Fig. 3, which gives the skeleton of the abac, one of the scales (the left-hand scale for convenience) must be displaced on account of the constant which occurs in the formula. We can get one point on this scale by calculation, thus 10 yards of wire of diameter 0.02 inch will give:— Ohms = $30.57 \times 10^{-6} \times 10 \div (.02)^2 = 0.764$; hence the dotted line passing through 0.764 ohms and 0.02 on the middle scale must intersect the scale of yards at 10.

The practice of specifying wire sizes in Standard Wire Gauge (S.W.G.) has now been superseded, and all wires are now referred to by their diameter in decimals of an inch. The reason for this change is that the new gauges

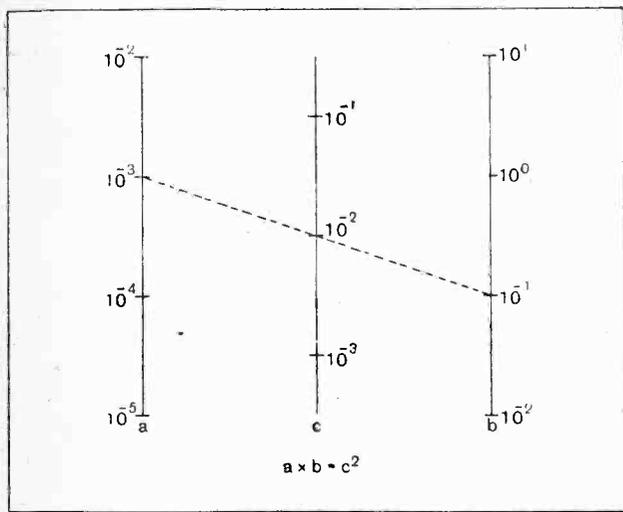


Fig. 1.—An abac in which the scales are so chosen that $a \times b = c^2$.

formula is microhms = $30.57 \times$ length in yards \div square of wire diameter in inches. This formula is of the form $b=a/c^2$; and the nearest approach to this so far discussed is of the form $a \cdot b = c^2$, which was shown in abac 1 and is given in Fig. 1 above, all three scales being equal in size.

This can be put into the shape we want by reversing the right-hand scale, as in Fig. 2, thus giving

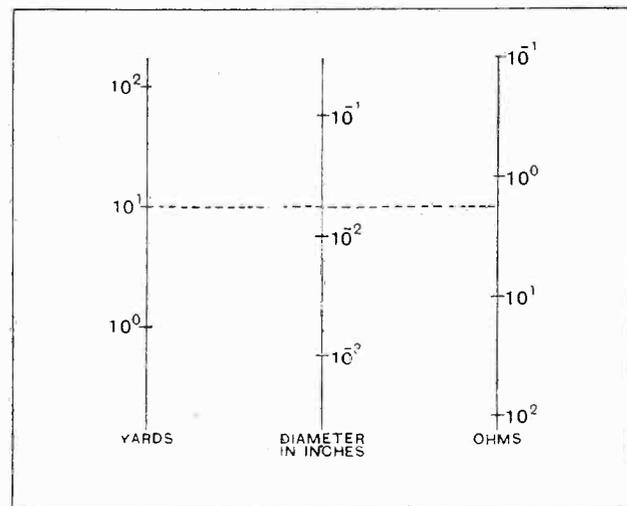


Fig. 3.—To obtain a practical chart, the left-hand scale of Fig. 2 must be displaced to allow for the constant.

have been chosen so that their diameters in decimals of an inch only contain three significant figures, whereas the old gauges could not be expressed exactly in deci-

S.W.G. v. Diameter in decimals of an inch.

S.W.G.	Inch.	S.W.G.	Inch.	S.W.G.	Inch.	S.W.G.	Inch.
1/0	0.324	13	0.092	26	0.018	39	0.0052
1	0.300	14	0.080	27	0.0164	40	0.0048
2	0.276	15	0.072	28	0.0148	41	0.0044
3	0.252	16	0.064	29	0.0136	42	0.0040
4	0.232	17	0.056	30	0.0124	43	0.0036
5	0.212	18	0.048	31	0.0116	44	0.0032
6	0.192	19	0.040	32	0.0108	45	0.0028
7	0.176	20	0.036	33	0.0100	46	0.0024
8	0.160	21	0.032	34	0.0092	47	0.0020
9	0.144	22	0.028	35	0.0084	48	0.0016
10	0.128	23	0.024	36	0.0076	49	0.0012
11	0.116	24	0.022	37	0.0068	50	0.0010
12	0.104	25	0.020	38	0.0060		

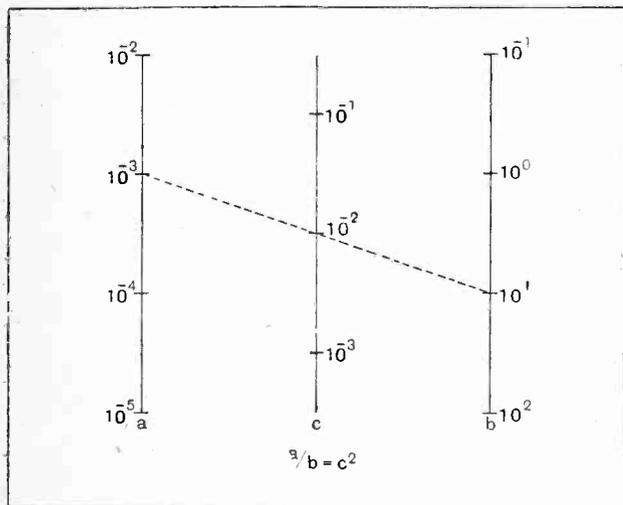
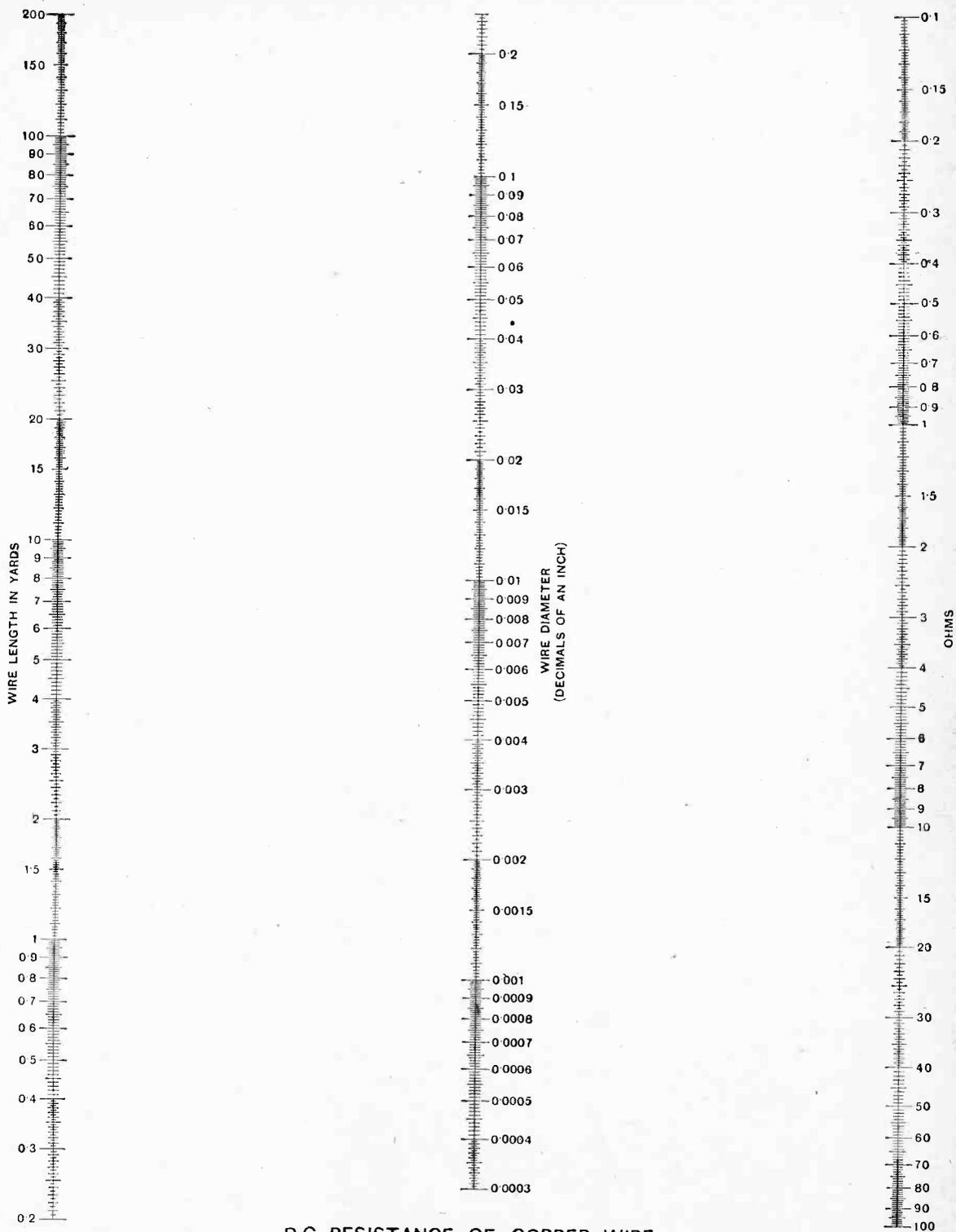


Fig. 2.—By reversing the right-hand scale of Fig. 1 an abac is obtained in which $a/b = c^2$.



D.C. RESISTANCE OF COPPER WIRE

W W ABAC

No 9

Useful Data Charts (No. 9).—

imals of an inch. The middle scale is accordingly given in inches, but a table is also given of wire gauges for the benefit of those who still think in terms of S.W.G., to which many retailers still cling, and probably will cling for a year or two.

The scale of the abac can be extended by remembering the resistance of a wire is proportional to its length. Thus, if we require the resistance of 1,000 yards of 0.0076 (S.W.G. 36), the abac shows that for 10 yards the answer is 5.29 ohms, hence for 100 yards it will be 529 ohms.

It must be remembered that the resistance of copper changes slightly with temperature, and that the abac refers to 60° F. (15.5° C.). The resistance rises by 0.00393 of its value at this temperature for every degree Centigrade rise: Thus, for a 10° C. rise, it would in-

crease by 0.0393, *i.e.*, 3.9 per cent., with a similar fall for a drop in temperature. These corrections, however, are of little interest to the wireless amateur unless he is constructing a precise measuring instrument.

The abac must *not* be used for finding H.F. resistance. We shall have something to say about H.F. resistance later on, and we shall find that the values may be in some cases ten times as great as the D.C. resistances.

Stranded wire can be treated by finding the resistance of one strand and dividing this by the number of strands. Thus the cheap kind of flex has 14 strands of 0.0076in. (S.W.G. 36), and 10 yards will have a resistance of $5.29/14=0.375$ ohms. The twist will increase this value somewhat, since each strand when straightened is more than 10 yards long, and the actual value is about 0.39 ohms.

R. T. B.

British and Japanese Amateurs.

With reference to the note on page 124 of our issue of August 1st, recording the two-way communication between G 5BY and AJ 1AW on April 28th, Mr. H. L. O'Heffernan points out that 1AW stated that this was the first direct amateur contact between Japan and Great Britain on *any* wavelength and not solely on the 20-metre waveband as we had previously understood. This adds interest to the record.

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International Prefixes.

We understand that amateur stations in U.S.A. will, when relicensed, use the nationality prefix "W" in place of the now familiar "NU," thereby adopting the system recommended at the Washington Conference which we printed in our issue of June 6th.

TRANSMITTERS' NOTES

Canada has already adopted the prefix "VE," and we presume other countries will gradually fall into line. Europe will not be greatly affected, as Great Britain still retains "G," France "F," Spain "EA," Italy "I," and Norway "LA," though the German "K" will be transferred to the United States, and for a time it may be hard to recognise Holland and Belgium as "PA" and "ON" respectively.

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R.S.G.B. Annual Convention.

The Annual Convention of the Radio Society of Great Britain will be held from September 28th to 30th. Members are invited to meet at the Institute of Electrical

Engineers at 5.0 p.m. on Friday, September 28th, when tea will be provided. The more formal proceedings will begin at 6.15 p.m. with Presidential greetings, followed by a discussion on "Frequency Stabilisation," which will be opened by Messrs. C. W. Goyder and E. J. Simmonds.

Saturday, September 29th, will be divided between business and pleasure, beginning with a charabanc excursion in the morning, with lunch at 1.0 p.m., followed by the General Business Meeting, and finishing with the Convention Dinner at Pinoli's Restaurant in Wardour Street. Applications for tickets for the dinner (5/- each) should be made to Mr. J. Clariccoats, 6, Hartland Road, Friern Barnet Road, N.11, the Chairman of the Social Committee.

On Sunday, September 30th, visits to various stations are being arranged by the London Area Managers.

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International Amateur Tests.

The results of the International Tests and competition between amateurs in the United States and Canada, which were carried out last February under the auspices of the American Radio Relay League, are announced in their official journal, "Q.S.T."

The winning stations are 1ASF, which we believe is owned and operated by Mr. Alec Watson at Yonkers, New York, and Canadian 1AR, owned by Mr. J. J. Fasset, of Dartmouth, Nova Scotia. Among the European participants, G 5BY, Mr. H. L. O'Heffernan, sent in by far the most comprehensive report, and the marks awarded to him by the Committee overtop by nearly one hundred the next outside competitor, Mr. K. Mahieu (EB 4AU), of Peruwez, Belgium.

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Forwarding Agent.

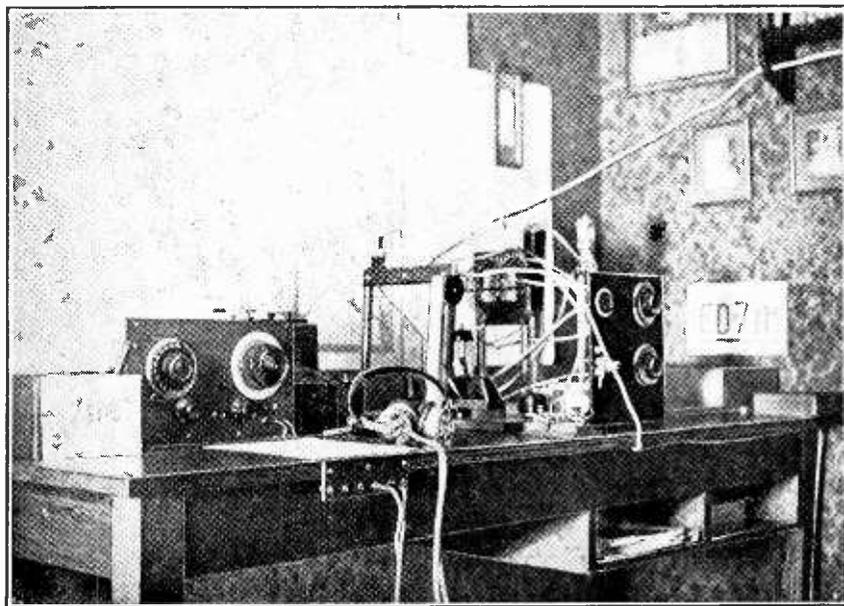
AQ 1LM, C. D. Connerton, Box 117, Baghdad, is willing to forward cards to stations in Iraq.

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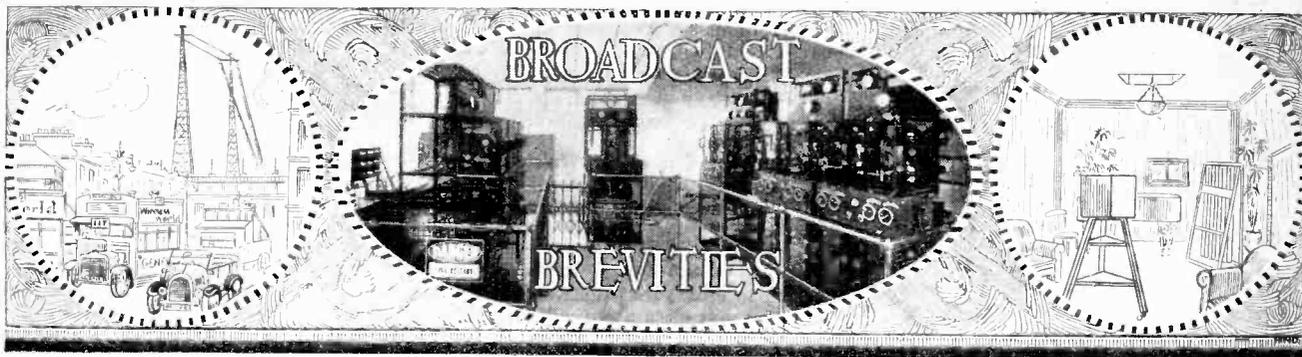
New Call-Signs and Stations Identified.

2AJO Coventry Transmitters' Association, 10 Ludlow Road, Coventry. Hon. Sec. Mr. L. W. Gardner (5GR).

2TA H. Andrewes, 4, St. Mary's Crescent, Henbury, N.W.4. (Change of address).



A DANISH AMATEUR STATION. ED 71M owned and operated by Jørgen Prior at Hellerup, near Copenhagen. He has worked with most countries in Europe on 45 metres with an input of only 1.5 watts obtained from accumulators.



News from All Quarters: By Our Special Correspondent.

Picture Broadcasting.—Forthcoming Continental Relays.—Those Lightning Critics.—“Close-ups” in the Studio.—Europe’s Wavelengths.—Nottingham and the Relay Scheme.

Picture Transmissions.

A month ago I was able to give exclusive confirmation of the report that the B.B.C. would inaugurate picture transmission experiments in the autumn. The tests are to begin in October with a short picture transmission daily from Daventry (5XX) outside regular broadcasting hours. The Fultograph system will be used.

Although a very small proportion of the listening community will be directly interested at first, it seems quite likely that the innovation will quit the experimental stage very quickly. I understand that, probably before these lines appear, a new company—Wireless Pictures, Ltd.—will be floated, with a capital of £425,000, for the purpose of constructing and selling picture receivers.

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And What of the Pictures?

So far as the B.B.C. is concerned, the next problem revolves round what pictures should be sent, and it is hardly likely that this will offer much difficulty. Weather charts, dress patterns, and crossword puzzles are included in the suggestions, but the most fascinating idea is the transmission of the photos of “missing persons.” If this is done in conjunction with “SOS” messages the whole country will soon be turned into an arena for amateur detectives. And if the pictures are not so clear as they might be, there may be some embarrassing “identifications” and overtime work for the ambulance brigade.

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A Continental Relay Advance.

A happy feature connected with the relay from the Ostend Kursaal last week was the fact that, for the first time since Continental relays were inaugurated, none of the B.B.C. engineers had to leave our shores. The line work on the Belgian side was left entirely to Belgian engineers, who fathered the transmission from the Kursaal to the Ostend Post Office exchange and thence to the repeater point at La Panne.

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More Relays Soon.

The excellence of the Kursaal relay justified the engineering policy which will be pursued in future relays, viz., that the lines used in relay work shall be left to the engineers of the countries through which they pass.

I hear that some interesting developments in Continental relay work may be

London and Daventry (5XX).	
SEPTEMBER 25TH.—A Military Band Concert.	
SEPTEMBER 26TH.—“Maritana,” an opera by Wallace.	
SEPTEMBER 27TH.—“The Golden Threshold,” an Indian song cycle.	
SEPTEMBER 28TH.—Promenade Concert relayed from the Queen’s Hall.	
Daventry Experimental (5GB).	
SEPTEMBER 25TH.—“Followers,” a play by Harold Brighouse.	
SEPTEMBER 26TH.—Promenade Concert relayed from the Queen’s Hall.	
SEPTEMBER 28TH.—Excerpts from “Aida” (Verdi).	
Cardiff.	
SEPTEMBER 23RD.—Service relayed from Cathedral Road Presbyterian Church. Sermon by the Rev. W. D. Davies.	
SEPTEMBER 25TH.—A Light Symphony Concert.	
SEPTEMBER 27TH.—A Programme of Syncope, Songs, Skits, and Sketches.	
Manchester.	
SEPTEMBER 26TH.—A Municipal Band Concert, relayed from the Bandstand, Southport.	
Newcastle.	
SEPTEMBER 29TH.—An Orchestral Concert, relayed from the Spa, Whitby.	
Glasgow.	
SEPTEMBER 28TH.—A Concert of Music set to Shakespeare’s Plays.	
Aberdeen.	
SEPTEMBER 25TH.—Inverness Gaelic Mod. Prize-winners’ Concert (Junior Section), relayed from the Wesleyan Central Hall, Inverness.	
Belfast.	
SEPTEMBER 27TH.—A Hubert Parry Programme.	
SEPTEMBER 29TH.—“Four-in-Hand,” a revue. Book and lyrics by John Watt. Music by Claude de Ville.	

expected shortly. So far, Cologne is the only German city which has been directly linked up with the Savoy Hill control room, but . . . there is a good line from Cologne to Berlin.

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A Good Idea.

“Twenty Years On” is the subject of a discussion between Mr. and Mrs.

Clough Williams Ellis to be broadcast from 2LO on September 22nd.

The idea of a “husband and wife” debate is a good one. Could it not be extended to include domestic topics? Or would the outcome be too highly controversial?

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The B.B.C. at Olympia.

I hear that the B.B.C. tableaux at the National Radio Exhibition are to flourish under the title “From B.C. to B.B.C.”

A description of the tableaux appeared in these columns last week.

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Those Lightning Critics.

As a “Surprise Night” novelty the recent efforts of Mr. James Agate and Mr. Hamen Swaffer were amusing enough. It is always exciting to witness (or hear) somebody performing something which calls for intensive and uncomfortable mental effort, and when the executant is a dramatic critic faced with the necessity of proclaiming his thoughts or a play which has only just concluded, the excitement grows. But I doubt whether the resulting criticism is likely to equal the fruits of mature reflection.

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First Impressions.

It is perfectly true that first impressions are sometimes the best. When, however, a work of art is concerned, first impressions are likely to be distorted, especially when the work of art is a play or story or something else which can only be viewed piecemeal, and not as a whole, like a picture.

The much-abused “armchair critic” has time and tranquillity on his side.

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Microphone “Close-ups.”

Meanwhile it is noticeable that broadcast dramatic technique is following the film. In recent plays, notably “Nurse Henrietta,” we have had examples of the screen “close-up” transported to the microphone. The performer approaches to within a few inches of the instrument and utters his thoughts aloud. This form of “close-up” is certainly more intellectual in its appeal than its prototype of

the screen, but it requires to be done very carefully, otherwise quite normal breathing may sound like the gasps of asthma.

Sometimes, I imagine, an exaggerated breathing effect is intentional, the idea being to depict acoustically the heaving bosom which counts for so much among the heroines of the stage and screen.

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"Kaleidoscope."

Mr. Lance Sieveking is pardonably exuberant over the favourable criticism which has followed the broadcasting of his Rhythm "Kaleidoscope." Over two hundred letters of praise have been received, a figure which must represent a very big body of listeners.

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A Covey of Critics.

How many people are aware that the B.B.C. now possesses a covey of critics quite apart from those who write in the Press and those who pour letters into the Savoy Hill correspondence bag?

They are few and select, these critics, but their judgments carry weight. Their numbers include several well-known men of letters, musicians, and educational authorities whose opinions on the programmes are sometimes very pungently expressed. It is to the credit of the B.B.C. Programme Board that it does not flinch. Often, of course, the criticism is favourable. It is always constructive.

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Broadcast Wavelengths in Europe.

In a report issued last week by the Union Internationale de Radiophonie concerning its recent meeting in Berlin, the following interesting paragraph appeared:—

"The Council recognised that it was now advisable to attempt a revision of the friendly agreements for the allocation of wavelengths in Europe in order that European Governments, having in mind the ratification of the Washington Convention, may make the most efficient use of the wave-band reserved by this Convention to broadcasting."

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How Daventry was Saved.

The regulations subscribed to at the Washington Convention provided that the frequencies of all broadcasting stations at present working on wavelengths above 1,000 metres should, in principle, be removed either into the band between 1,875 to 1,340 metres, or into the band between 545 and 200 metres.

While this ruling does not affect the B.B.C., mention of it calls to mind some anxious moments during the Washington Convention when the wavelength of 5XX hung in the balance. The 1,340-1,875-metre wave-band now provided is considerably more generous than it might have been had the European representatives not offered some rather fervent prayer and supplication. Incidentally, no new station may operate within this wave-band.

Compton Mackenzie at the Microphone.

Mr. Compton Mackenzie, the well-known novelist, will talk about "Siamese Cats—and Some Islands" from 2LO on September 24th.

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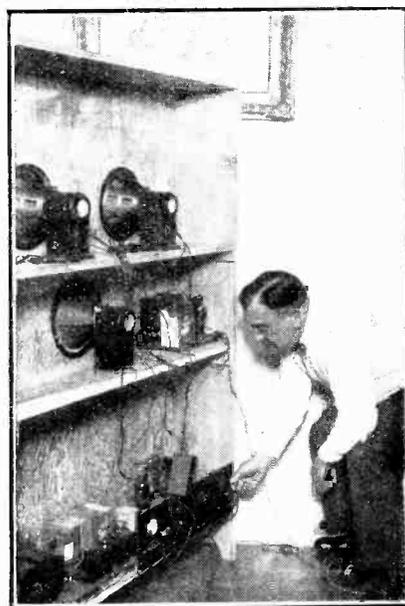
A Welsh Star.

John Pennar Williams, the Welsh miner who won first prize at the recent Welsh National Eisteddfod, will take part in a programme from 2LO on October 1st.

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Nottingham and the New Relay Scheme.

The announcement that the Nottingham relay station will close down with the inauguration of the new common wavelength scheme for the relays has naturally produced some strong feeling among Nottingham listeners, but not so much as Savoy Hill expected. The subsequent news that the Nottingham studio is to



A PLEASANT NEIGHBOUR. Mr. O. Mampe, the "champion radio devotee" of Palisade, New Jersey, who uses three coil-driven loud speakers in his dining room. He claims that he can loosen the wall plaster without introducing distortion.

be preserved has reassured listeners, who feared that local talent would disappear from the ether.

Every opportunity is to be given for the inclusion of local talent, and it is stated that the regional programmes emanating from the Birmingham studio will definitely include such talent from Nottingham and the East Midlands as is deserving of a wider audience. It is also planned to include in the regional bulletins news items of special interest to Nottingham listeners.

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Silent Nights for Testing.

To give listeners in the district an ample opportunity to adapt their sets to the new conditions, the Nottingham transmitter will be silent on October 1st, 8th, 15th, 17th, and probably 22nd, 24th, and 29th.

The B.B.C. engineers reiterate the opinion that, given a good outdoor aerial and a good earth, no crystal listener in Nottingham should have difficulty in securing good reception and a choice of programmes from 5GB and 5XX.

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U.S. Broadcast Advertising Fears.

Inferior broadcasting programmes in America seem to be causing concern among advertisers who have been wont to "buy time on the air." The cruel truth was disclosed by Mr. Thomas F. Logan, of the American Association of Advertising Agencies, in a recent convention at Detroit.

"An audience," he said, "will stay through a poor show in the theatre trying its best to get its money's worth, but it won't stick around listening to an inferior programme in the air for which it has paid nothing."

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Do Women Listen More Than Men?

In exhorting the programme builders to improve their standards, Mr. Logan mentioned the results of an interesting "listener census," recently taken to discover how the type and size of the listener audience change from hour to hour during the day. The same conditions probably obtain over here.

"The biggest audience" (he said) "is in the evening from 6 to 11, with the peak between 8 and 10. While the rural audience fades rapidly after 10 p.m., the town audience is still very large between 10 and 11. The midday peak between 12 and 1 is greater in rural districts than in the cities.

"Investigation shows that women make greater use of the radio than men. They can use it all day. Women turn on the radio during the morning and afternoon when they are busy with their household duties."

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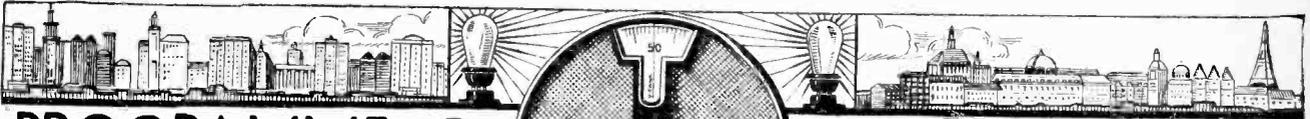
Programme Timing in Scotland.

The alterations in the timing of evening programmes recently announced by the B.B.C. as the result of the inauguration of an earlier first news bulletin will involve certain changes in the timing of regular Scottish features. The most important of these changes occurs in connection with the broadcasts of special interest to farmers. After September 24th the Bulletin of Market Prices for Farmers, which is compiled by the Board of Agriculture for Scotland, and which has hitherto been broadcast from all Scottish stations on Fridays at 6.45 p.m., will be broadcast instead on Thursdays at 6.30 p.m. The series of special talks to farmers, which starts again for the winter on October 5th, with a talk by Mr. Peter Reid, on "Braxy," will be given on Fridays at 6.30 p.m.

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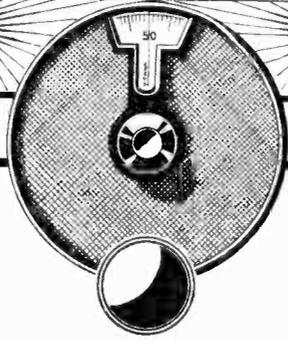
An "Intrusion."

An unusual item appears in Manchester's programme on September 22nd. It is entitled, "Both Sides of the Microphone," and is the work of the "Punch" humorist, L. du Garde Peach, who calls it "An Unpardonable Intrusion into the Listeners' Homes."



PROGRAMMES

FROM ABROAD



SATURDAY, SEPTEMBER 22nd.

All Times are reduced to British
Summer Time and are p.m. except
where otherwise stated.

BARCELONA (Radio Barcelona). Call EAJI (341.8 metres); 1.5 kW.—6.0, Exchange Quotations. 6.10, Sextet Selection; March, Under the Double Eagle (Souza). 6.15, Sacred Music. 6.25, Sextet Selections. Selection from Don Lucas del Cigarral (Vives); Waltz, Dans les Nuages (Waldteufel); Tempo de Minuetto (Zapella). 8.30, Lesson in Morse. 8.45, Wireless Telegraphy Lesson. 9.0, Exchange Quotations and News. 9.5, Orchestral Selections: Marche de France (Goublier-Salabert); Slow Waltz, Lèvres Adorées (Worslev); Selection from The Geisha (Jones); Ecos del Cantábrico (Fernández); American Dance, La última lágrima (Cotó); Serenata (Dvorak). 10.0, Chimes and Weather Report. 10.5, Programme from Madrid, EAJI.

BERGEN (370.4 metres); 1.5 kW.—7.0, Children's Programme. 7.30, Talk for Girls. 8.0, Orchestral Concert; Topical Talk in the Interval. 9.0, Talk. 9.30, Talk by Arne Espeland. 10.0, Weather Report, News and Time Signal. 10.15, Music from the Exhibition. 12.0 Midnight (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—4.30, Legal Talk by Dr. Falck. 5.0, Programme from Hamburg. 6.0, Ernst Lemmer, Talk: Reform Plans in Modern Parliamentarism. 6.30, Elementary Spanish Lesson. 6.55, Herr Knapstein, Talk: The Chamber Orchestra. 7.20, Prof. Minde-Pouet, Talk: Goethe's Influence up to the Present Day. 8.15, Programme from Frankfurt. 10.0 (approx.), Programme from Voxhaus.

BERLIN (Voxhaus) (484 metres); 4 kW.—10.10 a.m., Market Prices. 10.15 a.m., Weather Report, News, Sports Notes and Time Signal. 11.0 a.m., Programme of Gramophone Records. 11.30 a.m., Exchange Quotations. 12.55, Time Signal. 1.30, Weather Report and News. 3.10, Agricultural Prices and Time Signal. 3.30, Programme of Gramophone Records. 4.0, Dr. Walter Kron, Talk: Diseases of the Hair. 4.30, Joh. Riecken, Talk: Motor-boat Sport. 5.0, Humorous Recitations by Charlie K. Roellinghoff. 5.30, Concert: Overture to Jean de Paris (Boieldieu); Waltz from Gipsy Love (Lehar); Legende, Zorahayla (Svendsen); Fantasia on La Bohème (Puccini); Intermezzo from Suite No. 1 in F Major (Mozzkovsky); Preludium (Jamefelt), followed by Announcements. 7.0, Talk by L. Lehmann. 7.30, Dr. Ernst Rother, Talk: The Power of Suggestion—Energy, Enthusiasm, Capacity and Determination. 8.0, Prof. Arthur Benson, Talk: The Importance of Scientific Aviation. 8.30, "Im Liebespavillon," Operetta (Meyer-Helmund), followed by Weather Report, News, Time Signal and Sports Notes. 10.30, Dance Music. 12.30 a.m. (approx.) (Sunday), Close Down.

BERN (411 metres); 1.5 kW.—8.0, Time Signal and Weather Report. 8.5 (approx.), "The Marriage of Figaro" Opera (Mozart), relayed from the Municipal Theatre, Solothurn. 10.0 (approx.), News and Weather Report. 11.0 (approx.), Dance Music. 12.0 Midnight (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—4.0, Review of Books. 4.30, Concert of Light Melodies relayed from Gleiwitz (329.7 metres). 6.0, Talk. 6.20, Esperanto Lesson by Elsa Koschate. 6.30, Dr. Herbert Roth, Talk: The Modern Woman. 7.25, Talk relayed from Gleiwitz. 7.50, Georg Lichey, Talk: Christ. 8.30, Prose and Verse Recital. 9.0, Light Concert: Overture to Farend Volk (Leuschner); Light Variety; Dance Music, (a) Fox-Trot, Dolly Dimples. (b) Slow Fox-Trot: The Blue Room; Light Variety; Two Humorous Pieces for Orchestra (Finck). (a) Glächter und Gekicher, (b) Räuhergroteske; Light Variety; Dance Music, (a) Waltz-Boston (Witt). (b) Alabany Bound: Light Variety; Orchestral Selection, Kleine Overture (Beccé). 10.0, News. 10.30, Dance Music. 12.0 Midnight, Close Down.

BRUNN (441.2 metres); 3 kW.—7.0, Weekly Report. 7.10, Mozart Recital. 9.10, Exhibition Programme. 10.0, News from Prague. 10.20, Exhibition Programme.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Dance Music from the St. Sauveur Palais de Danse. 6.0, Talk: The Prevention of Rust. 6.15 Geographical Talk: Archaeological Excavations in Afghanistan. 6.30, Concert of Trio Music: Elle a deux Iosettes

HAMBURG, Call HA (in Morse) (394.7 metres); 4 kW.—10.15 a.m., News. 11.0 a.m., Programme of Gramophone Records. 12.10, Weather Report. 12.15, Exchange Quotations. 12.30, Concert from Hanover (297 metres). 12.45 (in the Interval), Shipping Forecast. 12.55, Time Signal. 1.10, News. 2.40, Exchange Quotations. 3.30, Review of Books. 4.0, Labour Exchange Report. 4.15, Music Talk by Dr. W. Heintz. 5.0, Concert: St. Fredmann the Topsy-turvy Saint: An hour with the inebriate Singer by the Mälersee; St. Fredmann manifests himself as a Voice from Eternity and presents himself to listeners through the Medium of Kurt Siemers; Father Noah and his Wife; Fredmann's Epistle to Kajsa Stine; To Ulla Winblad; Epistle to the Old Lady in the Theriophilium Boncala Tap-room and her Maileins; Epistle to the poet Wetzel; Epistle on Ulla Winblad's passage to the Tiergarten; Elegiacal Epistle to the Consumptive Father Movritz; Epistle to the Harp-player Father Molberg, when he was thrashed in the Rostock Krug; Epistle on a Concert in the Krug zu den drei Bitten; Father Movritz put on your Shoes; Singing during the Banquet, when Fredmann presented Deal to the Guests. 6.0, Request Programme. 7.0, Talk: From a Fire in the Port to the Foster Announcements of it. 7.30, Talk: What do you now think of your first work? 8.0, Concert of Operetta Music, followed by News and Concert from the Café Walhorr.

HILVERSUM (1,071 metres); 5 kW.—11.40 a.m., Police Announcements. 12.10, Concert of Trio Music. 1.40, Concert from the Tuschinsky Theatre at Amsterdam. 5.40, Time Signal. 5.42, Concert: Overture to Berlin, wieses went und lacht (Conradi); Waltz, Fortajacla (Morena); Ein Morgen in Sanssouci (Kockert); Selected Items by the Male Voice Quartet; Selection from Die schöne Cubanerin (Galwiel); Die Post im Walde (Schäfer); Selected Items by Male Voice Choir; Dorfklüder Waltz from Zigeunerprimas (Kalmán); From Heidelberg to Barcelona; March Kinderlieder (Ziehner). 7.25, Police Announcements. 7.40, Time Signal. 7.42, Programme, arranged by the Workers' Radio Society—Concert and Talk. 10.10, Concert relayed from the Royal Picture House, Amsterdam. 11.15 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40.—12.10, Concert of Trio Music. 5.10, Concert of Gramophone Selections. 7.25, Talk by Mme. Steph. v. Embden. 7.55, "Vaise Champêtre," Vaudeville (Fabricius) and "Huwelytscaandiaten," Vaudeville (Stumpf).

JUAN-LES-PINS (Radio L.L.) (434 metres); 1.5 kW.—10.0, Concert. 9.0, News, Weather Report, Talk for Women by Mme. la Comtesse de Tremeuze, and Concert. 10.0, Dance Music. 10.30 Close Down.

KALUNDBORG (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres).—7.30 a.m., Morning Gymnastics. 11.0 a.m., Weather Report. 1.15, Programme for Children. 3.30, Instrumental Concert: Overture to Raymond (Thomas); Ballet Suite from Lakné (Delibes); Hesperus-Vals (Lumbye); Ideale (Tosti); Gavotte (Sinding); Burlesque (Söderman); Dance of the Insects (Svendsen); Piano-forte Solos, (a) Fantasia, Op. 11 (Stenhammar), (b) Selection (Wilkund), (c) Study, Op. 17 (Neupert), (d) Selections (Grieg) (a) Nocturne, (b) Papillon, (c) Hjenad; Waltz from Die Schönbrunner (Lanner); Selection from I Pagliacci (Leoncavallo); Melody (Rubinstein); Idylle Passionelle (Kazigade); Morning (Grieg); Bourée (Halvorsen); Fox-Trot, Tjundada (Jersholt). 6.20, Sigurd Straugen, Talk: Some Native Types from the Danish Colonies in the Argentine. 6.50, Weather Report. 7.0 News and Exchange Quotations. 7.15, Time Signal. 7.16, Talk in Connection with the Travel and Wireless Exhibition at the Tivoli. 7.30, Axel Sanderose, Talk: The Danish Settlers in Canada. 8.0, Chimes from the Town Hall. 8.2, Experimental Concert from the Axelberg Studio. 10.0, News, followed by Dance Music. 12.0 Midnight, Chimes from the Town Hall. 12.15 a.m. (approx.), (Sunday), Close Down.

KAUNAS (2,000 metres); 7 kW.—5.30, "The Cuckoo," Recitative. 5.45, Announcements. 6.30, News. 7.0, Weather Report and News. 7.15, Programme Announcements. 7.30, Concert by a Military Band. 8.30, Talk. 8.45, Concert of Eastern Music.

(Denaret); Selection from La Bohème (Puccini); Pianoforte Solo, Mazurka (Chopin); Nocturne and Cantabile (Widor); Romance sans paroles (van Goens); Violin Solo, Liebeslied (Kreiser); Paul and Virginia (Masse); Cello Solo, Elegie (Massenet); Selection (Cuvillier). 7.30, "Radio-Chronique"; 8.15, Gramophone Selections. 8.30, Selection from Les Cloches de Cornville (Planquette); Topical Events Talk in the Interval. 10.15, News. 10.30 (approx.), Close Down.

BUDAPEST (555.6 metres); 35 kW.—6.0, Songs to the Lute. 6.35, Agricultural Talk. 7.15, Programme to be announced. 8.45, Concert of Military Music; News and Racing Results during the Interval. 10.15, Weather Report and Concert of Tziganic Music.

COLOGNE (283 metres); 4 kW.—12.10, Programme from Langenberg. 1.5, Concert from Works of Weber; Orchestral Selection, Overture to Sylvania; Soprano Solo from Lotoska (Uerulini); Concerto for Piano-forte and Orchestra; Orchestral Selection, Overture to Der Freischütz; Bass Solo from Der Freischütz; Tenor Solo from Euryanthe; Orchestral Selection, Anforderung zum Tanz. 2.30, Programme from Langenberg. 4.0, Poetry Reading from the Works of Erich Ebermayer. 4.30, Programme from Königswusterhausen. 5.10, Poetry Recital by Joachim Ringelnatz. 5.45, See Langenberg. 6.30, Richard Wenz, Talk: Rhinish Work-days and Holidays in Poetry. 7.15, Dr. Hans Stein, Talk for Workers: History of the German Railways. 7.40, See Langenberg. 8.0, Variety Programme, followed by News, Sports Notes, Orchestral Selections and Dance Music. 1.0 a.m. (approx.) (Sunday), Close Down.

CRACOW (566 metres); 1.5 kW.—7.0, Miscellaneous Items. 7.30, Talk. 7.55, Agricultural Report. 8.5, News. 8.30, Programme from Warsaw. 10.30, Restaurant Concert. 11.30 (approx.), Close Down.

DUBLIN, Call 2KN (319.1 metres); 1.5 kW.—1.30, Weather Report and Gramophone Selections. 7.20, News. 7.30, Recitations by Frank Fay. 7.45, Irish Lesson by Scann's O'Duinnine. 8.0, The Augmented Station Orchestra. 8.45, Gaelic Selections by Mairead Ní Annagán. 9.0, Banjo Solos by Jack MacGarvey. 9.10, The Augmented Station Orchestra. 9.20, Songs by Eva Tomsohn. 9.30, A Revue by H. O'Donovan and Company. 10.15, The Augmented Station Orchestra. 10.30, News, Weather Report and Close Down.

FRANKFURT (428.6 metres); 4 kW.—1.0, Gramophone Selections. 3.5, Programme for Children. 3.55, Hints for the Housewife. 4.35, Concert: Waltz-Potpourri from Rheinländer (Strasser); Kleine ländliche Suite (Gillon); Nordische Suite (Lorjussen); Hungarian Melodies (Korbay); Rondino on a Beet-hoven theme (Kreiser); Valse tzigane (Kettelbey); Spanish Dance, Adios montañas mias (Sarastate); Potpourri, Vom Rhein zur Donau (Rholde); Old Hunting March. 6.10, Reading from a Novel, by O. W. Studmann. 6.30, The Letter Box. 6.45, Lesson in Esperanto by W. Wischhof. 7.15, Short-hand Lesson. 7.45, Hans Meissner, Talk: The Theatre and Theatre goers. 8.15, "Die strafsache gegen Pannicke"—Play, followed by Dance Music from Voxhaus. 12.30 a.m. (approx.) (Sunday), Close Down.

Programmes from Abroad.—

LAHTI (1,522.8 metres): 35 kW.—5.0, Orchestral Selections: Overture to Die Fledermaus (Strauss); Waltz (Strauss). 6.15, Programme of Talks. 7.0, Gramophone Selections. 8.0, Talk, followed by Orchestral Selections: Overture to La Belle Galathee (Suppe); Waltz (Ziehrer); Tango Mirage (Larento); Tango (Albeniz). 8.45, News in Finnish and Swedish. 9.0 (approx.), Close Down.

LANGENBERG (468.8 metres): 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres), and Münster (250 metres).—12.10, Gramophone Selections. 1.5, Programme from Cologne. 2.30, Hints for the Housewife. 4.0, Programme from Cologne. 4.30, Programme from Königswusterhausen. 5.10, Programme from Cologne. 5.45, Concert from Düsseldorf: Nachtzauber (Storch); Der träumende See (Schumann); Holde Erinnerung (Kämpf); Pianoorte Solos. (a) Des Abends (Schumann), (b) Aufschwung (Schumann); Indian Cradle Song (Wesseler); A Meadow Full of White Marguerites (Heuser); Pianoorte Solos (Schumann), (a) Warum? (b) Grillen; Folk Song (Schauss); Gestörtes Ständchen (Schauss). 6.30 to 7.35, Programme from Cologne. 7.40, Dr. Herbert Leisinger, Talk: The Twentieth Century and Its Artistic Possibilities—The Theatre. Wireless and the Film, relayed from Elberfeld. 8.0, Programme from Cologne. 1.0 a.m. (approx.) (Sunday), Close Down.

LEIPZIG (365.8 metres): 4 kW.—8.30, Programme from Königswusterhausen. 7.0, Talk, The Importance of Former Legislation with Regard to the Protection of the Worker. 7.30, Talk: Art and Technique. 8.15, Mandoline Recital. 9.15, Operetta Concert: Soprano Solos, (a) Zigeuner Song from Judwiga (Dellinger), (b) Song from Die sieben Schwaben (Millocker); Tenor Solos, (a) Air from Göttergatte (Lehár), (b) Air from Spring on the Rhine (Eysler); Duets from (a) Don Cesar (Dellinger), (b) Der Obersteiger (Zeller); Soprano Solos, (a) Song from Boccaccio (Suppe), (b) Song from The Merry Widow (Lehár); Tenor Solos, (a) Song from La Bayadère (Kühnán), (b) Song from Bub oder Mädel (Graničstæden); Duets from (a) Madame Pompadour (Fall), (b) Wo die Lerche singt (Lehár); Tenor Solos, (a) Song from Der fidele Geiger (Eysler), (b) Song from Das Schwalbennest (Graničstæden); Soprano Solos, (a) Air from Eva (Lehár), (b) Song from Hellblauen Schwestern (Künnecke); Duets from (a) Der Liebe Augustin (Fall), (b) The Czarevitch (Lehár). 10.15 News and Sports Notes. 10.39 Programme from Voxhaus. 12.0 Midnight (approx.), Close Down.

LILLE, Call PTT (264 metres): 0.5 kW.—7.0, Market Prices. 7.10, Concert. 8.15, Wireless Talk. 8.45, Concert, arranged by the Wireless Association of North France, followed by News.

MADRID (Union Radio), Call EA17 (375 metres): 3 kW.—7.0, Orchestral Selections; Interlude by Luis Medina. 8.0, Dance Music. 9.45, Market Prices. 10.0, Chimes and Exchange Quotations. 10.10 (approx.), "A Midsummer Night's Dream," Play (Shakespeare, arr. Arcas), followed by News. 12.0 Midnight, Dance Music. 12.30 a.m. (approx.), Close Down.

MILAN, Call LM1 (546 metres): 7 kW.—8.35, Time Signal, Talk and News. 8.50, Variety Concert: Orchestral Selection; Overture to Iphigenia in Aulis (Gluck); Soprano Solo from A Masked Ball (Verdi); Baritone Solo from Ernani (Verdi); Mascarade for Pianoorte (Pick Maniagalli); Quintet Selections, (a) Pierrot's Serenade (Burgmeier), (b) Song (Lautada); Soprano Songs (Puccini and Mortara); Baritone Solo (Rotoli); Pianoorte Solos (Beethoven), (a) Per Elisa, (b) Rondo capriccioso; Readings from d'Annunzio's Gioconda; Orchestral Selections, (a) Overture to Iphigenia in Aulis (Gluck), (b) Symphonic Poem, Finlandia (Sibelius), (c) Persian Dance (Mousorgsky); Symphony from The Force of Destiny (Verdi). 10.55, News, followed by Concert from the Hotel Majestic Diana. 11.45 (approx.), Close Down.

MOTALA (1,380 metres): 30 kW.—Programme also for Stockholm (451.5 metres), Bödeç (1,190 metres), Göteborg (416.5 metres), Malmö (260.9 metres), Östersund (720 metres), Sundsvall (345.6 metres).—5.0, Concert of Light Music. 6.0, Programme for Children. 6.30, Concert of Old Time Dance Music. 7.30, Talk on Spain. 8.0, Cabaret Programme. 9.45, Topical Talk. 9.15, News and Weather Report. 9.45, Dance Music. 12.0 Midnight (approx.), Close Down.

NAPLES, Call INA (333.3 metres): 1.5 kW.—8.20, Wireless News. 8.40, Time Signal and News, followed by Harbour Notes. 8.50, Concert: Prelude to The Mastersingers (Wagner); Soprano Solo from The Marriage of Figaro (Mozart); Bass Solo from Crispino e la comare (Ricci); Tarentella from Fra Diavolo (Auber); Soprano and Bass Duets from The Daughter of the Regiment (Donizetti); "la Patente"; One

Saturday, September 22nd.

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Act Comedy (Pirandello): "La Sapienza dei Giovani," One Act Play (Zambaldi); Selection from La cena delle beffe (Giordano); Soprano Solo from Crispino e la comare; Bass Solo from Il ritorno di Columella (Foravanti); Dance from La Juive (Halévy); Soprano and Bass Duet from Don Juan (Mozart); Overture to The Grand Duchess of Gerolstein (Offenbach); Italian and Foreign News. 10.55, Calendar and Announcements. 11.0 (approx.), Close Down.

OSLO (461.5 metres): 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrunn (500 metres) and Rjukan (448 metres).—6.30, Programme for Children. 7.15, Weather Report, News and Agricultural Prices. 7.30, Talk: Phonetic Study. 8.0, Time Signal. 8.2, Orchestra Concert: Fantasia on Norwegian Melodies (Birknes); Autumn (Eggen); Pêcheur napolitain (Rubinstein); Des cloches à St. Cyr (Schmalstich); Klügende Traum (Percy); Ballet Music from Coppélia (Delibes). 9.0, Programme from Bergen. 9.30, Weather Report and News. 10.0, Topical Talk. 10.15, Dance Music from the Grand Hotel, Oslo. 12.0 Midnight (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres): 0.5 kW.—6.30, Radio Journal de France. 8.0, Sports Notes. 8.30, Concert arranged by the Association Générale des Auditeurs de T.S.F., followed by Dance Music from the Coliseum de Paris.

PARIS (Eiffel Tower), Call FL (2,650 metres): 5 kW.—6.45, Le Journal Parlé. 8.10, Weather Report. 8.30, Concert: Suite from Messidor (Bruneau); Violin Solos; Pastorale from Le Jugement de Midas (Cools); Chanson du Marin (Cools); Scènes pyrénéennes (Chauvet); Les Caprices de Marianne (Cadoul); Flute Solos; Lied (Frank); La vie brève (de Falla); Spanish Dance (de Falla); Selection from Cocorico (Ganne).

PARIS (Petit Parisien) (340.9 metres): 0.5 kW.—8.45, Gramophone Selections, Talk, News and Announcements. 9.0, Concert: Overture to Les Mousquetaires au Couvent (Varney); Selection from Sigurd (Rever); Finale from the Second Symphony in D (Beethoven); Affetto from the Brandenburg Concerto No. 5 (Bach); Suite L'Arlesienne (Bizet); Suite bergamasque (Debussy); Manhattan Beach March (Sousa), News in the Intervals.

PARIS (Radio-Paris), Call CFR (1,750 metres): 6 kW.—12.30, Gramophone Selections: Selection from L'Apprenti Sorcier (Dukas); Slavonic Dances (Dvorak); Selection from Lakmé (Delibes); Legend of the Grail from Lohengrin (Wagner); Quartet in E Minor (Beethoven); Layton and Johnstone in Selections from The Girl Friend (Rogers); Fox-Trot, I'm coming, Virginia; I can't get over a girl like you, News in the Intervals. 1.50, Market Prices and Religious Information. 3.45, Dance Music, News in the Intervals. 8.0, Agricultural Report. 8.15, Talk: Rural Trades, followed by Exchange Quotations and News. 8.30, Orchestral and Vocal Concert: Iphigenia in Aulis (Gluck); Suite, Jeux d'Enfants (Bizet); Suite from Masques and Bergamasques (Faure); Songs of Despairing Lovers. (a) Slavonic Song (Chaminade), (b) Solveig's Song (Grieg), (c) Triste est la Steppe (Gretchaninoff), (d) La Cloche (Saint-Saëns), (e) Hindu Song (Bemberg), (f) Arab Farewell (Bizet); Rondo Zingaresca (Ibrahim); Hommage à Rameau (Debussy); Gavotte and Minuet from Manon (Massenet); Pas sur la bouche; News in the Intervals.

PITTSBURGH, Call KDKA (63 and 27 metres): 25 kW.—11.0, Time Signal, Baseball Reports and Selections by the Crowder Brothers. 11.30, Concert from the William Penn Hotel. 12.0 Midnight, Time Signal and Concert (continued). 12.20 a.m. Sunday, Talk. 12.30 a.m., Home Radio Club Meeting. 1.0 a.m., Organ Recital from WJZ, New York. 1.15 a.m., Talk from WJZ, New York. 1.30 a.m., Selections by Godfrey Ludlow, The Keystone Duo, and Maguanti's Accordion Quartet from WJZ, New York. 3.0 a.m., Time Signal and Baseball Reports. 4.0 a.m., Time Signal, News and Weather Report.

POSEN (344.8 metres): 1.5 kW.—7.0, Topical Talk. 7.30, Talk. 8.0, Financial Report. 8.30, Military Band Concert. 9.0, Chamber Music. 9.30, Recital of German Songs. 10.0, Time Signal, News and Weather

Report. 10.20, Miscellaneous Items. 10.40, Dance Music from the Carlton Restaurant. 12.0 Midnight, Concert from La Maxon Philips. 2.0 a.m. (approx.) (Sunday), Close Down.

PRAGUE (348.9 metres): 5 kW.—5.30, German Transmission. 5.55, Agricultural Report. 6.5, Talk for Workers. 7.0, "The Nymph" Opera (Dvorak), relayed from the National Theatre. 10.9, Time Signal and News, followed by Orchestral Selections.

RIGA (526.3 metres): 4 kW.—5.30, Talks. 7.0, Vocal and Instrumental Concert. 9.0, Weather Report and News. 9.15 (approx.), Concert from the Café de l'Opéra. 11.0, Close Down.

ROME, Call IRO (447.8 metres): 3 kW.—8.30, Sports Notes, News, Exchange Quotations and Weather Report. 8.59, Time Signal. 9.0, "Lodoletta" Opera (Mascagni); In the intervals, Review of Art and Literature, and Topical Talk. 11.5, News. 11.15 (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres): 30 kW.—11.55, Baseball Announcements. 12.0 Midnight, Statler's Pennsylvanians, directed by Johnny Johnson, from New York. 12.30 a.m. (Sunday), Musical Selections from the Hotel Sagamore, Rochester. 1.0 a.m., "Mr. and Mrs. Rollo Skits." 1.30 a.m., Time Signal. 1.32 a.m., Variety Concert with Soprano Solos by Mildred Hunt, from New York. 2.0 a.m., "The Open Mike," from New York. 3.0 a.m., Organ Recital by Robert Berentsen, from Rochester. 4.0 a.m., Dance Music from the Hotel de Witt Clinton, Albany. 5.0 a.m. (approx.), Close Down.

STAMBOUL (1,200 metres): 5 kW.—6.15, Concert of Turkish Music. 8.30, Weather Report and Time Signal. 8.40, Concert: Overture to Coniolan (Beethoven); Hungarian Rhapsodies Nos. 8 and 9 (Liszt); Songs: First Movement of the Seventh Symphony (Beethoven). 10.0, News, and Close Down.

STUTTGART (379.7 metres): 4 kW.—5.0, Zither Recital: Rondeau brillant (Weber-Scheffel); Fantasia on Lorelei (Pugh); Celesta (Kollmannel); Rondollette in F Major (Svoboda); Giebet auf den Bergen (Ott); Präludium in A Major (Svoboda). 6.0, Dr. C. Elverspöck, Talk: On the Hunt for Rinaldo Pinalini. 6.30, Prof. Kantorowicz, Talk: England and Ireland, relayed from Freiburg (577 metres). 7.0, Book-keeping Lesson by Dr. H. Wolf. 7.30 Time Signal, Weather Report and Sports Notes. 7.45, Hebel Commemoration Programme: Reading from his Works by Karl Berner, relayed from Freiburg. 8.15, Programme from Frankfurt, followed by News, and Dance Music from the Café-Restaurant Wilhelmshaus, Stuttgart.

TOULOUSE (Radiophonie du Midi) (331 metres): 3 kW.—12.45, Vague Recital. 8.0, Exchange Quotations and News. 8.30, Instrumental and Vocal Selections from the Works of Schumann. 8.45, Orchestral and Choral Selections (Kettelby). (a) In a Persian Market, (b) In a Monastery Garden. 8.55, Concert. 9.55, Rhythmic Parodies for Dancing; Faust (Gounod); Liebestraum (Liszt); I Pagliacci (Leoncavallo); Carmen (Bizet); followed by Dance Music. 10.15, North African News. 10.30 (approx.), Close Down.

VIENNA (577 and 517.2 metres): 1.5 and 15 kW.—4.0, Concert. 6.5, Chamber Music: String Quartet in F Major, Op. 59 No. 1 (Beethoven); String Quartet in A Minor, Op. 51, No. 2 (Brahms). 7.25, Philipp Zeska reads from the Works of the Austrian Poets, Hans Müller, born October 25th, 1882, and Alex. Lernet Höllein, born October 21st, 1897. 8.30, "A Fairy Tale from Florence"—Operetta (Benatzky), followed by Dance Music from the Grill Room at the Hotel Bristol.

VILNA (435 metres): 1.5 kW.—6.0, Programme from Cracow. 7.0, Talk for Women by Ela Buncler. 7.30, Programme from Warsaw. 8.0, Gramophone Selections. 8.30, Concert, Time Signal, News and Dance Music from Warsaw. 11.30 (approx.), Close Down.

WARSAW (1,111 metres): 10 kW.—7.0, Miscellaneous Items. 7.30, Wireless Talk by Dr. M. Stepowski. 7.55, Agricultural Report. 8.30, Orchestral Concert, News in French during the Interval. 10.0, Time Signal, Aviation Notes, Weather Report, and News. 10.20, Police Announcements and Sports Notes. 10.30, Dance Music from the Restaurant Oaza. 11.30 (approx.), Close Down.

ZURICH (588 metres): 1 kW.—7.17, Concert by the Uto Orchestra, Jacques Schmid (Songs to the Lute) and the Orfeo Mandoline and Guitar Club. 9.0, "Didel oder Dudel"—Play (Jakob Bührer). 10.0, Weather Report and News. 10.10, Accordion Selections.

SUNDAY, SEPTEMBER 23rd.

All Times are reduced to British
Summer Time and are p.m. except
where otherwise stated.

Programmes from Abroad.—

BARCELONA (Radio Barcelona), Call EAJ1 (344.8 metres); 1.5 kW.—12.0 Noon, Relay of Chimes from the Cathedral in Barcelona, followed by Weather Report for Europe, Weather Forecast for North-East Spain and Aerial Route Conditions. 1.30, Concert of Light Music by the Iberia Trio; in the Intervals: Gramophone Selections. 9.0 (approx.), Close Down.

BASLE (1,010 metres); 1.5 kW.—Programme relayed from Bern. 8.30, Concert with flute Solos. 9.45, Weather Report and News Bulletin. 10.15 (approx.), Close Down.

BERGEN (370.4 metres); 1.5 kW.—10.30 a.m. Relay of Divine Service. 12.30, Weather Forecast and General News Bulletin. 8.0, Concert by the Station Orchestra, followed by Talk. 8.30, Lecture: Recital on "Mathias Skeibrok," by the Author, Arne Espeland. 10.0, Weather Forecast, News Bulletin and Time Signal. 10.15, Relay of a Restaurant Concert. 12.0 Midnight (approx.), Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—8.55 a.m., Chimes from the Garrison Church at Potsdam. 9.0 a.m., Morning Recital, relayed from Voxhaus, with Address, and followed by Chimes from the Berlin Cathedral. 11.30 a.m. (approx.), Orchestral Concert, relayed from Voxhaus. 2.0, Funkheinzelnmann's Programme for Children, relayed from Voxhaus. 3.30, Three Talks from Voxhaus; Practical Hints for Farmers and Notes on the Week's Markets. 5.0, Musical Selections. 6.30, Two Talks, followed by an Outside Relay. 10.15, Press News. 10.30, Dance Music. 12.30 a.m. (approx.) (Monday), Close Down.

BERLIN (Voxhaus) (484 metres); 4 kW.—8.55 a.m., Chimes from Potsdam Garrison Church. 9.0 a.m., Sacred Musical Recital, followed by Chimes from Berlin Cathedral. 11.30 a.m. (approx.), Concert of Orchestral Selections. 2.0, Programme for Children by Funkheinzelnmann. 3.0, Lesson on Shorthand, arranged by the Hans Bredow School. 3.30 to 3.55, Two Agricultural Talks. 3.55, Talk. 5.0, Concert of Instrumental Selections. 7.0, Two Talks. 8.0 (approx.) Vocal and Orchestral Programme, followed by Weather Report, Time Signal, Sports Notes and News Bulletin. 10.30, Popular Dance Music. 12.30 a.m. (approx.) (Monday), Close Down.

BERN (411 metres); 1.5 kW.—10.30 a.m., Religious Service and Address. 1.0, Time Signal and Weather Report. 1.5, Musical Selections by the Künstlerkapelle Aversano, of Bern. 3.30, Concert. 8.0, Time Signal and Weather Forecast followed by Orchestral Concert. 9.45, Sports Notes, News Bulletin and Weather Forecast. 10.0, Concert of Orchestral Selections. 10.35 (approx.), Close Down.

BEZIERS (158 metres); 0.6 kW.—8.15, General News Bulletin. 8.30, A Half-hour of Symphony Music. 9.0, Dance Music Programme. 10.0 (approx.), Close Down.

BRÜNN (441.2 metres); 3 kW.—10.30 a.m., Agricultural Notes. 11.0 a.m., Instrumental Music. 12.0, Orchestral Selections. 3.0, Musical Programme. 4.0, Concert of Light Music. 6.0, German Programme. 7.15 (approx.), Instrumental Concert. 10.0 General News Bulletin, relayed from Prague, followed by Orchestral Programme.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Dance Music relayed from the St. Sauveur Palais de Danse. 6.0, Bouzo and Sylvia in their Entertainment for Children. 6.30, Concert by the Station Orchestra. 7.30, Le Journal Parlé of Radio-Belgique. 8.15, The Station Orchestra under the direction of M. René Tellier, with Soloists. Concert from the works of Debussy, including "L'Après-midi d'un faune." 10.15 Late Press News. 10.30 (approx.) Close Down.

BRESLAU (322.6 metres); 4 kW.—8.45 a.m., Relay of the Chimes from Christ Church. 11.0 a.m., Catholic Morning Recital with Address. 12.0 Noon, Musical Selections followed by Talk. 2.35, Chess Talk. 3.0 to 3.30, Programme for Children. 6.50 (approx.), Concert. 8.30, Concert or Play. 10.0, General News Bulletin. 10.30, Musical Programme. 12.0 Midnight (approx.), Close Down.

BUDAPEST (555.6 metres); 35 kW.—9.30 a.m., News from the Press and Women's Talk. 10.0 a.m., Relay of Sacred Service followed by Time Signal and Weather Forecast. 4.0 (approx.), Concert for Children followed by Musical Selections. 10.20, Tzigane Music.

COLOGNE (283 metres); 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (468.8 metres) and Münster (250 metres).—9.0 a.m., Relay of Morning Catholic Festival with Choral and Instrumental Music, followed by Talks. 1.0, Orchestral

Report and Forecast. 9.15, Concert of Light Music. 10.0, Programme relayed from the Juan-les-Pins Municipal Casino; The Casino Orchestra in Selections of Popular Dance Music. 10.30 (approx.), Close Down.

KALUNDBORG (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres).—10.0 a.m., Relay of Morning Service. 11.30 a.m. (Kalundborg only) The Weather Report of the Meteorological Institute at Copenhagen. 5.0, Divine Service, relayed from a Church in Copenhagen. 6.30 (approx.), Children's Corner. 6.50 (Kalundborg only), Weather Report from the Meteorological Institute. 7.0, News from the Press. 7.15 Time Signal. 7.30, Talk. 8.0, Chimes, relayed from the Town Hall. 8.5, Concert of Danish Hunting Music: Two Hunting Songs by Niels Gade from "Jaegers Sommerliv." (a) Jeg gik mig i den dunkle Skov, (b) Der var saa taart under Lindens Lov: Sung by Per Knudsen. 9.45, Orchestral Programme. 10.45 (approx.), Outside Relay of Dance Music; in the Interval at 12.0 Midnight, Chimes from the Town Hall. 12.30 a.m. (approx.) (Monday), Close Down.

KATTOWITZ (422 metres); 10 kW.—6.50, Talk. 7.45, Talk. 8.30, Relay of Programme from Warsaw. Concert by a Male Voice Choir and the P.R. Orchestra, directed by J. Oziminski. 10.0, Time Signal, Weather Forecast and General News Bulletin. 10.30, Selections of Dance Music. 11.30 (approx.), Close Down.

KAUNAS (2,000 metres); 7 kW.—12.0 Noon, Relay of Chimes. 12.4, Weather Report. 12.10, Concert of Instrumental Music. 1.0, Children's Corner. 3.30, The Young People's Hour. 5.0, Talk. 6.0, Programme of Guitar and Mandoline Music, "The Wounded Eagle" (Prezovsky). 7.0 (approx.) Weather Report and Political Review. 7.30 (approx.), Concert or Opera.

KÖNIGSBERG (303 metres); 4 kW.—Programme relayed by Danzig (272.7 metres).—9.0 a.m., Morning Concert: Songs and Instrumental Items, Conductor, Ernst Maschke. 11.0 a.m. (Königsberg only), Weather Forecast. 11.15 a.m. (approx.), Instrumental Programme. 12.55, International Time Signal, relayed from Nauen, followed by Weather Report. 2.50, Hints for Chess Players by P. S. Leonhardt, followed by Spanish Lesson for Beginners by Kurt Metzke, Lecturer in Spanish at the Königsberg Technical Institute. 4.0, Young People's Hour. 4.30 (approx.), Selections by the Station Orchestra, conducted by Volkmar Shalak, followed by Talk. 8.5, Orchestral Concert by the Königsberg Station Orchestra under the direction of Erich Seidler, with Clarinet Solos by Willy Tantenlahn, followed by General News Bulletin and Sports Notes. 10.30 (approx.), Relay of Dance Music Programme. 12.15 a.m. (approx.) (Monday), Close Down.

LAHTI (1,522.8 metres); 35 kW.—Programme also for Helsingfors (375 metres).—10.50 a.m., General News Bulletin. 11.5 a.m., Orchestral Concert. 11.50 a.m., Time Signal and Weather Report. 12.0 Noon, Relay of Sacred Service in the Swedish Language. 4.0, Orchestral Concert of Light Music. 5.0, Talk. 5.30, Talk. 5.57, Time Signal and Weather Report. 7.0 (approx.), Concert. 8.45, Late News Bulletin in Finnish and Swedish. 10.0 (approx.), Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres) and Münster (250 metres).—9.0 a.m., Relay of Catholic Recital with Choir and Soloists, followed by Talks. 1.0, Instrumental Concert, followed by Talks. 4.30, Musical Programme, followed by Relay from Cologne. 9.0, Programme from Dortmund: "The Four Men from Steiermark," a humorous vocal quartette by the Graz Male Choir, followed by General News Bulletin, Sports Notes and Dance Music, relayed from Cologne. 12.0 Midnight (approx.), Close Down.

LEIPZIG (365.8 metres); 4 kW.—8.30 a.m., Relay of Organ Recital. 9.0 a.m., Morning Recital with Instrumental and Vocal Solos. 11.0 a.m., Concert of Orchestral Selections. 12.0 Noon, Talk. 12.30 Director Buch, Talk: Funkt. 2.0 to 2.30, Notes by the German-Speaking Union and News from the Foreign Press. 2.30, Musical Programme from the Jahresschau, Dresden: The Dresden Radio Orchestra under Gustav Augente. 7.30, "Half-Hearted Clarissa," Comedy in Three Acts by Max Brod. 10.0, Sports News. 10.30, Popular Dance Music, relayed from Voxhaus. 12.30 a.m. (approx.) (Monday), Close Down.

LILLE, Call PTT (284 metres); 0.5 kW.—1.35, Prices of Motor Oils. 8.30 (approx.), Concert of Vocal and Instrumental Selections, followed by General News Bulletin.

Concert under the direction of Herr Eysoldt and followed by Talks. 4.30, Instrumental Selections. 8.0, Concert of Popular Music by the Westdeutscher Rundfunk Orchestra directed by Herr Buschkötter, followed by Light Musical Selections, Late News Bulletin, Sports Notes and Dance Music. 12.0 Midnight (approx.), Close Down.

CORK, Call 6CK (400 metres); 1.5 kW.—8.30, Concert by the Station Sextet with Contralto Solos by Annie Broadhurst. 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

CRAGOW (566 metres); 1.5 kW.—10.15 a.m., Relay of Sacred Service from a Polish Cathedral. 12.0 Noon, Relay of the Fanfare from the Tower of Notre Dame in Cracow, followed by Time Signal and Weather Forecast. 1.30 to 2.30, Orchestral Concert relayed from the "Pavillon" Restaurant. 4.0, Two Talks on Agricultural Topics. 4.40, "La Chronique Agricole," by Dr. St. Wasniewski. 5.0, Programme relayed from Warsaw. 6.30, Twenty Minutes' Variety. 6.50, Talk. 7.15 to 7.30, Interval. 8.0, Fanfare from Notre Dame followed by Sports News. 8.30, Concert with Solists by the Symphony Orchestra of the "Hejnal" Musical Society under the direction of Vincelas Karas. 10.9, Programme relayed from Warsaw. 10.30, Relay of Concert by a Restaurant Orchestra. 11.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—8.30 to 11.15 (approx.), Programme relayed from Cork. Instrumental and Vocal Concert with Baritone Songs by James O'Sullivan. 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

FRANKFURT (423.6 metres); 4 kW.—8.0 a.m., Musical Programme followed by Talk for Parents. 12.0 Noon, Orchestral Concert. 1.0, Transmission of the Wiesbaden Agricultural Institute, followed by Young People's Hour arranged by Director K. Wehrhan. 8.0 to 8.30, Sports Notes. 8.30, Concert of Instrumental Music followed by Dance Music relayed from Berlin. 12.30 a.m. (approx.) (Monday), Close Down.

HAMBURG, Call HA (in Morse) (394.7 metres); 4 kW.—Programme relayed by Bremen (272.7 metres), Hanover (297 metres), and Kiel (254.2 metres).—8.25 a.m., Time Signal. 8.30 a.m., Weather Report and General News Bulletin. 9.0 a.m., Talk on Legal Matters. 9.15 a.m., Musical Programme. 10.55 a.m. (for Kiel only), Morning Service from the University Church, Kiel. 12.55, Time Signal relayed from Nauen. 1.0 (for Hamburg and Kiel), Popular Concert. 1.0 (for Bremen), Instrumental Music. 1.0 (for Hanover), Gramophone Concert. 2.0, Funkheinzelnmann's Programme for Children. 4.0 (approx.), Talk followed by Musical Programme. 7.30, Talk under the auspices of the School of Physical Training. 7.40, Sports News. 7.55, Weather Report. 8.0 (approx.), Concert or Play. 9.30 (approx.), Weather Forecast, News Bulletin and North Sea and Baltic Weather Report followed by Concert from the Café Walthof (for Hamburg and Kiel) and outside relay of Orchestral Programme (for Hanover and Bremen). 11.0 (approx.), Close Down.

HILVERSUM (1,071 metres); 5 kW.—12.40 to 2.10, Orchestral Concert by the Station Trio. 2.40, Concert of Selections by the Station Orchestra conducted by Nico Treep, with Violin Solos by Mr. v.d. Veldt. 7.40, Weather Forecast and News Bulletin. 7.45, Outside Relay of Vocal and Instrumental Concert. 10.40 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40.—8.10 a.m. to 9.10 a.m., Sacred Service with address and Vocal and Instrumental Music. 9.30 a.m., Relay of Protestant Church Service from the Keizersgrachtkerk, Amsterdam, Sermon by the Minister, the Rev. D. Sikker, Organ Prelude and Chanting of Psalms 42, 3, 63 and 84. 12.10, Concert by the Winkels Trio, followed by Talk and Concert. 5.30 (approx.), Relay of Church Service with Sermon and Organ Voluntaries followed by Evening Concert. 10.20 (approx.), Epilogue by the Choir. 10.40 (approx.) Close Down.

JUAN-LES-PINS (Radio L.L.), (434 metres); 1.5 kW.—1.0 to 2.0, Orchestral Concert, followed by a Programme for Children and a Talk by "Radiofo" (Marcel Laporte). 9.0, News of the Day, and Weather

Programmes from Abroad.—

LYONS (Radio Lyon) (291 metres) : 1.5 kW.—11.0 a.m., Concert of Sacred Music arranged by "La Maison Rabut." 12.0 Noon to 7.30, No Transmission. 7.30, "Le Journal Parlé," with Press Review, Topical Talk and News of the Day. 7.50 (approx.), Sports News for the day. 8.0, M. Soupiron, of "Le Nouveau Journal," Talk: Charles Voisin, the father of Aviation. 8.10, Orchestral Concert of Light Music. 9.15, Selections from the Dance Orchestra. 10.0 (approx.), Close Down.

MADRID (Union Radio), Call EAJ7 (375 metres) : 3 kW.—Programme relayed by Salamanca, EA)22 (405 metres).—2.0, Concert of Light Music by the Station Orchestra. 3.30 to 7.0, No Transmission. 7.0, Kiki and his friends in their programme for children, and musical selections by the Station Sextet. 8.0, Popular Dance Tunes by the Station Sextet. 8.30 to 10.0, No Transmission. 10.0, Time Signal and relay of Chimes. 10.5, Concert by the Engineers' Band under the direction of Don Pascual Marquina and Songs by Antonita Rojas. 12.0 Midnight, Programme of Dance Music by the "Palermo en Rosales" Orchestra. 12.30 a.m. (approx.) (Monday), Close Down.

MILAN, 1MI (549 metres) : 7 kW.—10.30 to 11.0 a.m., Concert of Sacred Music with Vocal Solos. 12.30, Time Signal. 12.32, Musical Programme by the Radio Quartette. 1.30 to 4.0, No Transmission. 4.0, Concert of Popular Selections. 5.25, Notes on Agriculture. 5.30, Programme by the Orchestra of the Majestic Hotel Diana. 6.0 to 8.25, No Transmission. 8.25, Opening Signal and News Bulletin. 8.35, Time Signal. 8.45 to 8.50, Sports News. 8.50, "Norma," Opera by Vincenzo Bellini, Talk by Ulderico Tegani in the Interval between Acts 1 and 2, Late News Bulletin and Sports News at the end of Act 2. 11.45 (approx.), Close Down.

MOTALA (1,380 metres) : 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,190 metres), Göteborg (416.5 metres), Malmö (260.9 metres), Östersund (720 metres) and Sundsvall (545.6 metres).—11.0 a.m., Morning Service relayed from a Stockholm Church. 12.35, Weather Report. 12.45, Exchange Quotations. 12.55, Time Signal. 5.0, Children's Corner. 5.55, Chimes from the Stockholm Town Hall. 6.0, Church Service relayed from a Stockholm Church. 7.45, Songs with lute accompaniment. 7.45, Concert of Orchestral Selections with Soloists. 9.15, General News Bulletin. 9.30, Weather Report. 9.40, Programme of Dance Music. 11.0 (approx.), Close Down.

MUNICH (535.7 metres) : 4 kW.—Programme relayed by Augsburg (566 metres), Kaiserslautern (277.8 metres) and Nuremberg (241.9 metres).—11.0 a.m., Relay of Chimes from the Town Hall, Munich. 11.15 a.m., Wireless Weather Chart for Bavaria. 12.0 Noon, Orchestral Concert. 1.0, Time Signal, Weather Report and Forthcoming Programme Announcements. 3.30 (approx.), Selections by the Radio Trio. 6.15 (approx.), Concert. 7.45, "The Countess Maritza," operetta in three acts by Kalman. 10.20, News Bulletin followed by Musical Programme. 11.45 (approx.), Close Down.

NAPLES, Call INA (333.3 metres) : 1.5 kW.—10.0 a.m., Morning Concert of Sacred Music. 4.45, Programme for Children. 5.0, Concert of Light Music, Artist: Signora Carla Spinelli (Vocalist). 5.30, Time Signal. 8.20, Press News. 8.40, Time Signal. 8.48, Naples Harbour Authorities' Report. 8.50, Orchestral Concert with Soloists: Selections from the works of Verdi; Fu la sorte dell'armi from Aida; Duet for Soprano and Mezzo-Soprano, Artistes: Signora H. Hisor and Signora R. D'Alba. 10.0, Sports News. 10.55, Calendar and Notes on tomorrow's programmes. 11.0 (approx.), Close Down.

OSLO (461.5 metres) : 1.5 kW.—Programme relayed by Fredrikstad (431.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrund (500 metres), Rjukan (448 metres).—10.59 a.m. (approx.), Carillon and Relay of Divine Service. 7.15, Weather Report and Press News. 8.0, Time Signal followed by Selections by the Station Orchestra. 9.30, Weather Report and News from the Press. 9.45, Current Topics. 10.0, Dance Music relayed from the Hotel Bristol in Oslo. 11.45 (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPIT (458 metres) : 0.5 kW.—Programme relayed at intervals by the following stations: Bordeaux PTT (275 metres), Eiffel Tower (2,650 metres), Grenoble (416 metres), Lille PTT (261 metres), Limoges (285 metres), Lyons PTT (476 metres), Marseilles (303 metres), Rennes (280 metres), Toulouse PTT (260 metres).—8.0 a.m., News Bulletin. 10.25 a.m., International Time Signal, and Meteorological Report. 12.0 Noon, Selections of Light Music. 1.0, Trade Notes. 1.30, Concert of Instrumental Music arranged by the General Association of French Wireless Listeners; La Croisade des

Sunday, September 23rd.

All Times are reduced to British
Summer Time and are p.m. except
where otherwise stated.

Enfants by Pierné. 3.0, Relay of Concert from the Concours Lépine; Selections of well-known Symphonies. 6.30, Le Radio-Journal de France. 8.0, Sports News. 8.30, Concert of Instrumental and Vocal Selections arranged by the General Association of French Wireless Listeners, followed by Late News Bulletin and Relay of Dance Music from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Höfelf Tower), Call FL (2,650 metres) : 5 kW.—8.56 a.m., Time Signal on 32.5 metres. 10.26 a.m., Time Signal on 2,650 metres. 6.45, Le Journal Parlé par T.S.F., Talks by Dr. Pierre Vachet: Portez-vous bien; Dectective Ashelbé: Police Anecdotes; M. René Casalis: Events in the Sports World. 8.10 to 8.20, Weather Report. 8.30, Concert by Mario Cazes and his Orchestra. 8.56, Time Signal on 32.5 metres. 11.26, Time Signal on 2,650 metres. 11.30 (approx.), Close Down.

PARIS (Petit Parisien) (340.9 metres) : 0.5 kW.—8.45, Popular Gramophone Records. 8.50, Talk. 8.55, General News Bulletin. 9.0, Concert of Instrumental Music followed by News Bulletin. 9.30 to 10.0, A Symphony Half Hour; Poco allegretto from the Third Symphony by Brahms. 10.0, General News Bulletin. 10.15, Selections of Orchestral Music. 11.0 (approx.), Close Down.

PARIS (Radio L.L.) (370 and 60 metres) : 1 kW.—12.30, Programme of "Radio Liberté"; News of the Day and Topical Talk. 12.10, Madame Guasco-Mondes, Cello Solos. 3.0, Dance Music Programme, arranged by "Les Etablissements Radio L.L."

PARIS (Radio Paris), Call CFR (1,750 metres) : 6 kW.—8.0 a.m., News Bulletin and Press Review. 12.0 Noon, Address by Father Pade: Le bonheur ici-bas se nomme l'Espérance; Recital of Choral and Instrumental Sacred Music, arranged by "La Vie Catholique," followed by Press News. 12.45, Orchestral Concert by the Albert Locatelli Orchestra. 4.30, The Grand Vatel Orchestra in a Dance Music Programme; in the Interval: News from the Press. 8.0, Agricultural Notes. 8.15, News Bulletin. 8.30, Orchestral Concert, under the direction of M. Eugène Bigot; in the Interval: Topics from the Evening Press and Late News Bulletin.

PITTSBURGH, Call KDKA (63 and 27 metres) : 25 kW.—4.0, Divine Service. 7.0, Roxy's Stroll, relayed from WJZ, New York. 11.0, Time Signal and Baseball Reports. 11.30, Outside Relay of Orchestral Concert. 12.0 Midnight, Time Signal and Baseball Reports, followed by Musical Selections. 1.0 a.m. (Monday), Programme from WJZ, New York. 2.15 a.m., Variety Programme from WJZ, New York. 3.0 a.m., Time Signal. 3.5 a.m., Variety Programme continued. 3.15 a.m., Baseball Reports and Teleciron Time. 3.30 a.m. (approx.), Close Down.

POSEN (344.3 metres) : 1.5 kW.—10.15 a.m., Relay of Sacred Service from a Polish Cathedral. 12.0 Noon, Time Signal. 5.0, Relay of Concert from Warsaw, Programme of Symphony Music. 6.30, Transmission by the League of Polish Youth. 6.45 to 7.15, Children's Corner, conducted by Madame Wanda Trojanowska. 7.45, Talk, relayed from Warsaw. 8.30, Vocal and Instrumental Concert. 10.0, Time Signal, followed by News Bulletin, Weather Forecast and Sports Notes. 10.20, Variety Programme. 10.40, Dance Music Selections, relayed from the "Palais Royal" Restaurant in Posen 12.0 Midnight (approx.), Close Down.

PRAGUE (348.9 metres) : 5 kW.—10.15 (approx.), Agricultural Report, followed by Musical Selections. 1.20, Topical Talk. 6.0, German Transmission, followed by Orchestral Programme. 10.0, Time Signal, General News Bulletin and Instrumental Concert.

RABAT, Call PIT (416 metres) : 2 kW.—9.30, Concert by the Station Orchestra. 11.30, Musical Selections by the Orchestra at the Jardin d'Eté in Rabat. 12.0 Midnight (approx.), Close Down.

RIGA (526.3 metres) : 4 kW.—10.15 a.m., Relay of Sacred Service (in Latvian). 1.0, Children's Corner: Stories and Songs. 4.0, The Radio Riga Orchestra, conducted by Arved Parups. 5.0 to 7.0, Four Talks. 7.0, Concert of Orchestral Items and Songs. 9.0, Weather Report. 9.30 (approx.), Relay of Dance Music from the Café de l'Opera. 11.0 (approx.), Close Down.

ROME, Call IRO (44.8 metres) : 3 kW.—10.15 a.m., Sacred Morning Concert by Orchestra and Soloists. 11.0 a.m. to 1.0, No Transmission. 1.0 to 2.0, The Station Trio in a Concert of Light Music. 2.0 to 5.0, No Transmission. 5.0, Opening Signal. 5.0 to 6.0, Relay of Dance Programme from the Casinetta. 8.0, Opening Signal and News of the Day. 8.20, Talk for Agriculturists. 8.30, Sports News and General News Bulletin. 8.59, Time Signal. 9.0, Concert by the Grand Symphony Orchestra and Soloists: The Third Symphony in E Flat Major (The Eroica Symphony) by Beethoven, (a) Allegro con brio, (b) Marcia funebre—Adagio assai, (c) Scherzo—Allegro vivace, (d) Finale—Allegro molto, Un poco andante, Presto; Talk in the Interval. 11.5, Late News Bulletin. 11.15 (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres) : 30 kW.—3.30, Divine Service from the First Baptist Church, relayed from Syracuse, N.Y.; Address by the Pastor, Dr. Bernard C. Clausen. 10.30, The New York Ballad Singers in their repertoire. 11.0, The "Steison Parole" Programme of the American Legion Band, relayed from Boston, Mass. 12.0 Midnight, Relay from New York. 12.30 a.m. (Monday), relayed from the Capitol Theatre New York. 2.0 a.m., Talk by the Editor of the "United States Daily," relayed from Washington, D.C. 2.15 a.m., The Atwater Kent Half-hour, from New York. 2.45 a.m., Time Signal. 2.47 a.m., A Biblical Drama, relayed from New York. 3.15 a.m., Experimental Transmission of Television Signals. 3.30 a.m. (approx.), Close Down.

STUTTGART (379.7 metres) : 4 kW.—11.0 a.m. (approx.), Morning Concert. 2.0, Children's Corner relayed from Berlin. 3.0, Talk. 7.40, Sports News. 8.0 (approx.), Concert of Vocal and Instrumental Music followed by News Bulletin and Sports Notes.

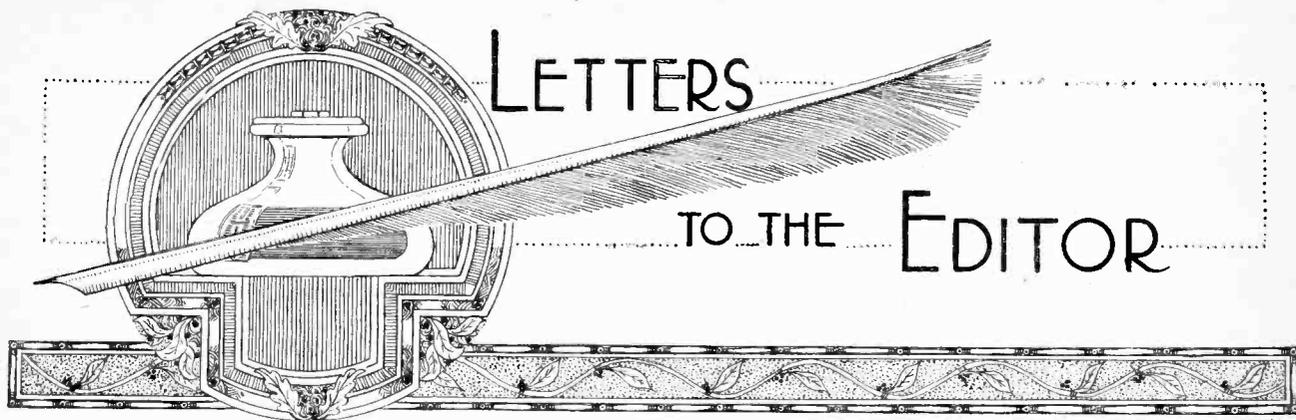
TOULOUSE (Radiophonie du Midi) (391 metres) : 3 kW.—12.30, Weather Forecast, Market Prices for Toulouse and Exchange Quotations. 12.45, Vocal and Instrumental Concert. 1.0, Time Signal (Carillon). 1.45, News from the Press. 8.0, Exchange Quotations from Paris, Prices of Cereals and News from the Fournier Agency. 8.15, News from the daily papers, "La Dépêche" and "Le Petit Parisien." 8.30, Concert of Light Music. 9.0, Concert of Popular Music: Selections from Mireille by Gounod; (a) Overture, (b) Chœur des Magnanailles, (c) Vincennes, à votre âge, (d) Chœur farandole, (e) Waltz, O légères hirondelles, (f) O Magali ma bien-aimée, (g) Trahir Vincent, (h) O toi mon âme je suis ta femme, (i) Ange du paradis, (j) Chœur des Saints Marie. 10.15, "Le Journal sans papier," with news from North Africa, followed by Late News Bulletin. 10.30 (approx.), Close Down.

VIENNA (577 and 517.2 metres) : 1.5 and 15 kW.—Programme relayed by Graz (357.1 metres), Innsbruck (294.1 metres), Klagenfurt (272.7 metres) and Linz (254.2 metres).—11.0 a.m., Concert by the Vienna Symphony Orchestra. 4.0, Orchestral Concert of Light Music. 8.5, "The Letter," Play in Three Acts by W. Somerset Maugham, under the direction of Dr. Hans Nüchtern. 11.0 (approx.), Close Down.

VILNA (435 metres) : 1.5 kW.—10.15 a.m., Relay of Cathedral Service. 12.0 Noon, Time Signal 4.0, Talk from Warsaw. 5.0, Concert relayed from Warsaw. 6.50, Talk relayed from Warsaw. Dr. W. Wajda: The Democratic Ideal in the United States. 8.30 (approx.), Concert. 10.0, Time Signal and General News Bulletin relayed from Warsaw. 10.30, Dance Music. 11.30 (approx.), Close Down.

WARSAW (1,111 metres) : 10 kW.—10.15 a.m., Relay of Morning Cathedral Service. 12.0 Noon, Time Signal and Fantasia from Notre Dame Church, Cracow. 12.10 to 3.55, No Transmission. 3.55, Weather Report. 4.0 to 5.0, Three Talks for Farmers. 5.0, Instrumental and Vocal Concert. 6.30, Variety Programme. 6.50, History Talk. 7.45 to 8.10, Talk. 8.30, Orchestral Concert. The Male Choir of the "La Harpe" Choral Society, conducted by W. Lachman, assisted by the P.K. Orchestra. 10.0, Time Signal, Aviation Notes and Weather Report. 10.5, Late News Bulletin. 10.20, Police News and Sports Notes. 10.30, Dance Music relayed from the Oaza Restaurant, Warsaw. 11.30 (approx.), Close Down.

ZURICH (558 metres) : 1 kW.—11.0 a.m. (approx.), Concert by the Zurich Station Orchestra. 12.29, Weather Report. 12.30, Selections by the Station Quintet. 4.0, Orchestral Concert relayed from the Carlton Elite Hotel. 7.30, Time Signal. 7.33, Religious Address. 8.0, Instrumental Concert. 8.30, Relay of Programme from the Grossmünster, Zurich, Organ Recital by Victor Schlatter: Old and New Italian Compositions for the Organ; 10.0, General News Bulletin. 10.20 (approx.), Close Down.



The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Tudor Street, E.C.4, and must be accompanied by the writer's name and address.

B.B.C. CONTROL ROOM.

Sir,—Is it not nearly time that the B.B.C. changed their method of transmitting speech? Announcements are pushed through at umpteen times their natural strength.

The London station seems to be the worst offender in this respect.

If the receiver is left untouched after an orchestral item has been put through, the following announcement sounds like some giant forty feet in height bellowing through a megaphone.

I understand that this is done so that the few crystal users in existence at the present time will be able (by much concentration) to catch what is being said.

Surely it is nearly time that the crystal user was left out of the question, for in these days of cheap valves, low filament consumption, and very cheap batteries, he is getting as antiquated as the crinoline.

J. T. OFFORD.

Romford, Essex.

September 8th, 1928.

Sir,—I would like through the medium of your correspondence columns to continue the subject of volume control at present found necessary by the B.B.C. in their transmissions.

Listening a week or so ago to a Wagner prom., I was much struck with the absolute failure of the transmission to do justice to several of the pieces. I have a gramophone record of one of them which quite surpasses the broadcast version simply because it conveys a fairer representation of the changes in volume from the orchestra. By this I do not accuse the person on the control of mishandling. What seems to be required is the abolition of such a person. Admittedly this is an ideal, but steps in this direction appear to be very desirable, and I think a statement by the B.B.C. that such an improvement can be expected, in the new regional stations, would be welcomed by all who are keen to further the progress of reproduction by radio.

If they really think that this improvement is impossible, I can only suggest that the controller's name be published, in the same light as that of conductor, when issuing programmes.

Ilford, Essex.

E. C. HUGHES.

September 7th, 1928.

COMPROMISE.

Sir,—Like your correspondent, Mr. H. H. Dyer, I have followed the articles on "Compromise in Receiver Design" with great interest, but one can hardly call Mr. Dyer's remarks a fair criticism of the writer's discussion of the merits of cone and horn loud speakers. The writer was careful to say "the average horn type speaker," and one cannot by any stretch of imagination call one with an 8ft. 6in. horn "average."

At the same time, I do not think justice has been done to the commercial horn speakers of good design.

C 45

One I have carefully compared with a good cone speaker using a choke output, a 3,000-ohm valve, and 120 volts H.T. The organ recitals on Mondays were used for the purpose of testing. No difference in the volume or quality of the pedal notes could be detected, except, perhaps, that the "colouration" of the cone speaker lent emphasis to the lower notes. The volume was just sufficient to cause slight overloading on loud passages.

With both speakers, lessening the input, by a grid circuit resistance to the H.F. valve, caused a decided reduction in the bass notes, and was especially noticeable in the case of the horn speaker!

Thus a good commercial speaker with a horn of exponential shape, even though theoretically its "cut-off" may be rather high, will give a good response to notes well below 200 cycles, which the writer of the articles suggests as the lower limit for speakers of this type.

A. L. THORNE.

Tunbridge Wells.

September 6th, 1928.

HEADPHONE REPRODUCTION.

Sir,—Your correspondent, Geo. F. Pohn, is surely a little optimistic when he says, "listening through headphones can give absolutely distortionless reproduction."

Even supposing he was fortunate enough to have a receiver which could achieve this greatly to be desired end, it would be interesting to know how he proposes to overcome distortion caused by the telephone diaphragms having a natural period of their own.

Our reason for entering into this correspondence is because we believe that a considerable amount of harm can be done to the industry by the spreading of the ideas:—

- (1) That realistic reproduction requires a super power valve, and high anode voltages, and
- (2) Distortionless reproduction can only be obtained through a crystal set and headphones.

Perhaps one of your technical staff could be prevailed upon to publish an article showing the actual reproduction curves of the reception obtained from a well-designed amplifier with a coil-driven loud speaker, as against the reproduction obtained from a crystal receiver and a pair of headphones.

We have always understood that the crystal detector is very far from being distortionless, and our own experience of headphones is that very considerable distortion takes place by their use.

We emphatically disagree with your correspondent when he suggests you can get the "real thing" by such methods, although we entirely agree with him in his suggestions regarding local atmosphere.

EAGLE ENGINEERING CO., LTD.

COLIN H. GARDNER.

Warwick.

September 4th, 1928.

READERS'

PROBLEMS

"The Wireless World" Supplies a Free Service of Technical Information.

The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.

A Fallacy.

I notice that it is sometimes recommended that the field coils for moving coil loud speakers should be wound on brass bobbins, with a view to preventing interference from irregularities in a D.C. supply system. Would it not be an advantage to use these brass bobbins in the construction of L.F. smoothing chokes?

S. C. S.

The two cases are not quite parallel, and there would be no advantage gained by winding an L.F. choke on a brass spool; this procedure is incorrect.

○○○○

The "Everyman Four" on a Frame Aerial.

I am shortly moving into a flat where it will be impossible to erect an outside aerial, and am wondering whether it would be possible to operate my "Everyman Four" from a frame. If so, how should it be connected to the set?

T. F.

Unless local conditions are exceptionally bad, the "Everyman Four" with a frame aerial of reasonable dimensions can be relied upon to provide full volume at distances up to fifty miles or more in daylight. To make the conversion, it is only necessary to replace the present grid coil of the H.F. valve by the frame, but it should be pointed out that instability may be produced by interaction between its winding and the H.F. transformer. The frame should accordingly be mounted at some distance from the receiver; or, alternatively, the H.F. stage may be completely screened.

Perhaps you will find it simpler to use a short indoor aerial, which will almost certainly give equally good results.

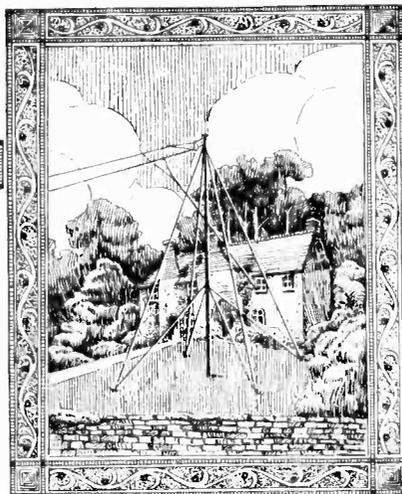
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Parallel Feed.

What is a "parallel feed" H.F. amplifying circuit, as applied to a screened grid valve? I understand that it is very stable, and should like to try it, using leaky grid detection and reaction.

A. T. W.

This description is generally applied to an H.F. amplifying stage in which H.T.



is fed to the anode through an H.F. choke; this component must be of high efficiency as it is, in effect, connected in parallel with the tuned grid coil of the succeeding detector valve. The arrange-

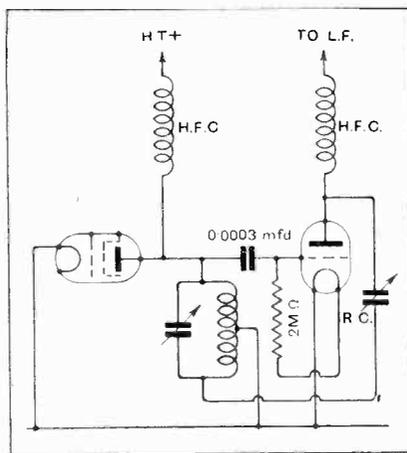


Fig. 1.—A screened-grid amplifying valve with H.T. feed through a choke.

RULES.

- (1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."
- (2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.
- (3.) Designs or circuit diagrams for complete receivers cannot be given; under present-day conditions justice cannot be done to questions of this kind in the course of a letter.
- (4.) Practical wiring plans cannot be supplied or considered.
- (5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.
- (6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers. Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

ment is as shown in Fig. 1, from which you will see that the "Hartley" method of reaction control is suggested, as it can easily be used with a centre-tapped coil.

○○○○

H.T. Extension Leads.

My "New All-Wave Four" is supplied from a large capacity accumulator battery of 160 volts, which, as you can imagine, is rather bulky. Instead of keeping it on the same table as the receiver, would it be practicable to install it in another room? I should prefer to adopt this course, if you can assure me that it would not result in any falling off in efficiency.

W. H. L.

The four anode circuits of the receiver in question are so arranged that signal currents—either at high or low frequency—do not pass through the battery, and there is no reason whatsoever why you should not install your H.T. cells at a considerable distance from the receiver.

○○○○

Unsuitable H.F. Chokes.

I have been advised to fit an H.F. choke in the grid circuit of the first stage L.F. amplifier of my set (2-V-2), in order to keep H.F. circuits out of the L.F. amplifier. Would it be permissible to use a large-size plug-in coil (of which I have a number available) for this purpose?

C. B.

Nowadays it is not recommended that ordinary tuning coils should be used as H.F. chokes. In the first place, the inductance of the largest size in common use is insufficient for many purposes; and furthermore, the physical size is unnecessarily great; this leads to the risk of trouble through unwanted couplings with other windings in the receiver. These couplings are specially to be avoided in a receiver with two H.F. stages, such as that you are using.

○○○○

Increasing the Range of a Milliammeter.

My milliammeter has a scale reading of 0.10mA. This was quite satisfactory when using ordinary valves, but since I have installed a super-power valve in the output stage, I find that the range covered is insufficient. Is it possible to make an easy alteration to the instrument, so that currents up to, say, 20 milliamps may be read?

W. W. M.

It is by no means difficult to modify your meter so that heavier currents may be measured. To double its scale reading, a resistance equal in value to the internal resistance of the meter should be connected in shunt with its terminals.

c 46

The Wireless World

AND
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As many of the circuits and apparatus described in these pages are covered by patents, readers are advised, before making use of them, to satisfy themselves that they would not be infringing patents.

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OLYMPIA, 1928.

Our Show Number and Voting Competition.

THE doors at Olympia have opened once again to reveal to the public the products of a year of intensive research and development work on the part of the British radio manufacturers. We hope that our Show Number of *The Wireless World*, taken in conjunction with our Guide to the Show of last week and our third Show Number, in which we propose to review the trend of progress, will provide a very complete record of broadcast receiving equipment of to-day.

Progress of the Wireless Industry.

The progress which the industry has made is, we think, reflected not only in the bulk but also in the interest to be found in the pages of our Show Number. In the past the public have been inclined to be satisfied with almost anything which called itself a wireless set and which would receive the broadcast programmes, but to-day the public are much more critical of the

performance of the medium through which the broadcasting programmes are to be brought into their homes, so that we see evidence of a keener rivalry between the various British manufacturers of radio equipment, resulting in departure from stereotyped designs and a definite lead towards individuality, with a consequent wide variety of apparatus from which the public can make their choice.

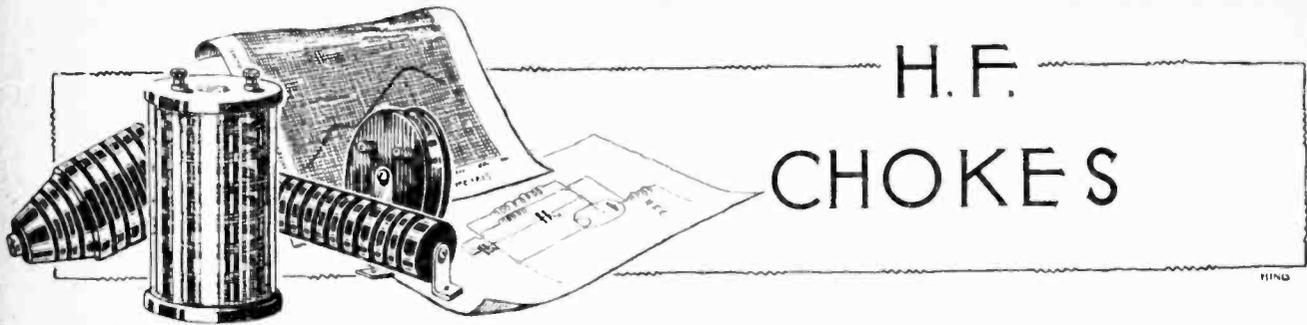
"Wireless World" Show Competition.

Just by reason, perhaps, of the increase in variety of apparatus, it is becoming more and more difficult to pick out what are the best products of the Show, and it is the appreciation of this difficulty which has prompted us to conduct the ballot which we announced in our issue of last week. We are most anxious that every reader of *The Wireless World* should record his vote for the apparatus which appeals to him as the best of its class in the various categories into which we have divided the exhibits as a whole. We believe that every reader of *The Wireless World*, whether he is able to visit the Exhibition personally, or has to depend solely on the Show issues of the journal for his information, makes up his own mind as to what he considers to be the outstanding feature of the Exhibition, and adds to this choice his opinion as to the best set, the best loud speaker, and so forth.

What the Voting Will Reveal.

Our object in conducting the Olympia Show Competition is to accumulate the views of every individual reader and to analyse them so that we can arrive at a result which will place the outstanding exhibits at the Show in order of merit as decided by our readers. To stimulate interest in the voting, *The Wireless World* is presenting prizes to the winning competitors as decided in accordance with the rules printed with the entry form, which is to be found in the advertisement pages of this issue.

The prizes being offered to the successful entrants are a first prize of £50 in cash, and second, third, fourth, and fifth prizes to the total value of a further £50 in the form of vouchers for the purchase of apparatus. Only apparatus exhibited at the Olympia Show may be included in the votes, and in making their choice readers should not omit to take into consideration the value of apparatus at the price asked for it, in order to ensure that low-priced apparatus may receive the same attention as expensive equipment when making a selection.



Principles of Design for Use in Broadcast Receivers.

By F. L. DEVEREUX, B.Sc.

THE H.F. choke is universally recognised as a device which offers a high impedance to radio frequency currents without introducing appreciable D.C. resistance into the circuit in which it is connected. As to the manner in which this desirable result is achieved there is considerable divergence of opinion. The explanation generally given is that the H.F. choke is essentially an inductance, and that its impedance is therefore proportional to the frequency or inversely proportional to the wavelength applied.

The conception of the H.F. choke as an inductance arose by analogy with the low-frequency choke which was a commonplace in electrical engineering long before its high-frequency equivalent was thought of. The reactance of such a choke at the frequencies used in power engineering is inductive, and the effect of any capacity it might have is entirely negligible. But at radio frequencies the association of capacity with inductance can mean only one thing—*resonance*. When it is realised that the capacity across a choke is raised by 10 or 20 micro-microfarads immediately it is inserted in a receiver circuit there can no longer be any doubt that every H.F. choke resonates well and truly at some well-defined wavelength.

The curve of Fig. 1 is typical of the majority of H.F. chokes on the market to-day, and clearly proves that the H.F. choke must be treated as a tuned circuit. The resonant frequency of this choke is 2,000 metres, and it will be seen that although the impedance to H.F. is 227,000 ohms on the Daventry wavelength (1,600 metres) it

falls off to 20,000 ohms at 500 metres. This falling off is serious if the choke is to be used for coupling the H.F. valves in a portable set, but in capacity-controlled reaction circuits is fortunately not so important since the impedance of the reaction condenser also falls as the wavelength is reduced, and is able to compensate for the falling off in H.F. current available at the anode. However, any means by which the falling off of impedance with increase of frequency could be remedied would be useful, and many suggestions for the achievement of this end have been made.

For instance, it has been suggested that if the sections of a choke, instead of being made all the same size, are wound with progressively increasing numbers of turns, each section will be able to deal with a selected band of frequencies, and that in this way the choking effect will be spread evenly over a wide range. The fallacy in this argument is to be found in the fact that the sections are all tightly coupled together; the arrangement, therefore, behaves as a single circuit

In spite of the widespread use of H.F. chokes in modern receivers, designers do not appear to have reached any general agreement as to the type which best satisfies the conditions of broadcast reception.

The present article clears up many misconceptions which have gained currency regarding the true function of the H.F. choke and explains the principles underlying its design.

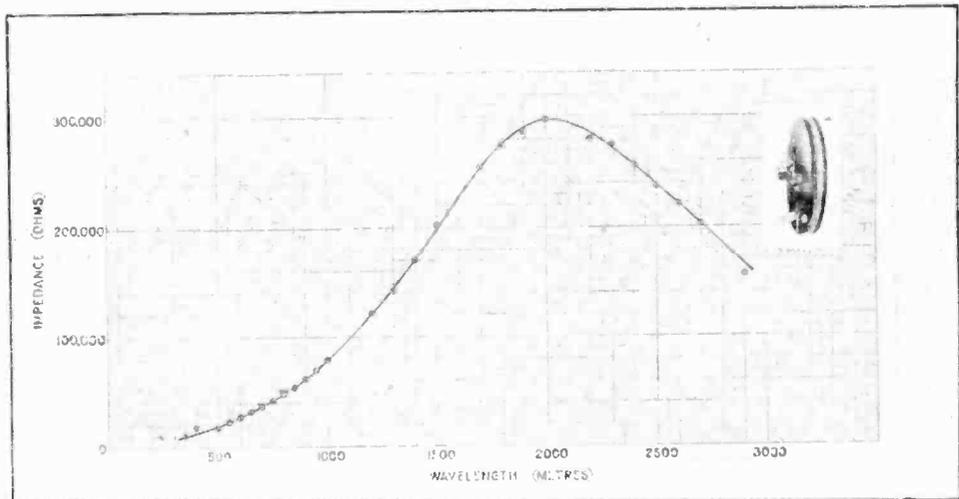


Fig. 1.—Curve showing variation of impedance with wavelength of a typical single-slot-wound H.F. choke; external capacity $8 \mu\mu\text{F}$.

H.F. Chokes.—

in which the separate inductances and capacities are linked together. Experimental proof of this is given in Fig. 2.

Another suggestion is that two chokes should be connected in series, one designed for short waves and the other for long waves. To this end a short-wave choke was wound with the object of using it in conjunction with the long-wave choke shown in Fig. 1. Actually the resonant frequency of the short-wave choke turned out to be a bit low for use on the 300-500 metre band, but this is immaterial to the discussion of the principle involved.

The chokes were first connected in series as in Fig. 4, but without the 20 micro-mfd. by-pass condenser. The impedance curve showed no trace of the influence of the short-wave choke. The combined curve had the same form as the long-wave choke (Fig. 1), but the peak was shifted slightly to the right. In spite of the fact that both chokes were separately screened, it would appear that, without the by-pass condenser, their constants combine to form one circuit when the connecting wire at the point A is electrically free. Immediately this point is tied down by the by-pass condenser the

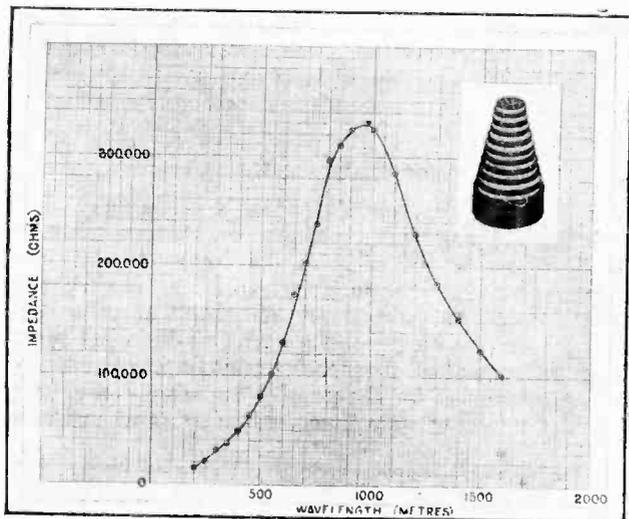


Fig. 2.—Experimental cone-shaped choke with sections of gradually increasing turns; the curve shows that this choke behaves as a single circuit.

effect of the short-wave choke makes itself apparent in the combined curve (see Fig. 5), though the increase of impedance below 500 metres is not as great as might be expected by the addition of the separate curves in Figs. 1 and 3. An increase in the capacity of the by-pass condenser would effect an improvement, but as this condenser is connected by the H.T. battery in parallel with the long-wave choke its capacity must be kept low if the performance of this choke is not to be impaired. Actually, 20 micro-mfd. was the minimum value which would produce any sign of a hump in the curve in the vicinity of 500 metres.

Having obtained a choke with the improved curve of Fig. 5 we will now consider whether it is of any practical value. It will be necessary first of all to examine the case of a single choke connected in the anode cir-

cuit of a valve as in Fig. 6. We have already satisfied ourselves that a choke is a resonant circuit; from Fig. 6 it is obvious that it is a *parallel* resonant circuit. In other words any H.F. current which flows is divided between the capacity branch and the inductive branch with its resistance. In a *series* resonant circuit the current is the same in all parts of the circuit, but in *parallel* resonance the currents in the two branches may be widely different. Actually the current is greatest in the capacity branch at wavelengths below resonance, and it is not until the wavelength exceeds resonance

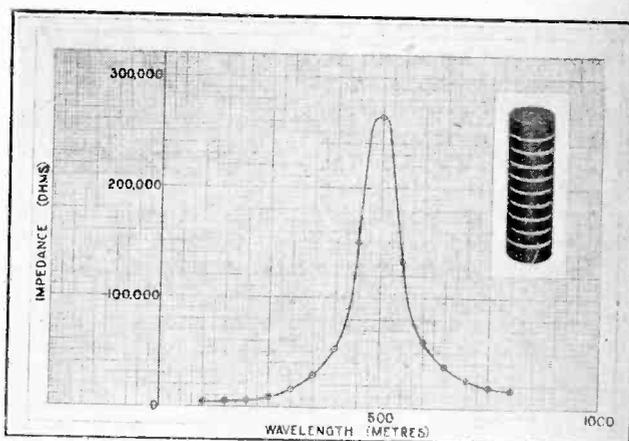


Fig. 3.—Experimental short-wave choke.

that the greater current transfers to the inductive branch. Fig. 7 illustrates this point diagrammatically. On the left-hand side of resonance the impedance of the choke may be represented by capacity and resistance in *series*, and on the right-hand side by an inductance and resistance in series. Most chokes are worked at wavelengths below resonance so that it is the self-capacity which does the choking and not the high inductance marked in plain figures on the carton!

In Fig. 6 the anode-filament capacity C_{af} is in parallel with the choke and merely tends to raise its natural resonance, but the anode-grid capacity C_{ag} serves

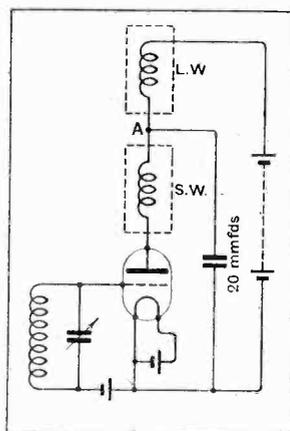


Fig. 4.—Long-wave and short-wave chokes connected in series to improve choking effect on short waves.

to transfer H.F. energy back to the grid. The phase of the H.F. voltage returned to the grid in this way will depend on whether the choke is being worked on the capacitive or the inductive side of resonance. If the choke is worked below the resonant wavelength the reaction effect is negative and the valve cannot oscillate; above the resonant wavelength the reaction effect is positive, and the valve will oscillate without any coupling between the anode and grid circuits other than the valve capacity C_{ag} .

H.F. Chokes.—

Connected as in Fig. 4 the experimental combined choke produced oscillation between 410 and 450 metres and also above 2,650 metres as indicated by the shaded areas in Fig. 5. It will be noticed that these oscillation bands occur only on the right-hand slopes of the resonance humps where the reactance is inductive.

The next step was to investigate the behaviour of the combined choke in a conventional capacity-controlled reaction circuit of the type shown in Fig. 8. The reaction condenser R.C. had a maximum of 0.0003 mfd., and the scale readings required to produce oscillation at different wavelengths are presented in the form of the curves of Fig. 9. Reading along the condenser zero line it will be observed that oscillation occurs between 502 and 547 metres. The coupling causing this oscillation is not the reaction

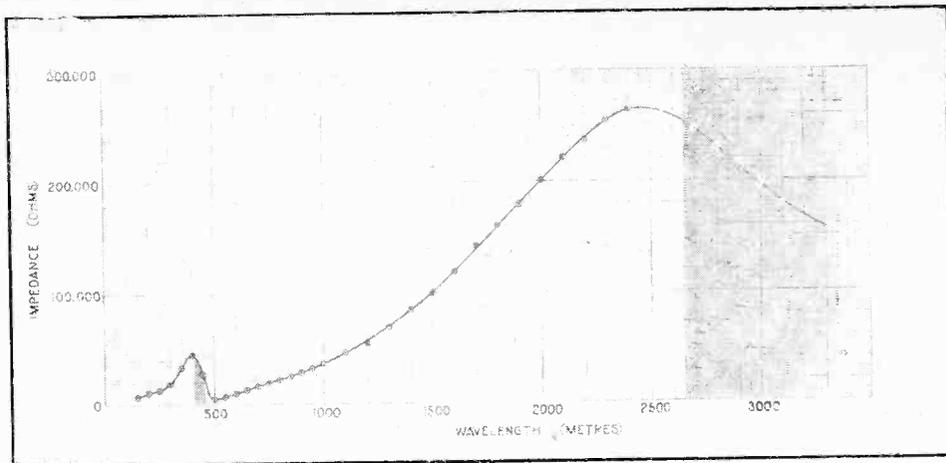


Fig. 5.—Combined curve of the chokes in Figs. 1 and 3, connected as in Fig. 4. The shaded areas represent zones of oscillation when connected in anode circuit of a D.E.H.210 valve.

coil and condenser R.C. but the capacity C_{ag} . When the capacity of R.C. is increased the intentional reaction circuit takes control and oscillation occurs over the upper shaded region. At 550 metres and 590 metres considerable reaction is required to produce oscillation, and between these two points the circuit is unstable, and the wavelengths of the oscillations no longer correspond with the wavelength scale as determined by the tuned grid circuit L_1C_1 . It was found that

receiver designed to cover a continuous band of wavelengths, but may be used in a set designed for the 300-500 metre band and the Daventry wavelength of 1,600 metres, when it can be arranged for the "blind spot" to occur, say, at 700 metres, where it will not interfere with reception. But do the results obtained justify the added complication? Between 400 and 500 metres in Fig. 9 the combination of long and short-wave chokes reduces the reaction condenser setting by only two degrees.

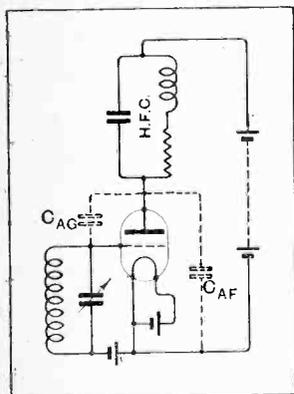


Fig. 6.—Circuit showing valve capacities which influence the performance of an H.F. choke.

midway between 550 and 590 metres the oscillations occurred on 525 metres, which corresponds with the peak of the lower oscillation curve. The obvious conclusion is that reaction due to the valve capacity takes control over this band, and, being of opposite phase to the reaction supplied by R.C. and L_2 , produces what is commonly known as a "blind spot." Theoretically, of course, the gap in the upper curve in Fig. 9 should coincide with the lower humped curve, but the effective capacity across the choke is raised when the scale reading of R.C. is increased which results in the "blind spot" being shifted to the left.

In order to show that the "blind spot" was not due to any intrinsic quality of the reaction circuit L_2 , R.C., the short-wave choke was removed, leaving only the long-wave choke and the by-pass condenser in the anode circuit. This arrangement gave the perfectly uniform result shown by the dotted line.

Chokes in series must therefore be ruled out in a

Rules for Designing H.F. Chokes.

It would appear, therefore, that a single H.F. choke is best. Although its impedance on the 300-500-metre band is low compared with the impedance at 1,600 metres, it is yet able to divert sufficient H.F. current for the purposes of reaction. We should therefore concentrate on the single choke and find by what means its impedance at all frequencies may be increased.

The expression for the parallel impedance of a tuned circuit containing inductance, capacity, and resistance

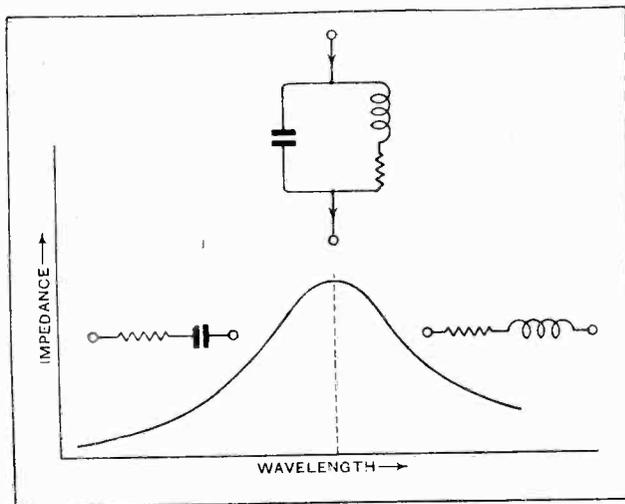


Fig. 7.—At wavelengths below resonance a H.F. choke functions principally as a capacity and at wavelengths above resonance as an inductance.

H.F. Chokes.—

is exceedingly complex by comparison with the corresponding expression for *series* resonance. Further, in the case of the H.F. choke the self-capacity and H.F. resistance terms are interdependent, and no mathematician has yet succeeded in producing a working formula. As a first approximation, however, the parallel impedance may be written as follows:—

$$Z_p = \frac{L}{C\sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2}}$$

At resonance $\omega L = \frac{1}{\omega C}$, and the expression simplifies to

$$Z_p = \frac{L}{CR}$$

The method of winding which gives the highest in-

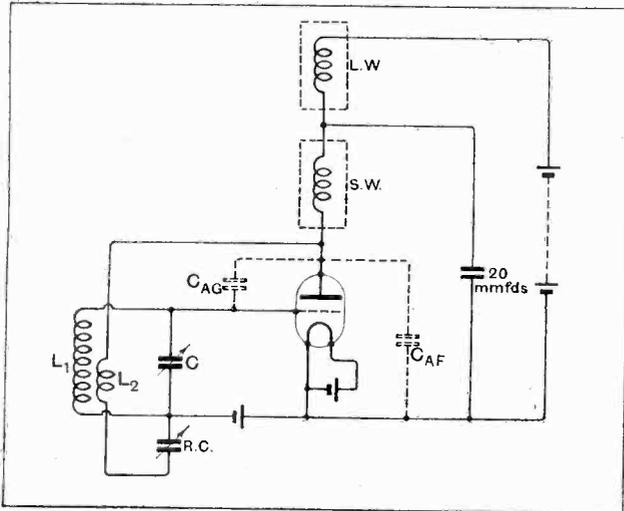


Fig. 8.—Capacity controlled reaction circuit making use of the experimental combined H.F. choke.

ductance with the lowest self-capacity and resistance will make the best H.F. choke. It should be noted that the resistance R is the high-frequency resistance which may be three or four times the D.C. resistance. The

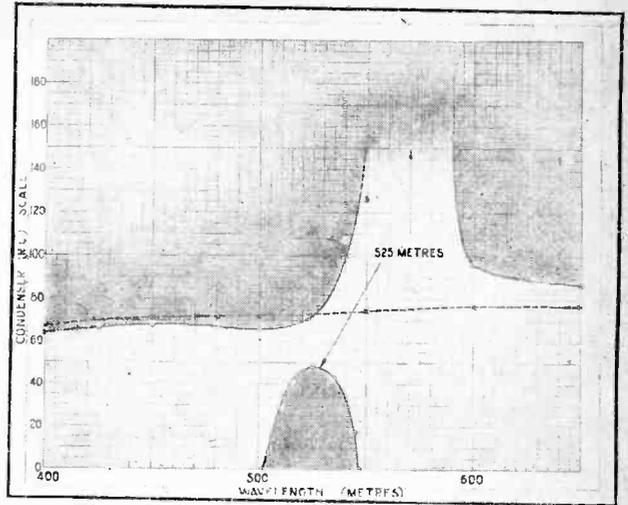


Fig. 9.—Curves showing the degree of reaction required to produce oscillation in the circuit of Fig. 8.

ratio $\frac{L}{R}$ is best for a compact coil; incidentally, a compact coil gives a reduced external field and reduces coupling with other circuits in the receiver. As the turns are increased, the ratio of increase of inductance outstrips the rate of increase of self-capacity, and this gives a better $\frac{L}{C}$ ratio. But as the turns are increased the resonant wavelength is raised, and the higher it is raised the lower will be the impedance on the 300-500-metre band, which will recede farther down the foot of the resonance curve.

The rules for winding an H.F. choke for broadcast wavelengths may be summarised as follows:—

- (1) Find experimentally the form of winding which gives the greatest $\frac{L}{CR}$ ratio.
- (2) Wind turns on this system until the resonant wavelength of the choke *in circuit* is just higher than the longest wavelength to be received.

MOVING COIL SUPPORTS.

VARIOUS materials have been suggested at one time and another for the "surround" of the cone in a moving-coil speaker; among them are pure rubber, rubberised fabric, such as is often used for aprons or for the mackintosh covers of tennis rackets, oiled silk, and thin leather.

The writer of the present note has not yet tried all these materials in practice, but has come up against an unexpected difficulty in the case of oiled silk. This was chosen in the first place as a support because it is particularly convenient to handle; it does not stretch like rubber, and so is easy to smooth out into an evenly taut sheet upon which the cone can be mounted. Further, since it is transparent, the central hole can be cut out very easily with the aid of a safety-razor blade *after* the cone is securely in position, so that one is spared

the difficulty of dealing with an unsupported ring.

It was found, however, after the loud-speaker had been in use a short time, that the oiled silk had become so slack that the moving coil was rattling against the magnet on low notes, the accuracy of centring having been entirely lost. Owing to lack of opportunity, the cone was not re-mounted immediately, and when the job was tackled a few days later it was found that the silk was once again taut and that the moving coil had returned to its original position.

Subsequent observation has suggested that the oiled silk is affected to a considerable extent by atmospheric conditions and by temperature, so that in spite of the advantages it offers during the assembly of the speaker it proves in extended use to be hardly as satisfactory a support as one would like.

LOTS of people keep a diary really and truly. This typically records what time the writer had tea and where. Other people, when they are very young, keep a diary in which they record their adolescent yearnings, with no relation to current events. Other people keep diaries sporadically and in skeleton, and can then fill up the gaps from their imagination. This latter is by far the most interesting form of diary; it leaves room for most interesting padding; one can always, if writing reminiscences, make the most cunning pen pictures of things just exactly as people believed they must have happened. This upsets nobody (except those who know the truth) and makes for the largest circulations.

Thus, when asked to write about my wireless reminiscences, I turn back to my old engagement books and see "Dine R. 8 o'clock Romano's." I recollect the conversation, what we drank, the exact state of development of broadcasting at that time, etc., etc. My only difficulty is, however, to compass six years in 60 lines—where to start? what to say amid this wealth of material?

Perhaps, however, a random search among the years will reveal something of interest, and as every story must have a moral, may serve to show what progress has been made.

Site Hunting in the Early Days.

First impressions of the B.B.C. are vivid enough. We had one office for the whole staff except the general manager (the present Sir John Reith), who had a side cupboard in which to interview all and sundry. There was Burrows, director, and Lewis, assistant-director of programmes; Anderson, the secretary; Page, helping Anderson; Miss Shields, secretary to Mr. Reith; and myself. Of these, Sir John, Page and myself still cling to the ship. Sir John is the



"—a side cupboard in which to interview all and sundry."

senior member of the B.B.C. both in his position and his length of service. It was he who set me on to my first job of finding a site for the London transmitter. I climbed to the top of Magnet House through a trap on to the leads, took a look round, spotted an enormous chimney, located it on the map, took bus and tube thitherwards, presented my new and beautiful card to the door-keeper of the owners of the chimney, interviewed the chief engineer of the concern and came out again. The engineer had not heard of broadcasting, and was not much impressed, I think, with what he saw of it sitting in his office, and politely indicated that his chimney was not a *great*—good morning.

Then we went to places all quite suddenly. "Mr. Reith wants you": with a few words of advice and encouragement, a hastily bought toothbrush and a tele-

gram to one's wife away in Essex, one stepped into a sleeper at Euston and woke to see the border hills in snow slipping past one's window.

Capt. Round was much (as he is now) my friend, mentor and adviser. Microphones! how he worked on microphones. I remember he had one that involved a packing washer and only a sixpence sufficed. One night an engineer of his, kept late, found himself without his tramfare and removed the packing washer. That microphone, we thought, was never so good again.

New premises occupied one. I was the only engineer in the B.B.C. for a month, and premises seemed my chief occupation then and thereafter for two years. It is a curious feeling, landing unknown, unhonoured and unsung, in a large provincial town to find a place for a studio, rent not more than £80 a year for offices, and everything must be central and "dignified," etc., etc. Those long, long trails of black, shining pavements slippery in the light of November street lamps! The depression of a rat-haunted warehouse that "might do"; but was there a lift? The acute excitement of seeing it come into shape; the opening nights with the odder screened corners carefully screened by ornamental palms hired from the local florist; the speeches, "This instrument forged in the minds of scientists, built by engineers, guided by industrious organisers, bids fair to mould the destinies of the world to an extent undreamed of even in these days of miracles"; (engineer *sotto voce*), "It is going out all right? Big Ben's on the line—" "Well, switch off the speaker." "We can't: he's Sir—" "Oh! never mind, Mr. Reith says—but—that plug, you fool, not *that* one!"



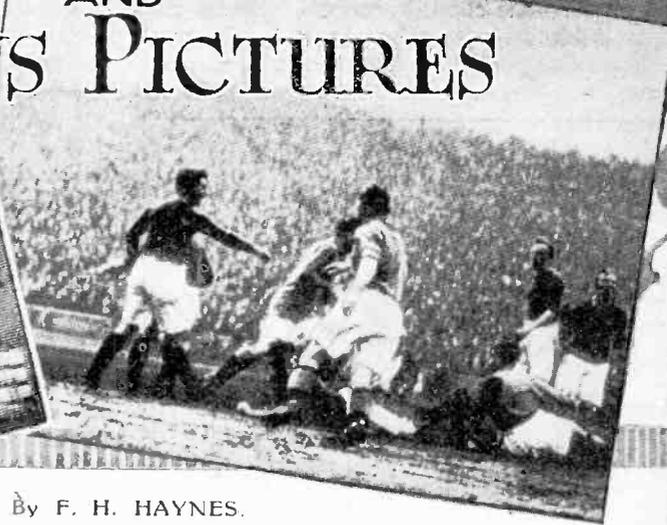
"—the odder corners carefully screened by ornamental palms—"

The Days of Hit-and-miss are Over.

It is too short an article to do more than indicate those hectic days. Microphones built of wood and rope, plasticine and optimism. Amplifiers covered with cigarette ends with pendulous valves hung up by their own connections in a room where one dared not move for fear of ponging. Studios with layers and layers of draping and deeper layers of fug, artists with coats off dripping and singing, enthusiasm, mistakes, inquisitors. Glorious days to look back on; but I think I prefer to feel more reliability, more stability and polish; on my side of the picture, anyway. I would not go through the agony again of waiting for a "big speech" when, if one little thing went wrong, it was a failure; we never could afford spares in those days, and speakers were blasé about the microphone itself.

There is so much more to be done, but, sadly enough in some ways, never in the hit-and-miss improvisations of former times.

PICTURE BROADCASTING AND NEWS PICTURES



By F. H. HAYNES.

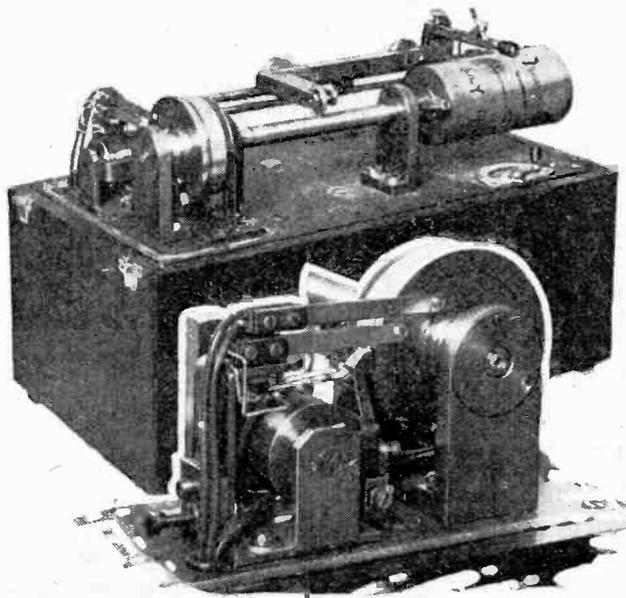
ALMOST at once announcements are to be made that a picture-broadcasting service has been inaugurated with daily transmissions from Daventry 5XX. There is every indication that amateurs will be taking up this new field with enthusiasm, and already requests are being made for precise details of the equipment one must install to receive the picture broadcasts. It has been the privilege of the writer, by the courtesy of Messrs. W. Watson and Sons, Ltd., and Mr. Otto Fulton, to describe the pioneer work that has preceded this signal innovation.¹ Although the apparatus in its various stages of development has been capable of results almost equal to those produced by the latest designs, it is simplicity of operation that has rendered the latest types of picture-receiving machine of interest to the general listener.

All forms of picture transmission, whether by wire or wireless, are primarily dependent for their success upon the merits of the devices adopted for holding the rotating parts at transmitter and receiver in step. It is a modification in the system of synchronising that has made possible the production of ap-

paratus suitable for home picture reception. It replaces the pendulum and governed electric motor, and is dependent upon actuating a relay at the receiving set. With modern valves and amplifiers it is erroneous to think that the operation of a relay on weak signals presents difficulty. Although actual constructional details of the new relay-controlled machines are not as yet available, the following should form a close description of how such apparatus is worked.

The Process in Brief.

The picture to be transmitted is photographed through what is known as a "line screen" and transferred on to the face of a sheet of copper foil. Photographic enthusiasts are acquainted with this method under the name of the "gum bichromate process," and it is commonly used in the making of half-tone blocks for printing purposes. In brief, an image in the form of a gum deposit is produced on the copper foil in which the white parts of the original picture consist of wide black lines, almost joining together, while the dark portions are represented by narrow lines of gum deposit or actually bare copper. Bearing in mind the form of the image one should remember that



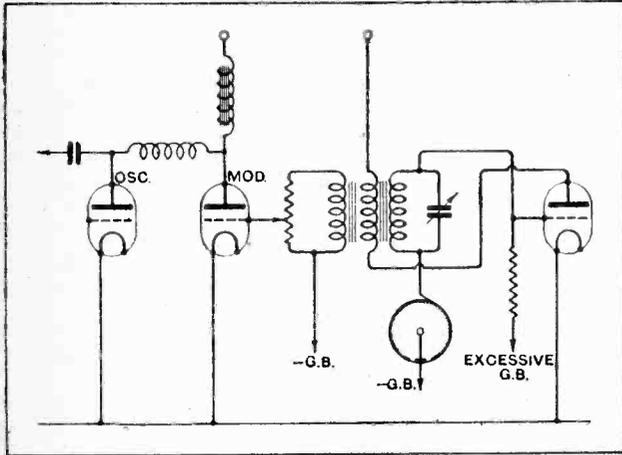
THE FULTOGRAPH. This machine will shortly be available for home picture reception.

¹ "Broadcasting Photographs," March 24th, 1926, p. 437. "Practical Picture Receiver," August 24th, 1927, p. 226. "Picture Transmission," May 23rd, 1928, p. 542.

Picture Broadcasting and News Pictures.—

the gum deposit possesses fairly good insulating properties. By examining the accompanying illustrations with a magnifier, the nature of the varying line thickness with light and shade will be at once appreciated.

With the copper plate clipped around a cylinder with the line image parallel with the axis, it is rotated in contact with a metal point in a like manner to the wax



An audio-frequency oscillation is interrupted by the insulating lines on the revolving copper foil. Excessive grid bias prevents the flow of anode current when the grid circuit is broken. The pulses of audio-frequency current thus set up are passed to the modulating apparatus of the broadcast station.

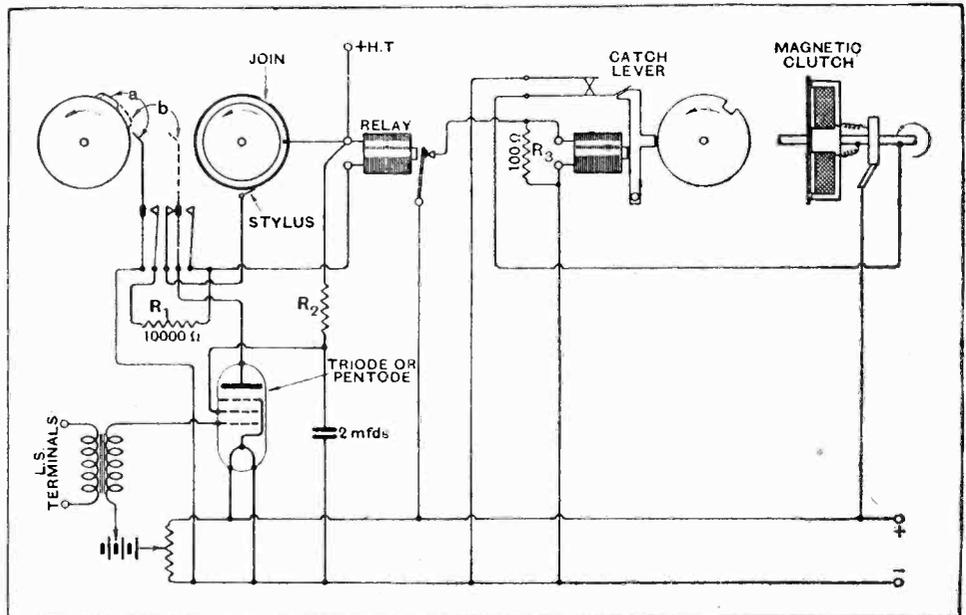
record of the phonograph. As the lines forming the image are usually fifty to the inch, and the pitch of the thread, which causes the needle to traverse the cylinder, may be fifty to the inch, it is obvious that the picture is analysed with a fine degree of definition. As the insulating lines pass under the needle, a local circuit is interrupted, and pulses of current of the order of 150 or more a second, but of varying duration, are passed to the wireless transmitter. Wave trains of corresponding duration are radiated, and when tuned in at the receiver are heterodyned into damped waves by reaction, or a separate oscillator valve. They are amplified at radio frequency if necessary, detected, amplified at audio frequency and after rectification by a second detector valve so as to form unidirectional pulses of current, are passed to the cylinder of the picture receiver. These pulses of current created at the receiver correspond exactly in

duration with the periods of conductivity between the copper foil and the needle at the transmitter.

Moistened paper treated with a starch-iodide solution is carried by the synchronised cylinder at the receiver, and is traversed by a small platinum stylus. Starch-iodide paper is perhaps more familiar under the name of pole-finding paper, and when current is applied to it a purple colouration is produced around the negative conductor. Thus, also, is a purple-blue stain produced on the revolving sheet of paper by the current derived from the output of the radio receiver. Bare portions on the copper image at the transmitter produce, therefore, a dark stain on the paper at the receiver, the depth of the stain obviously depending upon the amount of bare copper composed.

Carrier Frequency.

Just as C.W. morse signals are received as a series of clicks unless the receiver is suitably oscillating, so does the need for an oscillating receiver become essential in order that the C.W. wave trains may be converted into audible notes of varying duration so as to permit of amplification by an audio-frequency amplifier. In effect, the continuous wave trains are, themselves, chopped up into a series of audio-frequency beats. Such a cutting-up process may be carried out at the transmitting station, though the range of reception will, of course, be lessened. This chopping-up frequency, which is superimposed, is commonly referred to as the "carrier frequency," and it is only necessary to cause the insulating lines on the copper foil to interrupt an audio-frequency oscillating current rather than to control directly the C.W. wave trains of the transmitter. Reference to the accompanying circuit explains the details of the method, and it differs from the former



PICTURE RECEIVING CIRCUIT, showing how synchronisation is effected. Cam (a) applies a potential from the H.T. battery to the relay winding through the resistance R₁. By opening the relay contacts the catch lever is released which later drops into the slot and frees the magnetic clutch thus stopping the cylinder. In the meantime the synchronising signal is applied to the relay by the action of cam (b). On the termination of the signal the relay releases, the catch is withdrawn, and the contacts of the clutch are again closed thus restoring rotation.

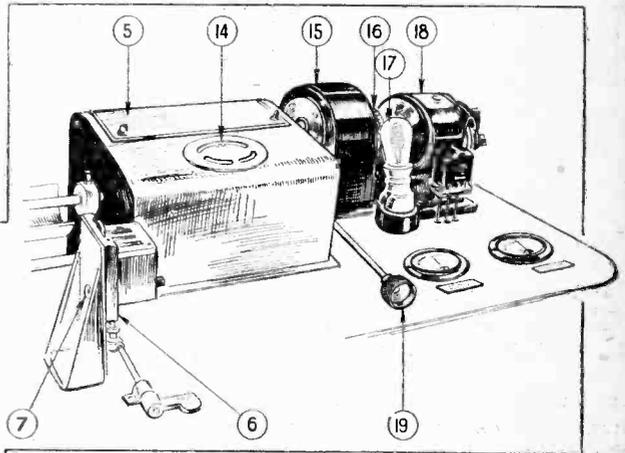
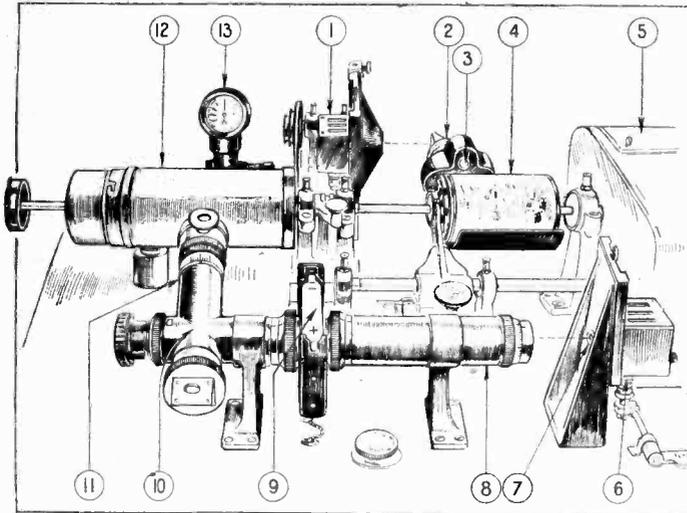
Picture Broadcasting and News Pictures.—

in that it corresponds to telephony instead of interrupted continuous waves (I.C.W.).

If the introduction of an audio carrier frequency is to be the process adopted in our coming broadcast transmissions, then obviously there is little point in preparing a gum line image on a copper plate. A transparent positive or negative film held in a glass cylindrical carrier might be traversed with a pencil of light, or the arrangement used for the sending of news pictures given further on in this article might well be adopted. These alternative systems necessitate the use of a photo-electric cell, the carrier frequency either being introduced by an electrical oscillator or a revolving, serrated disc interposed in the pencil of light falling on the cell.

Introduction of the Magnetic Clutch.

Synchronising remains to be explained. This is achieved by the transmission once each revolution of the cylinder of a modulated wave train similar to the now defunct tuning note, or, better still, a C.W. wave train free of modulation. Its maximum duration will



Apparatus used for the transmission of news pictures (Siemens-Karolus-Telefunken). An interrupted beam of light (1) falling upon the revolving image (4) illuminates by dispersion a photo-electric cell (3). After amplification the fluctuating currents are applied to a Kerr cell (9) at the receiver and control the passage of a beam of polarised light falling upon a revolving cylinder carrying a photographic film. The synchronous A.C. motor (15) holds the speed of rotation constant.

only be a fraction of a second, and it is conveniently sent out in the interval which occurs in the picture signal as the stylus passes over the join in the rolled image. In fact, it can be created with the aid of a metal strip covering the join.

By reference to the circuit diagram of a picture receiver it will be seen that the output from the wireless receiving set is applied to the grid of a detector valve which, in this case, is an anode bend detector, and produces direct current image-forming pulses between the stylus and the drum. Note that on the end of the cylinder are two cams as well as a cutaway portion to form a catch while the cylinder is driven through a magnetic clutch. When the stylus reaches the join in the paper the two cams come into operation, one completing the relay winding circuit through a resistance to the H.T. battery, while the other disconnects the stylus and applies the valve output to a relay. As a

result the relay is energised and its contacts opened. This action breaks the circuit of an electromagnet, which normally holds back a catch from falling into a slot on the cylinder. The catch moves forward against the cylinder, and on encountering the gap drops into position, arrests the cylinder, and in so doing breaks the circuit which energises the magnetic clutch. With the clutch thus released, the clockwork which drives the cylinder continues to rotate at its constant speed.

While this train of events is taking place in the relay, catch, and clutch, the shunt-resistance path connected to the relay and H.T. battery has been removed by the end of the contour of one of the cams being reached, and in the meantime the brief synchronising signal has commenced to be sent out by the transmitter. This

signal now controls the anode current of the valve and continues to hold up the relay, so that the clutch is still released and the drum held. As soon as the signal stops, the armature of the relay drops away, the catch releases, and the re-engaging of the clutch sets the cylinder in motion. Thus, once each revolution the receiving cylinder, which is running slightly faster than that at the transmitter, is briefly held and released again by a signal created from a conducting bar, or, if necessary, a cam on the cylinder of the transmitter.

Rendering a Simple Relay Sensitive.

It should be observed that the relay is pulled in by a comparatively heavy local current, and not by the received signal. By this means the use of a relay requiring a very fine setting is avoided, as it is merely the termination of the signal which allows it to fall open. It is important, of course, that the shorter cam should not open the circuit until the synchronising signal has commenced, while it is equally necessary that it should open before the catch drops into place and stops rotation. As an anode-bend detector, the valve

Picture Broadcasting and News Pictures.—

used with this part of the apparatus will be of moderately high impedance. The amateur will at once think of the possibilities of the pentode here as its high magnification factor will result in a heavy current fluctuation through the relay in spite of its excessively high impedance, the grid bias setting for rectification will be almost unaffected by change of anode potential, while the high impedance of the valve renders the high and varying resistance of the moist paper of small account.

Leaving the field of picture transmission as used for broadcasting, it is interesting to trace its similarity with the apparatus now almost exclusively used in this country for the transmission of news pictures by land line. As the urgency of news pictures prevents the affording of time for making a transparency, the original photograph or drawing in black, white, and half-tone, is clipped around the cylinder at the transmitter (4), and a fine pencil of light produces a tiny bright spot on the picture as it is revolved and traversed. Immediately against this illuminated spot is the aperture of a photoelectric cell (3). As dark and light portions of the picture pass under the spot respectively, light is absorbed or reflected back into the photoelectric cell. Current is generated in the cell according to the amount of illumination, and is subsequently amplified and passed out to the distant receiving station. When no change is taking place in the amount of illumination in the cell there is no change in its current output, and as valve amplifiers normally only deal with fluctuating currents, this continuous current must be interrupted, or, as with the previous system, a carrier frequency is required. As already stated, the valve oscillator may be used to modulate or interrupt the current, but in this case the carrier frequency is introduced by a serrated disc revolving so as to intercept the pencil of light (1).

The Kerr Cell.

Ignoring the complications arising out of the line transmission of high audio-frequency currents, the incoming signal at the receiver is applied across the plates of a Kerr cell (9). This device is, in reality, a tiny condenser contained in a glass box so that a beam of light can be passed between its plates. The dielectric is nitrobenzine, and the effect of applying an electrostatic strain to this transparent liquid is to alter its properties to the passage of a beam of light. On either side of the cell is a Nicol prism, and when these two prisms are in suitable relative position they become, in effect, transparent. The result is very much the same as two-bar gratings, which, obviously, only permit light to pass through them when the bars lie parallel.

Interposing the glass box of nitrobenzine renders it necessary to slightly rotate one of the prisms in order to still allow of the passage of light. With a potential applied between its plates this prism would have to be further adjusted to maintain transparency. Instead, however, the cell is used in this way as a shutter regulating the amount of light passing between the prisms in accordance with the potential applied.

A light from a small lamp (6) is regulated by a diaphragm (7), and after passing through the prisms and cell (8) and (9) is turned at right angles by a reflector (10), and finally focussed (11) on to a piece of photographic film carried on a cylinder in a light-tight box (12). Fluctuating potentials emanating from the transmitter, representing in their values the variations of light and shade of the original picture, thus by application to the Kerr cell at the receiver regulate the effect of a local source of light falling upon the sensitised film.



The black lines of the negative image represent the insulating gum deposit on the copper foil as used in the Fultograph system. The picture is formed at the receiver by the interrupted currents of varying duration being applied to a moistened paper sensitive by colouration to the passage of current.

**Tuning Fork Controlled
A.C. Motor.**

Synchronisation between the cylinders at the transmitting and receiving stations is obtained by electrically governed motors. Power to rotate the cylinder is supplied by a small D.C. motor (8) supplemented by an A.C. machine mounted on its shaft (15). Alternating current is generated or absorbed by the A.C. motor at a frequency which is definitely related to its speed of rotation. Connected to its stator windings is the circuit of an electrically driven tuning fork which can, of course, only vibrate at a given rate. By this means of frequency fixing, the speed of running of the A.C. machine is closely controlled, providing it is not called upon to appreciably resist or supplement the rotation produced by the D.C. motor.

To check within very close limits its speed of running with that of the distant station, a stroboscope is provided. This consists of a disc carrying white lines (16) equal in number to twice the frequency of the alternator. The disc is illuminated by a neon lamp (17), which flashes by being connected to the alternating current generated at the distant station.

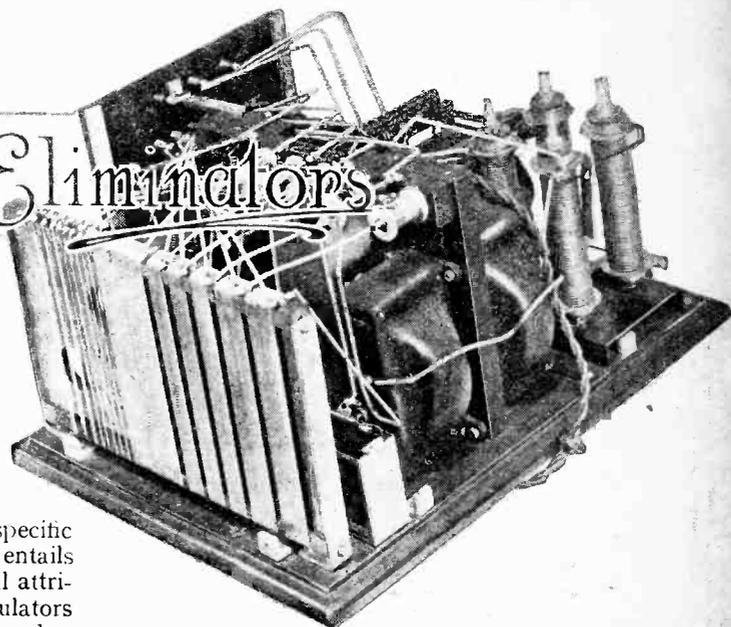
Markings on the revolving disc having the appearance of being stationary when viewed under the illumination of the neon lamp is evidence that the machines are correctly synchronised.

No great obscurity lies behind the working of picture transmission. No expert electrical knowledge is required to fully grasp its principles. To the radio enthusiast it is a simple mechanical device full of interest and fascination.

Back-Coupling in Eliminators

The Possibilities of a New
Neutralising Scheme in
L.F. Amplifiers.

By W. I. G. PAGE, B.Sc.



GIVEN two methods of achieving any specific object, we are liable to choose that which entails the least trouble, for is not laziness a natural attribute of human nature? The upkeep of accumulators and batteries is a continual trouble to us; little wonder, therefore, that as soon as battery substitutes were obtainable large numbers of listeners having electric light in their houses availed themselves of a new source of current supply to which only small attention need be paid over a long period. The performance, however, of such equipment is not always entirely satisfactory unless certain pitfalls are avoided.

The problem, for instance, of suiting the voltage of the supply mains to the requirements of the valves in a receiver has to be considered, but is not very formidable, while efficient smoothing can generally be obtained by the unstinted use of inductance and capacity. There still remains the question of the formation of unwanted A.C. potentials which unfortunately are built up across the common impedances that are almost certain to exist in the eliminator network.

The Anode Feed Resistance Scheme and Eliminators.

Before proceeding to discuss back-coupling due to eliminators, the reader is referred to an article by the author entitled "Battery Resistance and Distortion" which appeared in the issue of April 25th, 1928. A summary was given in connection with the anode feed resistance scheme which has proved entirely successful in preventing distortion or oscillation in all cases where a common H.T. battery of appreciable internal resistance is used. The importance of low-frequency reaction, with its quality-destroying properties, has not been properly appreciated until lately, with the result that the expressions employed to convey its effect on reproduction are accordingly somewhat confused. The expression "motor boating" has come to be regarded as a generic term for any low-frequency disturbance, be it a howl or a periodic popping noise, and it is at once important to state that the anode feed resistance scheme is extremely valuable with mains eliminators, but is not entirely certain to cure motor boating unless careful attention be paid to the addition of chokes and condensers in each

anode feed; further reference will be made to this when discussing the circuit of Fig. 3.

The resistance of an H.T. battery, across which unwanted speech potentials may be built up, has a value which is independent of frequency, and little fear need be entertained of the anode battery supply and its concomittant equipment having a resonant frequency which is within the audible range. Contrary to this, an eliminator with its multiplicity of chokes and condensers may very easily resonate at some quite low audible note, and a condition may arise in which sustained low-frequency oscillations are kept up. The choke filter output method to couple the last valve of a receiver to the loud speaker, which has often been pointed out as being almost essential with battery-fed sets, especially where the anode current is heavy, may actually complicate the network of reactances and add to the chances of resonance at low frequency in an eliminator, and it would seem advisable to consider the use of an output transformer provided that the impedances of the valve and loud speaker are carefully matched.

Normal and Reverse L.F. Reaction.

Besides the problem of resonance due to smoothing equipment and output filtering systems, there is in the case of A.C. the added complication of the impedance of transformers and rectifying components, while in some instances the mains voltage is broken down by a potential divider having a resistance of perhaps 15,000 to 20,000 ohms. Fig. 1 shows a simple three-valve set with a potential divider, AB. The speech currents from V_3 pass through AB, while the tappings S_1, S_2 , which provide for a lower anode voltage for V_1 and V_2 , allow a portion of AB (probably some thousands of ohms) to be common to the anodes of all the valves and hence to the grids of V_2 and V_3 . If the inter-valve couplings are such that the signal fed back from

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the last valve and the original signal as impressed on the first effective grid are in phase, low-frequency reaction will take place and the signal will be intensified until possibly audible oscillation takes place. On the other hand, should the original signal and the signal fed back be out of phase, reverse low-frequency re-

boating, but obviously, by virtue of reverse reaction, introduces a somewhat serious reduction of signal strength, and is liable to mutilate the frequency response characteristic.¹

Some experimenters have therefore avoided potential dividers, seeing that with multi-valve sets efficient and stable amplification is not always assured, and have favoured series resistance schemes in which a potential-dropping resistance is interposed in each anode lead such as is shown in Fig. 2. Although condensers of liberal capacity bridged the common negative lead to each tapping, and, further, although the chokes employed had large dimensions, motor boating was still possible owing to their common impedance. The next advance is the series resistance method shown in Fig. 3, employing a comprehensive smoothing circuit in each anode feed—an arrangement which has been developed by Messrs. Ferranti and which is successful in preventing motor boating.

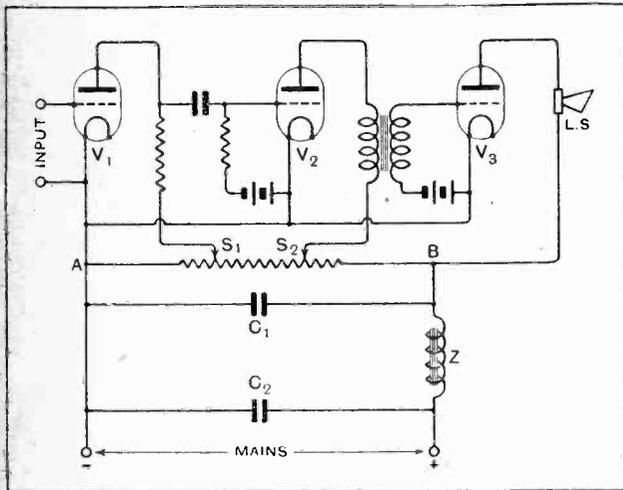


Fig. 1.—A simple mains-operated set in which a potential divider is used. As part of AB is common to the anodes of all the valves back coupling takes place. The addition of filtering chokes and condensers to the slider circuits S₁ and S₂ may lead to a low-frequency tuned circuit resulting in further feed-back complications.

action will take place and the normal signal strength will be reduced.

Mains potential dividers must perform have a high D.C. resistance, and to attempt to prevent the parasitic oscillations formed by them from reaching the anodes of preceding valves, chokes and condensers might be added to the tapping leads S₁ and S₂. Here, again, there is the chance of resonance resulting in a very high impedance associated with a circuit tuned to a low frequency. Potentials would be built up and fed back probably at the lowest frequency which the amplifier had been designed to pass. In these circumstances motor boating would occur and there would appear to be no other palliative than the reversal of one of the windings of the low-frequency intervalve transformer. This expedient generally stops motor

Neutralising Feed-back.

The values of R₁, R₂, and R₃ are somewhat difficult to arrive at without a milliammeter, for they depend on the value of the anode current, which in its turn depends on grid bias, etc.; for this reason, and also on account of the rather elaborate filtering equipment required, there are readers who prefer to adhere to the potential

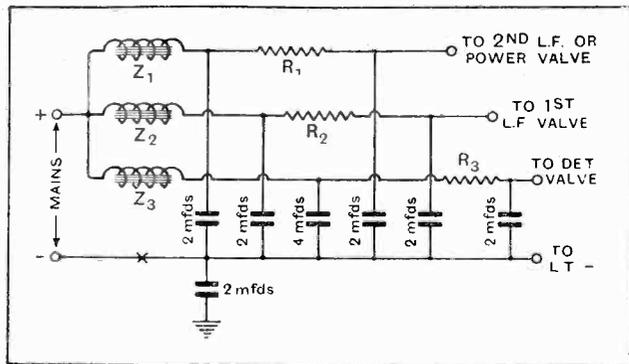


Fig. 3.—The anode feed resistance scheme with separate choke filter in every anode circuit. Motor boating is successfully prevented. The omission of the conventional choke at x is sometimes found advantageous.

divider method in which numerical values are more easily determined.

In brief, in order to obtain a complete measure of success when employing lighting mains to feed a multi-valve set, it may be either necessary to sacrifice amplification by intentional reverse reaction or to employ elaborate series filtering schemes for each valve. It is the main purpose of this article to describe some experiments with a new method of neutralisation of L.F. back-coupling, which is the subject matter of Patent 285,229 taken out jointly by the Igranic Co., P. W. Willans, and A. D. Hodgson. In Fig. 4 the speech currents from the last valve pass through the potentiometer AB, which is shunted across the mains, parasitic

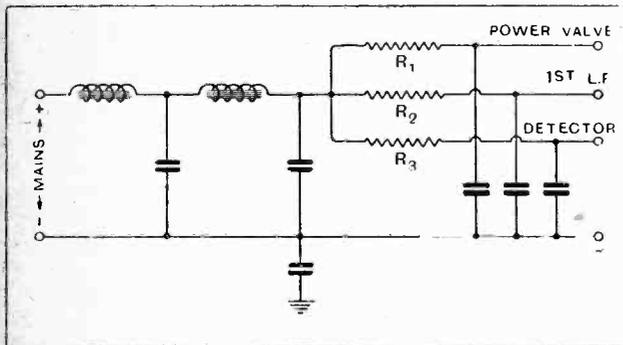


Fig. 2.—The anode feed resistance scheme as applied to an eliminator. Because the chokes are common to the three anode circuits motor boating can occur.

¹ *The Wireless World*, December 14th, 1927, "Back-Coupling in L.F. Amplifiers," Figs. 6 and 7. *The Wireless World*, April 25th, 1928, "Battery Resistance and Distortion," pp. 441 and summary.

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potentials are set up, and the usual feed-back takes place through the tapping to the anodes of V_1 and V_2 .

A two-stage resistance amplifier is shown, since in this case the phase changes are simple, for if a signal voltage is applied to the grid of V_1 , which makes it

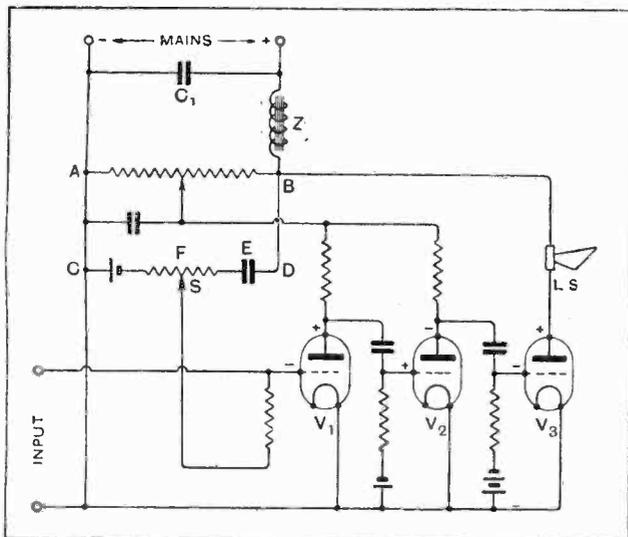


Fig. 4.—An amplifier fed from an eliminator employing a potential divider AB. By feeding to the appropriate grid the required value of parasitic A.C. potential by means of the A.C. potentiometer CD the feed back elements which cause motor boating and distortion can be neutralised.

negative, it is safe to assume (as the anode loads are non-inductive) that the plate of V_1 , and hence the grid of V_2 , will be simultaneously 180° out of phase or positive and so on until the output and largest potential will also be positive. This positive impulse will be impressed on AB and fed back to the plate of V_1 (also to the plate of V_2 , but it is the earliest valve which creates the greatest effect). The plate of V_1 has already been made positive by the normal signal, hence an increase in signal strength will take place, possibly accompanied by L.F. oscillation. Had we been experimenting with a three-stage resistance amplifier, the tendency would be towards a reduction in signal strength owing to reverse reaction.

If intervalve transformer coupling is employed, the phase changes are not simple and differ with individual makes. The question of direct and reverse L.F. reaction has been dilated upon at some length so as to show that it is always possible in a set with more than two valves (even with transformer coupling) to find a grid which is substantially in *opposite* phase to the feed-back elements which are tending to cause distortion and possibly distressing interruptions, for the neutralising scheme already referred to depends upon this.

Taking Fig. 4 again, let us suppose we could pick up an amount of feed-back energy equal to but in opposite phase to that which is passing through the amplifier

owing to the common impedance AB and impress it on an early grid, we could exactly neutralise the effect of back-coupling and produce an amplifier which would give an overall magnification equal to the theoretical product of each stage taken separately.

This desirable object is achieved by shunting what is equivalent to an A.C. potentiometer (CD) across the mains and picking up the required amount of A.C. energy by a variable one-megohm potentiometer F placed between a 1-microfarad condenser, E, and the necessary grid bias for the valve V_1 , which is the case of the resistance amplifier shown whose grid is such that intentional and unintentional feed-back will be amplified in opposite phase and thus neutralised. When the slider S is moved one way motor boating occurs, but when moved in the opposite direction a position is easily found where the set becomes stable and the quality of signals is excellent; any movement of S beyond this position results in an immediate reduction in signal strength, and the quality is adversely affected.

The reader will now appreciate that the reversal of one of the windings of an intervalve transformer to stop motor boating produces an uncontrollable amount of reverse reaction which probably goes far beyond the neutralisation point, so producing an unnecessary reduction in signal strength and possibly causing distortion. The word "neutralisation" has been used to describe the effect of the A.C. potentiometer, but the process is not the same as H.F. neutralisation by a bridge in which a somewhat critical point must be found and either side of which there is instability.

A number of typical four-valve receivers were taken and supplied with H.T. from a mains eliminator provided with a potential divider. Motor boating took place in nearly every case until one winding of the

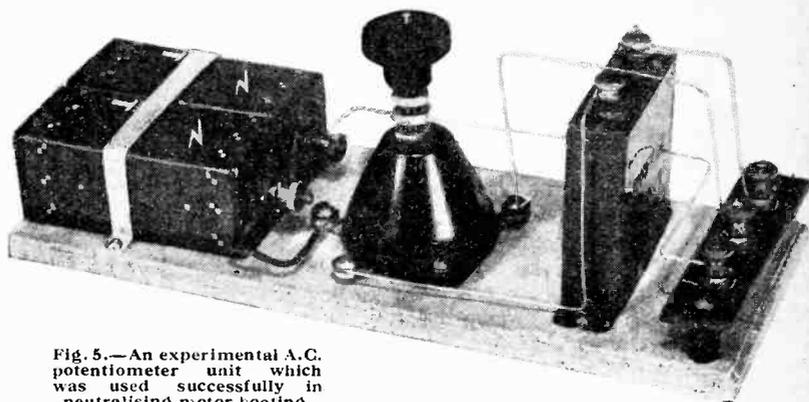


Fig. 5.—An experimental A.C. potentiometer unit which was used successfully in neutralising motor boating.

intervalve transformer was reversed. In the case of a set incorporating resistance coupling, motor boating was difficult to arrest until the amplification per stage was reduced to a small figure. The experimental unit shown in Fig. 5, which is the A.C. potentiometer CD of Fig. 4, was shunted across the mains, and a lead was taken from the slider S in turn to the low-potential ends of the grid circuits of the first and second L.F. valves of the sets with intervalve transformers. In one of the positions it was always found possible to stop

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motor boating and to retain good volume and quality with transformer windings connected in the normal way. With the resistance amplifier the correct grid could be predicted from the considerations discussed in connection with Fig. 4. Where transformers are employed and phase changes are uncertain, a trial can be made with S connected to the low-potential ends of either

L.F. grid circuit. Where the detector valve is involved in passing on parasitic L.F. oscillation, S can be connected to the detector grid, although the process here is somewhat obscure, yet satisfactory in the cases tried. The scheme whereby an unwanted oscillation of complicated wave-form is neutralised by one of similar magnitude but of opposite sign would appear to be logical and worthy of application.

VOLUME CONTROLS AND OVERLOADING.

The Relative Merits of Pre- and Post-detector Arrangements.

THE various methods used on wireless receivers for controlling the volume of signals without altering the tuning may be divided into two main classes, the dividing line between the two being at the detector valve. Of the various methods of volume control that operate by virtue of altering the input to the detector valve, the writer has nothing to say here, but it is desired to draw attention to a possible danger that arises when the control is incorporated in the low-frequency amplifier.

The point involved will perhaps best be seen from the consideration of the figure, in which is shown a detector valve followed by a transformer, the secondary of which is shunted by a high-resistance potentiometer connected in such a way that any desired fraction of the signal voltage across the secondary can be applied to the grid of the first low-frequency amplifying valve. Suppose that with this arrangement a station is tuned in, and is found to be giving a signal strength so great that the output valve is very seriously overloaded. The potentiometer will then be adjusted so that the output is no longer beyond the capacity of the last valve. But owing to the fact that the potentiometer is so connected that signals can be reduced by its aid so far that they become practically inaudible, it is quite within the bounds of possibility that, although no valve in the L.F. amplifier is receiving stronger signals than it can deal with satisfactorily, the detector may still be overloaded by the large high-frequency voltages that are being applied to its grid. The danger of this, which results in a serious deterioration of quality, is especially great where the detector is of the leaky-grid type depicted in the diagram.

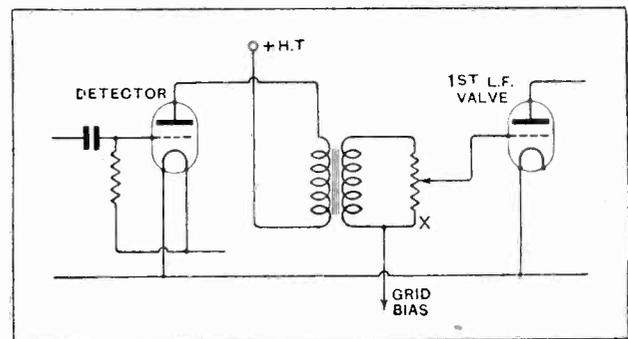
Loading the Valves Equally.

It is preferable, though not always possible, to arrange that whatever control of volume may be required should be obtained by altering the input to the detector, in order that this danger may be avoided. There are, however, occasions, notably when the amplifier has sometimes to be used in conjunction with a gramophone, when there is no alternative to the use of a volume control on the low-frequency side. In these cases the difficulty can be surmounted, though not without a little preliminary calculation, by inserting a resistance between the potentiometer and the source of grid-bias, at

the point indicated in the diagram by X. The value of this resistance should be so chosen that when the slider of the potentiometer is at its lowest point it should still be possible to overload the output valve before the detector is called upon to deal with an input that is beyond its capacity.

Limited Range Potentiometer.

The exact value that should be chosen for this extra resistance will depend on several factors, of which the amount of low-frequency amplification embodied in the receiver is perhaps the most important; as a guide, it may be suggested that it should not have less than one-twentieth of the resistance of the potentiometer. This

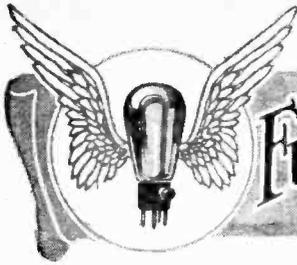


Volume control by shunting the secondary of the L.F. transformer with a potentiometer. A further resistance at the point X may be inserted.

will allow a range of one to twenty on the control; to the ear it will seem less than this, but it will be enough for practical purposes, since it is always safe to obtain large alterations of volume by manipulating the tuning controls. Arrangements may be made, if desired, to short-circuit the resistance, and so to allow of a greater range of control when the amplifier is being used for the reproduction of gramophone records.

Similar considerations apply when the control is effected by any other means that involve the use of only a portion of the output from the detector; and similar means of limiting the range of the control to a safe value will readily suggest themselves.

A. L. M. S.



Further Notes on the "MEGAVOX - THREE"



Making the Best Use of the Rising Transformer Characteristic.

By N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

THE manipulation of the *Megavox-Three* is extremely simple. Nevertheless it is desirable to indicate briefly how to achieve certain results with a minimum of trouble. In addition, two short sections dealing respectively with the design of the receiver and the volume control have been added.

In using the receiver, four features will arrest the attention of the operator. (1) The difference in signal strength between anode bend and leaky grid detection, particularly when using reaction. (2) The greater brilliance of leaky grid as compared with anode bend. (3) The greater selectivity of anode bend. (4) The ease with which H.F. oscillation can be quelled by aid of the volume control.

All these features can be easily explained by an examination of the physical properties of the elements concerned in the various processes.

The upper register with leaky grid may be considered by some readers to be rather powerful. This is due to the rising transformer characteristic (see Fig. 1), as first shown by the writer nearly three years ago.¹ The greater amplification of the upper audio-frequencies is

caused by magnetic leakage between the primary and secondary windings of the transformer. The extent of the rise decreases as the primary resistance increases. With a valve of low internal resistance the rise is appreciable. For example, in the *Megavox-Three* the valve resistance for grid leak detection is only 6,000 ohms,² which means a marked rise. On the other hand, for anode bend detection the valve resistance is 17,000 to 25,000 ohms, which will cause a drooping curve, as shown in Fig. 1, Curve 2.

Three Methods of Reducing the Upper Register.

If the reproduction is found to be too brilliant, the fault is an excellent one. It is easy to remove the upper register, but difficult to create it when absent from the receiver. Moreover, there are various ways of curbing the higher frequencies. The simplest way of reducing brilliance is to put a condenser of suitable magnitude across the primary or the secondary of the transformer. Suppose we choose the secondary, a condenser of 0.003 to 0.005 mfd. will be satisfactory. Alternatively, the condenser may be connected across the loud speaker terminals. The requisite capacity will depend upon the impedance of the loud speaker at the upper audio-frequencies.

With a reed-drive speaker, if a condenser is required, 0.005 mfd. is a suitable value. Coil-drive loud speakers may also be too brilliant. The brilliance will increase as the turns on the coil decrease, *i.e.*, 1,000 turns will give a more brilliant upper register than 2,500 turns. The condenser value in this case may be between 0.005 and 0.01 mfd., since the coil impedance is less than that of a reed-drive. In a well-damped room it is doubtful whether the condenser will be required. A second, and a neater, way of securing the above result is to reduce the intensity by aid of the volume control, then restore the signal strength to its normal value by aid of reaction. The reduction in resistance of the tuned anode coil will enhance the selectivity, thereby attenuating the upper register. The physical condition is that, broadly speak-

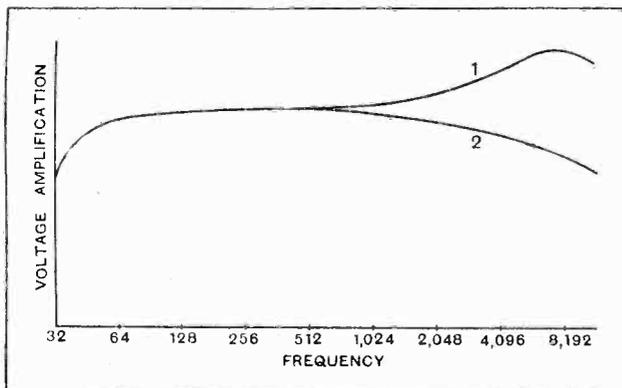


Fig. 1.—Curves illustrating transformer characteristic with valves of high and low resistance. Curve 1 shows the rising characteristic with a valve of 6,000 ohms resistance, while curve 2 is obtained with a valve of 20,000 ohms resistance.

¹ "Speech Amplifier Design." N. W. McLachlan, *The Wireless World*, January 13th, 20th, 27th, 1926.

² In the original article it was given as 12,000 ohms. 5,000 to 6,000 ohms is the correct figure for plus 4 volts on the grid.

Further Notes on the "Megavox-Three."

ing, the upper tones remain constant whilst the lower and middle tones increase due to the lower resistance of the anode coil. In some cases the greater selectivity of anode bend may be adequate without the aid of reaction. By virtue of the pronounced upper register, the quality when receiving distant stations will be found decidedly superior to that obtained with other classes of receivers.

Yet one more—the third—artifice can be adopted to curb the upper register. If two pentodes (P.M.24) are connected in parallel the power valve resistance will be halved. The inductance of the loud speaker will then be relatively doubled. The result will be a fourfold increase in power at the lower and middle frequencies, but considerably less at the higher frequencies. If two pentodes in parallel are insufficient to reduce the upper frequencies a third can be added.³ A coil of 2,500 turns used in conjunction with a *steel pot* and two pentodes in parallel yields an output which can only be described as truly remarkable for a H.T. of 150 volts.

Tuning and Selectivity.

We now pass on to the problem of H.F. tuning. With short aeriels, *e.g.*, 10ft. long, or aeriels of low damping, there is a certain degree of amplification due to the feed-back of the H.F. valve. This is, of course, stimulated by the low-loss aerial coil. Not only is the amplification enhanced, but also the selectivity. Nevertheless, the upper audio-frequency register is still powerful, as stated

the aerial terminals. Turn the volume control clockwise to its extreme position. Set the reaction condenser to zero and tune the aerial and anode condensers to the local station. Carefully swing the aerial condenser about one degree each way and note the high selectivity. Now turn the volume control a few degrees anti-clockwise and test the selectivity again. Two things will have happened. The tuning will be flatter and the tune point will have altered slightly. The flatter tuning shows the existence of feed-back when the control was all out, whilst the altered tuning is due to the insertion of resistance in series with the H.F. grid.

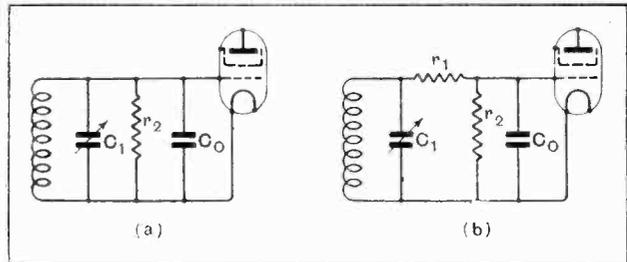
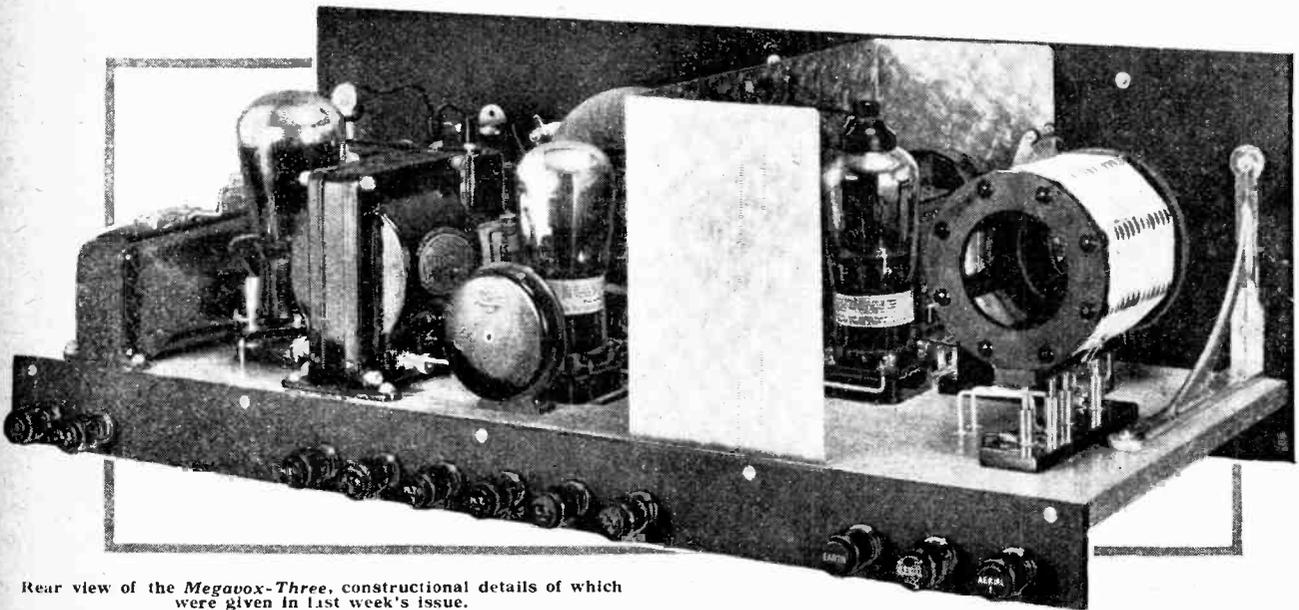


Fig. 2.—(a) C_0 is the filament to grid capacity plus the feed-back effect; this augments the capacity C_1 . The volume control is represented by r_2 . In (b) the resistance r_2 is interposed between C_1 and C_0 . Thus the effect of C_0 is reduced and at any given wavelength C_1 will now have to be increased.

This is illustrated in Fig. 2. The condenser C_0 across r_2 is due to the grid to filament capacity and partly to the effect of feed-back. When r_1 is zero this condenser is



Rear view of the *Megavox-Three*, constructional details of which were given in last week's issue.

above. This feed-back does not cause oscillation, but its presence can be tested in the following way. Connect an aerial of twin flex wire or something similar about 10ft. long (don't use a single strand of No. 30) to one of

³ See my remarks in *The Wireless World*, p. 116, July 25th, 1928. The upper frequencies were curbed by putting two pentodes in parallel, but the effect was more marked then, owing to the detector being resistance coupled, *i.e.*, there was no transformer to give a rising characteristic.

in parallel with C_1 , whereas when r_1 increases it is interposed between C_1 and C_0 , thereby reducing the effect of C_0 and altering the tuning. Moreover, when working on the local station, it may happen that beyond a certain point the volume control does not increase the loudness. This is due to the effect of C_0 , which causes mistuning. To get louder signals the aerial condenser must be decreased. Working on the local station, this mistuning can readily be tested. Tune both circuits and set the

Further Notes on the "Megavox-Three"—

volume control to give normal loudness. Now mistune the anode circuit. To restore to normal loudness both the volume control and the aerial condenser require adjustment.

Bringing in Distant Stations.

It is important to observe that when the volume control is adjusted for maximum signals, *i.e.*, r_1 in Fig. 2b is zero, the feed-back through the H.F. valve increases with the reaction condenser. This is due to a reduction in A.C. resistance of the anode coil. Ultimately the H.F. valve oscillates, but not the detector. This can be curbed by the resistance¹ r_1 , as explained in the original article. When r_1 is beyond a certain magnitude the H.F. valve will not oscillate even with increased reaction. It is then possible to make the detector oscillate "solo." If the H.F. valve is allowed to oscillate re-radiation occurs. By trial using the *Megavox-Three* on a roof aerial, and a four-valve set on a full-sized aerial in the same building, the re-radiation for all practical purposes was negligible. Moreover, for reception by the heterodyne method the detector can be made to oscillate.

When using reaction it is sometimes essential to employ anode bend for selectivity. When tuning to fine limits with anode bend it is imperative to be absolutely on the right wavelength. Moreover, both the reaction and tuned anode condensers must be manipulated con-

jointly. Owing to feed-back through the H.F. valve, this being promoted when the resistance of the tuned anode coil is reduced by reaction, the aerial condenser may also require adjustment.

When signals are very weak, leaky grid detection with reaction is a *sine qua non*; a nice method of operation is as follows: ascertain the position of the reaction condenser where oscillation occurs; insert a certain amount of resistance in the grid circuit of the H.F. valve by aid of the volume control, as explained above; set the reaction condenser beyond its *normal* oscillation position, but not far enough for oscillation to occur. Tune until a weak signal is audible, and strengthen l_j means of the volume control. The procedure is, of course, a question of juggling with the controls, but, once the receiver is known, this method is effective.

A similar procedure can be adopted—but without critical reaction—for obtaining, say, a distant station of moderate strength when situated one or two miles from the local station. Without reaction let us say that on the tune point of the distant station $2LO$ is troublesome. The volume control is adjusted to reduce the total signal strength, then with anode bend and reaction the selectivity and signal strength is increased. Although enhanced selectivity makes $2LO$ no weaker, the other station will be many times stronger than before. Thus the relative jamming due to $2LO$ has been reduced. In conducting this test the aerial should be connected to the terminal marked "aerial."

(To be concluded.)

¹The *Wireless World*, September 12th, 1928.

BOOK REVIEW.**The Patent System.¹**

The operation of the patent system is of more than ordinary interest to wireless constructors as a class. Familiarity with the principles and practice of broadcast reception leads almost inevitably to the study of radio science in its wider aspects. At this point—and often before—many enthusiastic amateurs feel the urge of inventive inspiration, and so find themselves considering the ways and means of securing patent protection.

Mr. Griffiths' book gives a clear and concise description of the outlines of modern patent law. The author's aim is to present and explain the principles underlying the grant of Letters Patent, and their standing in an action for infringement in the Courts, rather than to guide the amateur inventor through the intricacies of Patent Office procedure. In other words, the reader is given a broad outline of patent practice—the detailed preparation of the actual specification and claims, and the necessary official

formalities of putting through a patent, being in most cases safer left in the hands of a competent patent agent.

The following are some interesting points:—

An invention must be a "manner of manufacture" and not a mere discovery. Nor can any operation carried out by nature alone, without the aid of machinery or apparatus under the control of the operator, be protected by Letters Patent.

Every patent must have some degree of novelty and some modicum of utility. Otherwise the patent, even if formally granted, will be void, should it come into Court.

A person who is the first to "import" an invention into this country from abroad is entitled to secure Letters Patent for it. As the primary object of the patent system is to encourage the creation of new industries, the importer fulfils this object as efficiently as the actual inventor—*i.e.*, the person who suffers the pangs of mental creation. In these days of world-wide patents it is, however, difficult for the mere importer to oust the actual inventor.

In view of recent litigation, the chapter on "Abuse of Monopoly Right" should make a special appeal to wireless readers, though the average layman will still be puzzled to discover the exact conditions under which the privileges of an existing patent grant may be modified by the law in favour of competitive industrial interests and the public generally.

¹*Patent Law and Practice*, by A. W. Griffiths, B.Sc. (England), Barrister-at-Law. Published by Stevens and Sons, Chancery Lane, 7s. 6d. net, pp. xxvii. and 174.

BOOKS RECEIVED.

From Crystal to Television, by Vyvyan Richards, with a foreword by J. L. Baird. A simple and non-technical account of wireless and television. Pp. 116, with 10 diagrams and illustrations. Published by A. and C. Black London. Price 5s. net.

Wireless Observations During the Eclipse of the Sun, 29th June, 1927 (Radio Research Board, Special Report No. 7). A summary of observations taken at various stations on long waves, medium waves, and short waves, and of the variations in the strength of signals received at Liverpool University from Stavanger, Norway. Pp. 25, with map and 17 diagrams. Published by H.M. Stationery Office. Price 1s. 3d. net.

Die Wissenschaftlichen Grundlagen des Rundfunkempfangs (Principles of Broadcast Reception), by Dr. Ing. K. W. Wagner. Pp. 418, with 253 illustrations and diagrams. Published by Julius Springer, Berlin. Price RM.25.

The Wireless Manual, by Captain J. Frost. A non-technical handbook for broadcast and other listeners, containing notes and instruction on the working and upkeep of wireless sets, loud speakers, and batteries. Pp. 220, with 102 illustrations and diagrams. Published by Sir Isaac Pitman and Sons, Ltd., London. Price 5s. net.

USEFUL DATA CHARTS. (No. 10.)

The D.C. Resistance of Resistance Wire.

ABAC No. 9 of last week gave the resistance of any given length of *copper* wire of known gauge, and the chart was similar to that now shown in outline by the first three lines in Fig. 1. We must now extend this abac to deal with resistance wire, and we do this by multiplying the copper ohms by a factor which expresses the relative resistance of a resistance wire compared with that of a copper wire of exactly

in a position corresponding to its multiplier, as given in the Table. Note that the values given refer to the resistance of the wire at ordinary temperatures: if the wire is allowed to heat up, the resistance will increase.

An Example.

To find the resistance of 10 yards of Eureka wire of diameter 0.0124 inch (S.W.G. 30), put the edge of a ruler on the points corresponding to 10 yards of 0.0124 inch and mark its intersection with the reference line. Come back from this point through Eureka and the answer is given on the left-hand line as 55.6 ohms.

We always start at the *left*, using the *left-hand* scale, and go to the next *left-hand* scale, as shown by the single arrow line: coming back along the double arrow line we use the *right-hand* scales.

What Resistance Material should I use ?

Nickel Chrome has a high melting point, and can be used up to 1,000° C. (bright red heat); it is thus suitable for electric furnaces and radiators; it does not corrode or deteriorate even under severe conditions.

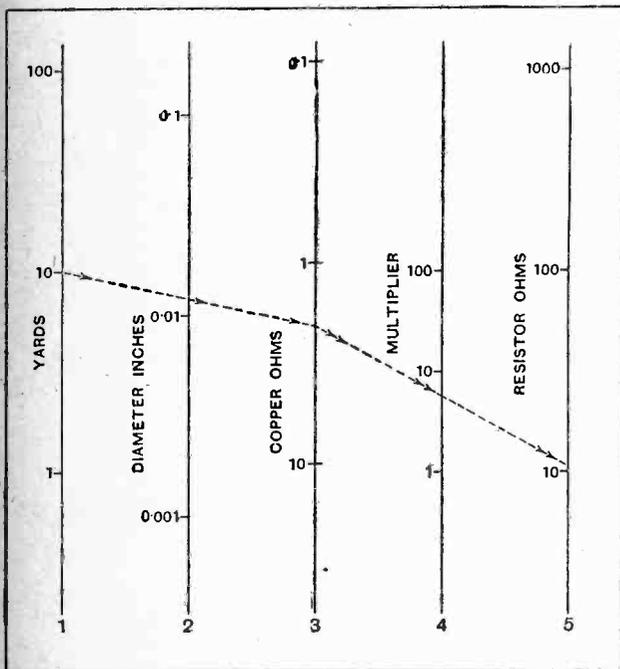


Fig. 1.—An extension of the abac already given for copper wire so as to reveal the resistance of other conductors.

the same dimensions. A list of multipliers for the chief resistance materials is given in the Table: if we mark out a scale of multipliers on line 4 (Fig. 1), making it half size, it is easy to verify by a ruler that the copper ohms multiplied by the factor chosen give the resistor ohms required.

We next proceed to make the abac more compact by folding it up along line 3. Line 4 will coincide with 2, and 5 with 1, so that, as Fig. 2 shows, each line has two scales attached.

Line 5 can be moved up or down as we please provided that 4 is moved in the same direction through half the distance. Accordingly it is convenient to arrange it so that, on folding, 1,000 ohms will coincide with 100 yards, 100 ohms with 10 yards, and so on. The graduations on line 3 are not required, since we do not need to know the copper ohms, and so they are omitted in Fig. 2.

Fig. 2, with the details filled in, becomes the abac overleaf: each actual resistance material is indicated

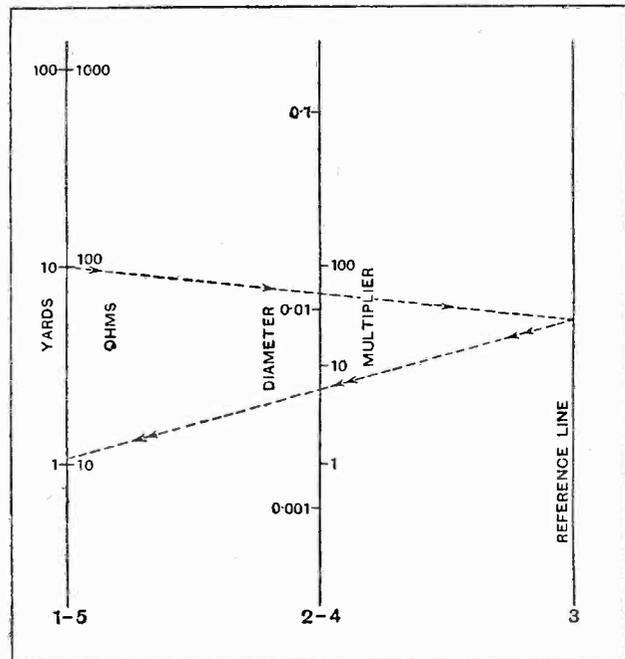
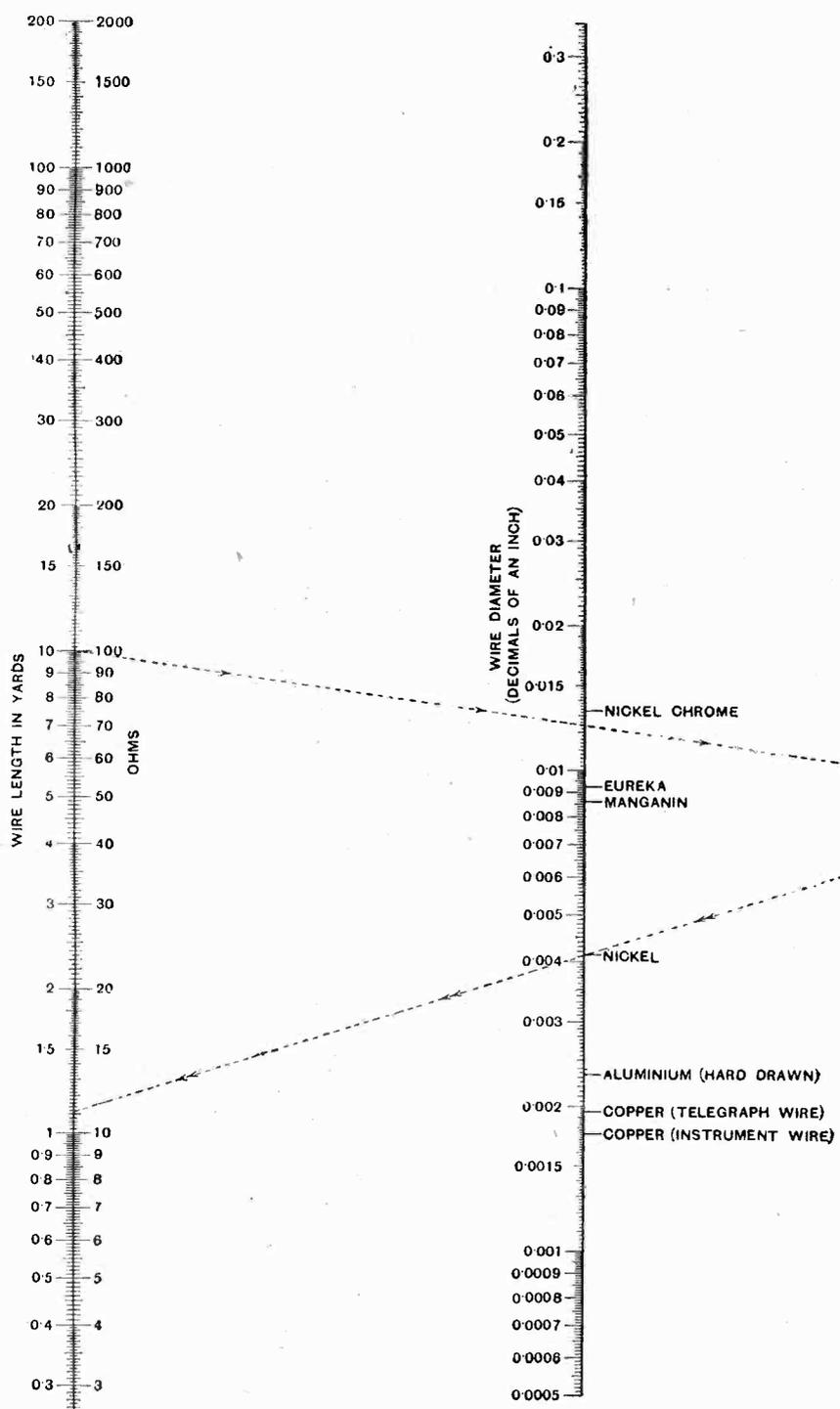


Fig. 2.—The five scales of Fig. 1 are here virtually folded symmetrically about a centre reference line.

On account of its high resistance, it is useful for filament resistors and ballast resistors when charging batteries from mains. It is sold as bare wire or strip only, but under the name of *nichrome* it can be obtained with cotton or silk covering. Some high-resistance potentiometers are made of nickel chrome, and it is to be found embedded in "Zenite" high-value resistances.



D.C. RESISTANCE OF RESISTANCE WIRE
 YARDS - DIAMETER - REFERENCE LINE - MATERIAL - OHMS

W. W. ABAC

NO 10

Useful Data Charts. (No. 10).—

Eureka is a nickel-copper alloy, and is much the same as *constantan*. Its change of resistance with temperature is very low, being 0.0022 per cent. per degree C.; it will stand heating up to 300° C., and does not oxidise in air. It is highly thermo-electric; that is, if a closed circuit is composed partly of copper and

	Relative Resistance.
Copper	1
Copper alloy for telegraph wire	1.25
Aluminium (hard drawn)	1.77
Nickel	5.56
Manganin	24.2
Eureka	28
Nickel Chrome	58

partly of Eureka, then on heating one of the two junctions a current will flow round the circuit. A simple thermo-couple can be made in this way by twisting together the ends of a copper wire and a Eureka wire and connecting the free ends to a galvanometer. When the twisted junction is held between the finger and thumb the heat developed will be shown by a movement

of the galvanometer pointer. This same property, however, makes the material useless for the construction of accurate resistances. It is chiefly used for filament resistors, low-resistance potentiometers, and "Zenite" vitreous resistances of low value; it has also been used in high-power gramophone amplifiers, where plate resistances are required capable of carrying 8 milliamperes.

Manganin is an alloy of copper, manganese, and nickel. *Tarnac* is very similar. *Manganin* is the wire *par excellence* for precision resistances, since its change of resistance with temperature is only 0.001 per cent. per degree C., and it is not thermo-electric when joined to copper. Silver solder should be used when making joints, since soft solder alters the resistance. To prevent slow change of resistance with time, it is advisable to bake the resistance spool at 120° C. for three hours, and finally cover it with paraffin wax.

Nickel is required for connections for medical apparatus and tips for sparking plugs; some intervalve transformers have their secondary windings composed of nickel wire, to decrease the stray magnetic flux.

Aluminium alloyed with copper and 0.1 per cent. silicon is used for telegraph and telephone wires where pure copper would be too soft.

R. T. B.



TRANSMITTERS' NOTES AND QUERIES

Argentine Amateurs.

The following QRA's supplement and correct the list of Argentine Amateur Transmitters in the R.S.G.B. Annual for 1928.

Additional Stations.

EX9	R. T. Donato, Rivadavia 5830, Capital.
BY1	L. A. Grecco, Brandsen 612, Capital.
BZ2	F. Grebe, Tarija 4254, Capital.
BZ7	A. Luis, Pepiri 1235, Capital.
CA2	A. Radaelli, Paraguay 2233, Capital.
DE7	J. Boggio, García Mansilla 2338, Victoria F.C.C.A.
DV2	A. B. Musante, Chiclana 730, Bernal (Buenos Aires).
GF6	L. Chiketa, Arequito (Santa Fe).
NA4	T. Santa Ana Jr. Santiago del Estero.
RA3	L. Del Bono, Timogasta (Catamarca).

Changes.

DE1	A. Martinez, Distrito Militar 22, Dolores (Buenos Aires).
DE6	L. L. Melendez, Muñiz entre Lynch y Estrada, Martinez (Buenos Aires).
DJ2	M. De Gregorio, General Mitre 328, Avellaneda (Buenos Aires).
DJ3	V. Rodriguez Pereyra, Estanislao S. Zeballos 254, Avellaneda (Buenos Aires).
EH2	C. D. Menditte, De la Garna.
EL7	R. Requejo, Av. San Martin 238, General Viamonte.
HB4	J. Costanzo, Laboulaye (Cordoba).
HC8	S. Figueroa, Villa Maria (Cordoba).
HE4	P. Holmsky, Tio Pujio (Cordoba).
HE5	M. C. Cesano, La Palestina (Cordoba).
HE6	A. Besso, La Palestina (Cordoba).
HF6	M. Lorenzatti, Villa Maria (Cordoba).
PA2	J. Nuche, Desamparados.

Deletions.

HD5	E. Favier, Cordoba.
HD7	R. Granillo Barros, Cordoba.
HE1	A. Del Castillo, Cordoba.
HA4	O. Casoli, Cordoba.
HA8	L. Casoli, Cordoba.
HB7	A. Vanelli, Cordoba.

Australian and New Zealand Amateurs.

A correspondent states that, according to correspondence he has received, Australia and New Zealand amateurs are disappointed at the comparatively small number of communications they are able to establish with Great Britain, and appeal for more work with British amateurs. He encloses a post-card from Z 4AV in Dunedin, New Zealand, asking "What has happened to all the English Hams these days? We have no trouble to work the EF's, EB's, EK's, etc., but we would sooner QSO 'Old England' than these others."

Possibly the holiday season may be partly accountable for such complaints—if, indeed, they are actually justifiable—or again the Antipodes may now be considered too easy to reach, and our long-distance enthusiasts may be trying to establish two-way communication with yet more distant spots.

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Norwegian Amateurs.

The Norwegian Radio Relay League, the formation of which was noted in our issue of August 29th, is anxious to attract the co-operation of British amateurs. Correspondence should be addressed to the N.R.R.L. Headquarters, Voksenlia, Oslo.

A German Amateur.

We understand that the station EK 4AO is now working with a new two-valve transmitter on telephony, using an input of 75 watts, and the operator would like to fix up a regular schedule with English amateurs. Communications may be sent either via D.F.T.V., Berlin, or the address may be obtained by anyone interested from Mr. F. Donald Cawley, 85, Hale Road, Hale, Cheshire, to whom we are indebted for this information.

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New Call-signs and Stations Identified.

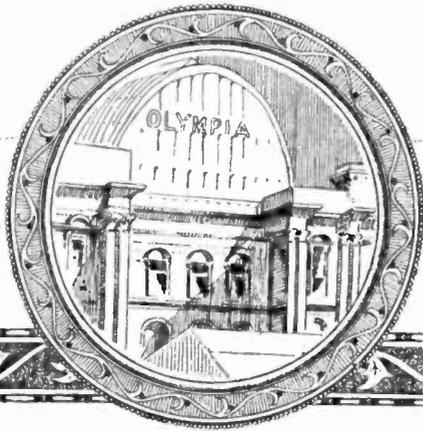
2DL	R. H. Lauderdale, Kilvington, Sutton Ave, Hounchurch, Essex. Transmits on 23.45, 90 and 170 metres, and welcomes reports from all distances. (Change of address).
6QF	A. M. Robertson, 27, Ladysmith Rd., Edinburgh, conducting skip-distance tests on 45 metres and will welcome reports from all distances.
2AAR	F. G. Morgan, 42, Rosebery Avenue, Crosby, Liverpool. (Change of address).
2AWV	C. J. Keed, 184, Henleaze Rd., Bristol.
AI2BY	Sergt. J. Peters, "B" Corps Signals, Rawalpindi, India. Transmits on 21.4, 41.9 and 80 metres.

Through the courtesy of EAR1 we give below a supplementary list of Spanish QRA's:—

EAR 37	Enilio Rotellar, Cervantes 11, Saragosa (in place of M. M. Morante).
EAR 41	Juan Golf, Libertad 115, Cabañal, Valencia. (Change of address.)
EAR 73	Martin Colon, Mallorca 152, Barcelona (in place of M. C. v J. Mangané).
EAR 107	Luis Floristan, Orcera, Calatayud.
EAR 108	Juan del Campo, Suarez Inclan 4 y 6, Avilés.

This corrects the list in the R.S.G.B. Annual for 1928 and the supplementary lists published in our issues of June 13 and 27.

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CURRENT TOPICS

Events of the Week in Brief Review.

APPARATUS FROM ABROAD.

The Radio Show at Olympia this year is again confined to British products, though we hope that in future years the barrier against apparatus of foreign origin will be removed, as we feel sure that there are many items emanating from abroad which are of interest.

If certain firms well known to our readers are, therefore, not showing at Olympia, they should not be blamed for lack of enterprise, as their absence is probably due to the ban on non-British exhibits.

RADIO RESEARCH INTERNATIONALISED.

The Union International de Radio-phonie, meeting in Brussels under the presidency of General Ferrié, has decided to establish an international wireless experimental centre.

AMATEUR HEARS HURRICANE CALL.

The first news to reach the outside world from the hurricane-swept districts of Florida was a wireless message from Palm Beach, picked up by an amateur at Jacksonville. All telegraph and telephone lines had been destroyed.

RECORD TRANSATLANTIC TALK.

The longest and most expensive Transatlantic telephone call yet made since the service was inaugurated took place on Monday of last week, when an American staying at the Savoy Hotel rang up a business associate in New York and spoke for ninety-five minutes. The conversation cost £285.

The connection was made about half past nine, says the *Daily Telegraph*, and the talk was only interrupted by two small breaks lasting a few seconds.

WIRELESS NEWS FOR THE ARCTIC.

A wireless "newspaper" has been inaugurated by broadcasting station KGO, San Francisco, for the exclusive benefit of isolated settlers in Alaska and Arctic regions further north. The bulletin, which will be broadcast every Monday, will be a summary of world happenings during the past week.

WIRELESS SHOW IN PARIS.

A wireless section is to be included in the Paris Automobile Show, which opens on October 25th. Nearly three hundred wireless firms will exhibit.

GUILDFORD RADIO SHOW.

A radio exhibition will be held in Guildford from October 16th-20th under the auspices of the Guildford and District Radio Society.

AMAZING.

Under the title "Amazing Wireless Invention," an Essex paper described last week a private demonstration of a combined wireless receiver and electrical gramophone reproducer.

THEY ALSO SERVE.

Young Frenchmen whose period of compulsory military service becomes due in November next are offered an opportunity of joining the brigade of radio-telegraphists.

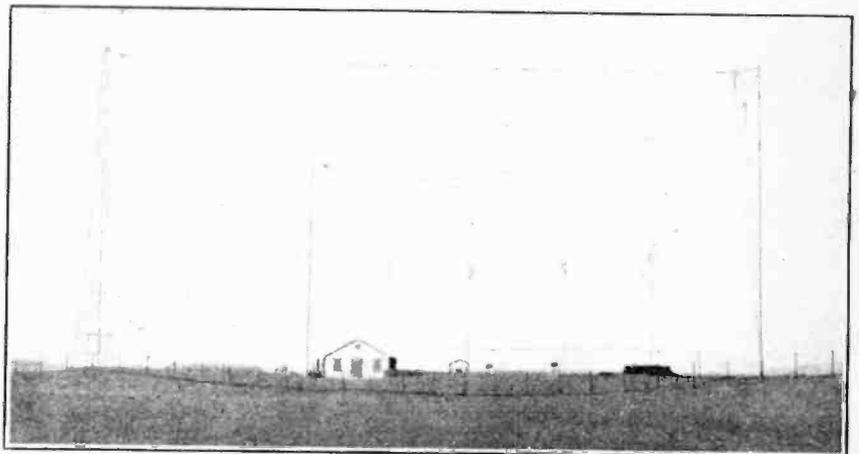
WIRELESS IN UNIVERSITY COURSES.

A wireless laboratory with a transmitting station (5DQ) is part of the electrical equipment of the Manchester Municipal College of Technology, which begins the Michaelmas term on October 4th. Enrolment dates for students are from October 1st to 3rd. Full information concerning the courses can be obtained on application to the Registrar, College of Technology, Manchester.

ONE O'CLOCK IN THE MORNING.

That a neighbour requires sleep is no reason why a wireless listener should switch off his loud speaker, even at one o'clock in the morning. This was the somewhat surprising declaration of the judge at Camden, New Jersey, a few days ago, when a woman complained that she and her husband were having their rest disturbed by the neighbour's loud speaker.

Records available go to show that the British listener is much more considerate for the welfare of his neighbour in the



A WIRELESS OUTPOST.—The new Marconi receiving station on the edge of the desert at Maadi, near Cairo, which carries long- and short-wave traffic from all parts of the world. Messages from England are received from the Dorchester beam station, working on 21 and 37 metres.

small hours of the morning. It would be ungracious to suggest that this is because the British broadcasting stations adopt more Puritan hours than those in America.

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SETTLING DOWN FOR THE WINTER.

The inhabitants of the lonely island of St. Kilda are reported to be facing the prospects of winter solitude with more than their usual fortitude owing to the installation of two broadcast receivers. With these they hope to keep abreast with the world's news until next May, when the summer steamship service is resumed.

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SHORT WAVES FROM HOLLAND.

PCLL, Kootwijk (Holland), now broadcasts every Wednesday at 1.30 p.m. G.M.T. in Dutch, English, French and German on a wavelength of 18 metres. The high power of 32 kilowatts is employed to enable residents in Java and other Dutch colonies to hear news from home. A beam aerial is used.

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POOLING MARINE WIRELESS EXPERIENCE.

At a conference at San Sebastian of the principal wireless maritime companies of the world, an International Radio Maritime Committee has been formed with the object of pooling the experience and knowledge of the various commercial organisations for the benefit of ship-owners, passengers and the public generally. Mr. A. Hubert, managing director of the Belgian Wireless Company, has been elected President.

Tottenham Society's Winter Plans.

Among the attractive events which figure in the forthcoming programme of the Tottenham Wireless Society are a demonstration of "Picture Broadcasting" by Mr. F. H. Haynes, Assistant Editor of *The Wireless World*, a lecture-demonstration on "The Ether Spectrum" by Mr. R. F. G. Holness, and a demonstration on "Copper Oxide Rectifiers" by Mr. F. E. R. Neale. The Society's meetings are held every Wednesday at 8 p.m. at the Institute, 10, Bruce Grove, Tottenham, N.17.

Some interesting remarks were made on the question of censorship in broadcast programmes in a talk given by Mr. H. A. Brown at the Society's last meeting. The speaker expressed gratification at the fact that we have advanced from the state of affairs when Bernard Shaw was not allowed to broadcast a speech unless he agreed to refrain from saying anything controversial!

Hon. secretary, Mr. F. E. R. Neale, 10, Bruce Grove, Tottenham, N.17.

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Opening the Session.

The South Croydon and District Radio Society will hold the first meeting of the season this evening (Wednesday) at the Surrey Drivers' Hotel at 8 o'clock, when officers for the ensuing session will be elected. The Society is busily engaged on the preparation of an attractive programme.

Hon. secretary, Mr. E. L. Cumbers, 14, Campden Road, South Croydon.

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Bargains!

An annual event in the activities of the Stretford and District Radio Society is the auction sale, which will take place to-morrow evening (Thursday) at 7.30 o'clock at headquarters, 6a, Derbyshire Lane, Stretford, Manchester.

Hon. secretary, Mr. W. Hardingham, 21, Burleigh Road, Stretford, Manchester.

BROADCASTING V. BOREDOM

Broadcast receivers, in addition to the regulation wireless apparatus, will form part of the equipment on five new steam fishing trawlers which were launched at Selby last week. In their voyages to Iceland and the White Sea the trawlers will cover a distance of 3,000 miles on each trip, and the broadcast receivers are intended to keep the men cheerful during long periods of inaction.

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GRADED LICENCE FEES.

Listeners to the programmes of the Austrian Broadcasting Company are taxed according to their incomes. Subscribers whose wages are less than £20 10s. per month are taxed at a minimum of 14s. per annum, while those whose incomes soar above this figure must pay not less than 2 guineas per annum. The fee increases proportionately to the number of loud speakers or headphones in use.

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POLITICAL BATTLE "ON THE AIR."

With only two months to go before the U.S. Presidential election, all three parties—Republicans, Democrats and Socialists—are making a determined bid to secure the allegiance of broadcast listeners.

The Republicans, says the National Broadcasting Co., will be on the air three nights a week and the Democrats twice. Both parties will broadcast twice a week over Eastern stations in the day-time. In addition, the Republicans will be on

the air through twenty stations twice a week at noon, with Chicago as the broadcasting centre. The Socialists have arranged for at least two broadcasts during the campaign, once in the East and once through the Pacific Coast network.

The only fear seems to be that the radio audience will listen merely to views with which it agrees.

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CLOCK WIRELESS.

The "Granny Set" is the name given to a new proprietary receiver which is incorporated in a miniature grandfather clock.

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THE WORLD BEATER.

Teacher (to geography class): "What was Columbus trying to find in 1492?"
Bright Pupil: "A short-wave hook-up to get India."—*Radio News*, New York.

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EXPLODING A MYTH.

"The legend of supposed seasonal interest that dominated the motor trade for many years has been transferred to wireless, but apparently with even less justification. Evidence has accumulated recently pointing to the fact that people listen to broadcast entertainment and talks in summer almost as much as during the winter evenings. . . . The enjoyment has ceased to be a seasonal occupation because most places where people stay on holiday possess receiving sets and portable sets can be taken to supply entertainment on a yachting cruise or a motor tour."—*Birmingham Post*.

NEWS FROM THE CLUBS.**Aerial Systems Reviewed.**

In his lecture on aerial and earth systems at a recent meeting of the North Middlesex Radio Society, Mr. L. C. Holton showed his intimacy with a very wide range of aerial devices used since the early days when Sir Oliver Lodge experimented with syntonic leyden jars. He referred to the tremendous advance made when one side of the aerial system was first "earthed," and later described some wartime aerial arrangements—among others, the "loop" and the "umbrella."

The lecturer advocated the use of a heavier gauge of wire for the "near" than for the "far" end of the aerial for the same reason that he recommended the use of more insulators at the free end than at the receiver end of the aerial, viz., that while greater potential changes occur at the free end of an aerial, the current changes are greater at the earthed end.

Hon. secretary, Mr. E. H. Laister, "Endcliffe," Station Road, Winchmore Hill, N.21.

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Change of Address.

The address of Mr. F. J. Waller, Hon. Secretary of the Southend-on-Sea and District Radio Society is now—"Lynthorpe," Grange Gardens, Southend.

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A Proud Record.

A few months before broadcasting commenced the Hackney and District Radio Society was formed, and since then, it has held weekly meetings without a break throughout the winter and summer. It is now considered, in view of the rapid progress made in the sciences allied to radio transmission and reception, that the name is hardly applicable to the activities of the Society, which is, therefore, to be known as the Hackney Radio and Physical Society.

The Headquarters at the Hackney Electricity

Showrooms, Lower Clapton Road, E.5, are capable of accommodating 150 persons, and are equipped with an up-to-date receiver and moving-coil loud speaker, which reproduces the programme from 2LO throughout broadcasting hours.

Persons who are interested in radio and desirous of joining the Society are invited to communicate with the Secretary, Mr. Geo. E. Sandy, 48, Melrose Avenue, Wimbledon Park, S.W.19.

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Public Demonstration.

A free radio demonstration, open to the general public, will be given by the Hackney Society on Monday next, October 1st, at 7.30 p.m., at headquarters.

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New Session at Wembley.

The Wembley Wireless Society will probably open the winter session on Friday, October 12th, with an inaugural meeting at Park Lane School at 8 p.m. An attractive programme has been arranged, several well-known names appearing in the list of lecturers.

At a recent meeting of the Committee, the President, Mr. C. R. W. Chapman, reported the receipt of a letter of thanks from the Wembley Hospital for the work carried out by the Society in installing a wireless set.

Arrangements are being made to visit the Post Office transmitting station and some of the research departments of well-known wireless manufacturers.

The Society is open to receive applications for membership, the fee for the year being 6s. per member.

Applications for membership and the syllabus should be addressed to the Secretary, Mr. H. E. Comben, B.Sc., A.M.I.C.E., 24, Park Lane, Wembley.

PROGRAMMES FROM ABROAD



SATURDAY, SEPTEMBER 29th.

All Times are reduced to British Summer Time and are p.m. except where otherwise stated.

BARCELONA (Radio-Barcelona), Call EAJ (344.8 metres); 1.5 kW.—9.10, Sextet Selections. 8.30, Lesson in Morse. 8.45, Wireless Lesson. 9.0, Exchange Quotations and News. 9.5, Orchestral Concert: Washington Post March (Sousa); Selection from Doña Francisquita (Vives); Sardana (Gravalosa); Czardas, Paris (Michiels); El andarin (Coto); Overture to Flotte Burschen (Suppé). 10.0, Chimes and Weather Report. 10.5, Programme, relayed from Madrid, EAJ7.

BERGEN (370.4 metres); 1.5 kW.—7.0, Programme for Children. 7.30, Programme for Girls. 8.0, Orchestral Selections: Overture to Nachtklänge von Ossian (Gade); Indian Love Lyrics (Amy Woodforde-Finden). 8.20, Topical Talk. 8.30, Talk by K. Sydnes. 9.0, Quintet for Piano (Borgström), followed by Selections by a Male Quartet. 10.0, Weather Report, News, and Time Signal. 10.15, Relay from another Station. 12.0 Midnight (approx.). Close Down.

BERLIN (Königswusterhausen) (1,250 metres); 40 kW.—4.30, Herr Hasse, Talk: The Work of the Modern Prison Officer. 5.0, Programme from Hamburg. 6.0, Talk by Margarete Trapp. 6.30, Elementary Spanish Lesson. 6.55, Dr. E. Hoffmann-Harnisch, Talk: German Patriotism and its Expression in Poetry. 7.20, Prof. Minde-Pouet, Talk: Goethe's Influence up to the Present Day. 8.30, Programme from Voxhaus.

BERLIN (Voxhaus) (484 metres); 4 kW.—10.10, a.m., Market Prices. 10.15 a.m., Weather Report, News and Time Signal. 11.0 a.m., Programme of Gramophone Records. 11.30, a.m., Exchange Quotations. 12.55, Time Signal. 1.30, Weather Report and News. 3.10, Agricultural Prices and Time Signal. 3.30, Programme of Gramophone Records. 4.0, Dr. Paul Frank, Talk: Medical Hygiene. 4.30, Talk on Opera by Dr. Otto Erhardt. 5.0, Concert: Overture in Italian Style (Schubert); Selection from Die Fledermaus (Joh. Strauss); Selections (Beccia), (a) Nocturne, (b) The Little Overture; Spanish Dance No. 8 (Sarasate); Selection from La Bohème (Puccini); Potpourri of The Merry Widow (Lehár); Selection from Ariadne auf Naxos (K. Strauss); Boston, Aura (Brausen); Fox-Trot, Keinst du das kleine Haus am Michigansee? (Heyman); Tango, Paqueta (Milano); Blues, Frag' nicht, wenn du nur glücklich bist; One-Step, Herr Ober, zahlen! (Hirsch), followed by Announcements. 7.0, Kurt Grossmann, Talk: Youth and International Reconciliation. 7.30, Dr. Ernst Rothe: The Power of Suggestion; Increase of Power. 8.0, Georg Lüdecke, Talk: Steeple Chasing in Autumn. 8.30, "Der siebente Tag"—Comedy (Kudolf Schanzer and Ernst Welisch), followed by Weather Report, News, Time Signal and Sports Notes. 10.30, Dance Music. 12.30 a.m. (approx.) (Sunday), Close Down.

BERN (411 metres); 1.5 kW.—8.0, Time Signal and Weather Report. 8.5 (approx.), Legal Talk: The Question of Divorce. 8.30, Popular Programme from Basle (1,010 metres). Zürich (588 metres) and Bern—Four Songs and Vodel Selections, Instrumental Concert of Country Music, and Accordion Duets. 9.45, News and Weather Report. 10.0, Orchestral Selections. 10.35, Dance Music. 12.0 Midnight (approx.), Close Down.

BRFSLAU (322.6 metres); 4 kW.—4.0, Review of Books. 4.30, Orchestral Concert. 6.0, Talk by Georg Hallama. 6.20, Esperanto Lesson by Elsa Koschate. 6.30, Literary Talk and Recitations relayed from G.ewitz (329.7 metres). 7.25, Programme of Talks. 8.30, Variety Concert: Orchestral Selection. Overture to Frau Meisterin (Suppé). Historical Anecdotes; Piano Solo, Polonaise in F Major (Liszt); Tenor Solos, (a) Air from Die Herzogin von Chicago (Kálmán), (b) Song from Princess Ti-Ti-Pa (Stolz), (c) Air from Eine einzige Nacht (Stolz). Two Orchestral Selections (Meyer-Helms); Anecdotes; Piano Solo, (a) Witches' Dance (Mac-Dowell), (b) Schmettlinge (Polak), (c) Concert Paraphrase on Joh. Strauss' Waltz Melodias (Grünfeld); Tenor Solos, (a) Für Dich allein (Geel), (b) Blumensprache (Benatzky), (c) Die schönsten Augen hat meine Frau (Erwin). Anecdotes—Orchestral Selection, Auf Wache-March (Rosey), News. 10.30, Dance Music. 12.0 Midnight (approx.), Close Down.

BRUNN (441.2 metres); 3 kW.—7.0, Concert. 8.0, Talk for Journalists. 8.10, Recitation from Tolstoi.

FRANKFURT (428.6 metres); 4 kW.—1.0, Gramophone Selections. 2.35, Programme for Children. 3.55, Hints for the Housewife, by Fimi Plannes. 4.35, Concert of New Dance Music; in the Interval: Announcements. 6.10, Reading from a Novel by O. W. Stüdman. 6.30, The Letter Box. 7.0, Lesson in Esperanto, by W. Wischoff. 7.30, Prof. E. D. Sittig, Talk: The Heavens in September—Jupiter. 8.0, Concert of Operetta Selections and Waltzes of Johann Strauss: Overture to Cagliostro in Wien; Waltz, Morgenblätter; Selection from Wienerblut; Jugendliche Waltz from Smplicius; Selection from A Thousand and One Nights; Waltz, Accelerations. 9.0, Variety Concert from the Kunstlerspielen Polter, Cassel, followed by Dance Music from Voxhaus. 12.30 a.m. (approx.) (Sunday), Close Down.

HAMBURG, Call HA (in Morse) (394.7 metres); kW.—3.30, Review of Books. 4.0, Labour Exchange Report. 4.15, Music Talk by Dr. W. Heintz. 5.0, Concert of Chamber Music: Trio, Op. 32, in D Minor (Arenscky); Second Movement of the Trio, Op. 17, in A Minor (Joun). 6.0, Request Orchestral Concert. 7.0, Talk by Herr Zilliardt, relayed from Bremen (272.7 metres). 7.15, Talk: From a Fire in the Port to the Poster Announcements of It: The Machines. 8.0, "Nanon," Operetta in Three Acts (Richard Genée). 10.15 (approx.), Weather Report, News and Sports Notes. 10.30, Concert from the Café Wallhof.

HILVERSUM (1,071 metres); 5 kW.—11.40 a.m., Police Announcements. 12.10, Concert of Trio Music. 1.40, Dance Music by the Raublers Band. 2.40, Concert, relayed from the Tuschinsky Theatre, Amsterdam. 5.40, Time Signal. 5.42, Concert: Overture to Light Cavalry (Suppé); Waltz, A Thousand and One Nights (Joh. Strauss); Potpourri of the Works of Offenbach (Conradi); Songs: Whispering of the Flowers (Blon); Selection from The Daughter of the Regiment (Donizetti); Songs; Serenades (Toselli); Selections from The Dollar Princess (Fall); One-Step, Quand on est jeune (Mercier). 7.25, Police Announcements. 7.40, Time Signal. 7.41, Concert and Talk, arranged by the Workers' Radio Society. 10.10, Concert, relayed from the Royal Cinecra, Amsterdam. 11.15 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40 p.m.—12.10, Concert of Trio Music. 5.10, Gramophone Selections. 6.10, Gramophone Selections. 6.40, Talk by Mme. Hendrikse-Knapen. 7.40, Concert: Vocal and Instrumental Music; Recitations and Programme of Talks.

JUAN-LE3-PINS (Radio LL) (434 metres); 1.5 kW.—1.0, Concert. 9.0, News and Weather Report. 9.5 (approx.), Vocal and Instrumental Concert. 10.0, Dance Music. 10.30 (approx.), Close Down.

KALUNDBOR3 (1,153 metres); 7 kW.—Programme also for Copenhagen (337 metres)—7.30 a.m., Morning Gymnastics. 11.0 a.m., Weather Report. 1.15, Educational Talk. 3.0, Programme for Children. 3.30, Instrumental Concert: Kadetzky March (Joh. Strauss); Waltz, Hofballtänze (Joh. Strauss); Overture to Morning, Noon and Night (Suppé); Mazurka Bella (Waldteufel); Venetian Serenade (Svendsen); Galop, Eilgut (Waldteufel); Recitation; Overture to La Dame Blanche (Boieldieu); Selection from Si j'étais Roi (Adam); Blondineries Vals (Ganne); Grossmütterchen (Langert); Pizzicato from Sylvia (Delibes); Esprit Français (Waldteufel). 6.20, Talk: A Danish Bishop. 6.50, Weather Report. 7.0, News, Exchange Quotations and Time Signal. 7.30, Talk: The Last Sheaf. 8.0, Town Hall Chimes. 8.2, Bellman Programme, with Introductory Talk and Songs to the Lute, by Sven Scholander, Stockholm. 8.0, News, followed by "Gottfred Writes a Play," Radio Farce (Hans Hansen). 9.45, Concert: Overture to Isabella (Suppé); Heinzelmännchens Hochzeit (Köpping); Waltz, Fleurs de Granada (Zois); Serenata di Baci (Michele); Fantasia on Danish Sea Songs; Dinka; Waltz (Jespersen); Nimiche Internecio (Ohlsen) March from The Chocolate Soldier (Oscar Strauss). 10.45, Dance Music. 12.0 Midnight, Town Hall Chimes. 12.15 a.m. (approx.) (Sunday), Close Down.

KATZWITZ (423 metres); 10 kW.—5.25, Talk. 6.0, Programme for Children. 7.0, Announcements. 7.30, K. Zienskiewicz, Talk: England of To-day. 7.55, Agricultural Report. 8.30, Programme from Warsaw. 10.0, Time Signal, Weather Report and News. 10.30, Dance Music.

8.40, Humorous Quartet Selections: A la carte (A. Vrana); Czech Songs (Fr. Vrana); Waltzes (Rutke). 9.0, Exhibition Programme. 10.0, Programme from Prague.

BRUSSELS (538.5 metres); 1.5 kW.—5.0, Orchestral Concert from the Café Metropole, Brussels. 6.0, M. Julien Flament, Talk: The Life of Words. 6.15, Talk by M. O. Laroche. 6.30, Trio Concert: Selection from Le Roi de Lahore (Massenet); Piano Solo, Mazurka (Benoit); Chaconne (Durand); Chanson d'Amour (Nougues); Waltz from The Count of Luxemburg (Lehár); Cello Solo, Litany (Schubert); Suite orientale (Borris); Violin Solo, Serenade (Dralle); The King Boys (Ayer). 7.30, "Radio-Chronique." 8.15, Gramophone Selections. 8.30, Gaiety Concert. 9.0, Reading from Marguerite et François (Parmentier). 9.15, Concert (continued). 10.15, News. 10.30 (approx.), Close Down.

BUDAPEST (555.5 metres); 3.5 kW.—5.45, Concert. 7.0, Talk and Reading News. 8.0, Orchestral Concert. 9.40, Time Signal, News and Weather Report. 10.0, Trio Concert. 11.0, Tzigane Music.

COLOGNE (233 metres); 4 kW.—12.10, Programme from Langenberg. 1.5, Concert: Overture; Waltz, Transaktionen (Strauss); Hungarian Rhapsody No. 6 (Liszt); Ankniff bei den schwarzen Schwänen (Wagner); Solo; Selections from Undine (Lortzing); Aus aller Herren Länder (Moszkovsky); Grosser Galopp (Liszt). 2.30, Hints for the Housewife. 3.40, C. Bennewitz, Talk: The German Wireless Exhibition. 4.0, Heinrich J. Rechtmann, Talk: Carl Spitteler, Lyric and Ballad Poet. 4.30, Programme from Königswusterhausen. 5.0, Dr. Krause, Talk: The Tasks of a School Doctor. 5.25, Programme from Dortmund (see Langenberg). 5.45, Orchestral Concert. 6.30, Reading by Dr. Wilhelm Leyhausen from Lettres de mon Moulin (Daudet). 7.15, Dr. Robert Michels, Talk: Seven Great Cities—Rome. 7.40, Dr. Adam; Talk for State Workers—The State Railways and Economics. 8.0, "Das Verwünschte Schloss," Operetta (Millocker). 10.30, News and Sports Notes, followed by Orchestral Selections and Dance Music. 1.0 a.m. (approx.) (Sunday), Close Down.

CRACOW (566 metres); 1.5 kW.—7.0, Variety Selections, followed by Foreign Affairs Talk. 7.55, Market Prices and News. 8.30, Programme from Warsaw. 10.30, Restaurant Concert. 11.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—1.30, Weather Report and Gramophone Selections. 7.20, News. 7.30, Recitations by C. Ni Dhaluigh. 7.45, Irish Lesson, by Seamus O. Duirine. 8.0, The Augmented Station Orchestra: Caprice in B Minor (Brahms). 8.15, Instrumental and Vocal Selections by Joseph Schofield and Mary Maguire. 8.35, "The Lord Mayor," Sketch by Mary Sheridan and Company. 9.10, Soprano Solos by Peggy O'Regan. 9.25, Light Operatic Selections by the Station Orchestra. 9.55, Tenor Solos by Andy Dunne. 10.5, Pipe Solos by A. Meikle. 10.15, The Station Orchestra. 10.30, News, Weather Report and Close Down.

Programmes from Abroad.—

KAUNAS (2,000 metres); 7 kW.—6.30, Announcements. 7.0, Weather Report and News. 7.15, Programme Announcements. 7.30, "Lapkus"—Play (Rucevicius). 9.15, Selections of Folk Songs and Music. 10.0, Dance Music and Variety Selections.

LAHTI (1,522.8 metres); 35 kW.—5.0, Orchestral Concert. 5.57, Time Signal, Weather Report and News. 7.0, Programme of Trumpet Music. 7.20, Mandoline Quartet Music. 7.50, Songs and Musical Selections. 8.30, Overture to Spartacus (Saasola). 8.45, News in Finnish and Swedish. 9.15, Dance Music and 10.0 (approx.), Close Down.

LANGENBERG (468.8 Metres); 20 kW.—Programme also for Air-la-Chapelle (4.0 metres), Cologne (283 metres), and Münster (250 metres).—1.10, Gramophone Selections. 1.5 to 4.30, Programme from Cologne. 4.30, Programme from Königswusterhausen. 5.0, Programme from Cologne. 5.25, Dr. Strahl-Sauer, Talk: My Friend from Afghanistan, relayed from Dortmund. 5.45 to 1.0 a.m. (Sunday), Programme from Cologne.

LEIPZIG (335.9 metres); 4 kW.—4.30, Concert: Prelude to Die Abreise (d'Albert); Selections from Manon (Massenet); Russian Scenes (Bantock); Two Waltzes (Teresa Carreno); March from Le fid (Cornelius); in the interval, Announcements. 6.0, Wireless Notes. 6.15, Talk on Taxation. 6.30, Programme from Königswusterhausen. 7.0, Prof. Mendt, Talk: Art and Technique. 7.30, Kurt Riechke, Talk: Chess and Work among Young People. 8.0, Weather Report and Time Signal. 8.15, "Die Nachtiglocke," Burlesque Opera in One Act (Donizetti); and "Herr und Madame Denis"—Opera-comique (Delaparte). 10.15, News and Sports Notes. 10.30, Dance Music. 12.0 Midnight (approx.), Close Down.

LILLE, Call PTT (234 metres); 0.5 kW.—7.0, Market Prices. 7.10, Concert. 8.15, Selections by Toto le Galéneux. 8.45, Programme arranged by the Wireless Association of Northern France, followed by News.

MADRID (Union Radio), Call EA17 (375 metres); 3 kW.—7.0, Sextet Selections. 8.0, Dance Music. 9.45, Weekly Market Report. 10.0, Time Signal and Symphony Concert: Overture to Anacreonite (Cherubini); Sarabande, Gigue, Badinerie (Corelli); L'Isle Juveuse (Debussy); Symphony in A No. 7 (Beethoven); "Baba-Yaga"—Musical Sketch (Liaoff); By the Tarn (Goussens); Prelude to Pepita Jiménez (Alfarriz). News. 12.0 Midnight, Dance Music. 12.30 a.m. (Sunday), Close Down.

MILAN, Call IMI (549 metres); 7 kW.—3.35, Time Signal and Talk. 8.45, News, followed by Concert: Symphony, Harold (Rossini); Waltz from Dinorah (Wevebeer); Selections (Scharlatti); Reading from Musa Iltaris (Glepioc); Variations (Proch); Selection (Schubert); Scherzo (Sinara); Orchestral Selections, (a) Invitation to the Dance (Weber), (b) Dance maraboe (Saint-Saens), (c) A Sera (Catalani), (d) Overture to Ruy Blas (Merdessehn). 11.55, News, followed by Dance Music from the Hotel Majestic Diana, and Close Down.

MOTALA (1,350 metres); 30 kW.—Programme also for Stockholm (451.5 metres), Bölen (1,111 metres), Göteborg (1,065 metres), Malmö (261.9 metres), Östersund (729 metres), Sundsvall (545.6 metres).—5.0, Concert of Light Music. 6.0, Programme for Children. 6.30, Concert of Old Time Dance Music. 7.30, Talk: Voices now Silent. 8.0, Talk: Professions and Professional Men. 8.15, Musical Cabinet. 8.45, News and Weather Report. 9.45, Topical Talk. 10.0, Dance Music. 12.0 Midnight (approx.), Close Down.

NAPLES, Call INA (333.3 metres); 1.5 kW.—8.20, Wireless Notes. 8.40, Time Signal and News, followed by Harbour Notes. 8.50, Concert. Symphony, La Ceneterola (Rossini); "La Maestina," Comedy (Nicoledoni); in the intervals, Dance from Teramors (Rubinstein); Two Entr'actes (Thomas); Overture to Si j'étais Roi (Adam) News. 10.55, Calendar and Programme Announcements. 11.0 (approx.) Close Down.

OSLO (401.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (134.8 metres), Hamar (555.6 metres), Notodden (411 metres), Porsgrunn (500 metres), and Rjukan (448 metres).—6.0, Programme for Children. 7.15, Weather Report, News and Agricultural Report. 7.30, Talk: The History of China for 4,000 years. 8.0, Time Signal. 8.2, Orchestral Concert: Rudolfs Klänge (Joh. Strauss); Mimosa Waltz (Jones); Ganz allerliebst (Waldteufel); Sangen til Dia (Thornussen); Chant d'automne (Armondola); Pie Notturno

Saturday, September 29th.

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(Gor); Palma di Malorca (Yoshitomo); Hawaiian Night (Yoshitomo). 9.0, Norwegian Poems and Prose Selections. 9.30, Weather Report, News and Sports Notes. 9.45, Topical Talk. 10.0, Dance Music from the Grand Hotel. 11.30, (approx.), Close Down.

PARIS (Ecole Supérieure), Call PPTT (458 metres); 0.5 kW.—6.30, "Radio Journal de France." 8.0, News and Sports Notes. 8.30, Concert arranged by L'Association Générale des Auditeurs de T.S.F.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—6.45, "Le Journal Parlé." 8.10, Weather Report. 8.30, Concert: Scènes pyrénéennes (Chauvet); Songs, (a) Les Lilas (Rachmaninoff), (b) Vieni, une flûte invisible s'approche (Caplet), (c) Madrigal (Pauré); Lied (Franck); Impression musicale (Grumbach); Songs (Citanova), (a) Ne plus t'aimer, (b) Nocturne, (c) L'Amour; Scènes touraines (Miguan), Pavane (Grumbach).

PARIS (Petit Parisien) (340.9 metres); 0.5 kW.—8.45, Gramophone Selections, Talk, News and Announcements. 9.0, Orchestral Concert: Overture to Les Diamants de la Couronne (Auber); Selections from Sapho (Massenet); Finale from the Symphony in D Minor (Franck); Wedding March (Mendelssohn); Selections from Les cent vierges (Lecocq); Karnaval (Siede); Zouaves' March from the French Suite (Poulès), News in the intervals.

PARIS (Radio-Paris), Call CFR (1,750 metres); 6 kW.—12.30, Columbia Gramophone Concert: L'Amour sorcier (de Falla); Overture to Egoon (Beethoven); Violin Solo, Air russe (Wieniawsky); Tenor Solo from The Marriage of Figaro (Mozart); The King of Thule from Faust (Gounod); Clarinet Solo from Le Pré aux Clercs; Virginia by Sophie Tucker; Together by Layton and Johnstone; Waltz, Rainona; Paul Whiteman's Band, Fox-Trot, Is It Gonna Be Long; News. 1.50, Religious Notes and News. 3.45, Dance Music. News. 8.0, Agricultural Report. 8.15, Talk and News. 8.30, Concert: A la Chambre (Fardyce-Matrat); Nocturne, Mazurka and Waltz (Chopin); Two Arabesques (Debussy); Pastorale (Franck); Réverie du Soir (Saint-Saens); Estampes (Debussy); Izeyl (Piérne), The Joss Ghislery Symphonians, News.

POSEN (344.8 metres); 1.5 kW.—6.0, Programme for Children. 7.0, Topical Talk. 7.30, Prof. Dworzaczek, Talk: Lithuania To-day. 8.0, Financial Report. 8.30, Concert of Organ, Contralto, and Pianoforte Solos. 10.0, Time Signal, News, Weather Report and Miscellaneous Items. 10.40, Dance Music from the Carlton Restaurant. 12.0 Midnight, Experimental Concert by the Maison Philips. 2.0 a.m. (approx.) (Sunday), Close Down.

PRAGUE (343.9 metres); 5 kW.—6.0, German Programme. 6.20, Agricultural Report. 6.30, Talk for Workers. 7.15, Orchestral Selections. 8.0, Weather Report and News. 8.10, Popular Programme. 9.0, A Comedy and Tambourin Selections. 10.0, Time Signal, News and Orchestral Music.

RIGA (526.3 metres); 4 kW.—5.30, Programme of Talks. 6.30, French Lesson. 7.0, Popular Concert: Overture to Fra Diavolo (Auber); Suite Champêtre, Nos. 1 and 2 (Anacle); Valse Boccaccio (Fetras); Flottenparade Marche (Eilenberg); Songs; Violin Solo; Songs; Recitations; Selections (Pickert), (a) Intermezzo, Le Secret, (b) O kommu, mein süßes Mädel; Waltz, Sirenenzauber (Waldteufel); Perpetuum mobile (Strauss); Waltz, Liebesfrühling (Vollstedt). 9.0, Weather Report and News. 9.30, Concert from the Cate de l'Opera. 11.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—8.30, Sports Notes, News, Exchange Quotations and Weather Report. 8.59, Time Signal. 9.0, "Manon"; Opera (Massenet); in the intervals, Review of Art and Literature, and Topical Talk. 11.5, News and Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—11.55, Baseball Announcements. 12.0 Midnight, Statler's Pennsylvanians, directed by Johnny Jolson, from New York. 12.30

a.m. (Sunday), Concert from the Hotel Sagamore Rochester. 1.0 a.m., "Mr. and Mrs. Radio Skits." 1.0 a.m., Time Signal. 1.32 a.m., Variety Concert with Soprano Solos, by Milfred Hunt, from New York. 2.0 a.m., "The Open Mike" from New York. 3.0 a.m., Organ Keccital by Robert Berentsen, from Rochester. 4.0 a.m., Dance Music from the Hotel Ten Eyck, Albany. 5.0 a.m. (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—6.15, Concert of Turkish Music. 8.30, Weather Report and Time Signal. 8.40, Concert: Symphony No. 7 (Beethoven); Song; Algerian Nights (Grieg). 10.0, News and Close Down.

STUTTGART (379.7 metres); 4 kW.—6.15, Talk on The Organisation of the German Caritas, relayed from Freiburg (577 metres). 6.15, Talk: Pezaires, the City of a Thousand Temples. 7.15, Book-keeping Lesson. 7.45, Time Signal and Weather Report. 8.15, Programme from Ulm on the Occasion of "Ulm Week"; Prelude to Parsifal (Wagner); Die Allmacht (Schubert-Liszt); Address by Burgomaster Fr. Schwannmberger, Dr. Weller and Georg Ott; German Prayer (Haeckenberger); Love Song (de la Haie); Jagers Morgenbesuch (Jungst); Herr A. Zoller, Talk: The Hinkel Pianola; Duets from Opera (Mozart); Theme and Variations from the Fovelin Quintet (Schubert); Old Vienna Pearls from Lauer's Waltzes; (Ulm District Dialect Poetry (Kolme); Selections by a Male Voice Choir (Sillcher), (a) O Maidle, (b) Süss' Liebe liebt den Mai; Selection for the Cornet à Piston; Swabian Dialect Poetry (Kohle); Selections (Sillcher), (a) Die Auserwählte, (b) Drei Köselein; Humorous Songs: Potpourri, O Dreiländchen hoch in Ehren (Lindeman), followed by News from Stuttgart. 11.30 (approx.), Dance Music.

TALLINN (403 metres); 2.2 kW.—5.30, Programme for Children. 6.0, Weekly Report. 6.30, News. 7.0, Gramophone Selections. 8.15, Dance Music from the Estonia Weisse Saal.

TOULOUSE (Radiophonie du Midi) (391 metres); 3 kW.—12.45, Instrumental Solos. 8.0, Exchange Quotations and News. 8.30, Orchestral Concert. 9.0, Vocal Concert: Air from Manon (Massenet); Air from La Tosca (Puccini); Hallelujah from Hit the Deck (Youmans); Selection from The Merry Widow (Lehar); Opium Dream from Persian Night (Saint-Saens); May Night (Rinsky-Korsakoff); Pose and Cabbage Couplet from The Great Mogul (Andran); Sirenae française (Wolter); Au clair de lune (Lecocq); Le père la Victoire (Ganne). 9.30, Waltz Programme from the Works of Strauss. 9.55, Dance Music 10.15, North African News.

WARSAW (1,111 metres); 10 kW.—5.25, Astronomy Talk by Dr. J. Gadmomy. 6.0, Programme for Children. 7.0, Miscellaneous Items. 7.30, Wireless Talk by Dr. M. Stepowski. 7.55, Agricultural Report. 8.5, News. 8.30, An Opreta Programme; News in French in the interval. 10.0, Time Signal, Aviation Notes and Weather Report. 10.5, News. 10.20, Police Announcements and Sports Notes. 10.30, Dance Music, relayed from the Oaza. 11.30 (approx.), Close Down.

VIENNA (577 and 517.2 metres); 1.5 and 15 kW.—4.0, Concert. 5.20, Programme for Children. 6.29, Chamber Music: Trio for Pianoforte in D Minor (Schumann); Variations on Schneider Kakadu (Beethoven). 7.10, Emmerich Reiners, Talk: The Olympic Games and their Poets throughout the Ages. 8.5, "The Dollar Princess," Operetta (Fall), followed by Concert: March, Fanfarenklänge (Fürki); Waltz, Durch die Weiten Felder (Lehar); Potpourri on The Geishe (Jones); Song from Lenz und Liebe (Schubert-Berté); Komm mit mir ins blaue Paradies (Eysler); Ja, ja, der Wein ist gut (Strecker); Potpourri, Lehariana (Geiser); Quadrille, Landstreicher (Ziehrler); Dance Suite, Mondana (Silving); Fox-Trot, March Potpourri (Robrecht).

VILNA (435 metres); 1.5 kW.—12.0 Noon, Gramophone Selections. 1.0, Programme from Warsaw. Time and News. 5.0, Announcements in Lithuanian. 5.0, Announcements. 5.35, Programme for Women by Mme. Eta Bundler. 6.0, "Ol-Son-Kisau," Oriental Play (Sierosawski); Talk. 7.0, Gramophone Music and News. 7.30, Talk from Warsaw. 8.0, Programme of Talks. 8.30, Programme from Warsaw. 11.30 (approx.), Close Down.

ZÜRICH (589 metres); 1 kW.—4.0, Concert from the Carlton elite Hot l. 5.15, Accordion Selections. 5.45, Weather Report and Exchange Quotations. 7.0, Chimes from the Zurich Churches. 7.15, Time Signal and Weather Report. 7.17, Popular Programme. 8.30, Concert of Folk Songs, Yodel Selections, Country Music and Accordion Duets, from Basle (1,010 metres), Bern and Zurich. 10.0, Weather Report and News. 10.10, Dance Music.

SUNDAY, SEPTEMBER 30th.

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where otherwise stated.

Programmes from Abroad.—

BARCELONA (Radio-Barcelona), Call EA11 (344.8 metres); 1.5 kW.—12.0 Noon, Relay of the Cathedral Chimes, followed by Report from the Barcelona Meteorological Service. 1.30, The Iberia Trio in a Concert of Popular Music; in the Interval, Gramophone Records. 6.0, Market Priests. 6.15, (approx.), The Station Orchestra and Vocalists: "La Farandole," Ballet Suite No. 1 (Dubois-Mouton); (a) Les Tambourinaires, (b) Les amies infidèles, (c) La Provençale, (d) Sylvine, (e) La Farandole Fantastique. 8.40, Sports News. 9.0 (approx.), Close Down.

BASLE (1,010 metres); 1.5 kW.—Programme relayed from Bern. 8.5, Orchestral Concert. 9.45, Weather Report and News Bulletin. 10.15 (approx.), Close Down.

BERGEN (370.4 metres); 1.5 kW.—10.30 a.m., Relay of Sacred Morning Service. 12.30, Weather Forecast and General News Bulletin. 8.0, Programme by the Bergen Station Orchestra, followed by Talk. 10.0, Weather Report, General News Bulletin and Time Signal. 10.15, Orchestral Selections. 12.0 Midnight (approx.), Close Down.

BERLIN (Königswusterhausen), (1,250 metres); 40 kW.—8.55 a.m., Garrison Church Chimes from Potsdam. 9.0 a.m., Morning Concert, relayed from Voxhaus, followed by Chimes from the Berlin Cathedral. 11.30 a.m. (approx.), Concert of Orchestra Selections, relayed from Voxhaus. 2.0, Children's Corner, arranged by Hans Bodenstedt, relayed from Voxhaus. 3.30 to 4.45, Three Talks on Agriculture from Voxhaus. 5.0, Concert, relayed from Voxhaus. 6.30, Talk. 7.0, Talk by Rolf Cunez, Modern Expressionist Dancing and Music, followed by relay from another German station. 10.15, News from the Press. 10.30, Selections of Dance Music. 12.30 a.m. (approx.) (Monday) Close Down.

BERLIN (Voxhaus), (494 metres); 4 kW.—8.55 a.m., Relay of Chimes from the Garrison Church at Potsdam. 9.0 a.m., Morning Recital of Vocal and Instrumental Music, followed by relay of Berlin Cathedral Chimes. 11.30 a.m., Orchestral Concert. 2.0, Songs and Stories for Children. 3.0, Shorthand Lesson by Prof. Dr. Ansel and Fritz Westermann. 3.30, Practical Advice on Agricultural Methods. 3.45, The Week's Market Report and Weather Conditions. 3.55, Agricultural Talk. 5.0, Orchestral Concert. 7.0, Talk. 7.30, Talk, followed by Concert with Instrumental Solos. 10.10 (approx.), Weather Report, Time Signal, Sports Notes and General News Bulletin. 10.30, Programme of Dance Music. 12.30 a.m. (approx.) (Monday), Close Down.

BERN (411 metres); 1.5 kW.—10.30 a.m., Religious Address. 1.0, Time Signal and Weather Report. 1.5 Orchestral Selections. 3.30, Instrumental Concert. 8.0, Time Signal and Weather Report followed by Concert. Pianoforte Selections by Hedi Batt. 9.45, General News Bulletin, Sports Notes and Weather Forecast. 10.0, Orchestral Programme. 10.35 (approx.), Close Down.

BRESLAU (322.6 metres); 4 kW.—Programme, relayed by Gleiwitz (329.7 metres). 8.45 a.m., Chimes, relayed from Christ Church. 11.0 a.m., Evangelical Recital, with Talk and Instrumental Music. 12.0 Noon, Concert, followed by Talks. 2.35, Talk for Chess Players. 3.0, Half-hour for Children, followed by Talks and Musical Selections. 8.30, Concert or Play. 10.0, General News Bulletin. 10.30, Light Music. 12.0 Midnight (approx.), Close Down.

BRÜNN (441.2 metres); 3 kW.—10.30 a.m., Agricultural Notes. 11.0 a.m., Musical Programme. 3.0, Orchestral Selections. 6.0, Programme for German Listeners. 7.15 (approx.), Orchestral Concert. 10.0, General News Bulletin, relayed from Prague, followed by Concert.

BRUSSELS (508.5 metres); 1.5 kW.—5.0, Relay of Dance Music from the St. Sauveur Palais de Danse. 6.0, Children's Corner; Bonzo and Sylvia in their Repertoire. 6.30, Concert by the Station Orchestra. 7.30, La Radio Chronique. 8.15, Concert by the Station Orchestra, conducted by M. René Tellier. "Louise," Grand Symphony Suite (Charpentier). 10.15, Late News Bulletin. 10.30 (approx.), Close Down.

BUDAPEST (555.6 metres); 35 kW.—9.0 a.m., Press News. 9.15 a.m., Beauty Hints. 10.0 a.m., Morning Service and Address. 12.15 (approx.), Musical Programme. 4.0 (approx.), Children's Corner. 5.0, Light Music. 10.20, Selections by the Tzigane Orchestra.

CORK, Call 6CK (400 metres); 1.5 kW.—8.30, Concert, with Instrumental Selections by the "All Ireland Trio." 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

COLOGNE (283 metres); 4 kW.—Programme also for Aix-la-Chapelle (400 metres), Langenberg (468.8 metres), and Münster (250 metres).—9.0 a.m. (approx.), Sacred Recital. 11.0 a.m., Two Talks. 1.0, Orchestral Concert, followed by Talks on Literature and Chess. 4.30, Concert and Talks. 7.50, Sports Notes. 8.0, Festival Concert of the Thyssen Choral Society, relayed from the Mülheim Town Hall, followed by Late News Bulletin, Sports Notes and Musical Programme. 12.0 Midnight (approx.), Close Down.

CRACOW (566 metres); 1.5 kW.—10.15 a.m., Relay of Cathedral Service. 12.0 Noon, Relay of Fanfare from the Church of Notre Dame, followed by Time Signal and Weather Forecast. 1.30 to 2.30, Concert by the Orchestra of the "Pavillon" Restaurant. 4.0, Talks for Farmers followed by "La Chronique Agricole," by Dr. St. Wasniewski. 5.0, Programme relayed from Warsaw. 6.30, Variety Items. 6.50, Talk. 8.0, Fanfare from Notre Dame. 8.15, Notes. 8.30, Orchestral Concert: Mme. Felicie Misky (Vocalist), Cavatina from the opera "The Marriage of Figaro," by Mozart. 10.0, Programme relayed from Warsaw. 10.30, Orchestral Concert from a Restaurant. 11.30 (approx.), Close Down.

DUBLIN, Call 2RN (319.1 metres); 1.5 kW.—8.30 to 11.15 (approx.), Programme relayed from Cork: Concert of Instrumental Music with Mezzo-Soprano Solos by Mary Maguire. 11.0, Weather Forecast and National Anthem. 11.15 (approx.), Close Down.

FRANKFURT (428.6 metres); 4 kW.—Programme relayed by Cassel (252.1 metres). 8.0 a.m. to 9.0 a.m., Recital of Music. 11.30 a.m. (approx.), Half hour for Parents, arranged by Dr. Flesch and Director K. Wehrhan. 12.0 Noon, Concert by the Station Orchestra. 1.0, Agricultural Notes, followed by Programme for Young People conducted by Director K. Wehrhan. 8.15, Sports Notes. 8.30, Orchestral Concert. 10.30 (approx.), Dance Music relayed from Berlin. 12.30 a.m. (approx.) (Monday), Close Down.

HAMBURG, Call HA (in Morse), (394.7 metres); 4 kW.—Programme relayed by Bremen (272.7 metres), Hanover (297 metres) and Kiel (254.2 metres).—8.25 a.m., Time Signal. 8.30 a.m., Weather Forecast and General News Bulletin. 9.0 a.m., Legal Notes. 9.15 a.m., Morning Recital of Music. 10.55 a.m. (For Kiel only): Divine Service relayed from the Kiel University Church. 11.0 a.m., "Hamburg Museum," Talk. 12.55, Time Signal relayed from Nauen. 1.0 (For Hamburg and Kiel): Musical Programme. 1.0 (For Bremen): Instrumental Selections. 1.0 (For Hanover): Popular Gramophone Records. 2.0, Children's Concert. 5.0 (approx.), Concert of Light Music. 7.30, Talk arranged by the School of Physical Training. 7.40, Sports News. 7.55, Weather Report. 8.0 (approx.), Concert or Play. 9.30 (approx.), General News Bulletin and North Sea and Baltic Weather Report followed by Concert from the Café Wallhof (For Hamburg and Kiel) and programme from the Café Continental (For Hanover and Bremen). 11.0 (approx.), Close Down.

HILVERSUM (1,071 metres); 5 kW.—12.40 to 2.10, The Station Trio. 2.40, Concert of Selections by the Hilversum Radio Orchestra. 7.40, General News Bulletin and Sports Notes. 7.50, Relay of Orchestral Concert. 10.40 (approx.), Close Down.

HUIZEN (340.9 metres); 4 kW.—Transmits on 1,870 metres from 5.40. 8.10 a.m. to 9.10 a.m., Divine Service with Address. 9.40 a.m. (approx.), Relay of Catholic Service (on 1,870 metres). 12.10, The Winkels Trio of Amsterdam followed by Musical Selections. 5.0 (approx.), Relay of Divine Service from Harderwyk, Seruon by the Minister, Dr. J. W. van den Bosch, Voluntaries by the organist, Dr. J. G. van de Pinte. 10.20 (approx.), Choral Epilogue conducted by Mr. J. H. Pickkers. 10.40 (approx.), Close Down.

JUAN-LES-PINS (Radio L.L.) (434 metres); 1.5 kW.—1.0 to 2.0, Concert for Children with Talk by Marcel Laporte. 9.0, General News Bulletin, Weather Report and Forecast. 9.15, Orchestral Concert. 10.0, Programme of Dance Music by the Orchestra at the Juan-les-Pins Casino. 10.30 (approx.), Close Down.

KALUNDBORG (1,153 metres); 7 kW.—Programme also for Copenhagen (357 metres).—10.0 a.m., Relay of Church Service. 11.30 a.m. (Kalundborg only),

Weather Report from the Copenhagen Meteorological Institute. 5.0, Relay of Evening Service. 6.30 (approx.), Programme for Children. 6.50 (Kalundborg only), Weather Report from the Meteorological Institute. 7.0, Press News followed by Time Signal. 7.30, Talk. 8.0, Chimes from the Copenhagen Town Hall. 8.5, Orchestral Concert with Songs followed by News Bulletin. 9.45, Concert of Selections from modern operettas: "Pour l'amour" of Fox-Trot, from "Phi-Phi" by Christine. 10.45 (approx.), Selections of Dance Music; in the Interval at 12.0 Midnight, Town Hall Chimes. 12.30 a.m. (approx.) (Monday), Close Down.

KATTOWITZ (422 metres); 10 kW.—6.50, Talk. 7.45, Talk. 8.30, Concert relayed from Warsaw. Selections by The P.R. Orchestra, Introduction to Fourth Act of "La Traviata" (Verdi). 12.0, Time Signal, Weather Forecast, News from the Press and Sports Notes. 10.30, Dance Music. 11.30 (approx.), Close Down.

KAUNAS (2,000 metres); 7 kW.—12.0 Noon, Chimes. 12.4, Weather Forecast. 12.10, Concert of Chamber Music. 1.0, Programme for Children. 3.30, Half-hour for Young People. 4.30, Health Talk. 5.0, Talk: Economics and Lite. 5.25, Musical Interlude. 5.35, Agricultural News. 6.0, Concert of Lithuanian Melodies, Violin Solos by M. Kofmekler. 6.30, Transmission of the Union of National Defence. 7.0, Weather Report and Political Topics. 7.30, Concert. 10.30 (approx.), Close Down.

KÖNIGSBERG (303 metres); 4 kW.—Programme relayed by Danzig (272.7 metres).—9.0 a.m., Musical Recital under the direction of Ernst Maschke. 11.0 a.m. (Königsberg only), Weather Forecast. 11.10 a.m., Orchestral Concert. 12.55, International Time Signal relayed from Nauen and Weather Report. 3.0, Lesson on Chess by P. S. Leonhardt. 3.30, Elementary Spanish Lesson by Kurt Metzke, Lecturer in Spanish at the Königsberg Technical Institute. 4.10, Half-hour for Young People. 4.45 (approx.), Concert by the Ostmarken Rundfunk Orchestra, Conductor, Volkmar Shalak, followed by Talks. 8.5, "In Praise of Wine," Concert by the Ostmarken Rundfunk Orchestra conducted by Walter Kelch, with introductory talk by Dr. Ludwig Goldstein. 10.15, General News Bulletin and Sports Notes. 10.30 (approx.), Relay of Dance Music Programme, from Berlin. 12.30 a.m. (approx.) (Monday), Close Down.

LAHTI (1,522.8 metres); 35 kW.—Programme also for Helsingfors (375 metres).—10.50 a.m., News from the Press. 11.5 a.m., Musical Recital. 11.50 a.m., Time Signal and Weather Report. 12.0 Noon, Relay of Divine Service in Swedish. 4.0, Concert by the Station Orchestra, conducted by Erkki Linko. 5.0, Talk. 5.57, Time Signal and Weather Report. 7.0 (approx.), Vocal and Instrumental Concert. 8.45, Late News Bulletin in Finnish and Swedish. 10.0 (approx.), Close Down.

LANGENBERG (468.8 metres); 20 kW.—Programme also for Aix-la-Chapelle (400 metres), Cologne (283 metres) and Münster (250 metres).—9.0 a.m. (approx.), Relay of Morning Recital. 11.0 a.m., Talk on The German Language and Agricultural Talk. 1.0, Concert of Orchestral Music under the direction of Herr Eysoldt, followed by Literary Talk and Chess Lesson. 4.30, Orchestral Selections. 7.0, Transmission for Workers; a Series of Talks on proletarian writers: This week, Andersen Nexø. 7.50, Sports Talk. 8.0, Programme relayed from Cologne, followed by News Bulletin, Sports Notes and Dance Music. 12.0 Midnight (approx.), Close Down.

LEIPZIG (365.5 metres); 4 kW.—Programme relayed by Dresden (273.2 metres).—8.30 a.m., Recital of Organ Music. 9.0 a.m., Instrumental and Vocal Concert. 11.30 a.m., Orchestral Concert. 12.30, Talk. 1.0, Veterinary Talk. 1.30, Agricultural Talk: Methods of Cultivation. 2.0, Talk arranged by the German Speaking Union. 2.10, Foreign Press Review. 2.30, Concert relayed from the Jahresschau, Dresden. Selections by the Dresden Wireless Orchestra. 6.30, "Moussa Lisa" Opera in Two Acts, by Max Schillings, conducted by the composer, Libretto by Beatrice Dovsky, relayed from the German National Theatre at Weimar. 10.0, Sports News. 12.0 Midnight (approx.), Close Down.

LYONS (Radio Lyon) (281 metres); 1.5 kW.—11.0 a.m., Morning Concert, organised by "La Maison Rabut." 12.0 Noon to 7.30, No Transmission. 7.30, "Le Journal Paris," General News Bulletin, Current Topics and News from the Press. 7.45, Sports Notes. 8.0, Concert of Orchestral Music, with Cello Solo by M. Testamire, Vision Paienne (Fosse). 9.15, Programme of Popular Dance Music. 10.0 (approx.), Close Down.

MADRID (Union Radio), Call EA17 (375 metres); 3 kW.—Programme relayed by Salamanca, EA122 (405 metres).—2.0, Musical Selections by The Union

Programmes from Abroad.—

Radio Orchestra, with Interlude by Luis Medina. 3.30 to 7.0, No Transmission. 7.0, Children's Corner, arranged by Luis Medina, and Items by the Union Radio Sextet. 8.0, Selections of Dance Music. 8.30 to 10.0, No Transmission. 10.0, Chimes and Time Signal. 10.5, Concert by the Band of the King's Own Regiment, conducted by Don José Power: Songs by Monna Lissa. 12.0 Midnight, The Palermo en Rosales Orchestra: Popular Dance Music. 12.30 a.m. (approx.) (Monday), Close Down.

MILAN (549 metres); 7 kW.—10.30 a.m. to 11.0 a.m., Recital of Sacred Music. 12.30, Time Signal and Selections by the Milan Radio Quartette. 1.30 to 4.0, No Transmission. 4.0, Variety Concert, with Renderings by the Station Quintet: Baritone Solo by Nazareno Pertinelli; Prologue from the Opera, "Pagliacci," by Leoncavallo. 5.25, Agricultural News. 5.30, Orchestral Concert, relayed from the Majestic Hotel Diana. 6.0 to 9.25, No Transmission. 9.25, Opening Signal and General News Bulletin. 8.35, Time Signal. 8.45, Sports News. 8.50, Relay of an Opera; in the Interval between Acts I and II. Ulderico Tugani, Talk: Town and Country; Late News Bulletin and Sports Notes at the end of Act II. 11.45 (approx.), Close Down.

MOTAJA (1,380 metres); 30 kW.—Programme also for Stockholm (454.5 metres), Boden (1,193 metres), Göteborg (416.5 metres), Malmö (260.0 metres), Östersund (720 metres) and Sundsvall (643.6 metres).—11.0 a.m., Relay of Divine Service. 1.35, Weather Report. 12.45, Stock Exchange. 12.55, Time Signal. 2.0, Relay Unveiling Ceremony of the Memorial to Richard Dybeck, Archaeologist and Composer of the Swedish National Anthem: Address by the Swedish Premier. 5.55, The Town Hall Chimes. 7.45, Orchestral Concert, with Vocalists. 9.15, General News Bulletin. 9.30, Weather Report. 9.40, Light Musical Selections. 11.0 (approx.), Close Down.

MUNICH (535.7 metres); 4 kW.—Programme relayed by Augsburg (566 metres), Kaiserslautern (277.8 metres) and Nuremberg (241.9 metres).—11.0 a.m., Chimes, relayed from the Munich Town Hall. 11.15 a.m., Transmission of the Wireless Weather Chart. 12.0 Noon, Concert of Orchestral Music. 1.0, Time Signal, Weather Report and Programme Review. 4.0, Reading by Ferdinand Classen from the Historical Portrait by Stefan Zweig: The Discovery of Eldorado; The Fate of J. A. Saters, once the richest man in the world. 6.0, Musical Programme. 8.0 (approx.), Concert or Play. 10.5, News Bulletin. 10.30, Relay of Concert. 11.45 (approx.), Close Down.

NAPLES, Call INA (333.3 metres); 1.5 kW.—10.0 a.m., Sacred Recital of Music. 4.45, Children's Corner. 5.0, Popular Concert, with Songs by Signora Carla Spinielli. 5.30, Time Signal. 8.20, Current Topics. 8.40, Time Signal. 8.48, Harbour Notes. 8.50, Orchestral Concert, with Soloists: Trio from Act I of Norma (Bellini) by Signora H. Hisor (Soprano), Signora Ada Testa (Mezzo-Soprano), and Signor Gastone Ferrero (Tenor) with accompaniment by the Station Orchestra. 10.50, Sports Notes. 10.55, Calendar and Programme Announcements. 11.0 (approx.), Close Down.

OSLO (461.5 metres); 1.5 kW.—Programme relayed by Fredrikstad (434.8 metres), Hamar (555.9 metres), Notodden (411 metres), Porsgrund (500 metres), Rjukan (448 metres).—10.20 a.m. (approx.), Chimes, followed by Relay of Divine Service from the St. Sauveur Church, Oslo. 7.15, Weather Report and News from the Press. 8.0, Time Signal. 8.15 (approx.), Concert by the Station Orchestra under the direction of Hugo Kramm. 9.30, Weather Report and News from the Press. 9.45, Topical Talk. 10.0, Programme by the Orchestra of the Hotel Bristol: Selections of Dance Music. 11.45 (approx.), Close Down.

PARIS (Ecole Supérieure), Call FPTT (458 metres); 0.5 kW.—Programme, relayed at intervals by the following stations: Bordeaux PTT (275 metres), Eiffel Tower (2,650 metres), Grenoble (416 metres), Lille PTT (264 metres), Limoges (285 metres), Lyons PTT (476 metres), Marseilles (303 metres), Rennes (280 metres), Toulouse PTT (260 metres).—8.0 a.m., News Bulletin and Time Signal. 10.25 a.m., International Time Signal and Weather Forecast. 12.0 Noon, Concert. 1.0, Economic Report. 1.30, Orchestral Concert, arranged by the General Association of French Wireless Listeners: La Navarraise by Massenet. 3.0, Musical Programme. 6.30, "Le Radio Journal de France." 8.0, Talk. 8.30, Vocal and Instrumental Concert, arranged by the General Association of French Wireless Listeners, followed by Late News Bulletin, Time Signal and Weather Report and Dance Music Selections from the Coliseum de Paris. 12.0 Midnight (approx.), Close Down.

PARIS (Eiffel Tower), Call FL (2,650 metres); 5 kW.—8.56 a.m., Time Signal on 32.5 metres. 10.26 a.m., Time Signal on 2,650 metres. 6.45, "Le Journal

Sunday, September 30th.

All Times are reduced to British
Summer Time and are p.m. except
where otherwise stated.

Parlé, par T. S. F., Talks by Detective Ashelbé, MM. René Casalis, Paul Castan, Pierre Descaves, Bertram Dupeyrat, Julien Maigret, Jean Volvey and Dr. Pierre Vachet. 8.10 to 8.20, Weather Report. 8.30, Dance Music Programme, conducted by Mario Cazes. 8.56, Time Signal on 32.5 metres. 11.26, Time Signal on 2,650 metres. 11.30 (approx.), Close Down.

PARIS (Petit Parisien), (340.9 metres); 0.5 kW.—8.45, Gramophone Records. 8.50, Talk. 8.55, General News Bulletin. 9.0, Orchestral Selections. 9.25, General News Bulletin. 9.30 to 10.0, Symphony Concert: First Movement from the Third Symphony in E Flat by Beethoven. 10.0, Late News Bulletin. 10.15, Concert of Orchestral Selections. 11.0 (approx.), Close Down.

PARIS (Radio L.T.), (370 and 60 metres); 1 kW.—12.30, "Radio Liberté" Programme, News Bulletin and Talk; Seventh Sonata (Mozart) by M. Scringes (Violin), and M. Edouard Flamant (Pianoforte). 3.0, Programme of Dance Music.

PARIS (Radio-Paris), Call CFR (1,750 metres); 6 kW.—8.0 a.m., General News Bulletin and Press Communications. 12.0 Noon, Address by Father Pade: On ne vient sur la terre, que pour mériter le bonheur, with Sacred Recital of Music, arranged by "La Vie Catholique," followed by News from the Press. 12.45, Concert by the Albert Locatelli Orchestra. 4.30, Dance Music by the Grand Vatel Orchestra; in the Interval, News from the Press. 8.0, Agricultural Report and General News Bulletin. 8.45, Concert by M. Eugène Bigot and his Orchestra; in the Intervals, Press Review and Late News Bulletin.

PITTSBURGH, Call KDKA (63 and 27 metres); 25 kW.—4.45, Telechron Time. 5.0, Church Service. 8.0, Roxy's Stroll Programme from WJZ New York. 10.45, Evening Service from the Shady-side Presbyterian Church: Address by the Pastor, the Rev. Hugh Thomson Kerr. 12.0 Midnight, Time Signal and Baseball Scores. 12.30 a.m. (Monday), Relay of Concert. 1.0 a.m., Time Signal and Baseball Scores, followed by Music. 2.0 a.m., Programme from WJZ New York. 3.15 a.m., The Continentals, relayed from WJZ New York. 4.0 a.m., Time Signal. 4.5 a.m., The Continentals Programme Continued. 4.15 a.m., Baseball Scores and Telechron Time. 4.30 a.m. (approx.), Close Down.

POSEN (344.8 metres); 1.5 kW.—10.15 a.m., Relay of Morning Service. 12.0 Noon, Time Signal. 5.0, Symphony Concert, relayed from Warsaw. 6.30 to 7.0, Programme for Children. 7.0, Notes by the League of Polish Youth. 7.15, Dr. W. Dalbor, Talk: A Review of Polish Literature during the years 1927-28. 7.45, Talk, relayed from Warsaw. 8.30, Orchestral Concert. 10.0, Time Signal, Weather Forecast and Sports News. 10.20, Twenty Minutes' Variety. 10.40, Programme of Dance Music, relayed from the "Palais Royal" Restaurant. 12.0 Midnight (approx.), Close Down.

PRAGUE (348.9 metres); 5 kW.—10.15 (approx.), Agricultural Report, followed by Programme of Music. 1.5, Economic Report. 1.20, Current Topics. 6.0, Transmission in German. 7.15 (approx.), Musical Selections. 10.0, Time Signal and News Bulletin, followed by Music.

RIGA (526.3 metres); 4 kW.—10.15 a.m., Relay of Divine Service. 1.0, Songs and Tales for Children with Musical Selections. 4.0, Concert by the Riga Station Orchestra. 5.0 to 7.0, Four Talks. 7.0, Orchestral Concert with Soloists, followed by Weather Report and General News Bulletin. 9.30 (approx.), Concert by the Orchestra of the Caté de l'Opera. 11.0 (approx.), Close Down.

ROME, Call IRO (447.8 metres); 3 kW.—10.15 a.m. to 11.0 a.m., Opening Signal and Vocal and Instrumental Morning Recital. 11.0 a.m. to 1.0, No Transmission. 1.0 to 2.0, Concert by the Station Trio. 2.0 to 5.0, No Transmission. 5.0, Opening Signal and Musical Selections. 6.30 to 8.0, No Transmission. 8.0, Opening Signal and News Bulletin. 8.20, Agricultural Talk. 8.30, General News Bulletin and Sports Notes. 8.50, Time Signal. 9.0, Concert by the Grand Symphony Orchestra: Concerto in A Major, Op. 219 for Violin with orchestral accompaniment (Mozart), (a) Allegro aperto, (b) Adagio (c)

Tempo di minuetto-allegro; Soloist, Oscar Zuccarini; Talk in the Interval. 11.5, Late News Bulletin. 11.15 (approx.), Close Down.

SCHENECTADY, Call 2XAD and 2XAF (21.96 and 31.4 metres); 30 kW.—4.30, Service and Address relayed from the First Methodist Episcopal Church, Schenectady. 7.30 to 8.0, Programme arranged by the United Radio Corporation, New York. 11.30, Concert by the Ballad Singers from New York. 12.0 Midnight, The "Stetson Parade" Hour, relayed from Boston, Mass. 1.0 a.m. (Monday), Leigh Programme relayed from New York. 1.30 a.m., Transmission from the Capitol Theatre, New York. 3.0 a.m., David Lawrence, Talk: Our Government, relayed from Washington, D.C. 3.15 a.m., Atwater Kent Half-hour from New York. 3.45 a.m., Time Signal. 3.47 a.m., Dramatic Selections from New York. 4.15 a.m., Television Signals—Experimental Transmission. 4.30 a.m. (approx.), Close Down.

SEVILLE (Union Radio), Call EAJ5 (494.3 metres); 1 kW.—2.0, Orchestral Concert of works by Spanish Composers, Gramophone Records in the Interval. 10.0, Concert by the Station Orchestra. 11.15, Dance Music. 12.0 Midnight (approx.), Close Down.

STAMBOUL (1,200 metres); 5 kW.—4.30, Concert of Orchestral Selections. 5.30, Prices of Cereals. 6.15, Selections of Turkish Music. 8.30, Weather Report and Time Signal. 8.40, Instrumental Concert. 10.0, Late News Bulletin. 10.30 (approx.), Close Down.

STUTTGART (379.7 metres); 4 kW.—Programme relayed by Freiburg (577 metres).—11.0 a.m. (approx.), Recital of Instrumental Music with Soloists, followed by Concert and Gramophone Records. 2.0, Funkleitzmann's Programme relayed from Berlin. 3.0, Talk. 7.45, Time Signal and Sports Notes. 8.0, Vocal and Instrumental Concert, followed by Selections of Light Music, General News Bulletin and Sports Notes.

TOULOUSE (Radiophonie du Midi) (591 metres); 3 kW.—12.30, Weather Forecast and Local Stock Market Report. 12.45, Orchestral Concert with Instrumental Solos. 1.0, Time Signal. 1.45, News from "Le Télégramme L'Express" and "Le Midi Socialiste." 8.0, Stock Exchange Quotations, Grain Prices and News from the Fournier Agency. 8.15, Press News. 8.30, Popular Concert. 9.0, Concert arranged by the "Association des Commerçants Radio Electriciens du Midi": Selections from "Werther" by Massenet, (a) Prelude, (b) Invocation à la Nature, (c) An clair de lune, (d) Lorsque l'enfant revient, (e) Air des lettres, (f) Air des larmes, (g) Prière, (h) Prelude from Act 4. 10.15, The North African "Journal sans Papier" and Late News Bulletin. 10.30 (approx.), Close Down.

VIENNA (577 and 517.2 metres); 1.5 and 15 kW.—Programme relayed by Graz (357.1 metres), Innsbruck (294.1 metres), Klagenfurt (272.7 metres) and Linz (254.2 metres).—11.0 a.m., Classical Concert by the Vienna Symphony Orchestra. 4.0, Concert of Popular Orchestral Music. 7.0 (approx.), Concert. 8.5, "The Living Corpse" Drama in Six Scenes by Leo Tolstoy, under the direction of Dr. Ivan Schmitz. 10.0 (approx.), Dance Music. 11.0 (approx.), Close Down.

VILNA (435 metres); 1.5 kW.—10.15 a.m., Morning Service relayed from a Cathedral. 12.0 Noon, Time Signal and General News Bulletin relayed from Warsaw. 4.0 to 5.0, Agricultural Talks relayed from Warsaw. 5.0, Concert relayed from Warsaw. The P.R. Orchestra in popular selections. Selection from "A Masked Ball" (Verdi). 6.50, Talk relayed from Warsaw. 8.30, Orchestral Concert. 10.0, Time Signal and Late News Bulletin from Warsaw. 10.30, Selections of Dance Music. 11.30 (approx.), Close Down.

WARSAW (1,111 metres); 10 kW.—10.15 a.m., Relay of Cathedral Service. 12.0 Noon, Time Signal and Fanfare from the Church of Notre Dame at Cracow. 12.10 to 3.55, No Transmission. 3.55, Weather Report. 4.0 to 5.0, Agricultural Talks. 5.0, Orchestral Concert. 6.30, Variety Items. 6.50, History Talk. 7.45 to 8.10, Talk. 8.30, Concert with vocal and instrumental solos. Aria from the First Act of "Iris" (Mascagni), by J. Turczanska (soprano). 10.0, Time Signal, Weather Report and Aviation Notes. 10.5, Late News Bulletin. 10.20, Police News and Sports Notes. 10.30, Selections of Dance Music, from the Oaza Restaurant. 11.30 (approx.), Close Down.

ZURICH (588 metres); 1 kW.—11.0 a.m., Concert of Light Music by the Station Orchestra. 12.29, Weather Report. 12.30 to 1.30, Selections by the Station Quintet. 4.0, Concert by the Orchestra at the Carlton Elite Hotel, Zurich. 7.30, Time Signal. 7.53, Religious Address. 8.0, "Request" Concert by the Station Orchestra: Part 1—Classical Works; Part 2—Selections of Light Music. 10.0, Weather Report and Late News Bulletin. 10.20 (approx.), Close Down.

OLYMPIA 1928.



Some Notes on Broadcasting of the Past and a Stand-to-Stand Report on the Show of To-day.

THE Radio Show at Olympia which this special issue of *The Wireless World* celebrates is the seventh annual British Exhibition to be held in London in the interests of broadcasting. The first of these exhibitions took place in London in September, 1922, and was prior to the official inauguration of British Broadcasting, although the experimental transmissions from Writtle, which were the prelude to the official activities of the British Broadcasting Company, had already served to whet the appetites of the British public for broadcasting on a more permanent and satisfactory basis.

The First British Radio Show.

It is interesting to recall that for the first exhibition special permission had to be obtained from the Postmaster-General for half-hour concerts to be broadcast specially for the purpose of indicating to the public visiting the exhibition what might be expected in the future of the wireless sets which it was the purpose of the Radio Exhibition to induce them to buy. *The Wireless World*, in reporting upon the Show, said that no doubt the exhibition would do much to add to the popularity of wireless "by introducing the public to the possibilities which broadcasting is about to open up." In the light of what has since transpired, it almost seems as if those remarks might have been quoted from some book of ancient history rather than being a record of the state of affairs just seven years ago.

We have much to be thankful for

in the way in which broadcasting in this country was established at the onset, and our thanks are also due to those who have so ably carried out the spirit of the terms under which the first arrangements for broadcasting were authorised.

— VOTE —
FOR THE BEST
AT OLYMPIA.
—
FOR DETAILS OF OUR
SHOW COMPETITION
SEE PAGE 371.

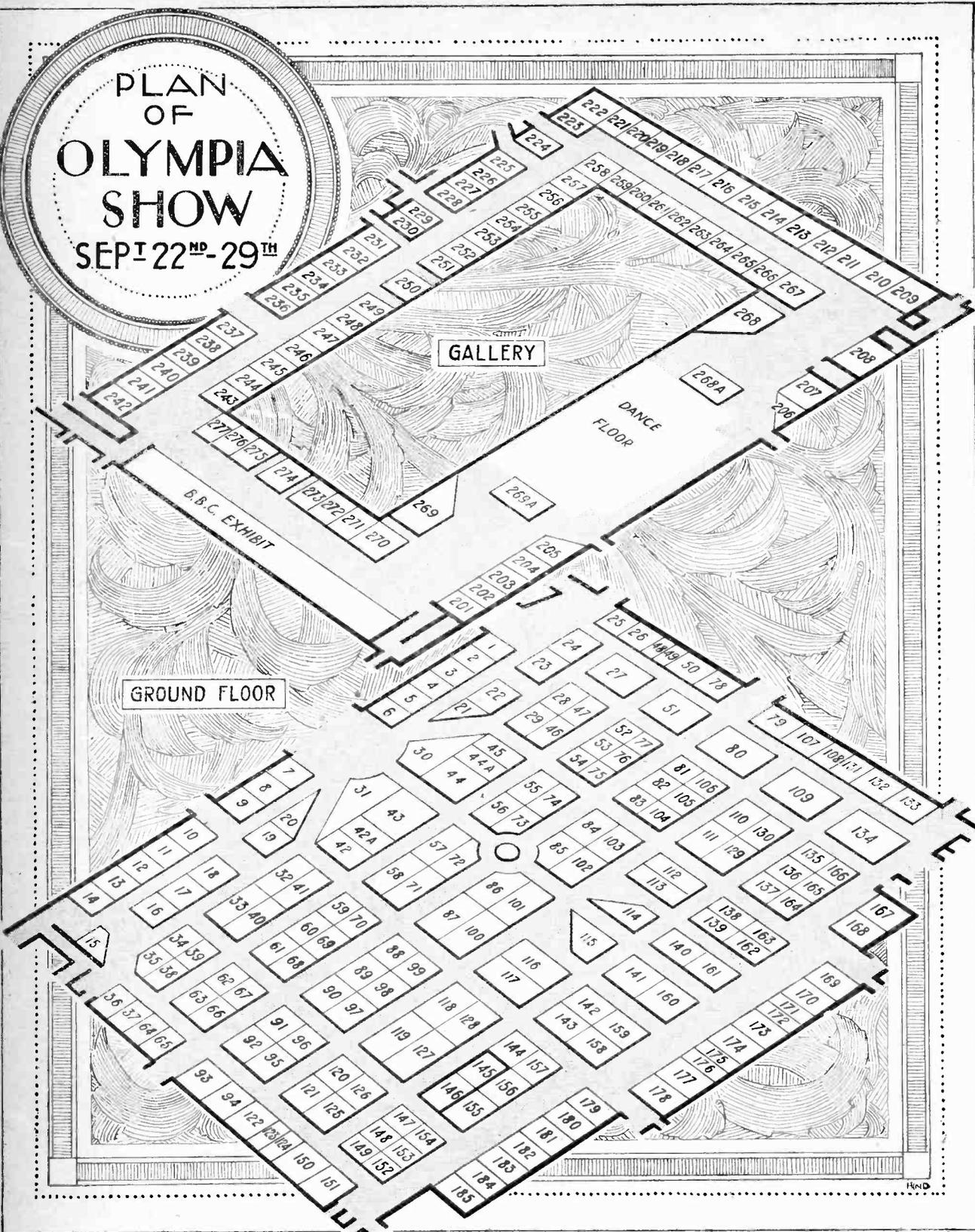
Had it not been for the far-sightedness of those who were then responsible for authorising the service, the manufacture and supply of receiving equipment might have remained in the hands of a few selected firms, with the result that to-day not only might prices have remained high, thus limiting the popularity of the service, but the absence of the competition and rivalry which to-day exists between the firms comprising the radio industry would have stunted development, and would undoubtedly have resulted in a much less varied choice of receivers and accessories than we now enjoy.

The Basis of the Radio Industry.

In the stress and turmoil of the rapid development of a new industry

it is easy to forget or to overlook the origin of the sound points of policy upon which the industry has been built up. This must be our excuse for diverting from the interests of the moment to remind our readers and the radio industry that for the present freedom of the industry we are indebted to His Majesty's Postmaster-General in the year 1922, the Rt. Hon. F. G. Kellaway, who to-day holds the position of Managing Director of the Marconi Company, for it was he who, acting in his capacity as Postmaster-General, stated in 1922 that he had "made it a condition in his discussions with the Broadcasting Company that there must be nothing in the nature of monopoly in regard to the selling of receiving sets. Every firm in the country capable of producing cheap and efficient receiving sets must be allowed to become a member of the Broadcasting Company on reasonable terms." Thus we see that whatever patent monopolies might have kept the industry in the hands of a limited number of manufacturers, any such attempt was frustrated at the outset by this wise and far-seeing stipulation, without which one cannot even assume that the variety of types of first-class wireless equipment at reasonable prices which we review in the pages which follow could have materialised, nor, indeed, is it too much to suggest that perhaps broadcasting itself would never have assumed its present degree of popularity, and justified a Radio Show at Olympia on the scale of that of 1928.

PLAN
OF
**OLYMPIA
SHOW**
SEPT 22ND-29TH



STAND TO STAND REPORT.

ADVANCE. (3)

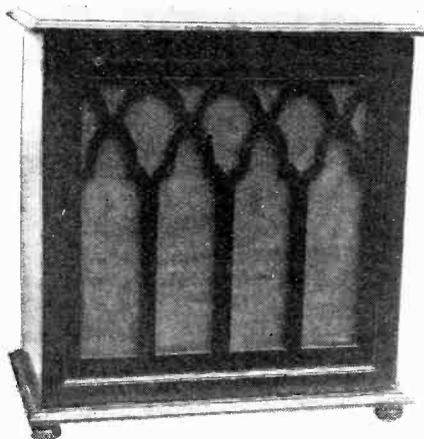
The principle exhibit on this stand is a 5-valve portable receiver embodying the popular arrangement of valves which is recognised as being the most suitable for sets of this type—two aperiodic transformer-coupled H.F. amplifiers,



The Advance Jap-lacquered finished transportable 5-valve receiver.

followed by a detector and two low-frequency stages. An interesting feature of this set is the rather unusual arrangement of the frame aerial. Generally,

either a tapped frame or two separate frames are fitted, but this firm favours a three-section frame and a special switch which connects all sections in parallel for the reception of the normal B.B.C. wavelengths and in series for the Daventry waveband.



The new Amplion "Lion" loud speaker, which gives remarkable quality and volume.

E. 3

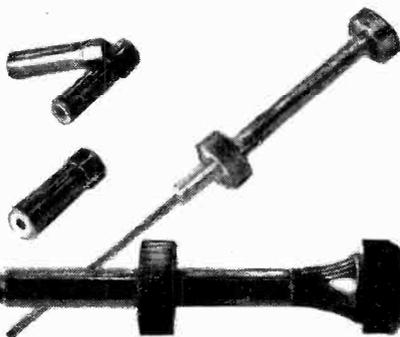
A three-valve self-contained portable set is exhibited, which should give the choice of two programmes on the loud speaker. Its loud speaker range is given as 25 miles from a main broadcast station and 100 from Daventry Junior. The coils fitted cover all wavelengths from 250 to 750 metres.

Provision is made in all sets for attaching an outside aerial and earth and thereby greatly increasing the loud speaker range of the set.

G. Farster, Carlton House, Lower Regent St., London, S.W.1.

AMPLION. (30 and 31)

It is often said that the loud speaker is the weakest link in the wireless chain; after a demonstration of the new "Lion" speaker one can venture the statement that the chain has been considerably strengthened. A remarkable new development has been achieved in

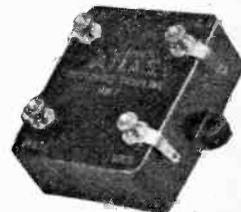


The "Atalanta" screwdriver.

cone speakers, whereby practically all the inherent faults of this species have been eliminated and the faithfulness of reproduction is on a par with that of a moving coil instrument but without the disadvantage of a field which requires

energising. A more natural and better proportional rendering of the bass is obtained, and the brilliance of high notes and general crispness of reproduction leaves little to be desired.

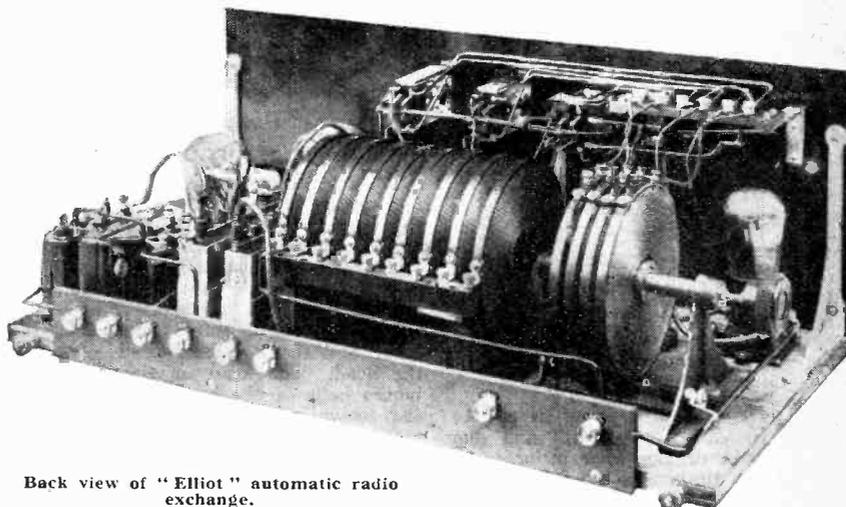
Attention has been paid to the design of the magnetic system, so that as compared with an orthodox cone loud speaker an enormous output can be handled without signs of rattling or overload. The 18-inch instrument is capable of accepting over 20 watts, and here, again, a satisfactory comparison must be made with a moving coil



The Atlas coupling unit.

speaker. In any loud speaker the following fundamental rules should be obeyed, and to quote from the technical publication issued by the makers, "For electric currents in the coil of any one frequency, but of varying strength, the moving part should have an amplitude or extent of movement directly proportional to the current strength. For currents of any definite strength, but varying frequency, the movement of the moving part should be inversely proportional to frequency, i.e., twice as large for the bottom A of a piano as for the A an octave above. When a very sudden current arrives, the acoustic part should be put into action without delay, and in a manner exactly corresponding to the current."

Hitherto in the conventional moving-iron instrument when the coil current is doubled the magnetic pull on the reed will probably be nearly quadrupled and



Back view of "Elliot" automatic radio exchange.

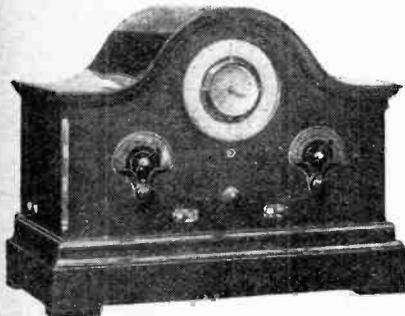
Stand to Stand Report.—

rattling will occur on a low note before it has reached one-fifth of what it could do on high notes. In the Amplion "Lion" speaker this disadvantage has been entirely eliminated by a new relative positioning of the reed pivot and the magnet pole, such that the undue increase of pull already mentioned is ob-



The Avometer, a universal testing instrument.

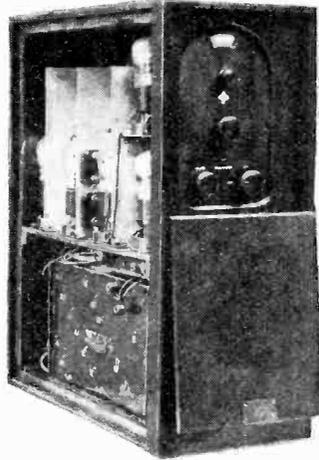
viated leaving only a remaining increase of torque proportional to the increase of current. The result is a reed movement proportional to the current. In this connection it should be pointed out that the relative disposition of the various essential parts must conform to a tolerance of less than 1-1,000th inch. It can be shown that at low frequencies it is difficult to get the air column to move properly, and were it possible to arrange for an increased amplitude to be given to the reed at these frequencies in an ordinary cone speaker the rattling already described would become worse. In the new loud speaker the reed is designed with a compensating action, which results in low-note reproduction such as hitherto has only been associated with moving coil speakers. The



The "Axuel" combined receiver and programme selector.

sudden starting at full power of a note in music is called "Attack," and due to the inertia of the cone in ordinary loud speakers there is a considerable lag on rounding-off, which causes lack of

brilliance. By a very ingenious arrangement this trouble is overcome by making the movement of the cone start

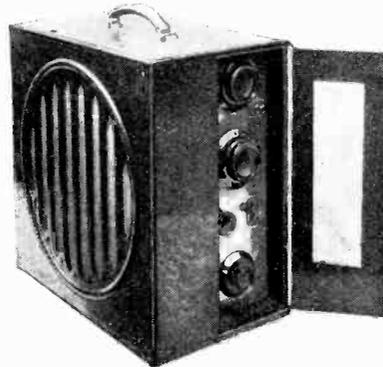


The B.R.C. transportable, with two tuned H.F. stages.

actually about 1-50th second late, but when the movement does take place it is extremely sudden and represents one-fifth of the normal cone speaker delay.

The "Lion" loud speakers are priced from £6 upwards, according to finish and to the type of containing cabinet, and it can be said with confidence that they mark a definite advance in loud speaker technique.

Graham Amplion, Ltd., 25-26, Savile Row, Regent St., London, W.1.



B.T.H. transportable receiver.

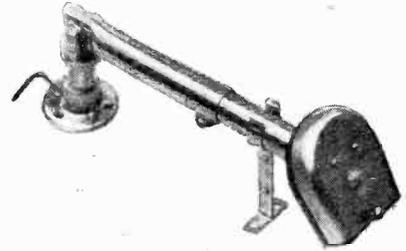
ATALANTA. (271)

Tools specially designed for set building are to be seen in great variety on this stand. Probably the special screwdriver and box spanners and the special "screwdriver" chuck and collets, the former of which we illustrate, are amongst the most important. The screwdriver consists of three main parts, the blade and shank, the knurled grip, and the head. The head remains stationary in the palm of the hand, thus steadying the screw, while thumb and forefinger rotate the screw through the medium of the knurled grip. This is specially designed for inserting screws in awkward places in the set.

Three box spanners are supplied for 2, 4, and 6 B.A. nuts, which fit on to the flat of the blade by means of a small bush inside the spanner tube. A combined tool of this type can be had for three shillings.

The "screwdriver chuck" is similar to the foregoing, but has a chuck fitment instead of a blade. It is supplied with three spring collets for holding small taps, reamers, etc. A wide range of other tools is being shown, including a special set of tools for set construction.

Atalanta, Ltd., 1-3, Brixton Road, London, S.W.9.



The B.T.H. telescopic tone arm.

ATLAS. (161)

Designed for operating sets intended to give a very large undistorted output, the Atlas model A.C. 36 eliminator has a fixed rated output voltage of 300 with two other tappings which are variable up to 180 volts. It is suitable for 100-125 and 200-250-volt A.C. mains, and is enclosed in a metal screening case. In addition, there is a complete range of less ambitious eliminators, for both A.C. and D.C. supplies.

A wide range of Pirtoid insulating tubes, both in black and natural colour,



The new B.T.H. enclosed cone loud speaker.

is also exhibited. This material is particularly suited for use as a coil former in the construction of high-efficiency inductances.

A new resistance coupling unit is also shown for the first time. The anode resistance has a value of 250,000 ohms, and the grid leak is of 2 megohms. A coupling condenser of 0.01 mfd. is in-

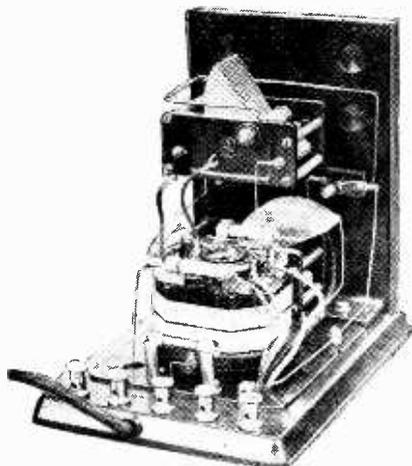
Stand to Stand Report.—

cluded in the containing case, which is of small dimensions and is moulded in brown bakelite. The resistors are not accessible for examination, as they are sealed in, but we are informed that they are of the vacuum type, manufactured under Loewe licence.

H. Clarke and Co. (Manchester), Ltd., Atlas Works, Eastnor Street, Old Trafford, Manchester.

AUTOMATIC RADIO. (274)

London, Paris or New York at the touch of a button has been the dream of the radio idealist for many years. This firm are showing a receiver in which it is claimed that this can be done. Once installed, the user can forget about the mechanism of the apparatus. It is undoubtedly the set of the future, and must not be confused with an ordinary



A new departure in set design: the B.F.H. two-stage receiver with a Mazda double valve.

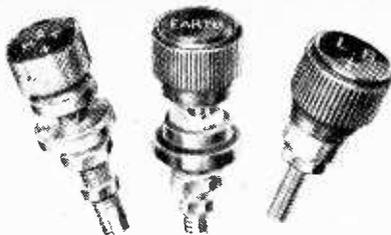
“switch over” set which gives two programmes only, and then only by using separate tuning condensers. The receivers developed by this firm employ no such complications, and are so reliable that anyone having normal intelligence can, if necessary, calibrate the receiver himself to the stations he wishes, although this is done, if desired, when the receiver is installed.

Other models are supplied in which greater latitude is given for obtaining stations not previously calibrated. In addition to this, anybody may obtain what may justly be termed the chassis of the instrument for incorporation in his own cabinet. It can be said without risk of being found guilty of hyperbole that the instrument is unique.

Automatic Radio Mfg. Co., Gosford Road, Beccles, Suffolk.

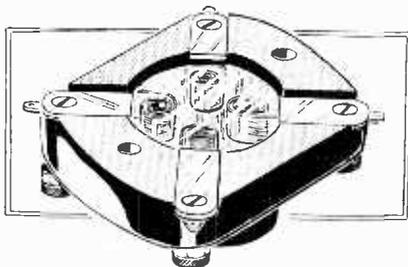
AVOMETER. (150, 151)

Although this instrument has been marketed now for several years, a new 1928 model has been produced. The purpose of the instrument is that of measuring current, pressure and resistance with precision over an exceedingly wide range. Four range scales provide for current measurements from 100 micro-amperes to



Benjamin Lee terminal trio.

12 amps.; five voltage ranges cover from 1 millivolt to 1,200 volts, while the resistance range is from 0.1 ohm to 1 megohm. The moving-coil meter which forms the heart of this instrument has a sapphire movement, and the knife edge pointer swings over an open parallex scale. The front of the set is of moulded bakelite, on the inside of which is mounted the whole of the switching apparatus, together with the shunt resistances and movement. When used as a voltmeter the instrument resistance is 1.67 ohms per volt, 6 milli-amperes being required for a full scale deflection. Each scale is individually calibrated to agree with the readings of standard instruments, the readings coming within the margin of error allowed for first-grade instruments of the British Engineering Standards Association. The Avometer is a complete instrument which, without the aid of external shunts or multipliers, gives direct read-



Underside of Benjamin "Vibrolder" showing mica disc.

ings without calculation. The price is £3 8s. net. Weight, 5 lb. Size, 7½in. x 6½in. x 4in.

The Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, Rochester Row, London, S.W.1.

AXUEL. (263)

Programme selectors, consisting of a clock which can be pre-set to switch on or off the wireless receiver for any pre-determined period of time in order that the household programme may be set for the day, have long been before the



Benjamin double-contact L.T. switch.

public. Usually, however, they are arranged to operate over a period of not less than a quarter and, in some cases, a half-hour. In this case, however, a control period of five minutes can be had. This instrument was available last year, but it is gratifying to see that this year it can be obtained in the eight-day type as well as the thirty-hour type. Furthermore, a clock can be had which operates over a period of twelve hours only.

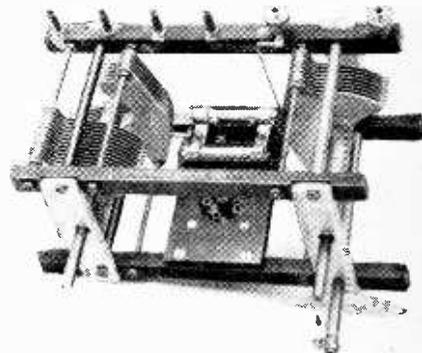
A complete six-valve receiver (not forgetting the clock) is also exhibited, and, as will be seen from our illustration, is as good in appearance as in performance.

Axuel Time Switches, Ltd., 45E, The Mall, Basing, London, W.5.

B.R.C. (141)

The "Radio Exchange," an automatic multi-station receiver described in last year's show review, is still one of the features of this stand.

A new three-valve mains set (0-v-2) uses two of the new directly heated valves in conjunction with an indirectly heated triode as a detector. The rectify-



Bowyer-Lowe short-wave chassis showing double tuning condenser on left.

ing and smoothing apparatus for H.T. supply is built in as a part of the set. Construction throughout is noticeably robust, and workmanship is of a high order. Insulation complies with the I.E.E. regulations.

A five-valve set is on similar lines, but in addition has two screened-grid H.F. amplifying valves. The mains equipment is mounted in a compartment below the set. The three tuning condensers are gang-controlled. A five valve portable is worthy of careful examination.

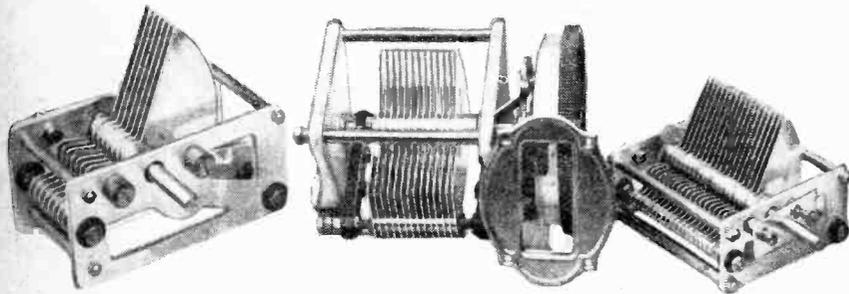
British Radio Corporation, Ltd., Elm Grove Road, Weybridge, Surrey.

B.T.H. (86, 101)

The outstanding feature of the B.T.H. exhibit is a range of receivers using the new "two stage" valve, which is, in effect, two valves enclosed in a single glass bulb. There are two terminals on the side for the extra anode and grid connections, while the filament pins are common to both. The simplest receiver exhibited is a two-stage set, using one of these valves; it is a detector-L.F. combination with resistance coupling, and is extremely compact, the tuning coil being wound on an extension of the valve base.

Stand to Stand Report.—

A more ambitious receiver is the five-stage set, which uses two of the new Mazda S.G.207 screened valves (filament consumption 0.07 amp. at 2 volts). The H.F. coupling circuits are tuned by



Bowyer-Lowe condensers (left to right) Log Major, Drum Control, and Log Minor.

drum-driven condensers mounted side by side, so that they can be operated over a limited waveband as a single control. The functions of detector and first-stage L.F. amplifier are performed by one of the double valves, while a P.227 (a highly efficient "Mazda" 2-volt power valve) is fitted in the output position. The set covers wavebands of 250-500 and 1,000-2,000 metres, the change-over being effected by means of a switch.

Among the new B.T.H. components is a telescopic tone arm for attachment to a gramophone. It is fitted with a concealed spring, which acts against gravity and thus reduces the pressure of the needle on the record; this pressure can be adjusted within limits by varying the length of the arm.

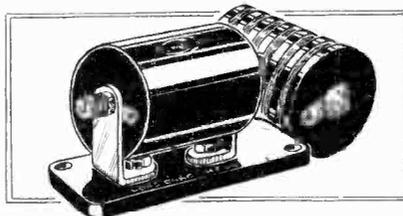
The new cone loud speaker is an attractive and workmanlike piece of apparatus, being completely enclosed in a dished moulded container of brown insulating material. Due to a misunderstanding, this was described in the Show Forecast as being fitted with a balanced armature movement; this was incorrect, the cone being actually energised by a reed unit of fairly conventional design, which is, however, suspended on springs anchored to the in-

side of the rear cover. The cone is reinforced by a number of radial strips of tough paper.

New components include a choke filter unit in a moulded case and two well-finished H.T. eliminators contained

in screening boxes. They are for A.C. supplies; one type delivers 5 milliamps and the other 10 milliamps. A particularly neat amplifier for gramophone reproduction work was also noticed.

The Junior R.K. loud speaker was illustrated last week. The complete equipment includes a suitable eliminator chassis (for A.C. or D.C. supplies as required) and a 2-valve amplifier. For radio work, the second stage only is required; the first valve is thrown into



Bowyer-Lowe long-range H.F. choke in baseboard and clip-in forms.

circuit for gramophone reproduction by means of a jack. Full details, together with circuit diagrams of alternative equipment, are given in the firm's catalogue.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.

BELLING LEE. (220 and 221)

This firm, whose reputation for terminals of the highest quality is well known, is showing their usual range of engraved terminals. Several additions have been made to the lettering of the engraved tops in order to keep pace with modern technical progress; "A.C. Mains" and "Pick-Up" are typical examples.

Probably the greatest interest lies in the great price reductions. The famous ebonite shrouded type "B" terminal is now 6d., type "M" and type "R" being now 4½d. and 3d. respectively.

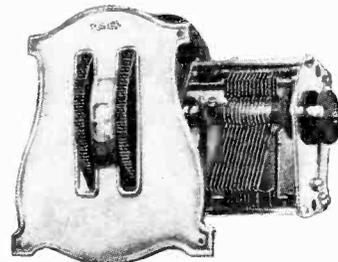
Belling and Lee, Ltd., Queensway Works, Ponders End, Middlesex.

BENJAMIN. (171)

The new "Vibrolder" is a development of the well-known Benjamin anti-microphonic valve holder, and is being

sold at 1s. 6d. Self-aligning flat spiral spring sockets are used as in the original type, but the form has been slightly modified to improve damping and prevent excessive lateral movement. A mica disc in the base prevents overstraining of the springs when inserting a rather tight valve. The original Benjamin anti-microphonic valve holder is retained at 2s. for those who have become accustomed to its use.

The new battery switch is a sound engineering job, and is well worth inspection. The contact springs are insulated from the one-hole-fixing bush by thin washers, after the manner of certain telephone jacks, and the provision of double springs obviates the necessity of a return contact through the bush and spindle. Equipped with soldering tags



Brandes' thumb-dial condenser.

the price is 1s., or with terminals 1s. 3d. *Benjamin Electric, Ltd., Brantwood Works, Pariff Road, Tottenham, London, N.17.*

BOWERMAN. (213)

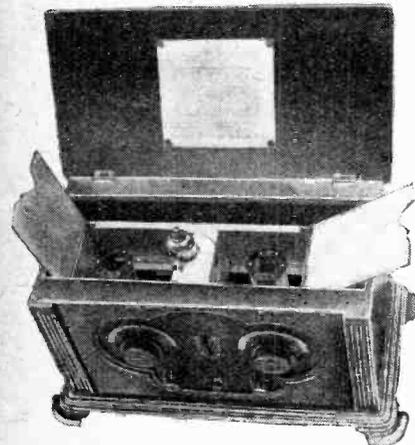
The most interesting exhibit to be seen on this stand consists of a cone unit of entirely new design, which, it is claimed, is capable of considerable volume and excellent quality. A reed is supplied with the customary fittings for attaching to a cone. Since the price is but 12s. 6d. it should have a special appeal.

In addition, the well-known Bowerman lightweight headphones and other devices are to be shown on this stand, and should provide great interest to newcomers to wireless.

G. Bowerman, Ltd., 10 and 12, Ludgate Hill, London, E.C.4.



British General long-range tuner with reversible cover plate for vertical or horizontal mounting.

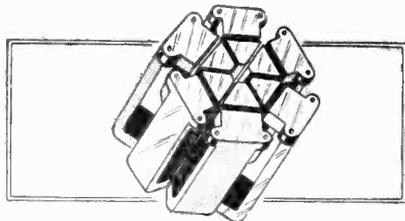


Interior of Bowyer-Lowe Screened Vox Populi Three with screens open.

Stand to Stand Report.—

BOWYER-LOWE. (51)

The 1929 range of receivers and components on the Bowyer-Lowe stand shows evidence of considerable activity in the research and development departments at

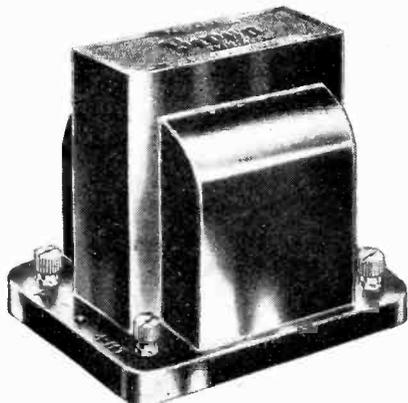


The permanent magnet system of the Brown "Cubist" loud speaker.

Letchworth. The possibilities of the screened grid and pentode valves have been fully exploited in an entirely new range of models, a new loud speaker has been developed and several new types of condenser have been added to the list of components, many of which have been redesigned.

The "Pentovox 2" is a receiver comprising a reacting detector valve and tuner covering 250-500 and 1,200-2,300 metres, followed by a pentode output valve. The price, including royalty and two picked valves tested in the receiver before despatch, is £6 8s.; set only £4/12/6.

The addition of a screened grid H.F. valve greatly increases the long-distance



The new Brown L.F. transformer.

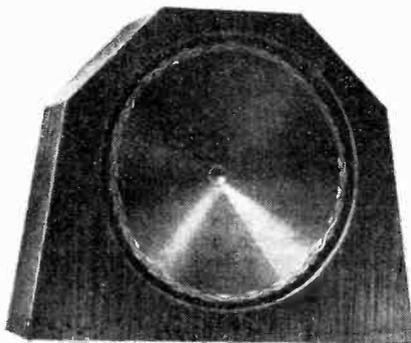
range, and the set in this form is known as the "Pentovox 3." As in the two-valve set, the change from short to long waves is accomplished by simple switching without changing coils. It is claimed that the sensitivity of this set is sufficient to satisfy the most ambitious "searcher." Both the two- and three-valve Pentovox sets are fitted with aluminium front panels and with back panels of insulating material of equal size to the front panels. In addition to simplifying construction this method permits wider spacing of the battery terminals with less possibility of congestion and short-circuits in the wiring.

The "Screened Vox Populi Three" is a de luxe edition of the "Pentovox 3."

E 7

The H.F. and detector stages are completely screened in separate containers with neat hinged lids. The long-wave coils are built permanently into the set, but the short-wave aerial coil is mounted on sockets and can be reversed to give greater selectivity; in addition, there are two aerial tappings on the back giving four degrees of selectivity on short waves and two on long waves. The H.F. amplification has been found to be so high that anode bend rectification and resistance-coupling can be used to improve quality while still retaining a satisfactory reserve of volume. The price is £20, including royalty and picked valves.

The "Screened Vox Populi Four" is designed primarily for frame aerial re-

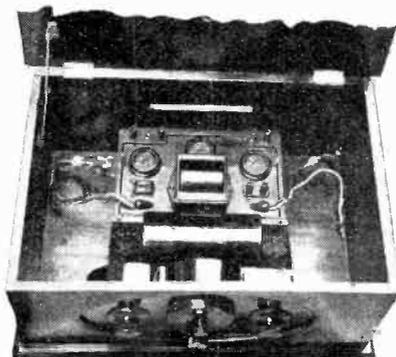


A miniature Brown loud-speaker.

ception, and has an additional L.F. stage transformer coupled to a three-electrode super power output valve instead of the pentode. Both the "Vox Populi" sets are fitted with terminals for a gramophone pick-up.

To do justice to the high quality of reproduction obtainable from these sets a new loud speaker has been produced. This is known as the "Senior Cone Reproducer," and has a balanced armature movement. Considerable care has been devoted to case acoustics, and results approaching moving-coil reproduction are claimed. The price is £5 in dark polished oak case.

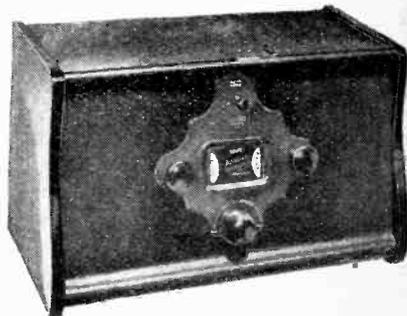
The range of de luxe receivers is rounded off with the "Gramo-Radiophone." In this model a "Screened Vox Populi Three" and Bowyer-Lowe cone speaker are built into a console cabinet



Interior of Brownie Dominion Three with valves and batteries removed.

together with a Garrard double-spring motor and turntable and a Burndept pick-up. Ample space is allowed for batteries and record storage. The price is £59, including valves.

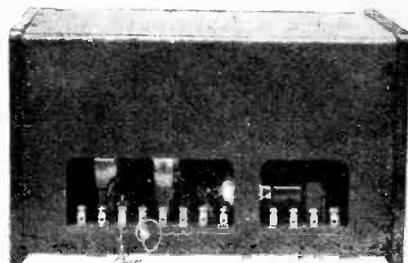
The new "Universal Short-Wave" re-



A good example of economical set production: the Burndept Screened Ethophone.

ceiver is a development of the model which proved so successful in the Colonies. The wavelength range now extends from 10 to 5,000 metres. This is made possible by means of plug-in coils, which automatically alter the connections of a duplex tuning condenser to give a capacity variation suited to the particular waveband in use. All the essential components, including the detector valve holder, are mounted in a compact "chassis" which is screened from the L.F. side of the circuit.

The new variable condensers are known as the "Log Major" and "Log Minor" respectively, the size of the latter being approximately two-thirds



Rear view of the Screened Ethophone. The H.F. valve is mounted horizontally.

that of the former. The construction is exceptionally robust, the end plates being pressed from thick aluminium plate. The vane thickness has also been increased to give rigidity. The main bearing near the panel contains a thrust ball race, and the adjustment is by means of a pivot bearing in the end plate. Both types are supplied with silver steel spindles and one-piece pigtail connection to the moving vanes.

Other new components which will repay examination are the new H.F. choke (7½ to 4,000 metres) and the drum-control condenser for portable receivers.

The Bowyer-Lowe Co., Ltd., Letchworth, Herts.

Stand to Stand Report.—

BRANDES. (118)

Interest is being aroused by a new lateral tuning condenser now offered as a separate component. It is edgewise-operated by fast and slow milled wheels, and the scale reading is exposed through a small aperture in the centre of the escutcheon plate.

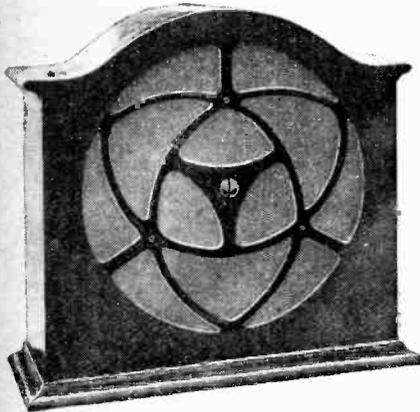


The Burndept Screened Portable Receiver.

In the 0.0005 mfd. size the price is 17s. 6d., while the standard all-brass Brandes condenser with reduction gearing has been reduced in price to 12s. 6d.

To the ranks of the small transformer is added a new Brandes type E. Externally it is finished in a small bakelite case, the reduction in size being attributed to a new form of core of high permeability.

Reduction in price is an added attrac-



The new Burndept Cone, in polished Erinoid cabinet.

tion to the now well-known Brandeset receivers.
Brandes, Ltd., Croy Works, Sidcup, Kent.

BRITISH GENERAL. (10)

When it is required to build a long range two- or three-valve set by the simplest and cheapest method, one cannot do better than adopt an aerial tuning unit

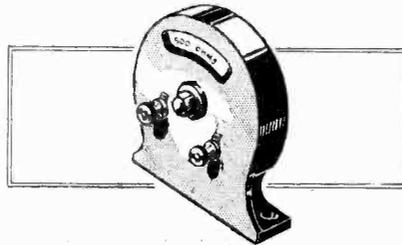
with tapped aerial coil and reaction coupling. The British General aerial tuning unit has long been known, and in its improved form consists of a robust cylindrical coil with totally enclosed ten-position selector switch and an internal cylindrical reaction coil. The two operating knobs appear through a cleanly moulded plate which, by carrying markings on both sides, provides for either vertical or horizontal mounting. This tuner, selling at 18s. 6d., covers a wave range of 250 to 2,000 metres, and its good appearance permits of its use in association with the best of cabinet work.

A new component is the British General heavy output choke. It is claimed to be of low D.C. resistance with a high value of inductance, which is well maintained on normal current-carrying requirements.

British General Manufacturing Co., Ltd., Brockley Works, Brockley, S.E.4.

BROWN. (155, 156)

The "Cubist" moving-coil loud speaker is one of the most interesting exhibits on this stand. It is of the permanent type, the requisite field being obtained by means of an assembly of six magnets with their magnetic circuit completed through a small gap. They are secured to a brass ring in such a

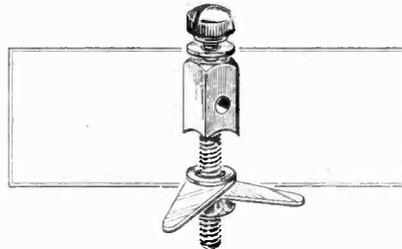


The Burndept wire-wound anode resistance occupies a minimum of space.

way that a hexagonal gap is formed; thus the moving coil is of this shape, and not circular. The diaphragm is a paper cone of 7in. diameter supported by a leather ring in the usual manner; the apex fits into a truncated spun aluminium cone of much smaller dimensions, the base of which is in turn secured to the coil.

The movement is mounted in a large cabinet, a metal "flare" being fitted in front of the cone; in effect, it forms an extension to it, and we can regard the whole as a cone set behind a short horn. An increase in volume is claimed, it being stated that the instrument will operate well on small inputs.

Centring is offered by three thin and flexible metal arms radiating from the



The new Burndept terminal.

moving coil, and secured to the framework at their outer ends. This comparatively rigid mounting should obviate the need for periodical readjustments. The moving coil is of the low resistance type, and is accordingly fed through a step-down transformer housed in the cabinet.

Of more conventional design is the Brown moving coil unit, the magnet of which is energised from a 6-volt accumulator. Its winding, which consumes 0.5 amp. at this voltage, will safely pass a heavier current, so a 12-volt battery may be used. The method of centring



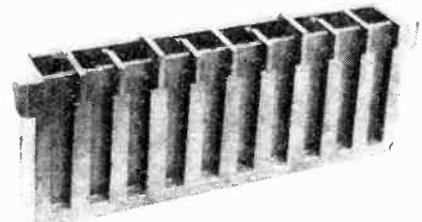
A new Burton product, a panel-mounting neutralising condenser.

the coil and its attachment to the cone is the same as in the case of the "Cubist" model. Also, it is of low resistance, the associated transformer being mounted in the base. The unit is intended for fitting to a baffle board or cabinet.

All the well-known loud speakers produced by this firm have been retained, and a smaller edition of the "Mascot" cabinet cone has been introduced; this miniature instrument is priced at two guineas.

The Brown intervalve transformer is a new product; it is completely enclosed in a brown bakelite case. Curves prepared in the National Physical Laboratory show a high and sensibly constant amplification from about 30 to 5,000 cycles. The ratio is 3.5:1, and the stated primary inductance is 175-200 henrys.

S. G. Brown, Ltd., Western Avenue, North Acton, London, W.



Section through a C.A.V. high tension battery container.

BROWNIE. (83)

The products on this stand will be viewed with special interest as a result of the recent successful action regarding the payment of royalties.

The "Dominion Three" is the centre of attraction on account of its low price and compact construction. The working parts are concentrated in the centre of a spacious cabinet and completely enclosed in a moulded cover which excludes dust and acid fumes; the batteries can there-

Stand to Stand Report.—

fore be placed inside the cabinet without making use of partitions. A tuner with a wave range of 200-2,000 metres is incorporated with a selector switch, and there is provision for the use of a gramophone pick-up. The condenser is controlled by the new Brownie "Dominion" vernier dial with a 12:1 ratio. This sells at 3s. 6d., and is enclosed in an artistic moulded bakelite case. A special copper plate is being prepared for printing the scales which will ensure accurate calibration.

A new anti-phonic valve-holder has



The electrolyte of this C.A.V. accumulator has the consistency of a jelly.

been added to the existing range of components, the price being 1s. 3d.

Brownie Wireless Co. of G.B., Ltd., Nelson Street Works, Mornington Crescent, London, N.W.1.

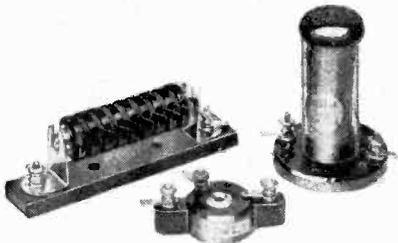
BULLPHONE. (42)

A large selection of well-finished loud speakers is being exhibited on this stand.

The "Nightingale" concert model has a moulded bakelite sound conduit and tone arm, and sells at 60s., while the cabinet cone speaker model, N.C.1, can be obtained in mahogany or walnut at 70s.

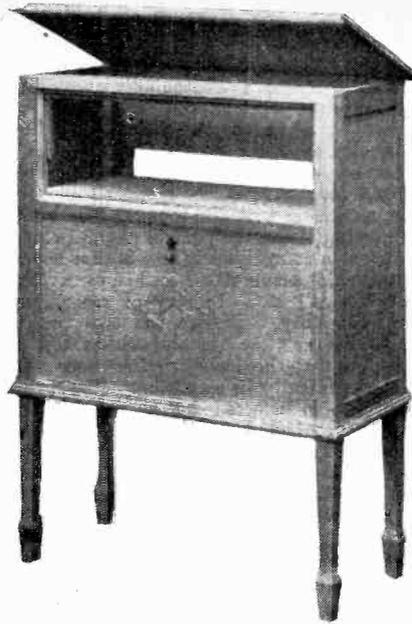
This company is now exploiting a number of useful components, among which mention should be made of the "Antipong" valve-holder, at 1s. 3d., and the Bullphone all-wave tuner for panel fixing. The latter consists of two coil units, the coupling between which is controlled by a large knob, whilst reaction is controlled by a vernier knob.

Bullphone, Ltd., 38, Holywell Lane, Great Eastern Street, London, E.C.



The "C.D.M." H.F. chokes and combined grid condenser and leak.

E 9



Camco Popular Cabinet.

BURNDIPT. (112, 113)

Although the "Screened Four" receiver has been in production for a few months, no apology need be offered for beginning a review of Burndipt apparatus with a description of this set; it is in every way up to date. The circuit arrangement comprises a screened grid H.F. amplifier, coupled by the tuned



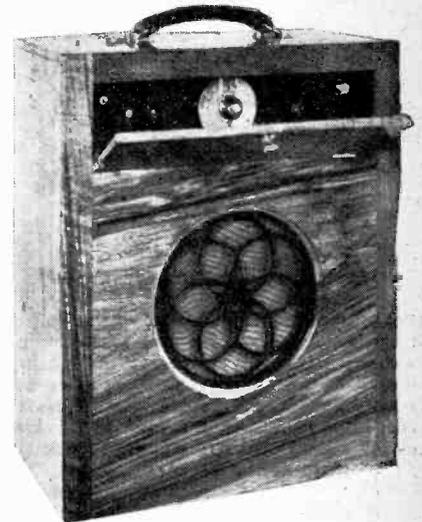
Camco moving-coil pedestal cabinet.

anode method to a grid detector. Appropriate coils for the medium and long broadcast wavebands are thrown into circuit by a three-position switch, which also controls the filaments. Another switch changes over the H.F. aerial-grid windings, and, by means of separate contacts operated by the same knob, gives

adjustments for varying degrees of selectivity.

Volume is controlled by means of a rheostat in series with the H.F. valve filament, which can be open-circuited when a pick-up (for which terminals are provided) is in use. There is also a reaction condenser, through which energy is fed back from the detector to the H.F. coupling coil, the tuning condenser of which is calibrated in wavelengths: thus it is not far short of the mark to say that the operation of tuning is reduced to the adjustment of a single dial. The two L.F. stages are coupled by resistance and transformer.

In last week's issue mention was made of the "Empire Screened Four," a receiver designed to cover wavebands of



The "Cantophone" five-valve portable.

20 to 48 and 220 to 560 metres, and specially intended for the Overseas listener. The choice of tuning ranges seems to have been made wisely, as almost all the worthwhile short-wave transmissions are included in the lower of these two bands. The essential circuit is the same as that of the receiver described above; the external appearance of the sets is identical, and they both uphold the Burndipt reputation for fine workmanship and advanced, but sound, design. The price of either is £29 16s., complete with valves.

The "Screened Ethophone" represents an attempt—and apparently a successful one—to produce a low-priced set by eliminating expensive processes and finish rather than by using cheap components and an inefficient circuit. That of the set in question is widely accepted as being in accordance with the very best modern practice, comprising as it does an S.G. high-frequency amplifier, grid detector, and a pentode output valve. A single three-position switch changes wave-range (both medium and long broadcasting bands are covered) and also controls the filament circuit. This switch, two condenser knobs, and a capacity reaction control are mounted on a metal escutcheon

Stand to Stand Report.—

plate which is pierced to disclose the graduated tuning dials.

In this low-priced receiver—it sells at £12 7s., complete with valves and royalties—the highly-finished cabinet work usually associated with Burndept productions gives way to a less costly, unconventional, but by no means unattractive



The "Cantophone Croxley Super."

type of container, in the form of a Rexine-covered metal box, with sloping front. Extended end-pieces of polished hardwood are fitted. The top does not open in the usual manner, but access to the interior, either for inserting valves or for other purposes, is obtained through an aperture at the back.

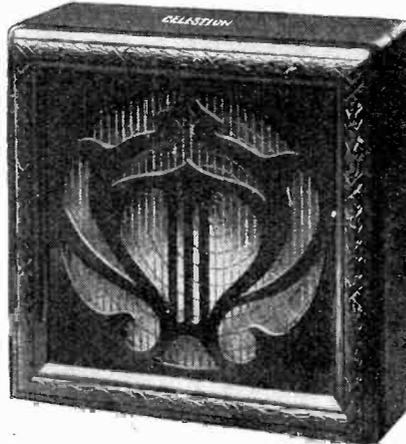
The detector is coupled to the output valve by means of a new transformer of small dimensions, in which a special core



Catesby 3-valve pedestal set.

alloy of high permeability is used. A gramophone pick-up may be put into operation by inserting an adaptor into the detector valve socket.

The "Screened Portable" is another new product with several features of interest; the circuit arrangement is an H.F.-det.-2 L.F. combination with a screened grid high-frequency amplifier. These four valves are mounted in two compartments with the tops of their bulbs projecting above the control panel, behind which is a compartment housing an Exide unspillable accumulator cell and a 108-volt dry-cell H.T. battery of reasonably large capacity. There are two tuning dials, but as they are both calibrated in wavelengths, the inexperienced user will find no difficulty in operation. Waveband changing is effected by a switch, and capacity-controlled reaction is fitted. The loud speaker, mounted in the lid, is of the Burndept cone type. It is noticed that the lead to the anode of the H.F. valve is screened, the metal sheathing of the wire being connected to the filament circuit. One of the most imposing pieces of apparatus in the Exhibition is the

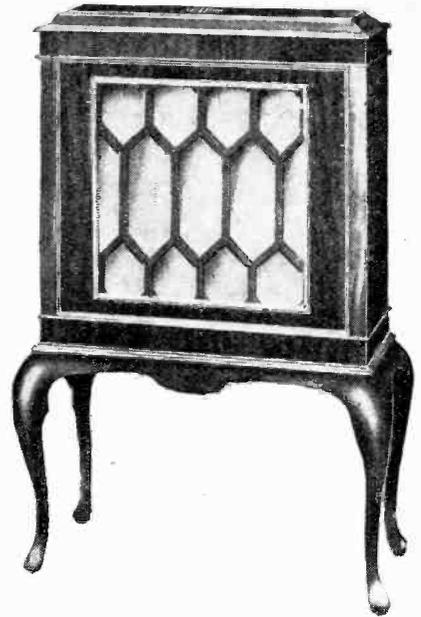


The Celestion C 10 loud speaker with reinforced diaphragm.

"Gramo-radio Reproducer," in which the "Screened Four" already described is combined, in a large and handsome cabinet about 4ft. wide and 3ft. high, with a gramophone turntable and a moving coil loud speaker. The valves derive their energy from an A.C. mains supply, the H.T. current being rectified by an Ethotron valve. Filaments are fed by a floating battery connected across a trickle charger fitted with a Westinghouse metal rectifier.

Several new components are exhibited for the first time. It is perhaps a far cry from ambitious and up-to-date receivers to the humble terminal, but the latter can be the source of much tribulation to the amateur constructor when it works loose in its hole. Such troubles should be non-existent with the new Burndept fitting, in which the body is of square section, undercut at the shoulder in such a way that four points which sink into the panel material are formed.

Again, the conventional "torpedo" anode resistance requires considerably more baseboard space than does the new wire-wound element, mounted in a narrow

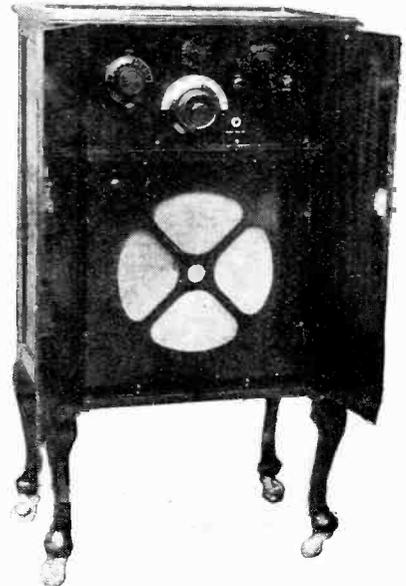


A handsome pedestal loud speaker fitted with 24in. diaphragm. A Celestion product.

bakelite disc-shaped container. It is supplied in values between 500 and 250,000 ohms.

Polished erinoid, available in six different colours, is used in making the containing case of the new Cabinet cone loud speaker, which has a 12in. reed-driven diaphragm.

Burndept Wireless (1928), Ltd., Blackheath, London, S.E.3.

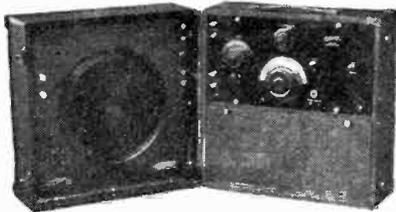


Cantophone Screened Three de Luxe.

Stand to Stand Report.—

BURNE-JONES. (96)

Again on this stand is to be found a complete receiver of very recent design. It makes use of the screened-grid valve and pentode combination and as a three-valve set tunes from 15 to 3,000 metres. Although wave-range change is effected by interchangeable coils, these are ganged together in pairs on ebonite



Chakophone Screened Three Portable.

mounts, an arrangement which greatly simplifies varying the tuning range. Reception on ultra-short wavelengths is claimed as a special feature of this receiver. It is worth while seeking out this set, which is all-metal built, and examining its layout and finish.

Another interesting receiver is the Magnum 1929 Screened Five. It is of good standard design and includes two neutralised H.F. stages; effective



Clitophone parallel-action tone arm.

screening is an essential property. Reaction is provided for in the detector stage, which is followed by resistance- and transformer-coupled L.F. stages. The set is supplied as a complete kit of parts with practical wiring diagram, also as a finished receiver. Ganged as well as individual edgewise-operated condensers are used for tuning, avoiding the appearance of complication on the front of the panel.

Burne-Jones and Co., Ltd., Magnum House, 288, Borough High Street, London, S.E.1.

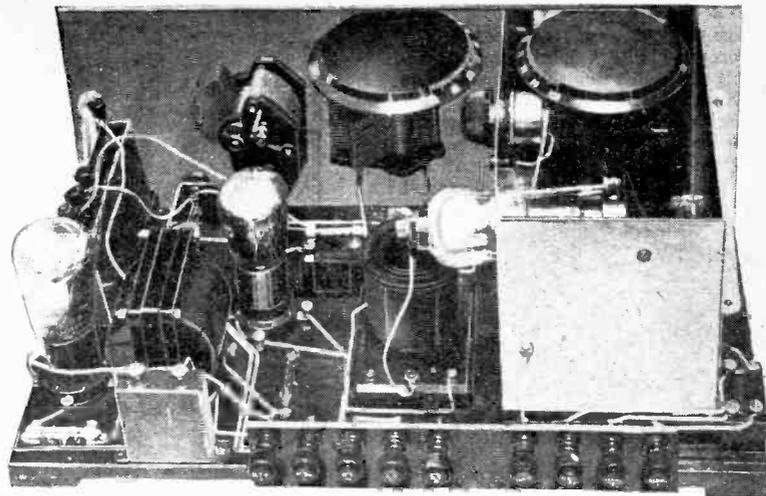
BURTON. (184, 185)

The Micro-log dial is probably the most important new component on this stand. By means of both main and auxiliary knobs fast and slow motion is obtained. Half a turn on the slow-speed



Climax Capital L.F. choke (right) and L.F.A. transformer.

E 11

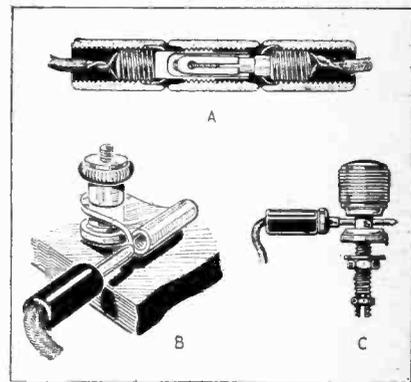


An interesting Colvern receiver making use of the screened grid valve and pentode.

knob locks it in position so that tuning is carried out entirely by slow motion. Degrees of scale setting are revealed through a celluloid-covered aperture on a silvered scale, while a central pointer sweeping a white celluloid semi-circle provides the essential requirement of being able to mark station settings. Like other Burton products of this season the face of this slow speed dial, as well as the crown of the knob, has a mottled finish which, apart from good appearance, does not hold dust. Good clean mouldings of pleasing outline and bright finish recommend this dial, which sells at 5s. 6d. and 6s.

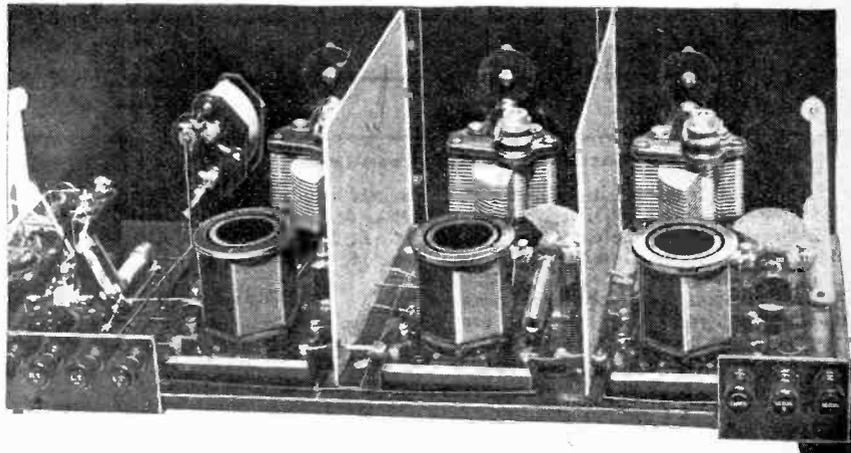
There is a good deal of difference in the class of variable condenser that manufacturers can provide for six or sixteen shillings, yet at the former low price, and complete with 4 in. dial the Burton variable condenser will withstand scrutiny on all the points usually examined on expensive models. The spindle, for instance, is suspended between two taper cones, giving an exact setting absolutely free from side play, and yet easy of rotation. An adjustable

friction band is fitted round the spindle, which, incidentally, is strapped across to a terminal to form connection with the



Some typical Clix products.

moving plates. Accurate machining and clean unbreakable mouldings render this condenser attractive and durable.

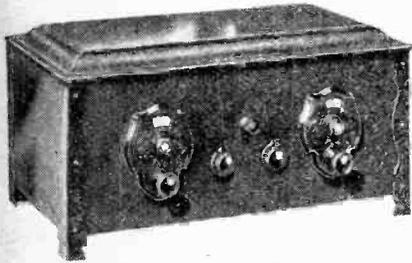


An example of the ganging together of the two-range Colvern coils by means of linked push rods.

Stand to Stand Report.—

A compact neutralising condenser, built somewhat like a miniature edition of the bigger, will meet the requirements of many set constructors.

Other new components are a thoroughly reliable valve holder carried on a moulded shell and selling at the low price of 1s., as well as a series of bakelite shrouded



The New Cossor Melody Maker.

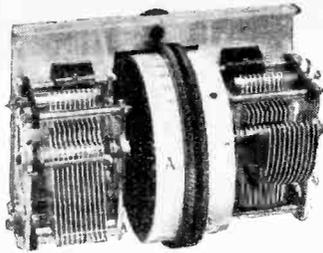
terminals in red and black carrying a wide range of lettering.

C. F. and H. Burton, Progress Works, Bernard Street, Walsall.

C.A.V. (114)

The new C.A.V. unspillable accumulators, with electrolyte in the form of a jelly, are primarily intended for portable sets. Distilled water can be added in the usual way, and is absorbed by the jelly, which assumes a crystalline appearance when this addition becomes necessary.

The H.M.6 60-volt high-tension battery



A pair of Cyldon condensers arranged for semi-gang control.

H.T. batteries are now dispatched in a fully-charged condition, and are given a three-cycle charge-discharge.

C. A. Vandervell and Co., Ltd., Acton, London, W.3.

C.D.M. (240)

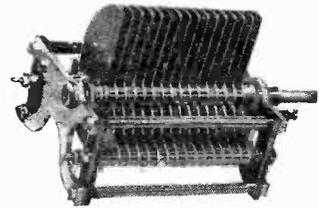
The chief exhibits on this stand consist of H.F. chokes, fixed condensers, and also fixed condensers with three terminals, the arrangement consisting actually of a grid leak built in the moulding with the condenser. The leak is not permanently connected across the condenser, but one end is led to a terminal. It is thus obvious that the leak may be connected directly across the grid condenser or the low potential end of it to filament, or to the slider of a potentiometer as desired.

Two types of H.F. choke are exhibited, one being of the customary upright type, the other being mounted in horizontal clips in the manner of an anode resistance. This is a great boon, since chokes with

ally chosen for its acoustic properties and is finished either in oak or mahogany colour at 38s.

Cabinets for the Mullard Master III* and Master V Portable (the latter at 52s. 6d.) are shown, in addition to standard portable and pedestal cabinets.

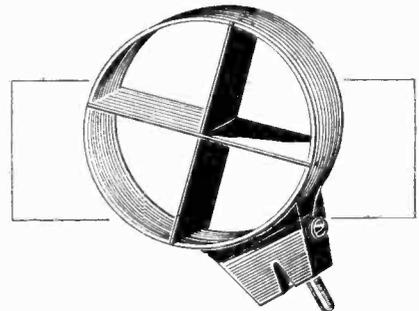
Carrington Manufacturing Co., Ltd., Camco Works, Sanderstead Road, South Croynon.



Cyldon transmitting condenser, with double spacing between vanes.

CANTOPHONE. (253)

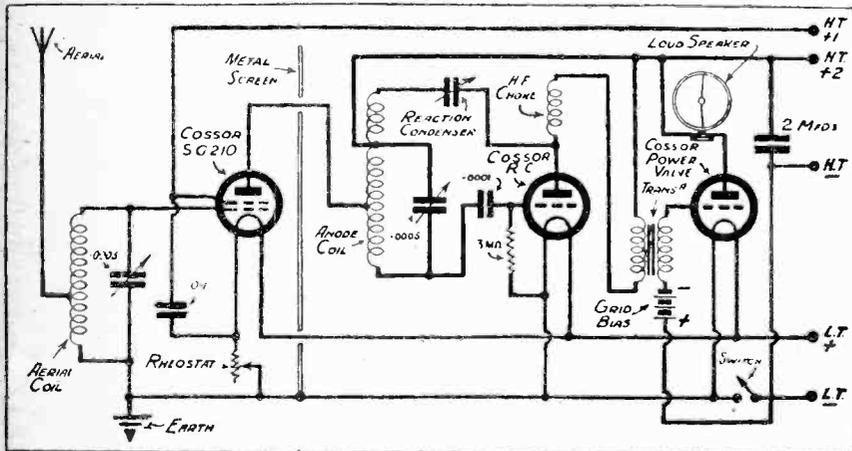
On this stand are exhibited sets and accessories in large numbers. Probably the most interesting of all is the small 2-valve portable, which is contained in an attaché case 12in. x 9in. x 5in., the whole set weighing 12lb. and costing 12 guineas. The range is 100 miles on 5XX, and 30 miles from a main station.



Short wave coil by Messrs. D.X. Coils, Ltd.

The Cantophone Portable Five, which we illustrate, is also of great interest. Undoubtedly, however, the greatest source of interest on the stand is a combined wireless receiver and gramophone contained in a magnificent cabinet and operating entirely off household supply mains. Provision is made for attaching extra loud speakers if desired.

The Cantophone Wireless Co., Remo House, 310-312, Regent Street, London, W.1.



Circuit diagram of the new Cossor set.

has many good features; its container is a one-piece moulding of "Milam," a substance largely used in the construction of car batteries, and is so robust that the risk of trouble would appear to be non-existent. The comparatively large porcelain plugs and vents that are fitted are, again, in accordance with car practice. There is a strong rubber carrying handle, and the 30 cells contained in the battery are arranged in three parallel rows of 10. A tapping is provided at each fifth cell. A large range of L.T. cells, in glass, celluloid, and moulded containers, is also exhibited. We are informed that all

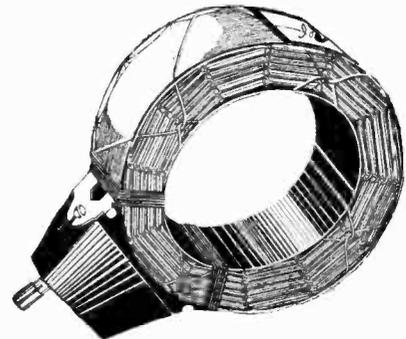
various windings may be slipped in or out as desired.

C. D. Melhuish, 8, Great Sutton Street, London, E.C.1

CAMCO. (107)

Camco Cabinets need no introduction, as this enterprising firm is soon to the fore with a suitable cabinet whenever a new set makes its appearance.

A baffle board specially made for The Wireless World moving-coil loud speaker is on view, as well as a table model moving-coil cabinet designed to fit all the standard movements. The wood is spect-



A "D.X." long wave coil.

Stand to Stand Report.—

CARBORUNDUM. (130)

The range of carborundum anode resistances, which are free from capacity and capable of withstanding considerable overloads without crackling or deterioration, has been extended, and now covers values between 2,500 ohms and 5 megohms.

The permanent detector units are still in evidence, and a large amount of space in this stand is devoted to the applications of this useful component. *Wireless World* readers will be interested in the specimen single-valve reflex set as designed by Mr. P. W. Willans, showing the application of the Carborundum unit



Battery switch by the "Pioneer" Manufacturing Co.

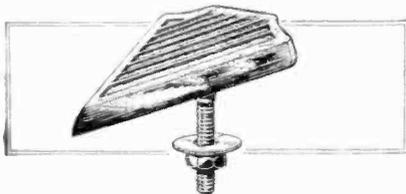
to this circuit. Other demonstration sets include a screened grid valve set with crystal detector and also a circuit recommended by the Carborundum Company.

The Carborundum Co., Ltd., Trafford Park, Manchester.

GATESBY. (25)

The radio department of Messrs. Catesbys, Ltd., has two very sound propositions to put before prospective purchasers of complete receiving sets.

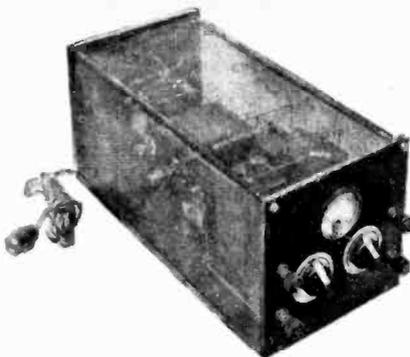
In the first place, the well-known Catesby 3-valve Pedestal Set, Type "A," with built-in loud speaker and complete with all accessories, has been reduced in price to £11 5s.



The new "Decko" dial indicator.

Secondly, an entirely new model embodying the latest developments in screened grid and pentode valves has been introduced. Known as the 3-valve "Consol," this receiver is entirely self-contained, and is mounted on rubber-tired castors, so that it can be easily wheeled from room to room. Separate frame aerials are used for long and short waves in conjunction with a change-over switch, and each set is calibrated on distant stations before despatch. The specification includes double-capacity H.T. batteries and a Ferranti L.F. transformer, and the price in oak is 25 guineas.

E 13



The "Musikon" L.T. eliminator for A.C. mains.

Both the above models may be purchased on deferred terms. *Catesbys, Ltd., Radio Dept., 64-67, Tottenham Court Road, London, W.1.*

CELESTION. (19, 20)

A portion of this stand is devoted to a display of portable, transportable, and cabinet type receivers manufactured by



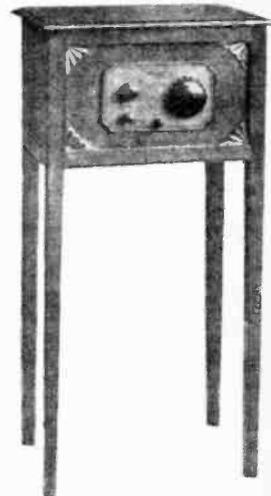
The "Decko" station locator.

various firms: each incorporates a Celestion loud speaker. The surprising number of portables in this private exhibition is a silent witness to the popularity of this firm's products. It is significant that the models shown this year are in no way different from those of last season, and it would appear that there is some hidden



More useful "Decko" components.

secret about this design which is not at first apparent. The veil was partially lifted during the course of conversation when some interesting facts were divulged. The secret of the Celestion is the reinforced diaphragm, a method of construction which imparts to the cone the rigidity of a board with the lightness of thin paper. To obtain anything approaching the same rigidity without reinforcement, the angle at the apex of the cone would need to be very acute, with the inevitable result that the sound waves responsible for producing the high notes would be reflected from the surface of the cone, near the apex, to the opposite face and reflected back again, thereby producing a choking effect. The result



Monarch III F. pedestal receiver.

of this would be a loss of the higher notes, as they would not have unrestricted access to the surrounding air. To overcome this disadvantage the angle at the apex of all conical diaphragms must be obtuse, or greater than a right-angle. Unless the cone is rigid, it will not impart to the surrounding air the maximum thrust given by the driving rod, as at large amplitudes the cone will distort, thereby leading to a loss in volume. Another effect of this, which, perhaps, is of greater importance is the detrimental effect of a distorting diaphragm or the tonal qualities of the apparatus. Herein, then, lies the secret of the Celestion design.

In addition to the wide range of loud speakers exhibited there are numerous examples of the Celestion Woodroffe gramophone pick-up, the outstanding feature of which is a lightly damped mechanism, which, it is claimed, reduces wear on the records to a minimum. This exhibits the same excellent workmanship which characterises all Celestion products.

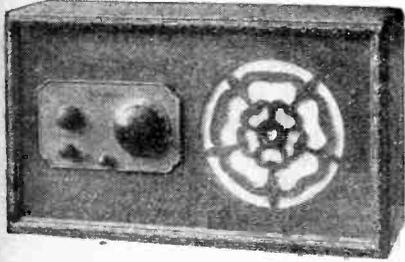
Celestion Radio Co., London Road, Kingston-on-Thames.

CHAKOPHONE. (139)

The receivers on this stand are all up to date, as the makers have been concentrating for some time on screened-grid and pentode valves.

Stand to Stand Report.—

The "Economy Two" is a neat detector and pentode set, costing only £4 15s., including royalty. A provocative challenge to "the L.S.5 brigade" was dis-

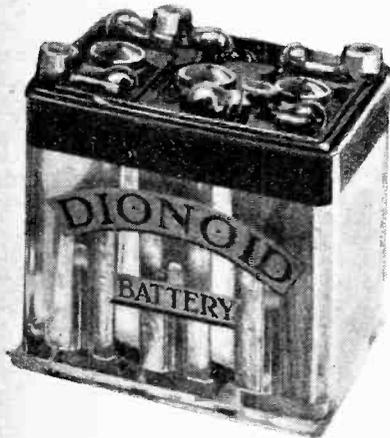


Monarch III T.S. table model with loud speaker.

played alongside this set on the stand, with the address of the demonstration room where one of these sets could be actually heard in conjunction with a moving coil. Incidentally, the moving-coil speakers designed by this firm for use with the pentode incorporated a special output transformer; the large number of turns required are not wound on the moving coil itself.

The "Screened Three" receivers are made up in the form of portables and transportables, and also as a Pedestal Grand. The latter set is one of the first to incorporate the new Amplion "Lion" loud speaker, and is available for operation by batteries or from A.C. or D.C. mains. It is also distinguished by other refinements, such as drum control condensers, and the price, which varies with specification, is in the region of £40.

Eagle Engineering Co., Ltd., Eagle Works, Warwick.



"Dionoid" six-volt H.T. unit.

CLIFTOPHONE. (82)

Gramophones are the principal exhibit on this stand, but three items of radio interest merit a special visit.

First there is the Cliftophone loud speaker. The movement is adjustable, and is of the circular iron diaphragm type. A large wood-grained paper cone diaphragm is attached to the edge of the iron diaphragm, and is partly driven and

partly directs the vibrations produced by the movement. It is claimed, therefore, that the advantages of the cone and horn type loud speakers are combined in one instrument. The standard model is £3 3s., in oak, and with open fret front, £3 13s. 6d.

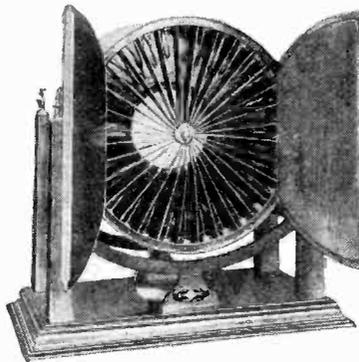
Secondly, attention is directed to a special tone arm and pick-up in which, by means of a parallel link motion, a perfect track alignment is maintained throughout the longest records. The price is £3 complete.

Finally, the well-known "Pelican" portable has been taken over by this firm, and is being sold at the reduced price of £14 14s.

Cliftophone and Records, Ltd., 95, Park Street, London, S.E.1.

CLIMAX. (80)

Most of the Climax components remain unaltered, but there are several additions including a special H.F. choke kit, a new L.F. transformer and output choke, and an addition to the range of "Chello" loud speakers.



A typical "Donotone" loud speaker.

The H.F. choke kit is for use in the Mullard Master Five, and comprises two distinct Climax chokes specially wound and packed in separate cartons.

The transformer (Type LFA) is recommended for use in the Mullard Master III,* and is priced at 25s.

The Climax "Capital" choke is suitable for L.F. coupling or filter feed output circuits, and has an inductance of 40 henries with a D.C. resistance of 500 ohms. The continuous current rating is 50 mA. maximum, and the price is 8s.

As the name implies, the "Bijou Chello" is a smaller edition of the "Cromwell" and "De Luxe" models. Terminals are provided so that the windings may be connected either in series or parallel to match the impedance of the output circuit. The price is £2 8s. in oak and £2 18s. in mahogany.

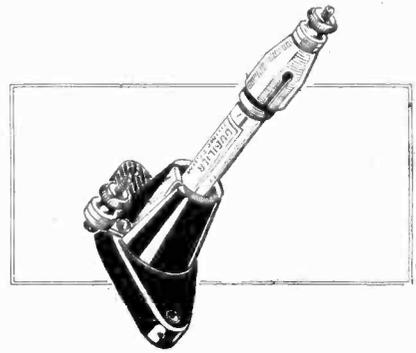
Climax Radio Electric, Ltd., Quill Works, Putney, London, S.W.15.

CLIX. (236)

Judging from the number of new variations and adaptations of the original Clix which have been seen during past years and the new adaptations which appear

this year, it would seem that it has long outgrown its original Clix uses.

The "Clix-Lox" adjustable wander plug and permanent locking plug is a highly ingenious device which no visitor to this stand should miss. The "Clix-Lox" wire connector which has only recently appeared is one of those



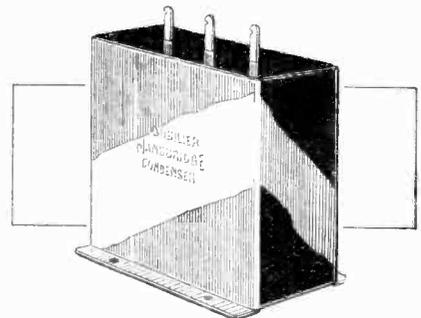
Dubilier vertical grid-leak holder, which helps to economise baseboard space.

small "gadgets" for which the wireless amateur and experimenter has been waiting for some considerable time past. Other exhibits which should on no account be missed are the special clix accumulator knobs and the terminal brackets.

Lectro-Linx, Ltd., 254, Vauxhall Bridge Road, London, S.W.

COLVERN. (91)

Wave range changing is the greatest problem in radio receiver design, and particularly troublesome when more than one tuned circuit is involved. One is well advised, therefore, to study carefully the new Colvern dual range coil which was illustrated in our Show Forecast. To short-circuit a loading coil when out of use may result in serious loss in efficiency in the remaining portion, whilst merely to



Dubilier dry electrolytic condenser of over 1,000 mfd. for smoothing L.T. circuits.

tap a coil, leaving part open-ended, creates poor reception on certain wavelength settings. The new Colvern coil consists of two concentric solenoids which, by means of a totally enclosed switch-action in the base, become either series or parallel connected, and their fields arranged either to help or oppose each other. By a careful arrangement of the

Stand to Stand Report.—

windings this method gives an approximate tuning range of 210 to 590 metres, as well as 800 to 2,000 metres. Another important point is that the addition of primary, neutralising or reaction windings is effectively carried out by means of sectioned windings on the end of the pair of coils. It is obvious that on the long wave setting, when the coils are acting together—giving a stronger field—that the required condition of greater linkage with a primary or reaction winding is obtained. Similarly the reduced field of the coils in opposition brings about the necessary reduced coupling. It should be noted that this form of construction renders the inductances almost free from stray field on the broadcast band, and even without screening the amount of linkage with other circuits is certainly restricted. Great attention has been paid to reliability in the arrangement of the four small spring blades used to produce the wave change. Being push-bar operated, a number of these coils, which are baseboard mounted, may be easily linked together and a re-

output for a moderate H.T. current consumption. A range of indirectly heated valves, including types for resistance coupling, general purpose, and super-

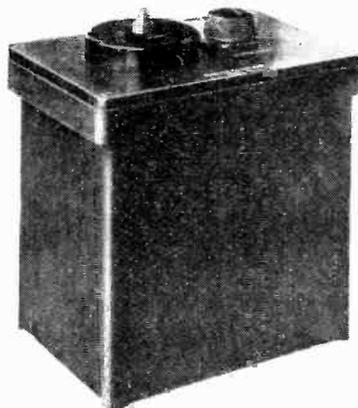
the second, which is a full wave rectifier, is rated at 3½-4 amps. The former is used in a new trickle charger just introduced, which is fitted with a switch so that the battery may be put on "charge" or "discharge" without disconnecting any leads.

The Cossor double-ended screened-grid valves, which consume 0.1 amp., are retained in addition to the new pattern, which is of the single-ended variety.

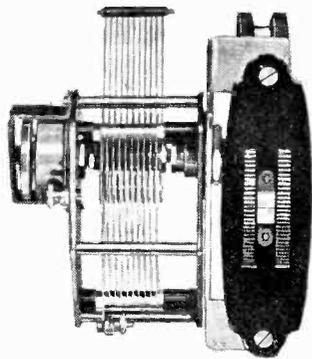
A new receiver for home constructors—the "New Cossor Melody Maker"—has been designed, and is sold in the form of a "kit" of parts. With the help of the very clear diagrams and instructions provided the veriest beginner should be able to undertake the building of it, particularly as such work as drilling, etc., is already done for him. The chances of encountering difficulty are still further reduced on account of the fact that the circuit is essentially simple and straightforward, complicating non-essentials being omitted.

The connections are given in the circuit diagram, which shows that the screened-grid H.F. amplifying valve is

power work, has similarly good characteristics. Screened-grid H.F. amplifiers, consuming 0.2 amp. at 2 volts and 0.1 amp. at 4 volts, are also produced, as



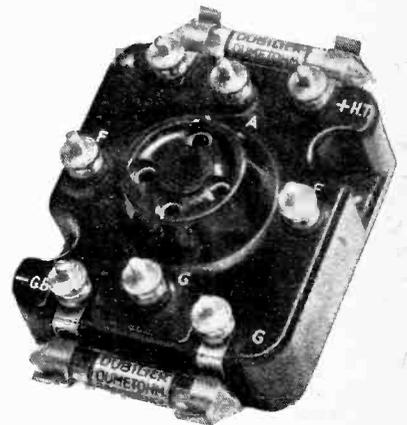
Dubilier Type D filter.



Dubilier K.C. condenser with drum controls for coarse and fine adjustment.



Dubilier H.F. choke with moulded case.



Combined R.C.C. unit and valve-holder made by Dubilier.

ceiver embodying several tuned stages can be switched by a simple plunger action. Three types are available for use as aerial couplings, neutralised intervalve couplings or tuned anode with reaction to suit the screened grid valve.

Many other Colvern coil specialities with spaced or sectioned wound turns are exhibited, as well as sets of machined castings for moving coil loud speaker construction.

A valuable little illustrated booklet of 32 pages is given away, and contains much valuable information compiled from long experience in the design of H.F. circuits. Specimen sets for home construction are available for inspection making use of screened grid valve and pentode.

Colvern, Ltd., Marney's Road, Romford, Essex.

COSSOR. (116)

The range of Cossor valves include many new types having exceptional characteristics. For instance, the new "Stentor Two," consuming 0.2 amp. at 2 volts, has a magnification factor of 8 and an impedance of 4,000 ohms—a mutual conductance of 2. It should provide a liberal

well as a range of directly-heated A.C. valves.

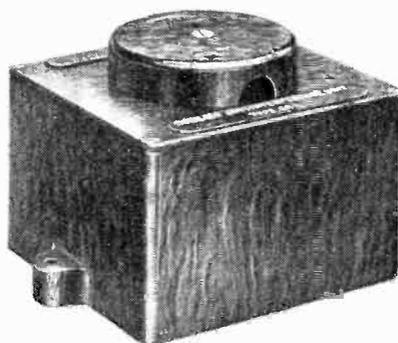
Mention should also be made of two new arc rectifying valves; the first is a half-wave rectifier for trickle chargers, which delivers a current of 0.3 amp., and

coupled to a grid detector through a tuned anode coil. It will be observed that the plate is connected to a tapping point on the coil; this is the only divergence from conventional practice. An extension of this coil acts as a reaction winding, energy being fed back through a small condenser. The single L.F. stage is transformer-coupled, the new "Stentor Two" valve already mentioned being used in the output position. The set is contained in an all-metal cabinet, which is supplied in parts which can be easily assembled.

A. C. Cossor, Ltd., Highbury Grove, London, N.5.

CYLDON. (159)

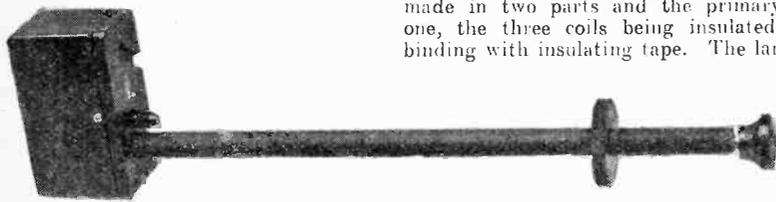
In last year's exhibition number of *The Wireless World* the reviewer of the Cyldon stand found occasion to praise in no stinted terms the variable condensers made by this firm. Regarding the standard products, which are practically unchanged, the present writer need say nothing beyond mentioning the fact that finish is of an even higher order than



Dubilier anti-interference unit type C.R.1, for shunting across the terminals of a motor.

Stand to Stand Report.—

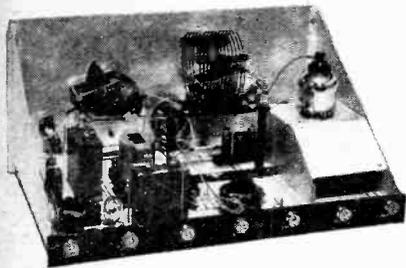
formerly. Painstaking attention to small details is evident, even in the comparatively inexpensive "Bébé" miniature condensers. It is observed that the firm still eschews such easy paths to our favour as the provision of single-hole fittings—against which criticism can be



The new "Ealex" combined lead-in tube and lightning switch.

levelled on the grounds of mechanical weakness—and still retains the more rigid three-screw mounting, in spite of our general aversion to drilling three holes where one, at a pinch will do.

It has often been stated that one of the best methods of tuning two circuits is by means of separate condensers controlled by edgewise drums mounted side-by-side in such a way that the moving vanes of each may be rotated "in step" over a limited band of wavelengths; here we have, if not "one-knob" control, at least one-hand control. It is evident that this firm are supporters of the



Eddystone short-wave receiver fitted with an aperiodic screened-grid H.F. stage.

system, as they are specialising in condenser assemblies (marketed under the trade name of "Synchrotune") which make its practical realisation an easy matter for the amateur. The rotors are not mechanically connected, and, although the control drums are set close together, there is just sufficient space for the interposition of a screen (which will often be necessary).

Double-spaced variable condensers for transmitters, designed to withstand potentials of thousands of volts, are introduced for the first time; except for the fact that spacing between vanes, and consequently overall dimensions, is increased, these are identical with the standard Cydon products.

Sydney S. Bird and Sons, Ltd., Saversfield Road, Enfield Town, Middlesex.

D.X. COILS. (223)

As the name of the firm would imply, the principal exhibit of this stand is coils. The short-wave coils developed by

this firm are specially worthy of attention by those interested in reception on short waves.

A transformer which they exhibit is specially worthy of attention, since the firm has followed the same practice that has made its ordinary H.F. coils a byword among wireless listeners, namely, no former is used. The secondary is made in two parts and the primary in one, the three coils being insulated by binding with insulating tape. The lamin-

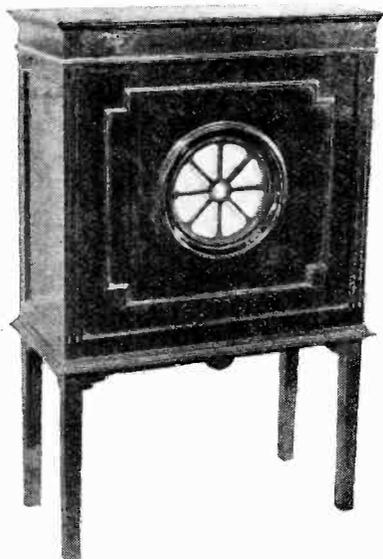
ations are of the best transformer iron.

On this stand the Pioneer Manufacturing Co., of Cromwell House, Fulwood Place, S.W., are exhibiting their new type of battery switch, which we illustrate. This switch is one of the best which it has been our privilege to examine and use.

D.N. Coils, Ltd., 542, Kingsland Road, London, E.8.

DAY. (248)

The most interesting exhibit on this stand is without doubt their new motor generator unit, which effectively does away with both high and low tension batteries, and will supply the needs of the largest type of set. The construction of the apparatus is on sound engineering



The Eddystone inexpensive moving coil loud speaker cabinet.

lines. The motive power is derived from the mains, be they D.C. or A.C., but, of course, the instrument completely isolates the mains from the receiver.

Another interesting exhibit is the "Musikon" L.T. eliminator which completely takes the place of the L.T. accumulator; there are, moreover, no floating batteries or other liquid-containing in-

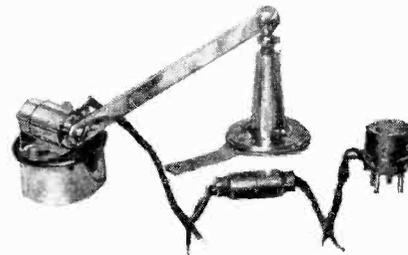
strument in the assembly, which is totally enclosed by a metal gauze screen.

On this stand the "Miller" gramophone pick-up manufactured by Messrs. J. P. Miller is also exhibited, together with a goodly assembly of parts for coil-drive loud speakers. A large range of proprietary lines are also exhibited, and nobody should fail to pay a visit to the stand.

Will Day, Ltd., 18-19, Lisle Street, London, W.C.2.

DECKOREM. (203 & 204)

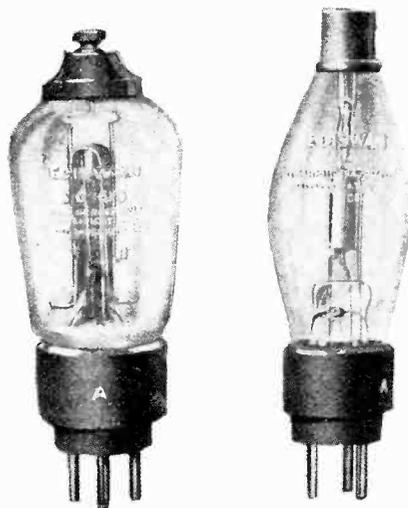
The number and variety of components exhibited on the Bulgin stand are so great that one is sorely tempted to make an unpardonable pun. A few only of the new exhibits can be dealt with. A highly interesting exhibit is a mains potential divider fitted with a terminal connection, thus greatly facilitating the work of the home constructor. It is totally enclosed



Edison Bell pick-up arm.

and can be obtained in more than one total resistance. The unique feature, however, is that tappings are not taken at equally spaced points, but are so disposed that the anticipated voltage from any given terminal is fairly near the actual voltage obtained.

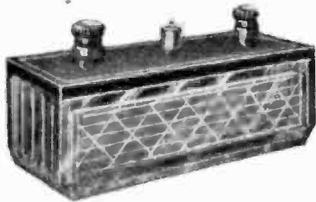
A neat central zero charge and discharge ammeter will probably be the next item to catch our predatory eye (or is it fingers?) as we examine the exhibits. A new and improved type of dial indicator, type P.4, is also exhibited. A leading



Ediswan new type screened-grid valve. On the right is an "M" type Ediswan indirectly heated cathode valve.

Stand to Stand Report.—

feature is a new type of station locator, which is invaluable to the man armed with a frame aerial set. Other new components



Ediswan "Loten" accumulator. No separators are used and a valuable feature is that the cells can stand on open circuit for considerable periods without loss of capacity.

too numerous to mention are also shown. A. F. Bulgin and Co., 9-11, Curzitor Street, Chancery Lane, London, E.C.4.

DE LA RUE. (235)

This stand is exclusively devoted to a display of bakelite, and of several coil formers, etc., made for various manufac-



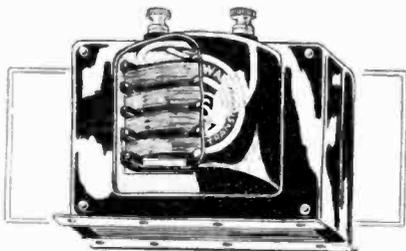
Ediswan H.T. and L.T. battery charger, giving a liberal output.

turers, several of which are easily recognisable.

Thos. De La Rue and Co., Ltd., 90, Shernhall Street, London E.17.

DETEX. (153)

Components are often introduced entirely in an endeavour to offer a reliable



New Ediswan L.F. transformer. Note the sectionalised windings.

E 17

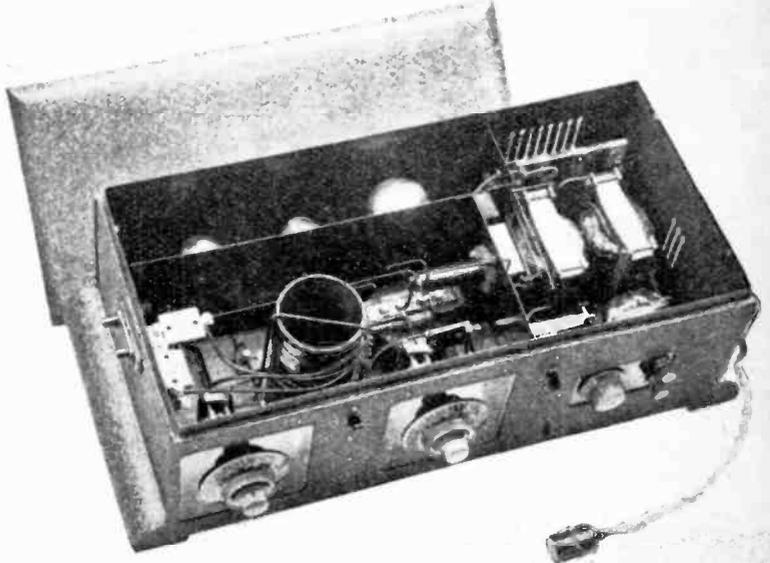
article at the lowest possible price. The Detex R.C.C. unit is probably in this category. It sells complete with resistances at 4s. A small flat moulding houses the intervalve coupling condenser, the resistance being carried in clips in recesses on the sides.

Detex products include H.F. chokes, push-pull switches, and break jacks.

Detex Distributors, Ltd., Detex House, 125-129, Rosebery Avenue, London, E.C.1.

compartment for batteries, while the "Monarch III" type F is of graceful and slender design and sells at £6 6s. Both the above are recommended for use with the "Cromwell Boudoir" or "Cromwell Grand" balanced armature cone loud speakers.

The "Cromwell V" portable set and the "Cromwell Triple Three" both incorporate pentode output valves. The latter set can be played as an ordinary gramophone, an electrical reproducing



Interior of Ekco "Mains Drive" 3-valve receiver.

DEW. (181 & 182)

A comprehensive range of receivers, accessories, and components by well-known manufacturers are to be seen on this stand. Development in radio probably lies in the direction of simplifying control and reducing the trouble of upkeep to a negligible quantity; in this respect it is interesting to examine the large number of portable and mains-driven receivers, and, in particular, those manufactured by such well-known concerns as Pye, Marconi, McMichael, Geophone, Rolls Caydon, Halcyon, Langham, etc. A receiver deserving of consideration is the "Dumolite Fidelity 4," as supplied to many educational authorities for use in schools.

Many models of new moving-coil loud speakers, together with a range of cabinets suitable to house these instruments, and a very comprehensive selection of high- and low-tension eliminators is being shown.

Messrs. Dew are making a special feature of marketing suitable tools for use by the radio constructor.

A. J. Dew and Co., 53-54, Rathbone Place, London, W.1.

DIBBEN. (109)

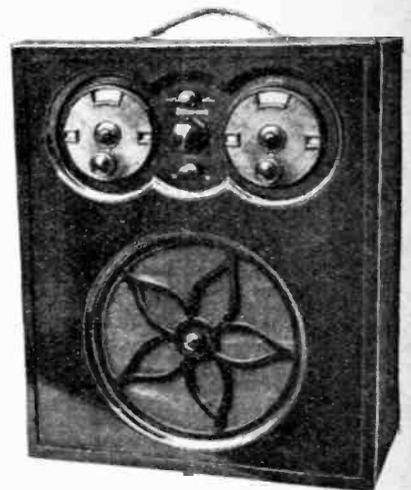
The receivers bearing these names are characterised by sturdy simplicity of design, high-class cabinet work, and reasonable price.

The "Cromwell III," at £9 5s. in oak, is a detector-2 I.F. set in a substantial Jacobean cabinet provided with a lower

gramophone, or a radio receiver, and has a parabolic type loud speaker mounted in the flare of the ordinary gramophone sound conduit.

The above sets by no means exhaust the range shown on this stand, which carries also a number of table models at attractive prices.

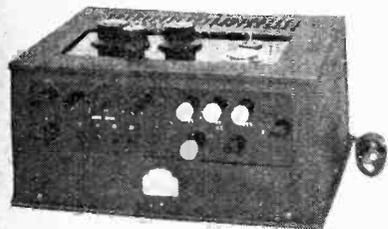
William Dibben and Sons, Ltd., St. Mary's Road, Southampton.



The Falk Stadelmann Blenheim Portable. It embodies both screened-grid valve and pentode.

Stand to Stand Report.—**DIONOID. (245)**

Needless to say, the justly famed moulded accumulators manufactured by this firm are of considerable interest. Batteries for all purposes and in all ampere-hour capacities are exhibited. The great feature of these batteries is



Ekco type C1A "All Power" unit for D.C. mains.

the ability to be taken completely to pieces. Accumulators in glass and celluloid are obtainable. H.T. batteries are obtainable in 6-volt glass units; a specimen of which we illustrate.

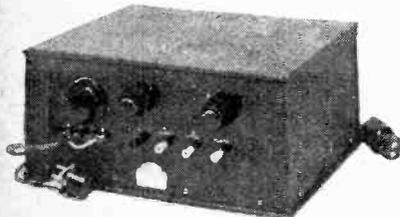
The Dionoid Battery Co., Ltd., Victoria Works, Prince of Wales Road, Darnall, Sheffield.

DONOTONE. (216 & 217)

As in past years, this firm are well to the fore with their unique loud speakers. Vast strides have, however, been made during the past year, especially in the matter of the actual movement itself.

The loud speakers may be obtained from five guineas upwards; the one which we illustrate is a ten-guinea model so far as its technical points are concerned. Actually, it can be obtained at that price in a simpler type of external mounting than that shown in the illustration.

This firm have also produced a gramophone pick-up which gives the minimum possible wear on the record, and is the result of exhaustive experimental work.



Ekco A.C. Model FV120 for supplying H.T. to L.S.5 valves.

Undoubtedly the principal exhibit is the "Donogram," which consists of a complete wireless receiver and gramophone mounted in a large and well-finished cabinet of the large pedestal type. The instrument is equipped with the firm's pick-up and loud speaker, and it is but the work of a moment to change from gramophone to wireless. The design of this loud speaker shows much ingenuity, and an examination of the arrangement of sound compartments and resonators will be found instructive.

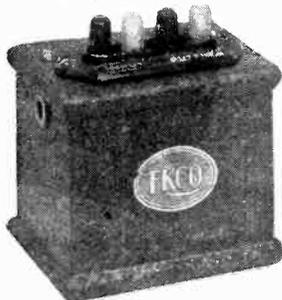
Donotone Loud Speakers, 40, Farnival Street, London, E.C.4.

DUBILIER. (102 & 103)

A large number of new components are to be seen at this stand. Of special interest to the set constructor is a neutralising condenser occupying the very minimum of space, and containing a small thumb screw for giving the necessary adjustment of capacity. Designed for base-board mounting, it can be placed vertically or horizontally in a receiver: it has a minimum capacity of 6 and a maximum capacity of 50 micromicrofarads, and sells at the modest price of 3s. 6d.

A very neat and well-finished midget condenser designed for panel mounting, and supplied in two capacities, viz., 0.0001 and 0.0002 mfd., is a new product of this company. It is particularly suitable for use as a reaction condenser in Reinartz and Hartley circuits, and may also be conveniently employed when a neutralising condenser of large capacity is required. The price of either model is 5s. 6d.

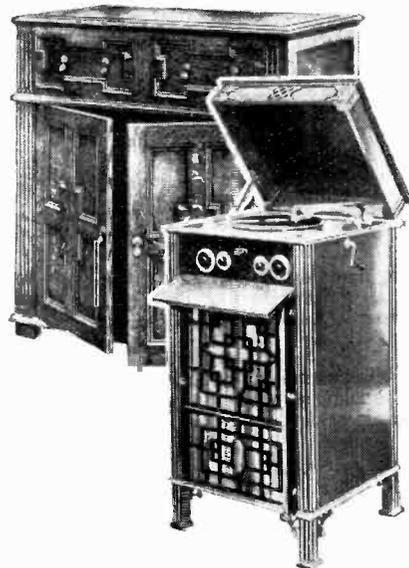
In order to prevent high-frequency currents from circulating in low frequency circuits it is often necessary to employ an H.F. choke, the inductance of which



Ekco isolating transformer.

must be high and the self-capacity of which low. These desirable features are also necessary to prevent choke resonance when this component is used, for instance, in the parallel-feed method of coupling a screened grid valve by the tuned anode method to the succeeding valve. It is, therefore, of interest to note the introduction of a new H.F. choke with sectioned windings completely enclosed in a moulded case. Four models are being made suitable for wavelengths from 20 to over 2,000 metres.

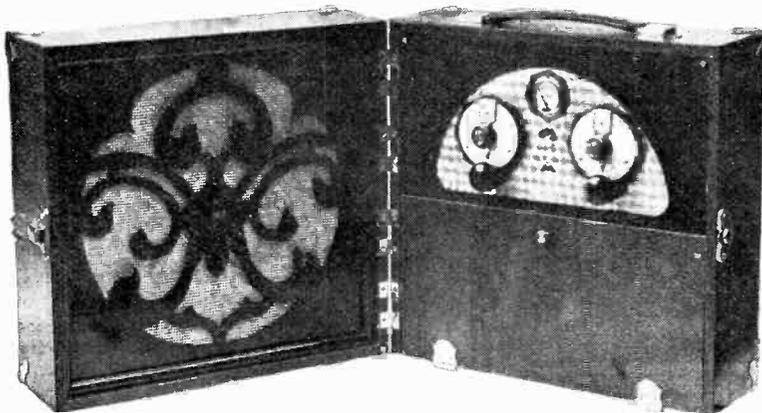
The well-known K.C. condenser is now marketed in two forms, incorporating drum controls. The first model has two thumb controls, one for coarse and one for fine tuning of the single K.C. condenser. The second model—the triple-



Electramonic gramophone-cum-wireless cabinet sets.

gang condenser—is controlled by three drums, but has no slow motion device: The drums are sufficiently close together to make either simultaneous or independent control of the three condensers possible. It should be noted that the ordinary K.C. condenser can now be obtained with a capacity of 0.0005 mfd.

The proper functioning of a high frequency amplifier depends to a great extent upon the prevention of interaction between electro-magnetic fields produced by the various inductances. The use of close-screening boxes is to be discouraged, as eddy current losses are created. A satisfactory compromise in this direction is to be found in toroidal winding, which confines the field within the limits of the inductance itself, and, while interaction within the set is prevented, there is the



Five-valve screened-grid superheterodyne portable set, by the Empire Electric Co.

Stand to Stand Report.—

obvious corollary of an absence of unwanted pick-up from a local station.

The well-known Dubilier toroid coil range has now been extended to the ultra short waves, and four new coils tuning between 22½ and 275 metres are being marketed.

The new vertical holder for the Dumetohm resistances is specially valuable where baseboard space is a consideration. In order to remove a Dumetohm resistance considerably less handling of the glass container is necessary, which is an advantage, as there is less likelihood of the transfer, showing the value in ohms, from being obliterated. In this connection it should be mentioned that a new form of more permanent transfer is being employed, and that the reference that was made to this component in the forecast to the Exhibition in our last week's issue was somewhat ambiguous.

Economy of space is extremely important in portable sets, and for those interested in their design the new Dubilier combined R.C.C. and valve-holder unit should appeal. It should be noted that the valve-holder may be used for the valve which precedes or succeeds the unit.



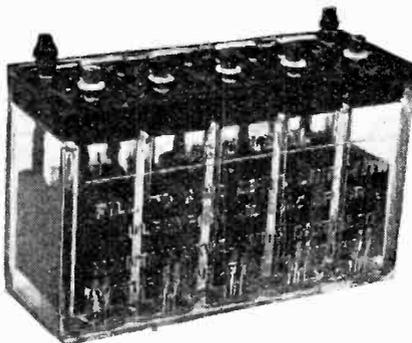
The "Eureka Orthodyne Three," a portable receiver with screened-grid valve and pentode.

The anode and grid resistances are detachable. In populated areas a great deal of interference of broadcast programmes due to man-made static is experienced, it is, therefore, of interest to note that Messrs. Dubilier are exploiting an interference eliminator which minimises this annoyance. The unit should be connected across the output terminals of the offending machine, e.g. the motor driving a vacuum cleaner, sewing machine, and such-like domestic appliance.

The popular Mansbridge and mica-type condensers are being shown, and, in order to facilitate the assembly of multiple condenser banks for battery eliminators, a range of condenser blocks consisting of a number of condensers mounted together in a single case, and separately tapped, is being manufactured.

E 19

For smoothing out ripples from D.C. or rectified A.C. circuits, having a nominal voltage of not more than 6, dry electrolytic condensers are now obtainable in both single and double units. The A1 types have a capacity above 1,000 micro-



Heavy-duty Exide H.T. accumulator with a capacity of 10,000 mA. hours. On one charge it will give 400 hours discharge at 25 mA.

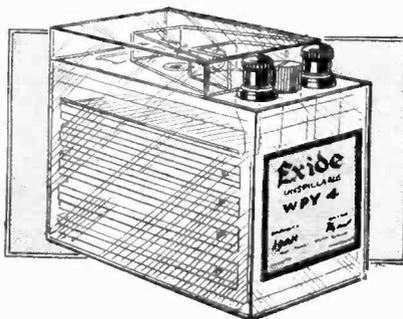
farads, while that of each unit in type A2 is between 500 and 1,000 microfarads. These capacities are obtained when the condensers are subjected to a steady polarising voltage, and are offering their condenser effect to a superimposed A.C. ripple voltage.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

DUNHAM. (257)

A very complete range of well-thought-out receivers and batteries is the keynote of this stand. A four-valve *de luxe* is a leading feature, built complete with internal H.T. battery eliminator and trickle charger. The H.F. stage uses a screened-grid valve, as do the other Dunham receivers. The receiver employs a switch to enable two, three, or four valves to be used as desired.

Probably the feature of this stand, however, is a comparatively inexpensive receiver built into a pedestal gramophone cabinet, with the usual compartment in the bottom housing the loud speaker. The loud speaker, however, which is of the cone type, is simply stood in this lower compartment behind a grille. It can thus be immediately removed from the set and taken into another room, or



Exide non-spillable accumulator for portable sets. No fewer than four acid traps are used and loss of acid is impossible.

into the garden as desired. This feature should prove extremely popular, as in many cases it is the fact of the loud speaker not being an independent unit which has withheld many people from obtaining a receiver of this type.

C. S. Dunham, Elm Works, Elm Park, Brixton Hill, S.W.2.

EASTICK (218)

This stand, with its numerous terminals, plug and socket devices, etc., is a source of great interest to Exhibition visitors, and, indeed, this is little to be wondered at, considering the large number of interesting exhibits.

The Universal type terminal is a special feature of interest. It is constructed so that it can take spade ends, split pin, or other plugs. In addition, the clear markings on the terminals are specially worthy of note.

Another item of interest is an eight-wire cord connector, which unlike many does enable one to determine instantly which wire goes to which socket. Moreover, it is non-reversible.

Exhibited on this stand also will be a unique feature, namely, the "Stansfield Converter," which enables H.T. to be derived from a four-volt accumulator;



Exide combined H.T. and L.T. trickle charger with meters for checking charging rates. By means of a special switch the mains are never connected to the receiver.

moreover, two H.T. tapings are available, one of which can be adjusted by means of a tapped potential dividing system. The instrument is made by the Stansfield Radio Co., Ltd., and while the idea is by no means new, it may be said that here is a device produced with all modern improvements which in no way resembles its original prototypes.

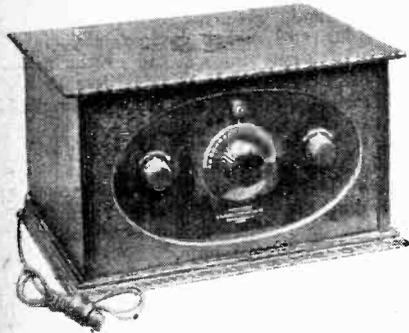
J. J. Eastick and Sons, Eclez House, Buphill Row, London, E.C.1.

EDDYSTONE. (34)

Of outstanding interest is a short-wave receiver fitted with a screened-grid H.F. amplifier. This set—the "Eddystone Scientific Three"—is one of the first screened-grid short-wave sets, and by means of three coils covers a wave range of 14 to 100 metres. In spite of the presence of an H.F. stage, single-dial tuning is retained, the aerial circuit consisting of a screened aperiodic coil. A second dial controls the application of capacity reaction to the tuned anode. In association with the detector valve is a potentiometer,

Stand to Stand Report.

giving a smooth reaction control. The new application of a pentode to short-wave receiver design, as arranged in this set, marks a development which may later become popular. Though the front panel is of aluminium, it is cellulose finished to match the containing cabinet. A special



The Faradex all-mains A.C. receiver.

chassis constructed model is assembled on aluminium front and base panels throughout. As a finished receiver the set is offered at £14 10s., while it is also available as a complete packed kit of parts for home construction at £8 10s. Coils are also supplied for use with this set for tuning to broadcast wavelengths.

A complete metal-framed unit for portable receiver construction is another new departure, while the design embodies the latest practice of screened-grid H.F. stage, detector and pentode. By means of switches, wave ranges of 300 to 500 and 900 to 1,800 are covered.

Users of moving coil loud speakers would be well advised to inspect low-priced yet highly finished Eddystone cabinet. Obtainable in either oak or



Ferranti rolled foil condenser of low internal resistance.

mahogany, it is 39in. in height overall, with the front panel of 2ft. square and a depth of 12in. It is of tasteful design, fitted with an attractive form of front grille, while the back panel, which is actually finished and polished, allows of good ventilation, so preventing resonance. In oak the price is £4 15s., and represents good value.

Among Eddystone components the short-wave coils are well known. A new form of H.F. choke has been introduced, and it is stated to be suitable for use on wavelengths from 3,000 down to 14 metres. It is wound on a grooved hollow

moulding and baseboard mounted on a small metal clip, which, it is interesting to note, permits of its swinging over into a horizontal position. Again, among short-wave components, is a new logarithmic scale variable condenser. Hollow ebonite spacers support the fixed plates, while the spindle rotates with a ball race and is ball centred. The precaution is taken of using an insulated pig-tail connector, to prevent the possibility of the condenser being noisy when tuning to ultra-short wavelengths.

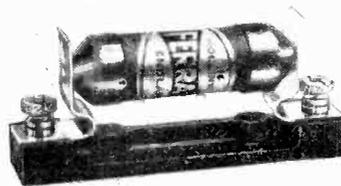
Stratton and Co., Ltd., Bromsgrove Street, Birmingham.

EDISON BELL. (129)

The sets on view on this stand adhere to well-tried practice, and are for the most part self-contained. The "Picnic" portable at £17 17s. and the "Hylo" transportable at £27 10s. are new this year, as are the "Compact Three" and "Pedestal Three," the "Homestead Three" and "Maison Three." The latter measures only 18in. x 15in. x 7½in., and has a frame aerial wound round the self-contained loud speaker. The price in oak is £9 9s.

A pick-up tone arm of simple design at 3s. is worth examination, and a special type of moving coil cabinet with internal flare is being shown.

Edison Bell, Ltd., Glengall Road, London, S.E.15.

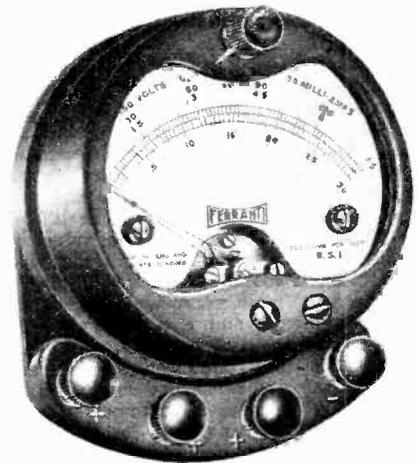


Ferranti resistance suitable for the series anode feed schemes with batteries and eliminators.

EDISWAN. (43)

Of the large number of interesting exhibits on this stand, that which arrests the attention of the enthusiast most is undoubtedly the range of new valves. The indirectly heated cathode valves are of unorthodox design, with a contact at the top of the glass bulb. The heater element, which is designed to work at 4 volts, consumes one ampere. The connections to the valves are as follows: The anode and grid pins on the 4-pin base are used in the normal manner, whilst the two filament pins are connected together in the base. Connection to the A.C. supply is by means of the small cap fitted to the top of the bulb. No alteration is therefore necessary in the wiring of a set designed for operation from batteries, but the low-tension accumulator *must* be disconnected, otherwise it will be short-circuited. The M.I.41 L.F. is suitable in an L.F. amplifier with transformer coupling, and about 4.5 volts negative bias should be applied. The M.I.41 R.C. is, as its name implies, suitable for resistance coupling and is also a very satisfactory anode-bend or leaky-grid detector; it has an impedance of 50,000 ohms and an amplification factor of 45.

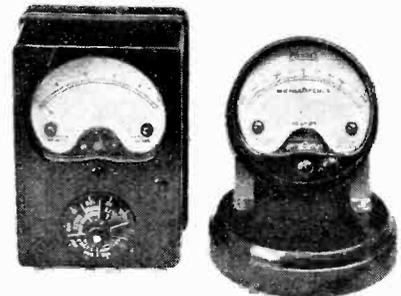
A series of the new type of screened grid valves having the anode at the top of the bulb is being marketed. There is a valve respectively for two-, four- and



Ferranti triple-range meter, in which a new switch allows the milliammeter to be interposed in the H.T. positive lead and not in the negative as heretofore.

six-volt accumulators, and the mutual conductances are 1.12 and 1.4, which represent a high standard of efficiency. The magnification factor in each case is 140. An important feature of the new Ediswan valves is their marking, for not only the filament volts and currents, but also the impedance and amplification factor of each valve is etched on the bulb.

The characteristics of the comprehensive range of orthodox triodes have been much improved, and it is the exception rather than the rule to find a mutual conductance under one milliamp. per volt.



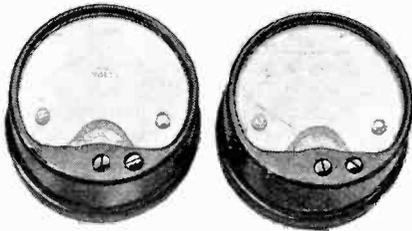
Ferranti valve-tester (left) which checks valve voltages and currents *in situ* in a receiver. On the right is a sensitive microammeter with centre zero.

The Ediswan "R.C. Threesome," which has gained such popularity, has been improved for 1928. Two standard circuits are now provided, the most popular probably being that which incorporates resistance capacity coupling throughout, while for those who prefer the correcting of tone values by a rising transformer characteristic, will appreciate a second model employing a transformer in the last stage. Capacity-controlled magnetic reaction is used and provision is made for switching over from short to long waves.

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The new shrouded type of L.F. transformer, selling at 22s. 6d., has a ratio of 3.5 to 1, and can be used after a detector valve having a high amplification factor. The N.P.L. curve submitted shows a linear response from 200 to 3,000 cycles, with a drop-off above this frequency.

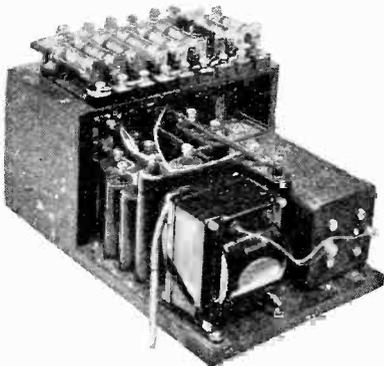
The "Loten" accumulator marks an advance in L.T. battery design; non-corrosive acid-resisting terminals are supplied, and special attention is drawn to the absence of separators, which are often the means of introducing injurious foreign material into the accumulator. It is supplied dry-charged, it being only necessary to fill with acid when the accumulator is immediately ready for service, thus eliminating the usual long first charge. These cells are specially designed to stand an open circuit for considerable periods without loss of charge, and are, therefore, equally suitable for use with



Ferranti A.C. voltmeter, incorporating a metal oxide rectifier bridge. On the right is a new meter with thermo-couple which will read accurately in H.F., L.F., and D.C. circuits.

valves requiring a minimum amount of current, as for discharges up to the normal 10-hour rate.

The H.T. eliminator and L.T. battery charger combined will be appreciated by those who have A.C. lighting mains. This equipment must not be confused with a trickle-charger, as it is capable of supplying heavy currents when necessary. The H.T. output is 30 mA. at 120 volts and two intermediate tapings at 45 and 90 volts are supplied. It is claimed by the makers that as an emergency the accumulator can be kept on charge while the set is being used for reception of



Ferranti H.T. eliminator for A.C. mains. A Ferranti mains transformer is followed by a copper oxide rectifier, which is again followed by series filter feeds to each tapping.

wireless transmission, but a slight hum will be audible in the loud speaker, which will not, however, be objectionable.

A small home accumulator charger selling at the popular price of £2 17s. 6d. contains a transformer, thermionic valve



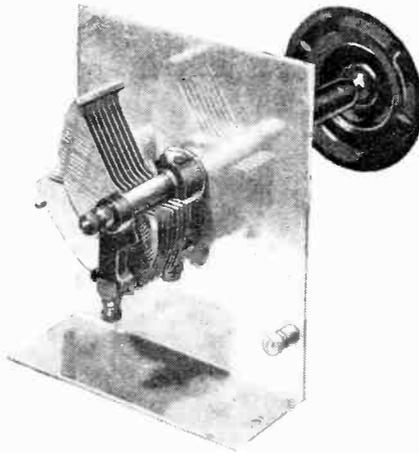
The Formo two-range tuner, with reaction winding between long- and short-wave coils.

and a barretter. It is capable of charging 2-, 4-, or 6-volt accumulators at a maximum charging rate of 2 amperes, and can be employed on supply voltages between 100 and 250 where the periodicity is not below 40 cycles.

Edison Swan Electric Co., Ltd., 123, Queen Victoria Street, London, E.C.

EFESCAPHONE. (127)

Here again is to be found a receiver of entirely recent design and employing the screened grid H.F. valve, detector and pentode combination. Known as the



A Formo short-wave tuning condenser, with screening plate and extension handle.

Waterloo Screened Valve Three, it tunes by means of interchangeable coils from 250 to 600, and 1,000 to 2,000 metres. The volume control is electrostatic by capacity reaction.

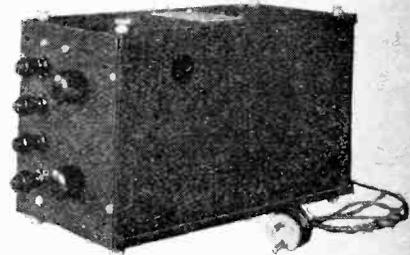
Another new design is the Blenheim portable. Particular interest attaches to this set, as it uses a screened grid H.F. valve, valve detector, a resistance-coupled stage, and, finally, a pentode. It covers both wave ranges and is claimed to give loud speaker range within 50 miles from a main station, or anywhere in Great

Britain, from Daventry. It weighs 30lb and the "all-in" price, including royalties, is £26 15s.

Falk, Stadelmann and Co., Ltd., 88-93, Farringdon Road, London, E.C.4.

EKGO. (48, 49, 50)

The entire range of Ekco eliminators has been redesigned for the coming season and complies in every detail with the recommendations of the I.E.E. All models are totally enclosed in earthed

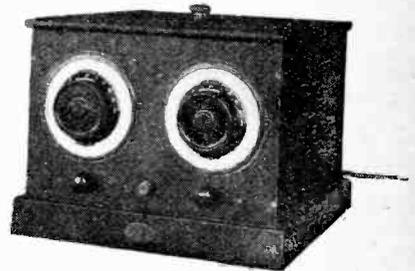


The G.E.C. H.T. battery eliminator for A.C. supply mains.

metal cases finished in dark brown crystalline enamel. Not only is the metal case a protection against shocks and short circuits, but also an effective screen in the case of A.C. models. All sockets are recessed and protected by a projecting ridge of insulating material, and the connecting plugs are without grub screws through which contacts with the live leads might be made.

The range is comprehensive and comprises no fewer than 14 distinct types, as well as a mains-driven receiver and an isolating output transformer. Visitors to the stand, that is, if they can get anywhere near it, should make a point of seeing the type CIA. "All Power" D.C. unit, the type FV120 super-power H.T. unit for A.C. or D.C. mains, the "Mains Drive" three-valve receiver, and the extremely reasonable range of low-power H.T. units. The CIA gives three sources of H.T. (0 to 120 variable, 100 (fixed) and "power"), L.T. up to 0.6 amp., and grid bias up to 21 volts negative. The A.C. model of the FV120 unit is interesting in that a Raytheon tube rectifier is used; the output is 120 milliamperes D.C., and there are in addition two variable tapings for voltages from 0 to 120.

The "Mains Drive" three-valve receiver is a reacting detector with two stages of L.F., one resistance- and one transformer-coupled. Coils for 250-550

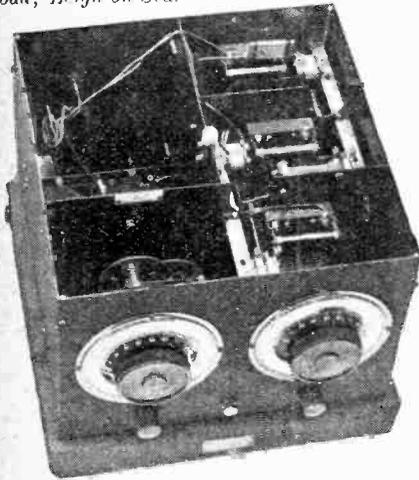


The Screened-grid Four. A Gecophone set.

Stand to Stand Report.—

and 1,000-2,500 metres are built into the set with a change-over switch. The current consumption on A.C. mains is 30 watts, and on D.C. mains 60 watts—not more than an electric light bulb.

E. K. Cole, Ltd., Elco Works, London Road, Leigh-on-Sea.



The interior of the Gecophone Screened-grid Four.

ELECTRAMONIC. (44)

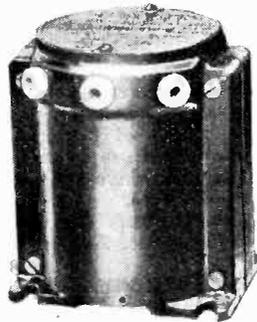
This firm has concentrated on the production of a series of extremely well-finished cabinet wireless-cum-gramophone sets. There is a very attractive Club Model, which is supplied complete with wireless set, a dual turn-table, and a switching device turning over from one record to another, which is necessary in cinema work.

A larger Theatre Model is extremely elaborate in conception, and consists also of a dual turn-table with switch-over control, but in this case the loud speakers are supplied as separate units. This enables the speakers to be located in the best position in the building for the proper distribution of sound.

The Electramonic Home Model consists of a battery-operated wireless set and a hand-wound gramophone, and sells at £36, while the large Theatre Model, with battery eliminator and electrically driven turn-table, sells at £175.

The tone-arm and pick-up employed in the Electramonic range incorporate some interesting features; for instance, there is a quick action fitting for the needle, and the unusual length of the tone-arm causes it to swing in practically a straight line from the circumference to the centre, thereby reducing wear and tear. With short tone-arms, the path of the needle across the record from circumference to centre is a pronounced arc.

The frequency response curve of these various equipments is linear from about 50 to 5,000 cycles, after which there is a sharp cut-off to eliminate needle scratch,



A shielded power transformer for supplying the heaters of A.C. valves. A G.E.C. product.

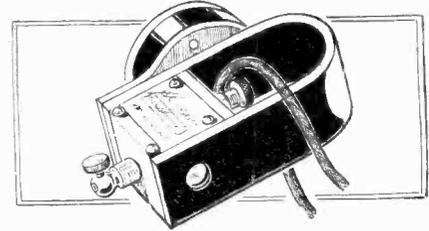
which it is claimed takes place at higher frequencies.

The Electramonic Co., Ltd., Bear Gardens, Park Street, Southwark, London, S.E.

ELECTRON WIRE. (45)

For those who find the soldering of connecting wires too tedious a task, a new form of "Simple-Strip" is being shown by this firm for the first time. It con-

sists of a narrow ribbon of $\frac{1}{4}$ in. flexible tinned copper, with a large number of oval holes drilled through it, of such a size as would normally fit the terminal shanks used in a receiver. "Simple-Strip" can, of course, be soldered, if necessary, but permanent connections are assured by its use. Bends and twists can be made with the fingers, and spade ter-



The Gecophone gramophone pick-up.

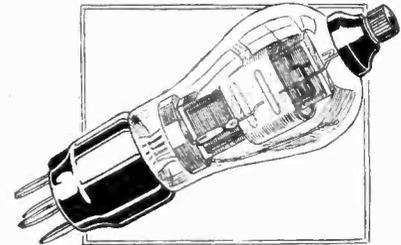
minals are made by cutting through the centre of one of the oval holes.

The "Superial" wire, which is now well known to the amateur, and which has a vulcanised rubber insulation, is being exhibited. The advantages of employing this type of wire is that less insulation is required at the points of support and at the lead-in.

The New London Electron Works, Ltd., East Ham, London, E.6.

EMPIRE. (247)

The main feature of interest which should arouse widespread interest is undoubtedly the "Metropolis" five-valve portable receiver. It may definitely be said to be unique. It employs five valves, two of them being of the screened grid type. The circuit is based on the

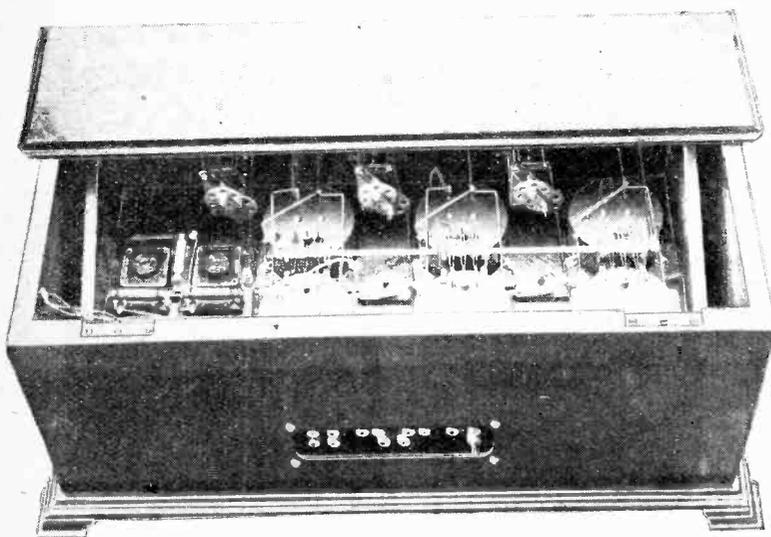


The new Osram 2-volt screened-grid valve, the S.215. The terminal on the bulb is the plate connection.

superheterodyne principle, but only one intermediate stage using a screened-grid valve and a tuned anode coupling to the second detector is employed. The other screened grid valve acts as first detector, using the anode bend system; a triode is employed as a separate oscillator. The L.T. consumption is 0.8 amp. derived from a 15-ampere-hour accumulator specially arranged to fit in the receiver without connecting wires, these connections being taken up by special clips.

In the lid is a cone loud speaker and frame aerial. A simple switch arranges for the instant changing not only from one wavelength band to another, but the switch is of the three-way position type, thus giving a choice of three wavebands.

The total H.T. current consumption is



Interior view showing the special switching arrangement of the Gecophone 6-valve stabilised receiver.

Stand to Stand Report.—

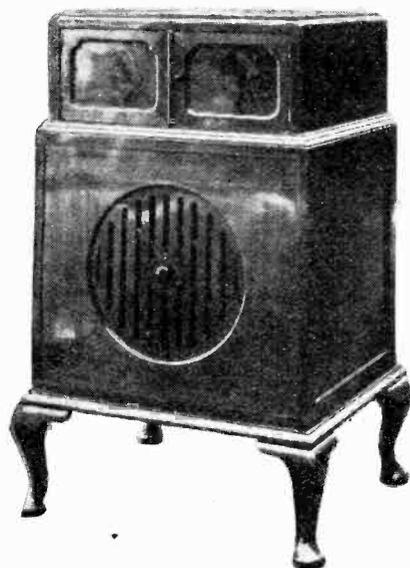
only 7½ milliamperes. The total weight of the instrument is only 22 lb., including batteries and all accessories. A suitable voltmeter for reading the state of the H.T. battery is mounted above the two tuning controls. The instrument is the result of many months of labour, and no visitor to the exhibition can afford to miss this exhibit.

In addition, several less pretentious portable receivers and a number of accessories are exhibited on the stand.

Empire Electric Co., 10, Fitzroy Square, London, W.1.

EUREKA. (144)

The Ortho-dyne Three, with screened grid H.F. amplifier and pentode output valve is representative of a circuit arrangement that has achieved popularity almost overnight. It is a self-contained portable set of the suitcase type, and in-



Gambrell Console Five.

cludes such features as wave-range switching and capacity-controlled reaction. There are two tuning condensers. Screening is almost complete, the small space available for the set proper being divided into three compartments. The same set is supplied in "transportable" form, in a mahogany cabinet. Both include a cone loud speaker.

Adapted for use with an open aerial, the "Screened Grid Three" embodies the same fundamental circuit, although it is, of course, modified by the omission of a frame.

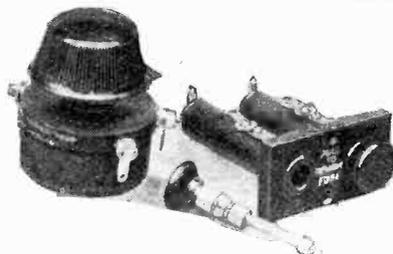
Components exhibited include mains transformers, chokes, variable condensers, and L.F. transformers.

The Portable Utilities Co., Ltd., Eureka House, Fisher Street, London, W.C.1.

EVER-READY. (44a)

The new popular portable high-tension batteries can be seen in three sizes on this stand; the 63-volt model sells at 10s.,

while the 99- and 108-volt batteries sell respectively at 15s. 6d. and 17s., and all three are tapped at every nine volts. The leatherboard container with sealed



Gambrell "Voluvernier" and twin fuse unit.

tappings is an innovation which makes for safety where there are likely to be a number of wires bunched together, as is met in portable sets.

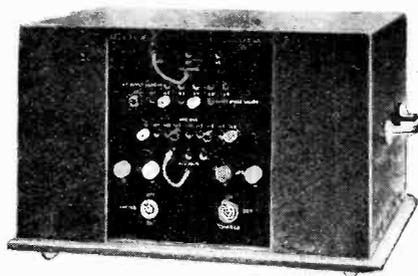
A series of grid bias batteries tapped at every 1½ volts and ranging from 1.5 to 22 volts, should provide ample negative grid potential for all valves giving normal loud speaker output.

Readers will be acquainted with the spring clip terminals usually employed on large H.T. batteries; it may therefore interest them to know that these can be obtained separately ready drilled for mounting on an insulator. For anode currents up to 16 mA. the Ever-Ready high capacity H.T. batteries should be popular, especially at the revised price of 22s. for a 99-volt unit.

Ever-Ready Co. (G.B.), Ltd., Hercules Place, Holloway, London, N.7.

OXIDE. (33, 40, 241)

A feature is being made of trickle chargers so designed that the batteries for a receiver are either on a suitable permanent charge, or are delivering current to the set. Under no circumstances are either poles of the mains connected to the receiver. There are three chargers—one for H.T., another for L.T., and a third in which both functions are combined. All three instruments incorporate the Westinghouse metal oxide bridge, and, of course, can only be used with

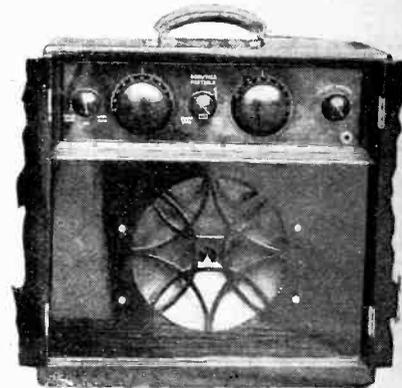


Gambrell "Combinator."

A.C. mains. The combined instrument has embodied two meters, one giving the L.T. battery-charging rate, which is variable by means of a resistance up to a maximum of 0.5 amperes, and the other indicating the H.T. accumulator charging current up to the maximum of 50 mA. These trickle chargers have been de-

signed to conform in every respect to the I.E.E. safety recommendations and to the requirements of the insurance companies; they are housed within well-ventilated metal cases, which are earthed, and are to be recommended to those who prefer the use of H.T. accumulators to eliminators, where there is often uncertainty as to back-coupling and mains hum. A new range of extremely ingenious unspillable accumulators for portable sets has been put on the market; they are designed with four separate acid traps, and the separators between the plates are made of a new treated wood pulp which is highly absorbent, allowing the proper functioning of the accumulator, even if the acid has fallen to a low level in the cells, by reason of the entry of acid into the first trap by splash. Whether the accumulator is used on its side or upright, it is arranged that the plates are completely covered by electrolyte.

For those who require a heavy duty H.T. accumulator of 10,000 mA. hours, the new W.T.10 type will appeal; it can be charged at ½ ampere and can be safely



The Dyson Screened-grid-Three. The small knobs to the left of each condenser dial are wave-change switches.

called upon to deliver 25 mA. for over 400 hours on one charge.

A large number of new L.T. accumulators are also on view on this stand.

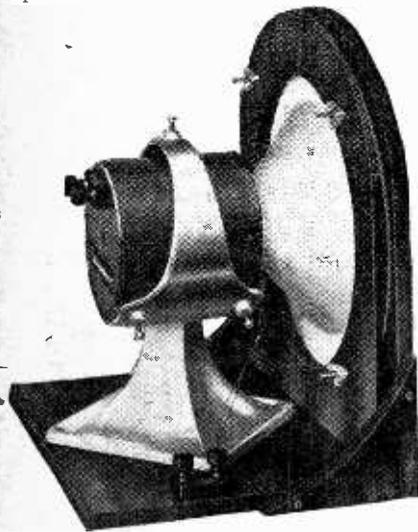
The Chloride Electrical Storage Co., Ltd., 217-229, Shaftesbury Avenue, London, W.C.2.

FARADEX. (76, 77)

Receivers operated entirely from the electric supply mains figure prominently among this firm's exhibits, two models being shown, one for D.C. mains and one for A.C. supply circuits. The only real difference between these is that the A.C. model incorporates a special electrolyte rectifier consisting of pure aluminium and stainless steel electrodes immersed in a solution of "Chromel." The circuit arrangement comprises an anode bend detector followed by two stages of low-frequency amplification. Tuning is on the Reinartz principle, but the remainder of the circuit is rather unusual. Between each valve, in the filament circuit, is fitted a resistance which, by virtue of the difference in potential across its ends,

Stand to Stand Report.—

gives each anode the required voltage. A heavy duty choke, specially recommended for use in circuits passing a relatively large current, is provided with two windings accommodated on separate bobbins, thereby ensuring a high insulation between coils. These can be connected either in parallel, or series, or used separately in different branches of an eliminator smoothing circuit. The D.C. resistance of each coil is only 130 ohms, and gives an inductance of 20 henries. The component is rated to carry 120 milliamperes.



The "Centrex" moving coil loud speaker by Goodman.

A well-designed mains transformer giving two output voltages is another interesting component. The high voltage winding delivers 250 volts to each anode of a full wave rectifying valve, and the low voltage secondary, for lighting the valve, gives 6 volts at 2 amperes. The core is of generous dimensions and built up from "Stalloy" special transformer stampings.

Book Bros., Ltd., 55, Cardington Street, London, N.W.1.

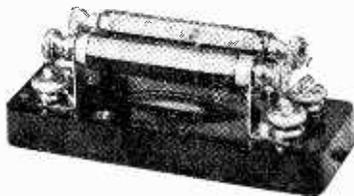


Graham-Farish variable anode resistance.

FELLOWS. (36, 37, 64, 65)

The aim of Fellows Wireless is to provide a reliable receiver of attractive appearance selling at a price representing good value. For £7 2s. 6d. one can obtain a two-valve cabinet-type receiver with full equipment. The circuit system is entirely standard and the components reliable, while in conformity with home

requirements large circular tuning dials with their scientific appearance are avoided. Tuning is accomplished by slow



Resistance capacity coupled unit of Graham-Farish.

motion knobs and the scale settings appear through apertures.

Absence of control dials is a feature of the Fellows Portable Five. Three knobs are exposed on its control panel, only one being used for tuning. A pair of doors reveals the controls and loud speaker grille. It is tastefully finished in dark blue grained morocco and is priced at £19 12s. 6d. inclusive of royalties and all accessories. The Fellows range includes two-, three-, four- and five-valve sets to meet all broadcast receiving requirements.

Fellows Wireless, 2, Princes Street, Cavendish Square, London, W.1.

FERRANTI. (84 & 85)

Amateurs are now well acquainted with the standard voltmeters and ammeters manufactured by this company; a new range conforming to the high standard already achieved will, therefore, appeal strongly to the more serious experimenter. The thermal instrument, which is the same size as the well-known voltmeters, contains a thermo-couple in *vacuo* and reads accurately in H.F., L.F. and D.C. circuits, and can be accurately checked on the latter. The temperature error is less than 0.1 per cent. per degree C. No thermal hysteresis takes place as in the hot-wire type, and the consumption is only about 20 mW. in the heater circuit. The capacity of the instrument to earth is small, and true



The Halcyon lightweight portable. Note the station log card and neat appearance of the control panel.

R.M.S. readings on a parabolic scale without wave-form errors are obtained. Voltmeters and ammeters of this type in various ranges are available. It is extremely important to be able to measure A.C. voltages and currents at various points in A.C. eliminators. The introduction, therefore, of a series of A.C. voltmeters and ammeters containing a bridge of four copper-oxide rectifiers will have considerable appeal.

They are calibrated in R.M.S. values, the scale shape is nearly linear, and the instruments can be used on circuits from 25 to 100 cycles. The voltmeters can be obtained with a resistance of about 160 ohms per volt, or, if specially ordered, 800 ohms per volt.

A new microammeter of the ordinary Ferranti meter dimensions, and reading from 0 to 250 microamps, with centre zero, will be extremely useful to those



A typical "Henderson" battery eliminator.

who wish to make accurate measurements of grid leak values and the flow of grid current in an amplifying valve. The standard three-range combined voltmeter and milliammeter can now be purchased with a slightly altered switching arrangement whereby the reading of anode current is taken in the H.T. positive lead and not in the negative.

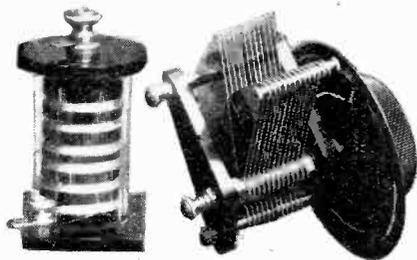
A new valve tester is ingenious and consists of a multi-range instrument, having a resistance of 1,000 ohms per volt and a multi-way switch connected to a four-pin adaptor for insertion into an ordinary valve-holder. The valve is put into the top of the adaptor and the various constants tested under working conditions in the receiver.

A number of receivers of the "Everyman Four" type are being shown on this stand, provided with low-range milliammeters in the plate circuit of the anode-bend detector rather than in the plate circuit of the last valve. It is rightly pointed out that good quality is more likely to be obtained under perfect detector conditions than by passing a badly rectified signal to a well-controlled power-output valve. By examining the valve's characteristic the normal anode current at the maximum curvature can be set by attention to grid bias and H.T., and further examination of the curve will show the maximum anode current that can be tolerated (when a

Stand to Stand Report.—

sine wave is impressed on the grid) before the flow of grid current.

Messrs. Ferranti have brought out an extremely informative publication of 87 pages, entitled "True Radio Reproduction," in which can be found the necessary anode current data for the well-known anode-bend detectors. There is also a fund of information concerning

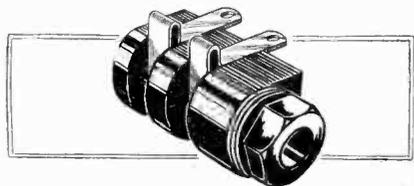


An H.F. choke and variable condenser by Norman Huntly.

the technique of practically every branch of radio reception. There are no fewer than fourteen oscillograms demonstrating the extreme care that must be exercised in handling sine waves.

For the coming season special attention has been paid to the manufacture of complete A.C. and D.C. H.T. eliminators. As pioneers in research work connected with elimination of motor-boating and incipient oscillation, the mains equipment of this company will be examined with interest, as the well-known series anode-feed resistance scheme with choke filtering in each tapping is employed. Amateurs have found difficulty in arriving at the correct value of feed resistances to use under various circumstances; this problem is now made simple by the use of a graph published in "True Radio Reproduction," giving resistance values under all working conditions.

Ample loud speaker output should be able to be obtained for all domestic purposes without using any voltages above that of the lighting mains; all apparatus, therefore, designed by this company for battery substitute purposes will be



The Igranik midjet jack, a useful component where space is restricted.

strictly limited for use with such voltages. Home constructors' mains units for almost every conceivable combination of valves can be purchased, and a large range of heavy-duty chokes, broad rolled foil low-resistance condensers and feed resistances are available. There are mains transformers and metal-oxide rectifiers giving various outputs, and an

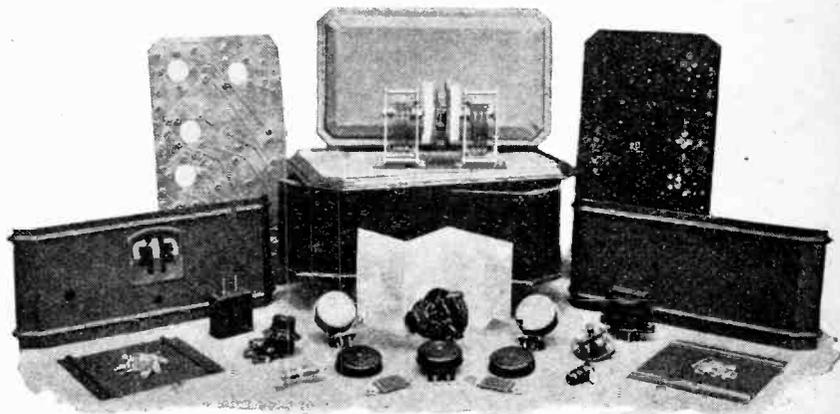
interesting item is the provision of an earthed metal eliminator container with fuse and switch contact so arranged that when the lid is lifted the mains are entirely disconnected.

Ferranti, Ltd., Hollinwood, Lancs.

FORMO. (140)

In the Show Forecast which appeared in last week's *Wireless World* mention was made of the fact that the Formo Company expected to exhibit L.F. coupling devices in which the various parts comprised in a dual impedance stage, as well as those of a two-stage amplifier (resistance- and transformer-coupled), are mounted in a single cylindrical container of small dimensions. A visit to the stand revealed the fact that there has

with plates conforming to the logarithmic law is of exceptionally small dimensions, and is retained for the coming season. Another component, the *de luxe* model, on somewhat similar lines, has been introduced; it has bearings at each end of the spindle, which is hollow, and conceals a piston which connects to the rotor terminal. Dimensions are not increased, except that the overall back-of-panel space now amounts to 2 3/8 in. This condenser is moderately priced at 6s. A short-wave model, with screening plate and extension rod for mounting at a distance of 4 in. behind the panel, is also available; its maximum capacity is 0.00015 mfd., and the screen is bushed with ebonite so that it may be separately earthed—a desirable feature when the



The component parts of the Igranikit. A home constructor's outfit of unusual design.

been a last-minute addition to this range of "potted" couplings in the shape of a unit comprising an L.F. transformer and filter output, complete with choke and condenser. In accordance with the best practice, it is arranged that the low potential end of the loud speaker shall be joined to the negative L.T. lead. Several demonstration sets, showing the extreme simplicity of construction resulting from the use of these various units, are on view.

A new valve holder, in brown bakelite, is fitted with a protective plate of the same material on its underside. Dimensions have been reduced to a practical minimum, and the projecting soldering tags are sensibly arranged so that the filament circuits may be wired with straight leads.

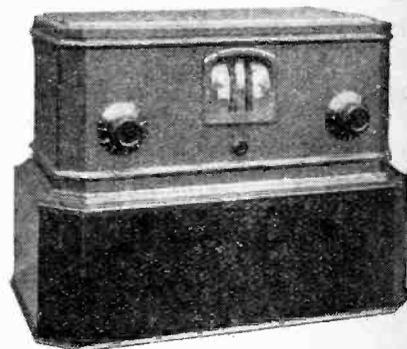
A two-range tuner, designed primarily for detector-L.F. sets with switch wave-band change, is wound with a single-layer solenoid for the short waves and pile windings for the long-wave and reaction coils. The latter is common to both bands; thus the change-over is simply effected by means of a single-pole switch. Reaction is, of course, controlled by means of a variable condenser, as the coils are fixed. The cylindrical former on which the coils are wound is fitted with a six-pin mounting, although interchangeability is required only when reception on other bands is anticipated.

The standard Formo variable condenser

is used for reaction purposes in certain circuit arrangements.

Reverting to the dual-impedance coupler already mentioned, it may be noted that the company has issued a booklet dealing at some length with the problems of L.F. amplification, and giving an amplification curve relating to its unit; this shows a good rising characteristic well maintained up to nearly 8,000 cycles. Good amplification is given at the very low frequency of 32 cycles.

The Formo Company, Crown Works, Cricklewood Lane, London, N.W.2.



The completed Igranikit receiver. Note the clean appearance of the front panel.

Stand to Stand Report.—**G.E.C. (28, 29, 46 & 47)**

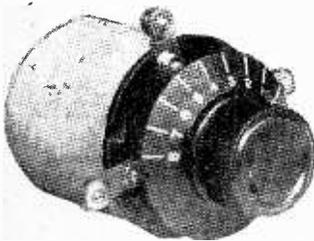
A number of interesting additions have been made to the Gecophone range of receiving sets, while modifications of a minor nature, to enable the best results



The Igranic Universal Portable Receiver.

to be obtained from the new and improved valves, have been made to last year's models.

The new screened grid four-valve receiver is designed to work with a frame aerial, and embodies two stages of H.F. amplification using the S625 screened grid valves, followed by an anode bend detector and one transformer-coupled L.F. stage fitted with a super-power valve. The H.F. circuits are tuned by gang condensers operated by one dial, and a separate condenser tunes the frame. Wave change switches are fitted, which enable long or normal broadcast wavelengths to be tuned without changing the coils. A screened grid valve is used also in their four-valve portable set, which consists of one H.F. stage coupled to the detector by a tuned anode circuit, and followed by

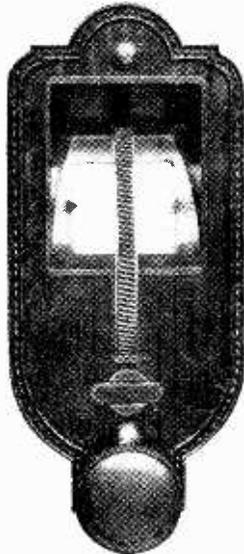


The resistance valve changes logarithmically in this Igranic wire-wound variable resistance.

two transformer-coupled low frequency amplifiers. The screened-grid valve, an S215, is, of course, used as the H.F. amplifier. A 110-volt dry battery and a 2-volt unspillable accumulator supply the power necessary to operate the set. The loud speaker is fitted with a balanced armature movement, and is accommodated in the lid. The weight of the set is 35lb. only, so it can be said to be really portable.

The gem of the Gecophone collection is a compact three-valve set, the Victor Three, embodying a detector and two L.F. circuit using resistance-capacity couplings between the two low frequency amplifiers. The aerial circuit is best described as a modified Reinartz, with, of course, capacity control of reaction. At the very low price of £8 10s., inclusive of valves and batteries, and measuring only 9¼in. x 5in. x 7¼in., this can be regarded as one of the outstanding features of the exhibition.

An A.C. mains-operated set, designated the "All Electric Three," consists of a grid detector with reaction, followed by two transformer-coupled L.F. amplifiers, is fitted with one K.L.I valve, one "H.L. point 8" valve, and one P625A super-power valve. The mains transformer is provided with a tapped primary winding, so is suitable for all supply circuits between 200 and 260 volts at 50 cycles. In view of the comparatively high plate voltages made possible by utilising the supply



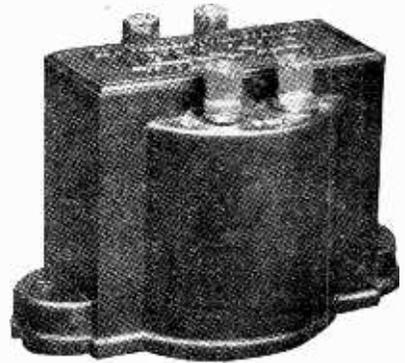
The Igranic drum condenser control with illuminating lamp behind the aperture.

mains, a choke-capacity output circuit has been fitted, to militate against the possibility of receiving a shock when attaching or detaching the loud speaker with the mains connected.

Compared with the bijou Victor Three, the six-valve stabilised receiver can be portrayed best as an Atlantic liner gazing placidly down on a fussy little tug, but neither could fill the role of the other. The six-valve set is essentially a long-distance receiver, embodying as it does three H.F. amplifiers separately tuned. The change from long to normal B.B.C. waveband is by means of a series of multi-contact switches which bring into operation the appropriate coils. These are linked to a common shaft which is operated by a single control knob on the set.

Among the new accessories developed during the quiet season is an H.T. battery eliminator for 50 cycles supply mains of between 200 and 260 volts. It delivers an output of 50 milliamperes at 180 volts, and

is provided with one fixed and two variable output voltages. An Osram U5 full-wave rectifying valve is fitted. Another new component is a power transformer for supplying the heaters of the indirectly heated cathode valves, or the "point 8"

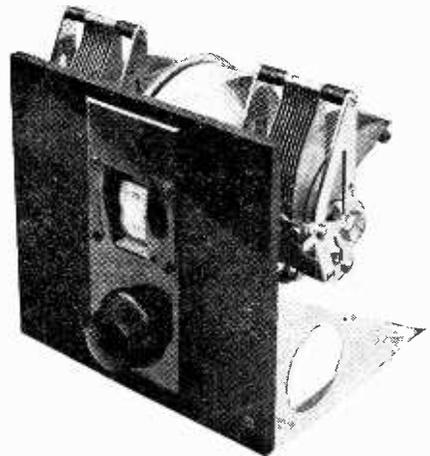


The J type L.F. transformer with a bakelite moulded case. An Igranic product.

type, and is enclosed in a black crystalline finished case. The visitor should not fail to examine the gramophone pick-up and other associated apparatus, such as electrically driven turntables, fitted with special motors, which operate off either A.C. or D.C. supply mains of any voltage.

The superior characteristics of the improved Osram valves are due mainly to a new process in manufacture which has provided the filaments with a tenacious coating of highly electron-emitting chemical. The most interesting development is in connection with the screened grid type of valves. These can be divided broadly into two categories—H.F. amplifiers and power valves. In the first category an addition of a 2-volt screened grid valve with a four-pin base will be welcomed by many. The four pins on the base are: filament, control grid and screened grid (formerly the plate pin), the anode being brought out to a terminal on the top of the glass bulb.

Without going into technical details of the steps which led up to the modifications of the four-electrode valve to convert this into a power valve, it will



J.B. drum-control unit with ganged left-hand condenser.

Stand to Stand Report.—

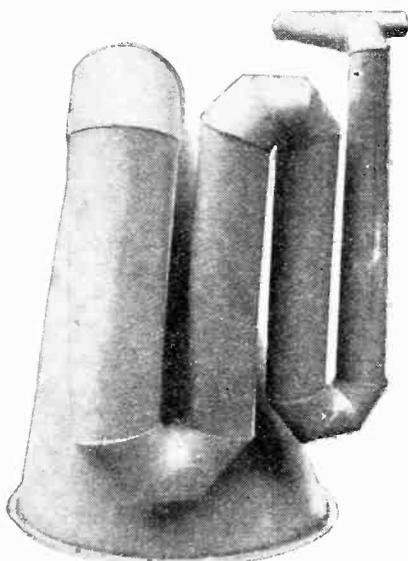
suffice to say that the introduction of a fifth electrode in the shape of a screen between the screen grid and the plate has resulted in a valve having the extraordinary characteristics of the H.F. type, coupled with the power-handling qualities of an L.S.5a, but does not demand anything like the same anode potential.

Further additions to the Osram range are a screened grid H.F. valve, a high impedance three-electrode valve, a general purpose valve and a power valve, all with special filaments for A.C. mains operation. These consume 0.8 amp. at 0.8 volts, and are designated the "Point 8" type.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

GAMBRELL. (27, 108)

The simple design and pleasing proportions of the Gambrell Table Model Two first attracts the visitor to Stand 27.



The "Waveola" horn for cabinet loud speakers.

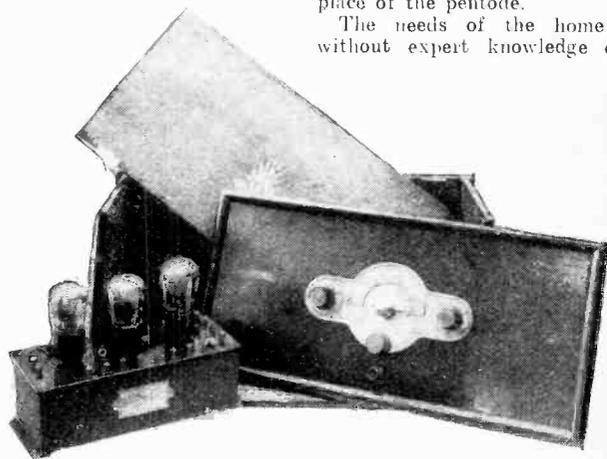
This receiver has only one tuning dial, but is capable of giving alternative programmes in most parts of the country. As in all Gambrell sets, this model is operated entirely off the electric light mains. The crystalline finish on wood is interesting, and gives a handsome appearance. The D.C. model costs 12 guineas, and the A.C. model 18 guineas inclusive of valves.

The Table Model Screened Grid Four is of more ambitious design, and is housed in a high-class mahogany cabinet. Although giving a wider range of stations the essential simplicity of control has been maintained by the use of thumb control tuning condensers.

The "Console Five" employs two screened grid H.F. valves, and receives on a frame aerial rotating inside the cabinet. The control panel is of beautifully grained wood, and again drum control condensers are used. Provision is

made for a gramophone pick-up, and there is a volume control on the L.F. side. The built-in loud speaker is a Celestion C14. The cabinet is of the highest possible quality and finish, and the price for the D.C. model is £68 and the A.C. model £75 complete.

The "Combinator" and "Battinator" units are already known to most of our readers, so we will pass to Stand 108, where the components are being shown.



Lamplugh constructors' kit comprising panel, panel tuner, baseboard unit and collapsible cabinet.

Here the principal items of interest—apart from well-established components such as the "Neutrovernier"—are the new "Voluvernier" volume control at 6s. 9d., and the Twin Fuse Unit at 6s. 6d. The latter is fitted as standard in all Gambrell mains sets, and since there is a low-ampere fuse in each lead from the mains the set is completely protected from all shorts or earths. The price of spare fuses is 6d. each.

Gambrell Radio, Ltd., Buckingham House, Buckingham Street, London, W.C.2.

GODWINEX. (1)

Two new portables have been added to this firm's range of self-contained receivers; both use the screened-grid valve as H.F. amplifiers. The three-valve model embodies a 2-volt screened-grid valve coupled to a detector by a tuned anode circuit and thence, by means of a transformer, to a pentode valve. Two anode coils are fitted, one for the normal wavelength and the other for the higher B.B.C. wave band. These, as well as the condenser tuning the anode circuit, are mounted in a screened compartment to prevent interaction between the anode circuit and the frame aerial. The wave change is effected by means of two switches mounted immediately below the tuning condensers for the circuits with which they are concerned. Although this requires two operations to change over from long to medium wavelength, it overcomes the detrimental capacity coupling that would be present if a single controlled switch was fitted. A Brown cone loud speaker is fitted, and provision

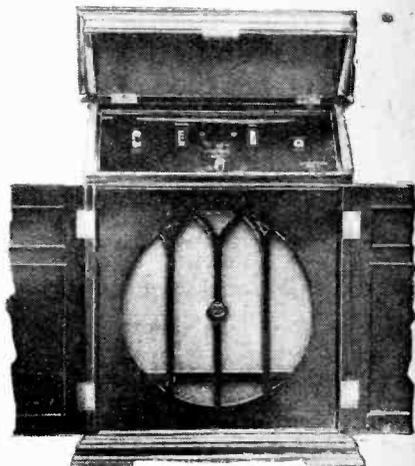
is made for plugging in either a pair of telephones or a separate loud speaker when required. The H.T. is derived from a 120-volt dry battery and a 4-volt accumulator provides the filament current.

The four-valve model incorporates the same general arrangement as its three-valve counterpart, with the exception that the low-frequency amplifier consists of two stages, resistance capacity and transformer coupled, in this order, in place of the pentode.

The needs of the home constructor without expert knowledge of soldering

are catered for in the shape of kits of parts for building up into three-valve sets. In addition to the "Constructor-Three," a set of parts, together with complete working instructions for building a three-valve set with a screened grid H.F. valve is exhibited.

There are many who possibly find the burden of constantly transporting the L.F. accumulator to the nearest changing station rather irksome and would welcome a really reliable substitute. The "Stedipower" unit for use on A.C. supply mains will provide a solution for this, as it is claimed that an output of 6 volts up to 1 ampere is obtainable.



The new Langham portable set with mechanical wave-change switch.

Stand to Stand Report.—

A Westinghouse metal rectifier is fitted, together with heavy duty smoothing chokes and condensers of the electrolytic



Lewcos H.F. choke.

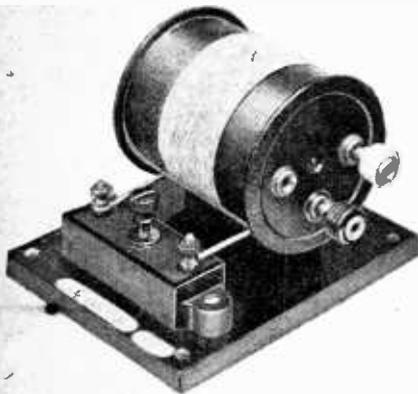
type having capacities of the order of some thousands of microfarads.

T. Dyson and Co., Ltd., 2, Coleman Street, London, E.C.2.

GOODMAN. (269a)

Among the many interesting features on this stand there are one or two which stand out beyond the rest.

The first of these is undoubtedly the new "Centrex" moving-coil loud speaker which we illustrate. The actual moving coil itself is wound in three sections on a substance which at first sight resembles paxolin. This substance is specially pre-



The Lewcos wave trap which has a Litz-wound coil.

pared, and not only is it impervious to water, but it does not warp under great heat. Its non-warping qualities render it specially suitable for its purpose, in case overheating accidentally took place in the loud speaker at any time.

Another novel feature which is common to other Goodman coil-driven loud speakers is the fact that by a slight thread arrangement on the moving-coil former it is virtually impossible to fix it on to the cone incorrectly. The usual adhesive is also applied, of course. The instrument possesses a unique centring device.

Of almost equal interest is the Junior Moving Coil set of parts, which, with its

simple but certain centring devices and other attributes, costs only £3 10s.

Yet another feature which should not be missed is the range of loud speaker and receiver cabinets. Visitors are strongly advised to examine these very closely.

Goodman's, 27, Farringdon Street, London, E.C.1.

GRAHAM-FARISH. (119)

Fixed condensers, anode resistances, and grid leaks are the specialties of Graham-Farish. A new product on this stand is a variable high resistance supplied in four range values of 10,000 to 70,000 ohms, 60,000 to 150,000 ohms, and 100,000 to 500,000 ohms, these being used principally as anode resistances and possessing the required current-carrying capacity. The other gives a range of 1 to 7 megohms, and is primarily intended as a variable grid leak. The provision of a third terminal permits of this component being used as a potential divider, making it suitable for the most favoured form of volume control. Most important is the fact that the internal construction does not take the form of a rubbing contact on the face of the resistance material. A smooth movement is obtained across the faces of a large number of contacts embedded in the resistance material. This component at 5s. 6d. is one of the cheapest forms of volume control and may be arranged as a potentiometer or even as a variable high resistance. For leaky grid detection, also, the variable grid leak model is a component that has been sought after for many years. These resistance units are well finished with moulded cases and have attractive thumb-grip operating knobs.

A grid leak selling at 1s. is also offered. The resistance material carried on a strip within the usual form of tube is itself metal capped, while the insulating tube is fitted with turned metal ends and terminals.

Graham Farish Limited, Brooley, Kent.

GRIPSO. (214)

On this stand an effective display has been made of the well-known accessories made by this firm. Bakelite terminals with coloured labels, spade ends, and similar small "gadgets" are shown.

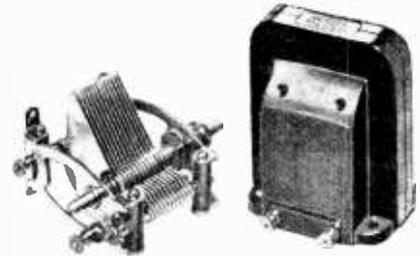
Of special interest is a new form of earthing clip and grid leak holder.

L. H. Reid and Co., 32, Victoria Street, London, S.W.1.

HALCYON. (17, 18)

The products of this firm have always exhibited what can truly be said to be sound wireless practice, and as these have been kept up to date there are no modifications of an outstanding nature we can record. In both portable and transportable models the "popular" circuit arrangement is favoured—namely, 2 H.F., a detector, and 2 L.F. amplifiers—five valves in all. The latest models have had minor modifications made to the panel layout resulting in a cleaner appearance than hitherto, and all cabinet types are fitted with turntables to facilitate orientation when searching for distant

stations. Drum controls with a vernier attachment are fitted to the tuning condensers, and a pilot lamp has been incorporated. This is a useful addition, as in sets of this type there is no indication of whether the valves are on or off, unless a modulated carrier wave is tuned in.



Lissen condenser for baseboard or panel mounting (left). On the right is the new shrouded L.F. transformer made in two ratios: 2½ and 3½ to 1.

The cabinet model is fitted with two 60-volt high-tension batteries of ample capacity to have a reasonably long life in view of the discharge they are given, and a 4-volt L.T. accumulator. Although the use of 4-volt valves may add a few ounces to the weight of the set, owing to the increase in size of the L.T. accumulator, it is claimed that the improvement in the overall efficiency more than compensates for this.

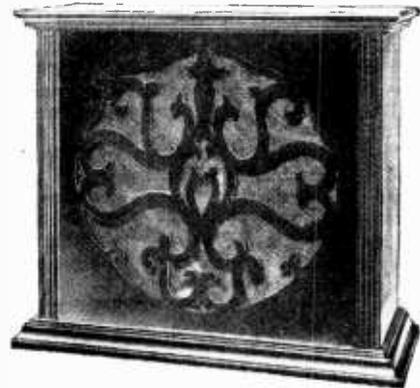
With regard to the portable model, a 100-volt H.T. is fitted and a 4-volt accumulator. Celestion loud speakers are incorporated in all Halcyon sets. The lightweight portable is enclosed in a handsome green crocodile, or brown leather, case with oxidised metal fittings.

The Halcyon Wireless Co., Ltd., 313-319, Regent Street, London, W.1.

HART BROS. (215)

The special low capacity flexible wire manufactured by this firm is naturally one of the leading exhibits on this firm's stand. Other exhibits consist mainly of seven-way battery cords and similar devices.

Hart Bros. Electrical Mfg. Co., 4, Queensway, Ponders End, Middlesex.

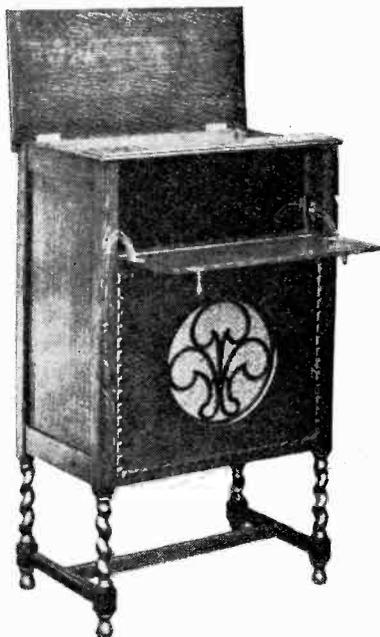


The Lissen cone loud speaker.

Stand to Stand Report.—

HART COLLINS. (15)

It is not always convenient for those forced by modern conditions to reside in densely populated areas to have access to an outside aerial, and this has led to an increasing demand for a receiver which does not rely on external connections for its efficient working. To meet this demand, Hart Collins have augmented their range of portable and transportable sets and modified their last season's models to bring these up to date. Five valves are fitted to all models, the Tourist Portable incorporating two high-frequency stages, coupled together by aperiodic H.F. transformers followed by an anode bend rectifier and two transformer-coupled low-frequency amplifiers. The transformer following the detector has a high impedance primary winding;



An excellent example of a combined receiver and loud speaker cabinet by W. T. Lock.

consequently, there is negligible loss in amplification due to linking together an anode bend detector and the low-frequency amplifier in this way. The outstanding advantage of this arrangement is that it enables smooth control of reaction to be obtained, thereby greatly increasing the sensitivity of the set, as it is possible to bring the circuit up to the oscillating point without the objectional "threshold" howl so often experienced. Provision is made for reception of both medium and the long waves, the change being made by means of two switches, one on the control panel and the other in the lid. The switch on the panel changes over the aperiodic H.F. transformers, and the one in the lid connects the sections of the frame aerial either in series or parallel. The leads to the frame and the loud speaker are concealed behind a special leather hinge.

E 29



A portable receiver by the London Radio Manufacturing Co.

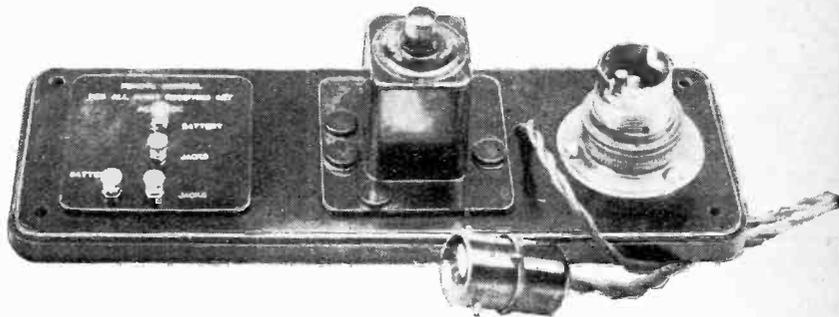
thereby imparting a very clean appearance to the set, as there are no loose wires visible.

A Celestion loud speaker is fitted, which, while very sensitive to weak impulses, will also handle the full output of the last valve without overloading. A 100-volt dry battery supplies the anode current and a 40-ampere-hour 2-volt accumulator provides the filament current. The latter is fitted with glass wool, which absorbs the electrolyte and prevents leakage.

The Tourist 5-valve cabinet set is entirely self-contained and embodies a similar circuit to that of the portable model. It is enclosed in a handsome polished case in either oak or mahogany, and is supplied fitted with either a cone loud speaker or an Amplion Radiolux.

The Passport portable is one of the new models and is a 5-valve set also, enclosed in an attractive hide suitcase with the frame aerial and a cone loud speaker fitted in the lid. The circuit differs from that of the "Tourist" models in that the H.F. stages are choke-capacity-coupled, but the detector and L.F. portion closely resembles the arrangement found so effective in the earlier models. This is a two-range instrument, the change from short to long waves being effected by a single switch, which changes over the connection of the frame aerial.

The transportable model is enclosed in



The Lotus remote control relay for mains-operated receivers.

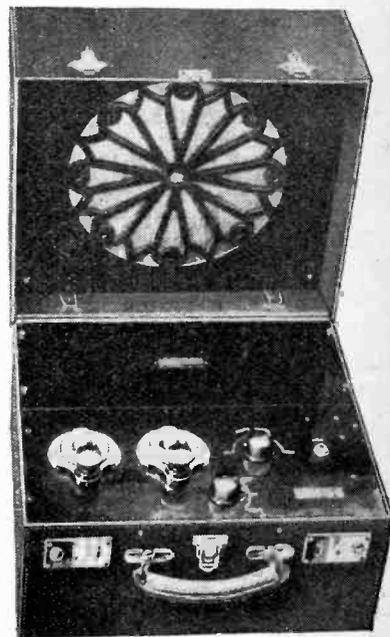
a polished walnut case fitted with a cone loud speaker, and utilises the same circuit arrangement as the portable.

Hart Collins, Ltd., 38a, Bessborough Street, Westminster, S.W.1.

HENDERSON (258)

This firm, who have always been to the fore where battery eliminators are concerned, still hold their high position as experts in this particular work.

Apart from the technical excellence of the apparatus exhibited, the visitor cannot fail to be impressed by its appear-



The Lotus Portable.

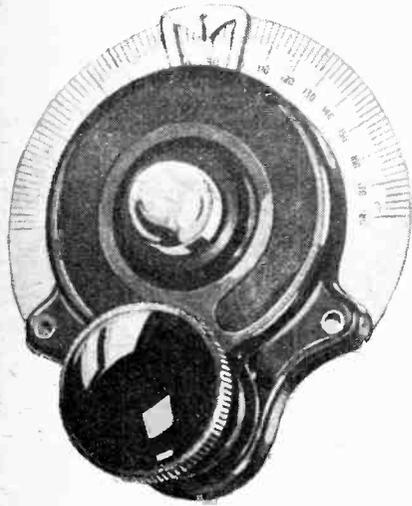
ance of their products. In addition to being specialists in battery eliminators, they are also portable specialists, and produce a large variety of portables and transportables. It would be impossible to do justice to these receivers in the course of a few words, and nobody interested in this type of set should fail to visit this stand, where they will receive a very cordial welcome.

One very important item of the smaller class which should not be missed is the special quick-break battery switch. It is

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also perfectly suitable for use on the mains.

W. J. Henderson and Co., Ltd., 351, Fulham Road, London, S.W.10.

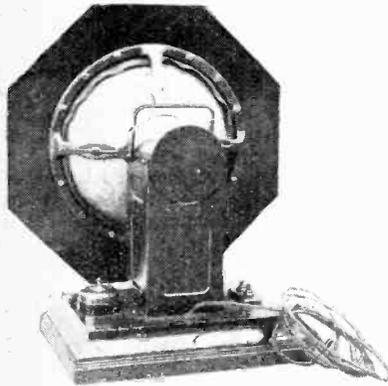


The Lotus vernier dial.

HUNT. (273)

At this stand the well-known electrical measuring instruments manufactured by this firm are well to the fore.

The greatest interest lies perhaps in the various complete testing sets, such, for instance, as the Precision testing set and the Amateur's testing set. The former instrument consists of a single meter mounted on a panel with several terminals, and boxed in. Voltage ranges from 0.8 and 0.120 can be obtained, and current values ranging between zero and 4 milliamperes. The Amateur's testing set



The new M.P.A. Dual Inductance Self-energising loud speaker.

consists of two meters mounted with several terminals. The ranges obtainable are similar to the Precision set in the matter of voltages, and on the current side 0.200 milliamperes and 0.4 amperes.

In addition, a large number of this

firm's well-known "Polynet" products is shown, including filter condensers, of various capacities and various test voltages, mica condensers, and similar devices, the workmanship of which is unimpeachable.

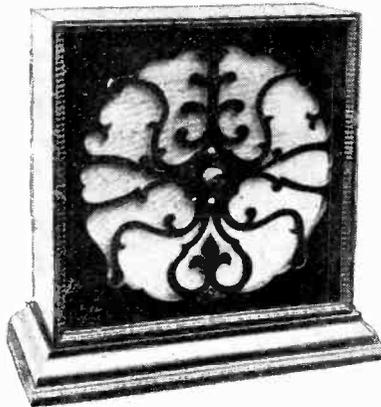
A. H. Hunt, Ltd., H.A.H. Works, Tunstall Road, East Croydon.

HUNTLY. (264)

On this stand will be found several variable condensers and H.F. chokes which are of promising appearance.

In addition, there is exhibited an entirely new type of valve, called the "Four In One," since it is possible to make this valve do the work of four, a multi-electrode system being employed. There are twelve connecting pins on the base of the valve, which are made non-reversible. A receiver is shown wired up which is virtually a four-valve set, consisting of the usual H.F. circuit with reaction, the coupling between the "H.F." and detector valve being made by means of a standard transformer, commonly known as the split primary type. All connections, however, go to the one valve.

Norman Huntly, 35, Clerkenwell Green, London, E.C.1.



Portability is a feature of this M.P.A. moving coil loud speaker for D.C. mains excitation.

IGRANIC. (53, 54 & 75)

The Igranic Electric Co. can be relied on usually to produce something a little out of the ordinary at this season, and their surprise on this occasion is a unique construction outfit which has been so well thought out that it is difficult to see how the set builder can possibly make a mistake. The panel carrying the component is supplied ready drilled, and all holes are given a distinguishing number which corresponds with numbers on a key chart against which are the descriptions of the components to be assembled. These are all chosen from the best of the Igranic range, and have been specially adapted for this outfit. Each is fitted with special fixing attachments, which also act as the electrical connection. The components are held in position by screws and nuts, and it is unnecessary for the constructor to make a single soldered joint. After assembling the components, the base is

reversed and a drilled fibre sheet, with metal-bushed holes, is placed in position. The holes are inter-connected by stout wire, and when nuts have been run on the protruding screws and tightened to ensure electrical connection the receiver is correctly wired. This is the key to the design, as by supplying the wiring in



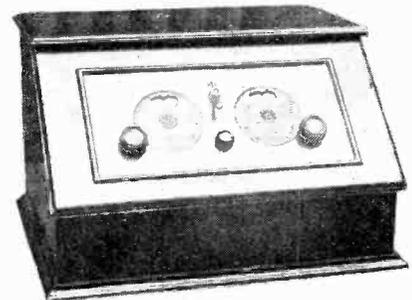
One of the "Mainten" battery eliminators.

this form it is impossible for the constructor to make a wrong connection.

The circuit favoured is a neutralised H.F. amplifier followed by a regenerative detector transformer-coupled to an output valve, which can be a pentode. It can be battery-operated or mains-driven as desired, and an eliminator is provided if the second-mentioned course is adopted. In this case A.C. valves with indirectly heated filaments can be used in the H.F. and detector stages.

The complete set of parts comprising everything necessary to build this set, together with metal stampings for the case, is supplied at the very modest price of £6 6s. A kit of parts for a two-valve set on similar lines, but building up into a detector and L.F. combination only with a pentode output valve and intended for A.C. mains operation, is also shown.

The Universal five-valve portable set incorporating two stages of screened-grid H.F. amplification, a grid detector, and two low-frequency stages must not be overlooked, as this contains many novel features. The H.F. amplifier comprises one tuned and one aperiodic stage, in this order, but by ganging the variable condensers only one tuning control is neces-



Marconiphone 3-valve receiver fitted with screened-grid H.F. stage and pentode.

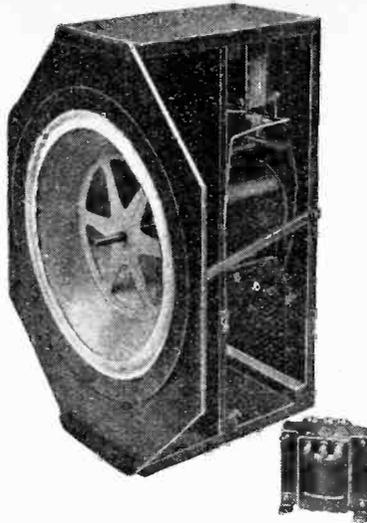
Stand to Stand Report.—

sary. Volume is controlled by de-neutralising the tuned H.F. stage, and works very well in practice, as shown by the number of stations received on this set, under not too favourable conditions, in their demonstration room at No. 28, West Kensington Gardens, within a few minutes' walk of the Exhibition. Provision is made for reception of both long and medium B.B.C. wavelengths, also for the attachment of an outside aerial and earth, which considerably increase the range of the set.

The batteries, which comprise two large size 60-volt for the H.T. and an unspillable 2-volt accumulator, are contained in a separate case. This enables adequate battery power to be made available without imposing an extra burden on the transporter.

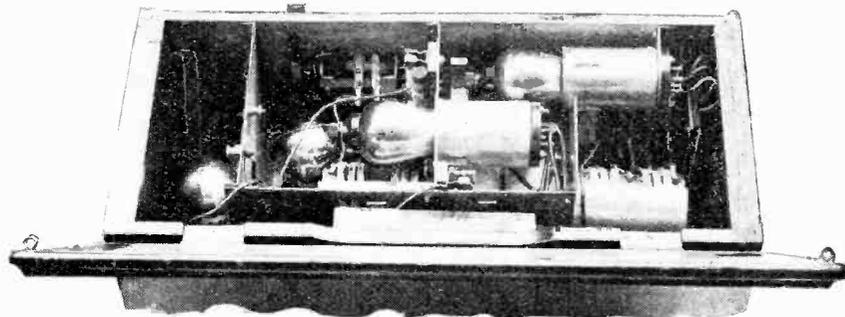
In the variable high resistance the element is wire-wound, giving eight different values, selected by means of a built-in multi-contact rotary switch fitted with an engraved bakelite knob and dial. The resistance value varies logarithmically, the greatest change being between the lower values. This is intended for panel mounting, and can be obtained in two maximum values, up to 50,000 ohms and up to 250,000 ohms.

Two types of mains supply units are shown; the V208 model is an H.T.



Marconiphone moving coil loud speaker chassis with its adjustable ratio output transformer.

resistance, the feature of which is the method of making contact with the resistance element without introducing mechanical wear, the new Vernier Drum condenser dial, with an illuminating



Internal arrangement of the two screened-grid H.F. stages of the Marconiphone Model 44 receiver.

battery eliminator for A.C. supply mains only, and gives an output of 30 milliamps at 200 volts, a valve rectifier being fitted. Three output positive terminals are provided, and any voltage up to the maximum can be taken from each, as all are variable. The other model is the V208A, which is a combined H.T. eliminator and L.T. trickle charger. The H.T. unit is the same as that incorporated in the V208, and delivers the same output. The L.T. accumulator is placed on charge when the receiver is switched off, and an ingenious "no-volt" cut-out automatically disconnects the cells from the charging circuit when the battery is fully replenished, thereby safeguarding the accumulator from damage should this be left on charge for a longer period than necessary.

There are many new components which will hold the interest of the visitor, and a close examination is recommended of such accessories as the Megostat variable

device, and the wide range of L.F. transformers.

Ignic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C.4.

J. B. CONDENSERS. (105)

The new drum control differs from conventional practice in that the drum is used only as an indicator, the actual movement being supplied by a small knob immediately below the scale. This drives the main dial by friction, giving a reduction ratio of 16:1. The panel plate is supplied either with bronze or oxidised silver finish, and, being free from unnecessary ornament, presents a neat and business-like appearance. The price of the complete dial is 10s. 6d., and it can be supplied, if necessary, with an extra bracket for left-hand condensers to form a dual gang unit.

A new vernier dial has been introduced with a 100-degree scale finished in oxidised silver. A friction drive giving freedom

from backlash is employed, and the price is 5s. 6d.

The old type of disc movement in the slow-motion condensers has been replaced by a new enclosed ball-bearing movement which is much more compact. A new type of dial has also been fitted which gives better control, looks neater and occupies less space. The reduction ratio on the large diameter vernier knob is 40:1. Finally, an entirely new range of midget condensers has been introduced. A one-piece rigid frame holds the fixed vanes, which are mounted on ebonite insulators, and a low minimum is ensured by a special shape of vane. The capacities range from 0.00025 to 0.00025 mfd. at prices from 3s. 9d. to 5s. 9d.

Jackson Bros., 8, Poland Street, London, W.1.

K.T.B. (239)

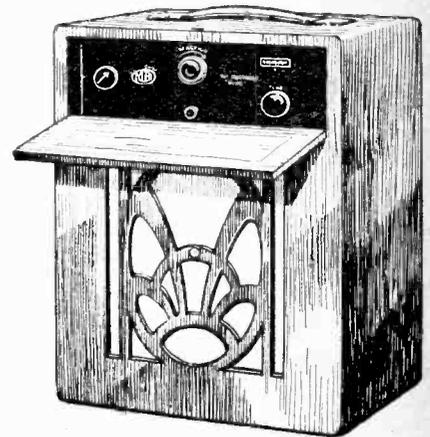
The "Waveola" type of horn is featured on this stand. It consists, as our illustration shows, of a series of tubes of varying diameters connected to one another by specially designed reflecting elbows. Thus, a "Waveola" horn of from six to eight feet in length can be fitted into quite a small cabinet.

K.T.B. Mfg. Co., Ltd., 210, Hammer-smith Road, London, W.6.

LAMPLUGH. (81, 106)

The popular panel plate tuner for home construction remains substantially the same as last year. The appearance of the escutcheon plate has, however, been considerably enhanced by embossing the dial readings and finishing in antique bronze. The price remains at 35s., but a mahogany oak or walnut panel and an additional battery switch are now included in the price. The difficulties of the home constructor have been still further reduced by the introduction of a series of amplifier units for baseboard mounting. These, in conjunction with the Lamplugh collapsible cabinet and the lucid charts supplied, make the production of a working receiver a simple matter for the novice.

Among the complete receivers, the "Screened Grid Three" including pentode output valve is the set of the moment, but the "Popular Two" and "Popular Three" receivers should not be

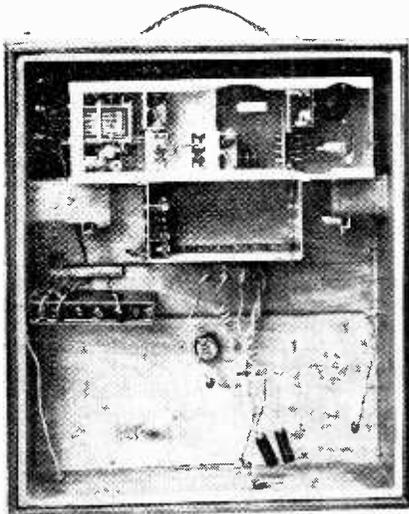


McMichael portable set with two screened grid valves, detector and pentode.

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overlooked, as they are interesting examples of carefully thought out design for manufacture by mass production methods. The cabinet work throughout is excellent and strikes a modern note in its general proportions.

S. A. Lamplugh, Ltd., King's Road, Tulseley, Birmingham.

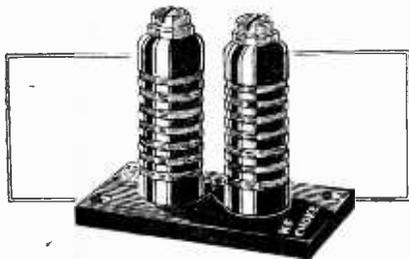


View of the interior of the new McMichael portable set. Elaborate screening is arranged for the two screened-grid valves.

LANGHAM. (55 & 74)

The new 1929 model portable receiver incorporates some new and original features, the most important being the wave-length-changing device, which enables this operation to be carried out mechanically instead of by what is claimed to be the less efficient electrical method.

The four high-frequency transformers are arranged on a sliding member, which



McMichael binocular choke, with an inductance of 90,000 microhenrys.

is controlled by a lever projecting through the panel, movement of which causes the transformer contacts to rub against the necessary spring contacts. Lightness has been obtained by the use of cellulose finished burr walnut aluminium panels, which are unbreakable.

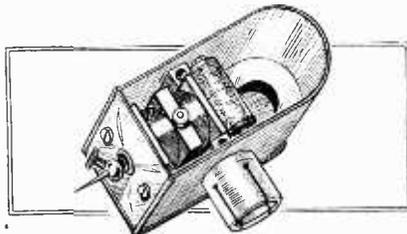
A transportable set, containing the new wave-change device and having a turntable permanently attached, is being shown, and the Transatlantic Portable can now be obtained with gramophone motor and turntable incorporated so that records can be electrically reproduced

through the L.F. amplifier of the radio set.

Langham Radio, 96, Regent Street, London, W.1.

LEWCOS. (110)

By far the most important of the new products on this stand is the "Lewcos" H.F. choke. This constitutes an important advance in H.F. choke design, and is not unlikely to become, in the near future, the standard by which other chokes are judged. Independent measurements show the self-capacity to be 1.6 microfarads and the natural wavelength over 3,000 metres (in circuit, over 5,000 metres)—from which the industrious may work out the inductance if they feel inclined. If the weight of wire used is any criterion, the inductance must be exceptionally high. The dimensions are $1\frac{1}{4}$ in. \times $2\frac{1}{2}$ in. \times $3\frac{3}{8}$ in. high, and terminals are fitted at top and bottom. The price of 9s. is above the average, but so is the promise of performance. A large scale chart intended to demonstrate the relative efficiency is shown on the stand, but as the vertical scale is not defined the exact interpretation of the curves is difficult.



McMichael gramophone pick-up. A differential movement is employed and the magnetic system is designed to minimise scratch.

A neat six-pin short-wave unit with strip-wound grid coil should not be overlooked by DX enthusiasts. There are also some new high-efficiency wave traps on view. The latter will be mounted on moulded bases when in production.

And, of course, a comprehensive display of instrument wires.

The London Electric Wire Co. and Smiths, Ltd., Church Road, Leyton, London, E.10.

LIBERTY. (6)

The principal exhibit on this stand is a supersonic outfit comprising a three-stage intermediate frequency amplifier unit and plug-in oscillator couplers. The I.F. unit consists of four accurately matched long-wave transformers



Met-Vick elastic aerial unit, which provides a means of electrically altering the length of the aerial so as to give different degrees of selectivity.

assembled in block form, with terminals on an ebonite panel for connecting up. It is only by careful matching of the long-wave transformers that the maximum amplification can be assured. This also has no little bearing on the selectivity of the completed set.

The outstanding advantage of the supersonic-heterodyne receiver is that it obviates multiplicity of tuned circuits in a set embodying a number of high-



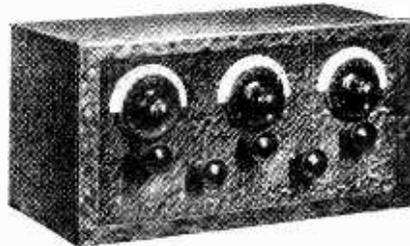
Met-Vick H.F. choke with new baseboard clip.

frequency amplifiers. The units are supplied with a practical wiring plan and a theoretical diagram, and for the benefit of those who are not familiar with this type of set a booklet has been prepared explaining the theory and operation of the supersonic-heterodyne type of receiver.

Radi-Are Electrical Co. (1927), Ltd., Bennet Street, London, W.A.

LISSEN. (57, 58, 71 & 72)

A new L.F. transformer is now available, which is completely sealed with a bakelite case, thereby excluding moisture and dust, and making the windings immune to all atmospheric changes. There are two models with ratios of $3\frac{1}{2}$ to 1 and $2\frac{1}{2}$ to 1. It is understood that the secondaries are the same in each case, but the primaries are slightly different one having an inductance of the order of 50 henrys. The core is of silicon steel and laminated with paper insulation between stampings to prevent eddy current losses. The sectionalised windings



Met-Vick 4-valve receiver with A.N.P. coils and two stages of resistance coupling. This set is entirely operated from A.C. mains.

in three separate bobbins follow certain well-tried practice and should result in low self-capacity.

Constructors will be interested in a variable condenser which is so designed that it can be mounted either on the baseboard for drum control or in the ordinary way on the panel. The rotor spindle projects at either end to facilitate ganging, and a noteworthy feature is the provision of a spring clip to locate the moving vanes in position, thus obviating the use of thrust bearings on the stator end-plates. The vane supports for

Stand to Stand Report.—

the stator are outside the dielectric field. For those of slender means the Lissen popular cone loud speaker at £2 17s. 6d. will obviously appeal. There are very few components used in an orthodox receiver that this company does not manufacture.

Lissen, Ltd., Friars Lane, Richmond, Surrey.

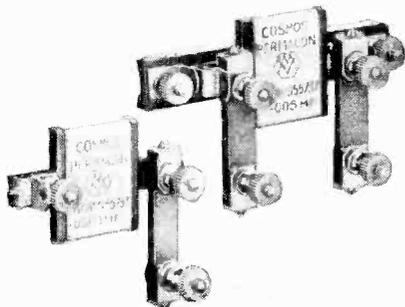
LITHANODE. (226)

One of the items of interest on this stand is a new type non-spillable accumulator. In addition, several meters are shown in which markings such as "Low," "Medium," "Full," were given in place of the normal voltage markings.

Lithanode Co., Ltd., 190, Queen's Road, Battersea, London, S.W.

LOCK. (229, 230)

The name of Lock has long been synonymous with skilled craftsmanship in the matter of cabinet making, and it is pleasing to note that they have not been tempted to waver from the high standard which they set themselves originally. There are literally cabinets for



Met-Vick detector and R.C.C. units with moulded resistance elements capable of passing comparatively heavy currents.

all purses and purposes, from the magnificent M/C3 cabinet to those of more humble proportions and price.

Particular mention should be made of the pedestal-type cabinets for moving-coil loud speakers. They are also showing first-grade ebonite panels to harmonise with the high-quality finish of their cabinets.

W. and T. Lock, Ltd., St. Peter's Works, Bath.

LONDON ELECTRIC STORES. (208)

One of the most interesting features of this stand is the new "Pranco" tuner. The stand is largely devoted to an exhibition of the leading proprietary lines.

London Electric Stores, Ltd., 9, St. Martin's Street, Leicester Square, London, W.C.2.

LONDON RADIO MFG. CO. (209 & 210)

On this stand is exhibited a large number of excellent cone loud speakers. One of the most interesting of all is the "Orphean Standard" cabinet cone loud speaker. Scarcely less interesting is the instrument known as the "Orphean Cone" loud speaker, which sells at a very low price. It consists of a frame

square moulded in burr walnut and highly polished. The material (bakelite) is light in weight and very strong. It is intended to be hung from the wall of a room.

Visitors interested in portable receivers should not forget to pay a visit to this stand.

London Radio Mfg. Co., Ltd., Station Road, Merton Abbey, London, S.W.

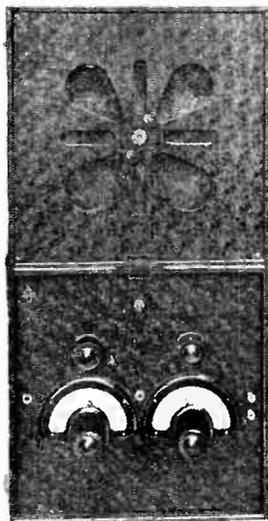
LOTUS. (115)

In view of its low price, the Lotus logarithmic condenser was examined with



Met-Vick combined eliminator for H.T., L.T., and grid bias. The series anode feed resistance method and a full-wave rectifier is incorporated.

some interest. Chemically-cleaned brass is used throughout in its construction, except for the ball bearings; there is a race at the dial end of the spindle and a single ball at the other. Side or end-play could not be detected, and the movement was easy and smooth. A slow-motion dial, of the type in which the operating knob is mounted below the centre of a friction-driven disc, is of rather unusual design, the graduated disc,



Front view of the Met-Vick 5-valve portable set, which is designed to work optionally on A.C. mains or batteries.

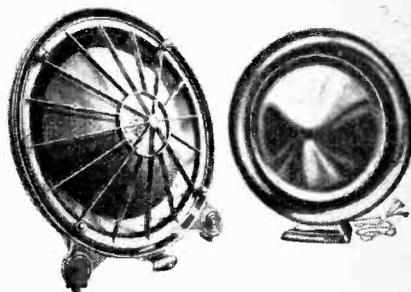
which is of silvered metal and partially enclosed, being traversed by a slotted cursor

A Lotus remote control relay for "all

mains" receivers is being demonstrated, and is likely to arouse interest, in view of the increasing popularity of this kind of set. The device is interposed between the mains supply and the apparatus, and derives the very small amount of energy which it consumes from a two-cell dry battery.

The Lotus portable and transportable receivers include the very up-to-date but already popular combination of screened-grid H.F. amplifier, triode detector, and pentode L.F. stage. Externally, these sets are of more or less conventional appearance, but examination of the interior shows that much ingenuity has been used in devising complete screening of the H.F. amplifier. There are separate tuning condensers for frame and H.F. coupling circuits, a single switch for wave-range and filament control, and capacity reaction. Four-volt valves are used instead of the two-volt types, which are more popular in this type of set. A fabric cone loud speaker is included in the case, which, in the transportable model, is of oak, mahogany, or walnut, as required. The suitcase model is in hide.

Garnett, Whiteley and Co., Ltd., Lotus Works, Broadgreen Road, Liverpool.



New Mullard "Pure-Music" speakers.

"LUNMET." (79)

Although the activities of this firm are directed primarily to the supply of raw material, brass stampings and small metal parts to radio manufacturers, a visit to this stand is well worth while, since an examination of the numerous small parts will be productive of useful suggestions to the experimenter and constructor. The wide range of aerial wires alone justifies a special visit; in addition to the standard 7/22 plain and enamelled copper wires, samples of stranded aluminium wire and an exceptionally strong multiple-stranded phosphor bronze aerial wire are on view.

London Metal Warehouses, Ltd., Hill Street, Blackfriars Road, London, S.E.1.

M.P.A. (21, 22)

The principal exhibit of this firm is the Ethatropé, an electrically operated combined five-valve receiver and gramophone, built into a handsome pedestal cabinet. Superlative quality of reproduction has been the aim of the designers, and sensitivity, as regards the wireless side, was a secondary consideration. The wireless equipment can be considered a high class amplifier with an additional circuit for receiving purposes. Five valves are used;

Stand to Stand Report.—

a regenerative detector followed by three low-frequency stages, the first two being resistance-capacity coupled and then by a transformer to a push-pull amplifier. This feeds a moving coil loud speaker accommodated in the lower part of the cabinet.



Mullard H.T. supply unit for A.C. mains. Series anode feeds and a full-wave rectifier are employed.

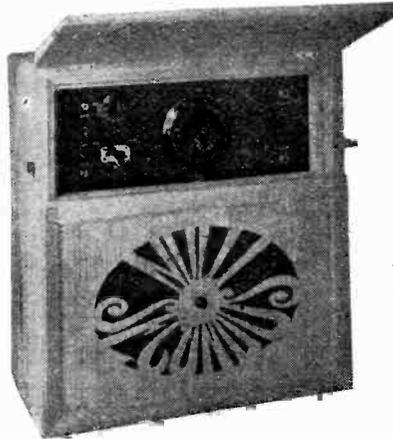
The motor driving the turn-table operates from either D.C. or A.C. supply circuits, and its speed is controlled by a resistance. Ample accommodation has been provided for records in the base of the cabinet below the loud speaker. A wide range of loud speakers is shown also; coil drive for A.C. and D.C. supplies, cabinet cones, and open type reed-driven cones, to mention a few only. The most interesting loud speaker exhibited is a dual-inductance self-energising moving coil instrument. It is difficult to explain the action of this without recourse to diagrams, but briefly it combines the action of a moving coil with the sensitivity of the reed-driven. A permanent magnet of the horse shoe type, but with extended end pieces, is fitted and is provided with the usual windings on each pole. In the concentrated field of the magnet is mounted a reed to which is attached a coil of small diameter with a soft iron pole piece passing through its centre. The iron core is, of course, fixed to the reed, likewise the coil. This floats in a magnetic field generated by the extension pieces on the main magnet. The

moving coil is connected in series with the winding on the pole pieces and imparts to the cone diaphragm, to which it is attached, a force assisting that imparted by the reed. The combined effect of these two actions enables better reproduction to be obtained than would be possible with any reed-driven mechanism, and it is claimed to respond to a frequency range very nearly as wide as that of the moving coil types. The volume handled is limited at present, but we understand that interesting developments are likely to follow.

M.P.A. Wireless, Ltd., 62, Conduit Street, London, W.1.

MARCONIPHONE. (59, 60, 61, 68, 69, 70, 232, 233)

So many new Marconi sets, components and eliminators of outstanding design have been introduced this season that it is only possible to deal with the more popular models in this limited space. The demand for a two-valve set is met by an entirely new receiver—the Marconiphone Model 23. Provision is made for the use of a pentode, if desired, so that an output



The Nulli-Secundus 5-valve transportable receiver.

normally associated with a three-valve set is obtainable. Its sloping front panel is fitted with a double dial metal cover plate provided with apertures for calibration. Small friction geared knobs operate the tuning and reaction condensers. Wave change is effected by a plunger. Space for high tension and grid batteries is provided in the cabinet, while its design allows for

it being directly connected to an "all-mains" drive unit. Royalty paid, it is offered at the popular price of £7 5s. A modification of this model is the Type 23A, in which it is combined with a cone



Ormond 5-valve portable in suitcase form.

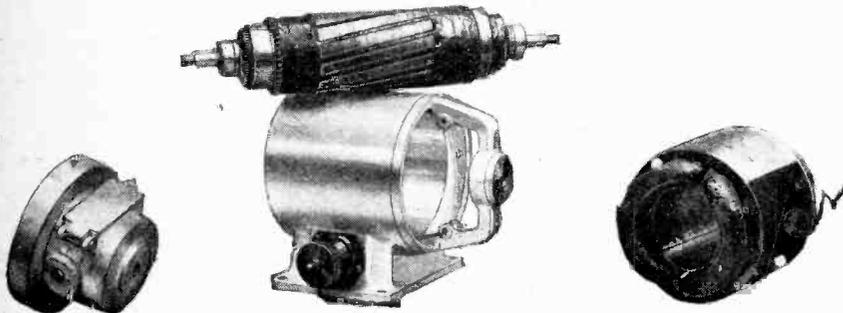
loud speaker, attractively finished, and with its grille lying back from the vertical.

Next among the new sets is the Model 34 short-wave receiver. Horizontal edge-wise tuning dials are a feature of the design, so that the tuning and reaction condensers are mounted well back from the operating knobs and stand with their spindles vertical. By means of totally enclosed plug-in coils and broadcast coil adaptor, it covers a wave range of from 10 to 3,000 metres or more.

Many enthusiasts will visit the Exhibition for the purpose of searching out sets embodying the screened-grid detector-pentode combination. Marconiphone Model 35 is of this class. Like the Model 23, it has an attractive metal cover plate, two recessed dials viewed through apertures, slow motion tuning knobs, and two-way key switch giving ranges of 250 to 650 and 1,000 to 2,000 metres. A short-wave adaptor renders reception possible on 10 to 100 metres. This interesting receiver of high grade finish is of modest price, and with royalty paid sells at £12.

Another and entirely different class of receiver is the Model 44. Having two H.F. screened-grid stages, tuning is simplified by the use of thumb dial control. One hand is engaged in tuning the aerial circuit, while two side-by-side thumb dials simultaneously tune the H.F. stages. This is a range-getting set which, by virtue of its three tuned circuits, possesses good selectivity. Provision is made for readily converting it for an "all-mains" drive so as to dispense entirely with batteries. In quoting the price with accessories, reference is made to its suitability for use with the moving-coil loud speaker, while mention is also made of its adaption for use with the pentode.

Already the Marconiphone moving-coil loud speaker, developed by Captain H. J.

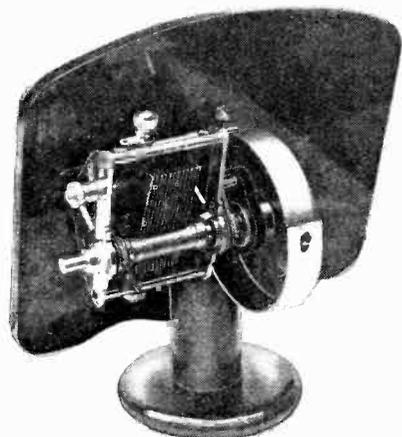


A dismantled Newton generator.

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Round has, at its low price of 6 guineas, attracted a good deal of attention. It can now be inspected in detail and its many novel features revealed. For instance, the field magnet spool is entirely open to give good ventilation, and the magnetic circuit to the front plate is completed through a pair of iron bars. A current of 0.6 to 1 ampere is consumed at a potential of 6 to 10 volts, and with the exceedingly small gap in which the moving coil operates the desirable very high flux density is undoubtedly obtained, this being the principal reason why this loud speaker is so sensitive. Centring is carried out without restricting the movement, by means of a centre rod and supple spider secured to the diaphragm near its centre of gravity. Up to approximately 10 watts appears to be the aim as regards field-coil consumption, as the resistance is about 800 ohms for mains working at 100 volts. As the current is only 100 mA, a series resistance readily adapts it for use on 200-250-volt circuits.

An all-metal housed unit with U8 rectifying valve and two LS5A valves arranged in push-pull is available for



Ormond drum control condenser.

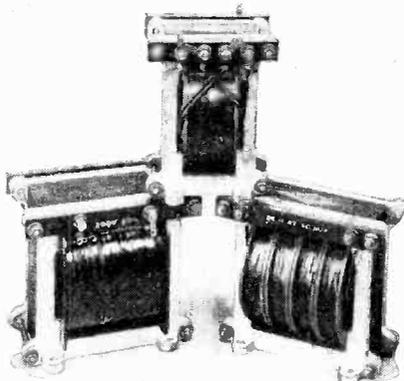
moving-coil loud speaker operation from A.C. supply. In this case the field magnet windings forms part of the smoothing circuit.

"All-power" battery eliminator units have been introduced for ready connection to Marconiphone receivers for mains operation without modification. Especially do these eliminators meet the requirements of safety and conform to electric supply requirements.

Much interest will be roused by the fact that a "popular" transformer has been added to the Marconiphone range of components. It is of the small variety and its compactness recommends it to the portable set constructor. Another entirely new model is the Universal transformer with either a 2.7 or 4 to 1 ratio. Universal output transformers have also been introduced for the particular purpose of matching the new pentode valve to the loud speaker. Tappings provide for its use with the ordinary power valve.

New Marconiphone power transformers of the G.L.H. types, as well as giving

450 + 450 volts at 80 mA. for use with the U8 rectifying valve, and supplying its filament needs of 7.5 volts at 2.5 amperes, include a winding giving 5.5 volts



A selection from the wide range of Parmeko transformers and chokes.

at 3.8 amperes for the filament heating of valves of the LS5 type.

A logarithmic variable condenser is yet another new product. Cleanness of finish is its obvious merit, while an original arrangement of insulating bushes points to a thoroughly low loss design. The plain shaft gives one hole fixing, and its thick polished aluminium end plates provide perfect rigidity.

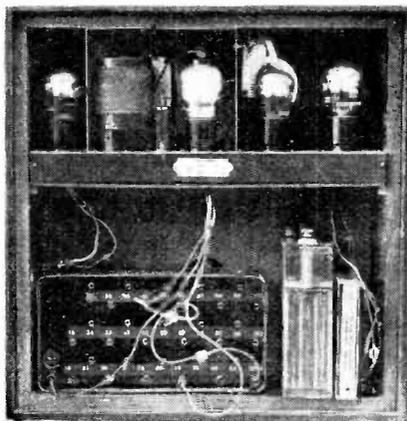
Marconiphone Co., Ltd., Marconi House, Strand, London, W.C.2.



The Peerless valve holder.

McMICHAEL. (128)

Unorthodox, but interesting in design, is the new H.F. binocular choke with limited external field and extremely low self-capacity. Its inductance is 90,000 microhenrys, its D.C. resistance 250 ohms, and the selling price is 4s.



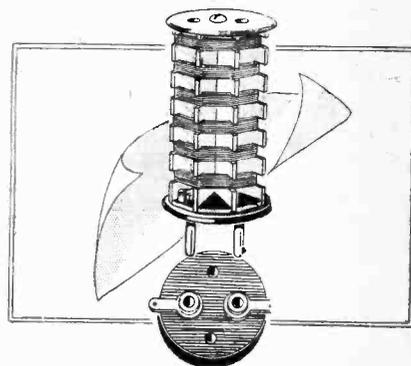
The Bedford (Peerless) Portable with tuner amplifier built as an independent all-metal unit incorporating a screened-grid valve.

A new pick-up has just been introduced which sells at 32s. 6d.; it operates on the differential principle, and it is claimed that a special arrangement of the magnetic system employed minimises "scratch."

The "Home Constructor's Screened Three," of which full constructional details are given in the leaflet, is designed for ultra-short, medium and long waves. A screened-grid valve is used in the H.F. stage, which is coupled to the detector by the choke-feed tuned anode method, and leaky grid detection is used.

Capacity-controlled magnetic reaction is applied to the tuned anode, so that aerial re-radiation is negligible. The last valve, which can be a pentode, is coupled by a Ferranti transformer. The presentation of the constructional data, including panel-drilling details, list of parts, circuit diagram, baseboard layout and wiring diagram, is commendable, and it closely follows the best practice employed by leading designers of wireless receiving apparatus.

The "Super Screened-Four Portable" self-contained receiver marks a definite



Peerless interchangeable H.F. choke.

advance in design, as will be appreciated by an examination of the interior. Instead of the conventional two stages of H.F. amplification aperiodically coupled by chokes or transformers, two screened-grid valves are used, one of which is choke-coupled and the other tuned by a condenser which is differentially gauged to the frame aerial condenser. By this means an H.F. gain of ten times that obtained by the conventional portable H.F. scheme is probably obtained. The screened-grid valves and their associated components are completely screened in metal boxes, and, to allow of their easy withdrawal, the valve-holders are hinged. Detection is by the leaky-grid method, and reaction on to the tuned H.F. stage is capacity-controlled. The detector is coupled to a pentode valve by a transformer. A most important feature is the extremely small total anode current of approximately 8 mA. This is partly brought about by the fact that the pentode functions reasonably well if its screened-grid volts are reduced to about 60 while retaining the anode voltage at 120. A rheostat on the H.F. valves acts as an efficient volume control, and a switch is provided for changing the wave

Stand to Stand Report.—

range. This portable set, which, it is claimed, vies in performance with the "Screened Dimic-Three" using a full-sized aerial, is of outstanding merit, and sells at 35 guineas complete.

The "Screened Dimic-Three" can now be obtained complete with an eliminator



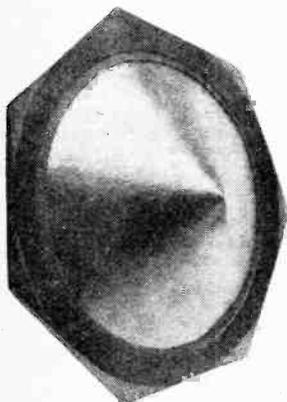
Triode detector with pentode output valve; a new Peto Scott set.

housed within the cabinet for deriving both filament and anode current from A.C. mains. A transformer and Westinghouse metal oxide bridge, together with liberal smoothing equipment, are used, and, pending the introduction of "point eight" directly heated A.C. screened valves, a battery is floated across the L.T. terminals. The well-known Dimic coils are now made from 20 to 10,000 metres, and a range of Unimic coils is being shown.

L. McMichael, Ltd., Wexham Road, Slough.

METRO-VICK. (32 & 41)

Perhaps the most prominent feature of this exhibit is the comprehensive range of eliminators and mains-operated sets. The breaking down of mains voltage and the smoothing methods employed follow the well-trying series feed scheme and potential dividers are only used where grid bias is obtained by a drop in volts



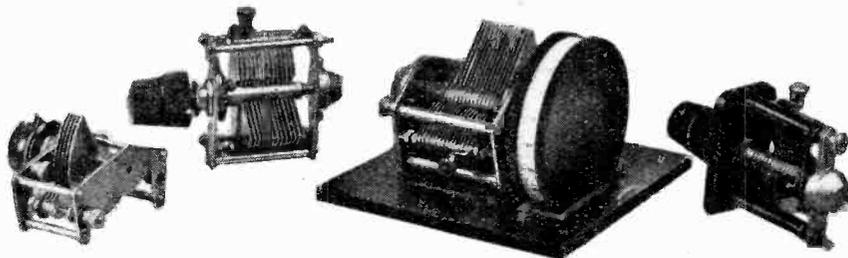
Philips cone loud speaker. A new feature is the provision of a switch to change its impedance to suit valve conditions.

across a resistance interposed between the H.T. and L.T. common connection.

Besides the well-known five-valve receiver there are now three and four-valve sets with resistance and resistance-

transformer couplings respectively. They can be obtained either completely wired up and tested or in the form of component parts with full details for wiring and assembly. A well-finished and inexpensive fabric case selling at 15s. can now be obtained to give these sets a tidy appearance and to keep out the dust.

The skeleton resistance-coupling units are an innovation, as the resistances consist of a moulded conductive material, which is chemically inert. The entire material represents the actual resistance element, which militates against either breakdown or noisiness in operation. The current-carrying capacity from 5 to 10 milliamperes is extremely high for this type of unit, and prevents instability when using normal anode currents. Readers will welcome a reduction in price of the Cosmos A.C. valves, the efficiency of which reaches a very high standard. The A.C./G. now sells at 15s., while the



New Polar condensers: (left to right) Volcon, Q.J., Drum Control "Ideal" and Reaction.

A.C./R. is 17s. 6d. Their respective mutual conductances are 2.5 and 4 mA. per volt, the latter figure being nearly twice that of any other valve on the market. When the ordinary battery-operated valves of a receiver are changed for these indirectly heated cathode valves, the overall amplification is very nearly doubled.

There is a new Cosmos "Shortpath" valve, the S.P.60/B, which can be operated by a 6-volt accumulator without a rheostat and consumes only 0.09 amp., and has a magnification factor of 35 and an impedance of 50,000 ohms. Three rectifying valves are being exploited: the S.P.41/U and the S.P.43/U being half-wave, while the S.P.42/U is full-wave, and the respective D.C. outputs are 30 mA., 75 mA., and 60 mA.

An exhibit which will probably attract a great deal of attention is the elastic aerial unit which provides the equivalent of being able to reduce the electrical length of the aerial from its maximum to just a few inches, so as to provide a large variation in selectivity and sensitivity when interference is being experienced. The unit is made for various methods of mounting, and sells from 12s. 6d. to 17s. It must not be thought that the principle employed is merely the introduction of a variable series aerial condenser; it is indeed a clever adaptation of the neutrodyne system, whereby a symmetrical network of inductance and capacity is applied to the aerial system of any receiver having already a series aerial condenser (should this not be in-

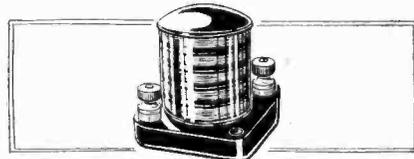
corporated in the set a special elastic unit can be supplied). The unit contains an auto-transformer coil, which is earthed at its centre, and from the extreme ends of which voltages 180° out of phase are developed when signals are received. To the two extreme ends of the coil are connected the two stators of a three-electrode variable condenser, while the rotor is connected to the aerial terminal of the wireless receiver. If the rotor is close to the stators, the signal strength is equal to that normally obtained with the aerial connected to the set itself, as the capacity is about 0.00025 mfd., but as the movable plate approaches the centre position between the two fixed plates, not only is the series capacity reduced to a very small value, but a reverse impulse is obtained from the other end of the coil.

If the coils of the set or the earth wire are picking up signals, then the balance is not central but slightly displaced towards

one end of the coil, which will give a reverse impulse to compensate for the signals obtained on the coils of the set or the earth wire.

It will be seen that under these conditions an aerial can be varied from its maximum down to absolutely nothing, and it is claimed that the balance is so perfect that with two H.F. valves in a five-valve set the local station fully tuned in can be cut out to zero by a fraction of a turn.

Since signals can be balanced out, an aerial from a few inches to hundreds of feet can be obtained continuously variable to meet any requirements. For selective reception the adjusting knob should be turned towards the middle or



Polar H.F. choke.

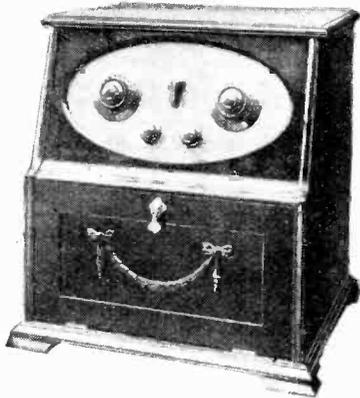
balance point, so as to work with the smallest possible aerial consistent with signal strength and one's ability to tune critically.

A twist of the knob brings back the full-size aerial again for distant reception. The use of this unit with a small aerial for portable sets in conjunction with a frame aerial will allow some little extra signal strength without completely destroying selectivity.

Stand to Stand Report.—

The "Cosmos" H.F. choke is now supplied with a neat metal spring clip for horizontal baseboard mounting, which makes for a more rigid anchorage.

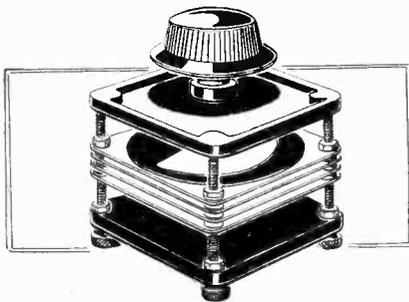
A number of well-known hospitals have installed the Met-Vick special



An example of advanced set design: the Pye 3-valve receiver with screened-grid high-frequency and pentode output valve.

hospital set, which is being exhibited and which will especially appeal to those who are interested in communal reception. A short-wave receiver expressly designed to withstand the tropical conditions experienced in some colonies has been evolved, containing three valves, the L.F. amplifier being coupled by resistance capacity.

On the assumption that one of the chief advantages of a portable set is that it can be used in any room in a house (thus obviating expensive house-wiring), a five-valve self-contained portable set has been designed which at the option of the user can be made entirely A.C. mains-operated



For throttle-controlled reaction circuits: the Pye differential condenser.

when used in conjunction with a "B" type combined H.T., L.T. and bias eliminator. Ordinary filament valves can be exchanged for the A.C. valves when mains are not available.

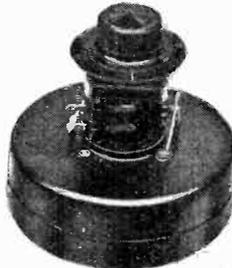
Metro-Vick Supplies, Ltd., 155, Charing Cross Road, London, W.C.2.

MULLARD. (88,89,90,97, 98, 99, 133 & 267)

A component which is attracting the attention of wireless enthusiasts who are deriving valve current from lighting mains is a new wire-wound potential divider supported *in vacuo*. There are ten terminals leading to various tappings

on the resistance element, and the whole instrument takes up little more space than an ordinary electric lamp. The P.M.4D. valve, which has proved such a satisfactory detector, has now been reduced in price to 10s. 6d. and becomes the P.M.4D.X., with modified characteristics; the magnification factor is now 15 and the impedance 7,500 ohms, while the conductance is 2mA 1 volt, as before. The two-volt counterpart is the P.M.2D.X., with a magnification factor of 13.5 and an impedance of 10,700 ohms, giving a slope of 1.25. The P.M.6D. has a characteristic very similar to that of the P.M.4D.X., and has an amplification factor of 18, an impedance of 9,000 ohms, and a slope of 2.

It is no exaggeration to say that the pentode valves lately introduced are having a profound effect on the design of L.F. amplifiers. The P.M.22 is a two-volt pentode output valve with a magnification factor of 82 (this was erroneously stated to be 32 in the forecast to the Exhibition in last week's issue). The P.M.24 is a four-volt pentode with a magnification factor of 62 and an extraordinarily high mutual conductance of 2.5



The Pye tuner, with built-in switch.

The Permacore transformer, with silver primary and nickel secondary windings, has a high primary inductance and can be used after anode bend, in which a valve of the P.M.4D.X. class is employed.

The new Mullard "Pure Music" speakers, models C and H, retain the balanced armature principle of construction. Type C is a small edition priced at 53s. 6d., specially made for use either on a table or suspended from a wall. Model H is a more ambitious speaker, selling at £6 6s. and, is capable of handling a heavy anode dissipation.

For users of A.C. mains there is the Mullard H.T. unit with a full-wave rectifying valve and a feed scheme embodying series resistances and filters.

Mullard Radio Valve Co., Ltd., Nightingale Works, Nightingale Lane, Balham, London, S.W.12.

NEWTON. (243)

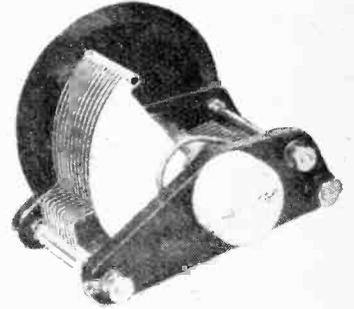
This stand is devoted entirely to the exhibits of motor generators and converters of various types; there is a small double output generator which can be mechanically driven for the supply of both H.T. and L.T. This instrument is naturally only one of the minor products of the firm, there being other types suitable for wireless transmission and other purposes shown in great profusion on the

stand. The exhibits cannot fail to interest all visitors to the Exhibition, be they technical or otherwise.

Newton Bros. (Derby), Ltd., 56, Kingsway, London, W.C.2.

"NULLI-IN-SECUNDUM." (8)

The transportable five-valve cabinet receiver incorporates two high-frequency



The new Pye variable condenser.

amplifiers coupled together by aperiodic H.F. transformers, a leaky grid detector valve, and two low frequency stages with transformer coupling. The control panel is neatly arranged, having the main tuning condenser in the centre with a small dial for controlling reaction in the top left-hand corner. The only other knob on the panel is a switch which changes from long to medium waves, and in the centre position switches off the valves.

Provision is made for attaching an external aerial and earth, also a gramophone pick-up. A jack is fitted to take telephones for the reception of distant transmissions when conditions are unfavourable for loud speaker reproduction, or when a separate loud speaker is used. The insertion of the plug automatically disconnects the built-in instrument, this being a balanced armature-driven cone. A specially designed turntable is supplied with every model and greatly facilitates the orientation of the receiver to bring the plane of the frame in line with the incoming waves.

The same care has been exercised in the



A two-valve Pye home set of novel design. Control knobs are under the lid.

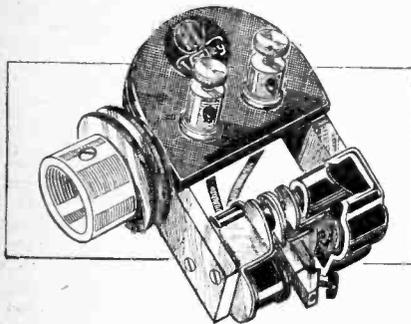
Stand to Stand Report.—

choice of woods used for the cabinet as has been given to the general design and construction of the electrical circuits. The receiver is supplied fitted in either oak, polished mahogany, or walnut cabinets of pleasing design and finish. To meet special requirements the set can be obtained built into a handsome Jacobean pedestal cabinet, or, if desired, with a lacquered finish.

C. Creswick Atkinson, 55b, High Street, Bedford.

ORMOND. (138, 162, 163)

Dealing first with improvements and additions to the Ormond range of condensers, we find that a slow-motion drum dial is now made to fit standard condensers. The design is simple and robust,



New R.I. Varley gramophone pick-up. Note the rubber buffer on the armature as well as the cushioning pieces above for the purpose of creating uniform damping at all amplitudes.

in keeping with all Ormond products, and incorporates a slow-motion friction drive similar to the No. R/204 S.M.D.I.D. vernier dial. A knurled edgewise control knob just protrudes through a slot at the side of the escutcheon plate, which is neat and plain.

To meet the demand for small reaction and tuning condensers a new range of all-metal small logarithmic condensers has been introduced, the prices averaging



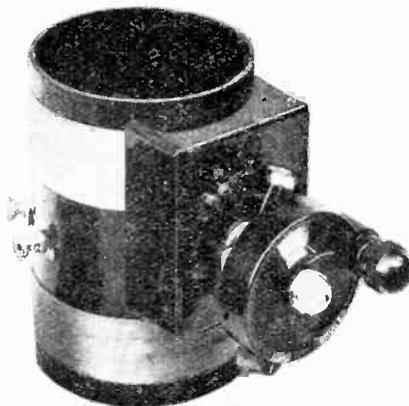
R.I. Varley tone arm which provides for the pick-up always running tangentially in the groove.

about 7s. 6d. These condensers are provided with extensions of the main spindle to facilitate ganging.

Two new switches are shown, a push-pull battery switch in two sizes for $\frac{1}{4}$ in.

or $\frac{1}{8}$ in. panels and a barrel type anti-capacity switch with any number of poles from one to six.

Other components of interest include a midget condenser with an improved



New R.I. two-range tuner. It has one-hole fixing and there are no exposed leads.

indicating knob, which is also being fitted to Ormond rheostats, a small slow-motion dial selling at 3s. 6d., and the popular dual indicator dial with silver marking on a black background.

The well-known Ormond 5-valve portable has been redesigned and fitted in a new type of vertical cabinet. The same circuit is now made up also in the form of a suitcase portable which sells at £26 17s. 6d.

A new screened-grid and pentode table model set makes its appearance for the first time and costs £15 in mahogany.

Finally, there is the Ormond radio-



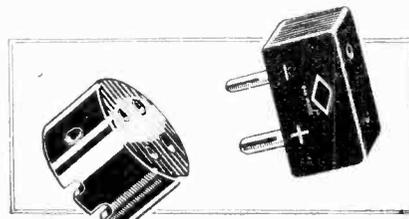
The new complete wire-wound resistance coupling unit of R.I. Varley. It is fitted with a resistance feed to avoid coupling arising through the common H.T. battery.

gramophone pedestal set. This comprises a 4-valve receiver and electric gramophone, and the equipment includes a built-in Celestion loud speaker, Garrard double-spring motor and large H.T. batteries. The set is entirely self-contained and works off an internal frame aerial. The standard cabinet is of the vertical type, but a console model is also available.

Ormond Engineering Co., Ltd., 199-205, Pentonville Road, King's Cross, London, N.1.

PARMEKO. (147)
Specialising entirely in A.C. battery eliminators and their attendant transformers and chokes, the Parmeko range includes almost every combination of input to output voltages. Little purpose would be served in enumerating the many models, yet one popular transformer is to be seen which, in conjunction with metal rectifying units will produce independently L.T., H.T., and grid biasing potentials. High voltage models are available for use with valve rectifiers. Standard models of power chokes of both the small and heavy duty class will attract the moving-coil loud speaker enthusiast to this stand. All transformers and chokes are clamped between stout aluminium plates and possess an engineering-like appearance.

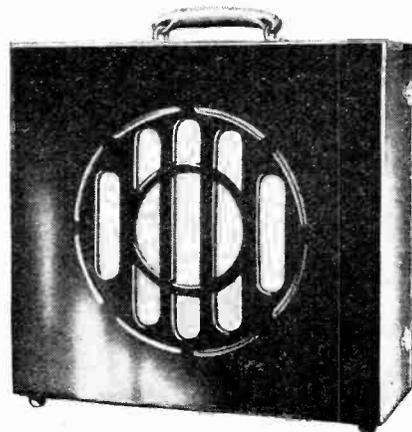
Partridge and Mee, 12, Belvoir Street, Leicester.



The "Red Diamond" loud speaker extension plug and socket.

PEERLESS. (35)

One should stop at this stand in order to scrutinise the kit of moving-coil loud speaker parts. An original magnetic system is employed for the purpose of obtaining high flux density across the gap. The pole and back plate is in one piece, turned from solid steel bar, while the cylinder of the field magnet and front plate are also turned from the solid. Leakage flux is kept to a minimum by the aid of a steel ring extension on the end of the centre pole, so that the diameter of the moving coil is appreciably larger than the pole where surrounded by the field winding. A gap of $\frac{3}{32}$ in. is adopted with a field energising

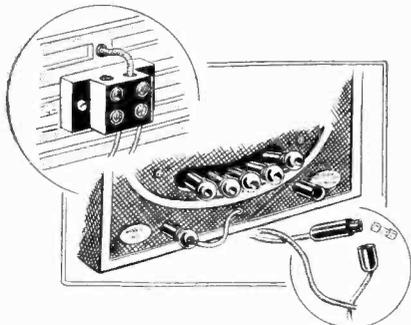


An excellent example of a Rues Mace Portable.

Stand to Stand Report.—

consumption of 3.6 watts, or just over 0.5 amp., from a 6-volt accumulator.

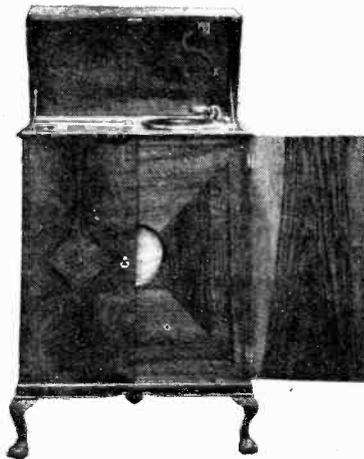
The Peerless S.L.F. variable condenser is offered at the competitive price of 5s. 6d. It has a steel spindle and one end bearing, while a spring pressure plate



Features of the Regentone H.T. supply units. Metal parts are not exposed in the main leads, while the plug connectors are protected by sleeves. An adjustable tapping regulates the output and the fuse is arranged in the flex connectors.

ensures reliable contact with the rotor. One-hole fixing is provided, and the end plates are of bakelite.

If a portable set is to be selected by a consideration of the layout of its tuner and amplifier the unit of the Peerless portable receiver is well worth examining. It employs a single screened grid H.F. valve, and has a two-position wave range switch. The totally enclosed H.F. amplifier is followed by a detector valve and two L.F. stages. The unit is



Rhapsody Twin "Full Grand" receiver.

built entirely in aluminium plates and is exceedingly light, and when fitted in its cabinet with 108 volts H.T. battery and a large 2-volt accumulator it weighs 30 lb.

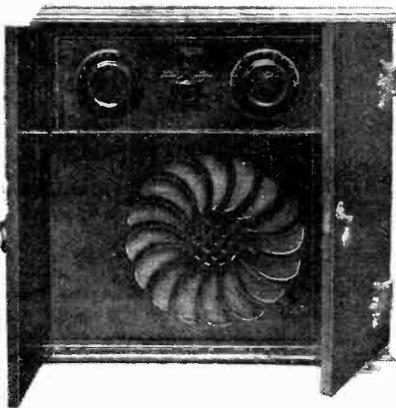
Although it is hard to differentiate between the many H.F. chokes made to-day, the Peerless model is interesting, as it is wound on a six-edged fibre support with a six-section winding and a two-pin base connector.

Bedford Electrical and Radio Co., 22, Campbell Road, Bedford.

PETO SCOTT. (142)

The "Triple-Two"—so named because a pentode valve is fitted in the output position and it gives practically three-valve results—is likely to be the forerunner of a type of set which will achieve wide popularity for medium and short distance reception. With no more than 150 volts H.T. it should be capable of giving ample volume from a suitably designed moving-coil loud speaker, always provided that the H.F. input is sufficiently great. The L.F. stage is transformer coupled, and all up-to-date features such as waveband switching and capacity-controlled reaction are fitted. There is ample room for batteries in a large compartment under the receiver proper.

This firm also exhibits a good example of the combined radio-gramophone reproducer. On the "wireless" side there are two H.F. stages with screened valves, the couplings being tuned by ganged condensers. Next comes a leaky grid detector followed by resistance- and transformer-coupled L.F. amplifiers (in that order). The H.F. amplifier is completely screened. The set derives its power from



The "Melva" receiver by Messrs. Rialton Radio.

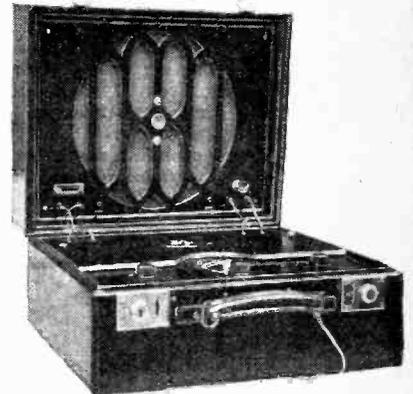
an A.C. mains supply, the filament current being obtained from a floating battery in conjunction with a trickle charger. A moving-coil loud speaker is mounted in the lower compartment of the cabinet, which is naturally of large dimensions. A gramophone turntable and pick-up is fitted; there is a separate volume control for use with this form of reproduction.

New components introduced by this firm include a pair of ganged condensers with an edgewise dial and knob control. Provision for balancing individual circuits is provided by a rotating milled-edge disc which moves one of the fixed end plates of each element. Untuned transformers, specially intended for portable receivers of the popular "H.F." type, are on show. The first and second stage couplings are arranged to "peak" at slightly different wavelengths in order to avoid instability.

Midget reaction condensers, with a maximum capacity of 0.0001 mfd., are now available in two types, with and without a metal screening plate, which

is insulated from the vanes in order that it may be earthed when used in "Hartley" circuits.

The Peto Scott Co., Ltd., 77, City Road, London, E.C.1.



Rolls-Caydon "Phantom" portable.

PHILIPS. (94, 122)

The attention of the listener is directed to the Philips loud speaker, which, selling at the modest price of 50s., embodies features to be found in no other instrument. It is a free-edge cone in a seven-sided moulded frame, driven from the back by a totally enclosed unit. Being of the differential type it adjusts itself to handle the liberal amplitudes produced by large input, while, at the same time it is sensitive to weak signals. A most important fitment is a snap-action switch which adjusts the loud-speaker impedance to more closely match the output valve. This refinement would appear to be an essential feature for quality reproduction when loud speakers are required to work



A combined H.T. and L.T. charger by Messrs. Runbaken.

with output valves of both high and low impedance.

Philips receiving sets and eliminators are available for inspection at 32, West Kensington Gardens, W.14 (adjoining Olympia), and tickets of invitation are obtainable at the stand.

Philips Lamps, Limited, Philips House, 145, Charing Cross Road, London, W.C.2.

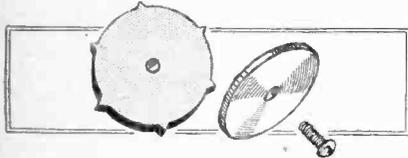
Stand to Stand Report.—

POLAR. (111)

The name of Polar is generally associated with the well-known "All Brass" condensers, which are much in demand by set manufacturers.

The "Ideal" condenser is now available for parallel-to-panel mounting with drum control. Two drums are fitted, one for fine and one for coarse tuning, the prices ranging from 14s. to 15s. Phosphor bronze ball bearings can be specified at 6d. extra.

Three new types of miniature condensers make their appearance for the first time. The "QJ" is a miniature replica



Component parts of the Selhurst centring device.

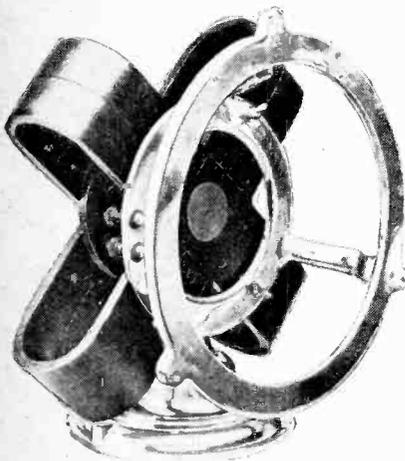
of the "Ideal." The reaction condenser resembles the "QJ," but is fitted with ebonite distance pieces in order that both sets of plates may be isolated. Finally, there is the new "Volcon," a 0.0001 mfd. miniature variable selling at 5s. 6d.

Another component of interest is the new H.F. choke, for which the comparatively low price of 4s. 6d. is charged. An inductance of 300,000 microhenrys and self-capacity of 1.5 micromicrofarads is claimed.

Wingrove and Rogers, Ltd., 188-189, Strand, London, W.C.2.

PORTADYNE. (4)

A portable set and a transportable cabinet receiver comprise the exhibit of



The Selhurst permanent magnet loud speaker.

this firm. The "Portadyne Junior" is a five-valve attaché-case model with a balanced armature loud speaker in the lid. A two-stage H.F. amplifier, which we understand incorporates a rather unusual resistance-capacity coupling arrangement between valves, is followed by

a grid rectifier and two low-frequency stages resistance capacity and transformer-coupled in this order.

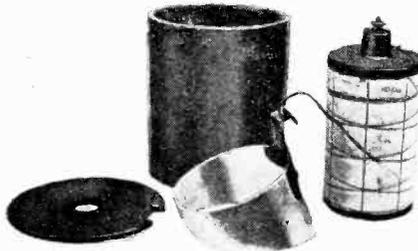
The cabinet set embodies a similar circuit to that of the portable, with the following modifications in the remainder of its equipment. A Celestion loud speaker and a turntable is fitted, and provision is made for using a separate loud speaker.

Wittingham Smith and Co., 110, Kew Green, Kew, Surrey.

PYE. (87, 100)

The external appearance alone of the Pye receivers always conveys to the writer an impression that they are capable of doing their job, and doing it well. They are wireless receivers, and no attempt is made to make them appear to be anything else. In spite of this (or, perhaps, more accurately, because of it), they have a cleanness of line that surely cannot offend the aesthetic sense of the most sensitive.

A wide range of new models has been produced; space does not permit of a description of all of them, but an attempt will be made to outline the salient fea-



Siemens rechargeable L.T. sack cell.

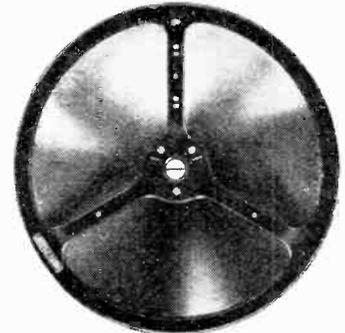
tures of what are judged to be the most interesting models. All the sets are mounted on a metal chassis, and are housed in dark walnut cabinets; the visible part of the control panel is finished with a brown crystalline surface, and the knobs are of the same colour.

The Type 250/A.C. is a two-valve detector-L.F. set, using Cosmos indirectly heated A.C. valves. H.T. current is derived from a Westinghouse metal rectifier shunted by a potentiometer; a part of the voltage developed across its resistance is used to bias the L.F. valve. As in all the new Pye sets, there is a switch wave-band change. Reaction is controlled by means of the new differential condenser, to be discussed later (and which is used in all the sets to be described), while volume is adjusted by means of a high-resistance potentiometer connected across the secondary of the L.F. coupling transformer. A choke filter output is fitted, and there are terminals for a pick-up.

Intended for battery supply, receiver Type 360 uses a Mullard screened-grid valve as an H.F. amplifier. The screening of this stage is fairly complete. Single-layer solenoid coils are used on the short-wave side; they appear to be designed for the maximum efficiency possible in solid wire inductances of reasonable dimensions. Long-wave coils are wound in slotted ebonite formers, and are mounted with

their axes at right-angles to adjacent windings. The H.F. stage is coupled by means of the tuned-anode system, with reaction between detector plate and coupling coil. The long-wave winding is mounted within a cylinder which carries its associated reaction coil. The grid and plate circuit change-over switches are coupled together mechanically, and work very smoothly; they are of the Pye anti-capacity pattern.

A Mullard P.M.4D valve operates as a grid circuit detector, and is coupled to the pentode output valve by means of a transformer. Another transformer, specially wound to suit the high impe-



New model Six-Sixty cone loud speaker, selling at a popular price.

dance of this valve, passes on audio-frequency impulses to the loud speaker. It is interesting to note that this transformer is to be marketed. At a number of points there is evidence of careful design, and attention to small details. For instance, the connecting wires are "pinched" over their tags before soldering; thus the mechanical strength of the joint is improved. Batteries are housed in the lower compartment, and are connected by leads carrying identification labels.

Probably the most interesting set of all is the three-valve A.C. mains receiver, Type 350 A.C. Its detector-L.F. side is similar to that of the two-valve set already described, while the H.F. amplifying



Six-Sixty turntable, with peripheral ball-race for use with portable sets.

arrangements are almost identical with those of the three-valve set discussed in the preceding paragraph, although a new Cosmos indirectly-heated screened-grid valve of high efficiency is used as an H.F. amplifier. Volume is controlled by means of a small condenser in series with the aerial. The set complies with the I.E.E. recommendations as to safeguarding precautions.

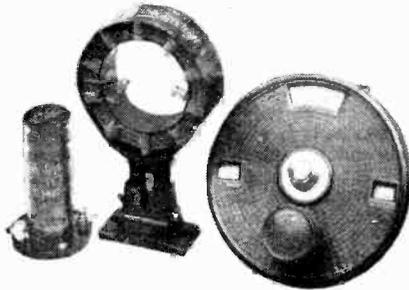
Among new components, the Differential Reaction Condenser seems to be particularly attractive. Mounted between bakelite end plates, its vanes are of brass,

Stand to Stand Report.—

with a thin bakelised board dielectric. There are three elements, one moving and two fixed, and as the capacity of one side increases that of the other decreases. The advantage of this system is that variation of reaction adjustment has a negligible effect on tuning; it gives, in effect, a modified form of throttle control when connected in the manner specified by the makers. The spindle is insulated, so the component may be mounted on a metal panel without bushing.

The dual-range tuning unit, with built-in change over switch, is certainly worthy of mention; it includes windings carried in slotted comb formers, which appear to comply closely with the specifications for ideal coils laid down in articles which were published in *The Wireless World* some time ago.

Except for the fact that its spindle is not insulated, the new low-priced variable condenser is almost as attractive as its more expensive forerunner (which is retained). Features include a ball race at each end of the spindle, a pigtail, and an



Some typical components, including the "Sovereign" slow motion dial, by "J. R. Wireless."

improved dial. A friction gear gives a reduction ratio of 40:1.

Other new products include a trickle charger, pentode valve holder, and a number of power transformers and chokes. The range of these latter components is now so extensive that there would appear to be a type for every conceivable need.

W. G. Pye and Co., Granta Works, Montague Road, Cambridge.

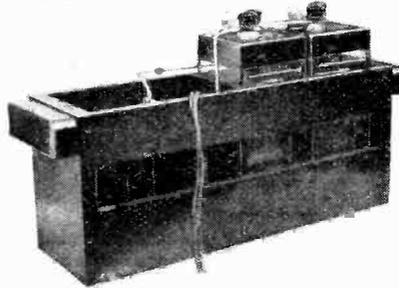
R.S.V.P. (52)

The exhibit of greatest interest on this stand is a combined radio and gramophone receiver built into a suit case of surprisingly small dimensions considering the nature of the apparatus. Actually it is no larger than the average portable gramophone, but of course has a vastly wider field of utility than any gramophone could possibly achieve. For wireless reproduction a five-valve receiver is used, the circuit follows the generally adopted practice in this respect, namely, two H.F. stages, a detector and two low-frequency amplifiers. The lid accommodates a cone loud speaker and two separate frame aerials, one for the normal broadcast wavelengths and the other for the Daventry band.

A 100-volt H.T. battery and a 2-volt L.T. accumulator are ingeniously accom-

modated in the same compartment as the gramophone motor. For gramophone reproduction the low-frequency side of the receiver only is used, an Igranite pick-up being the link between the receiver and the amplifier. Records up to 12 in. diameter can be played. At the surprisingly low price of £35 this combined equipment should prove very popular.

J. L. Gottlieb and Co., Ltd., 15, Cranmer Street, Grays Inn Road, London, W.C.1.

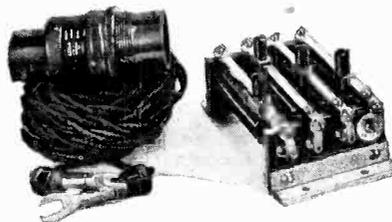


A Sparta 4-volt battery combined with trickle charger.

R.I. AND VARLEY. (51, 73, & 222)

So vast a range of new components is revealed by a visit to the R.I. Varley stand that space does not permit of reference to all the refinements introduced into their new components. Much attention is being given to the Compound Mass Suspension Gramophone Pick-up. It is readily apparent that much thought has been given to its design. Its principal merit is that resistance to the movement of the needle in the groove is practically constant with amplitude. The higher frequencies of the gramophone groove are of small amplitude, while the bass frequencies are proportionately greater. Thus the vibrating armature moves against a strip rubber cushion when vibrating at the higher frequencies. Lower frequencies, however, are capable of displacing an armature of larger mass, and in this case the small cushion moves a slightly larger plate mounting suspended on a pair of rubber buffers. A fairly liberal gap width is provided with the differential action of the armature so as to produce reasonable uniformity of field strength and avoid valve overloading.

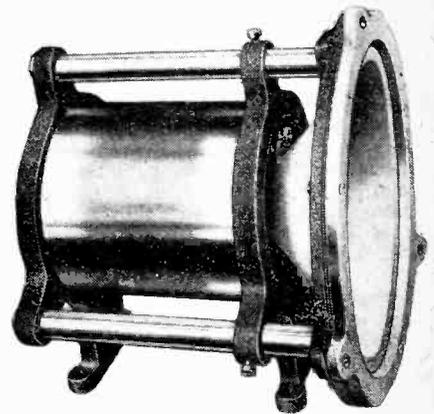
A new gramophone pick-up arm is a really useful component, for rarely is it permissible to change the normal sound box for the electrical pick-up using a standard tone arm. This new pick-up arm abounds with novel points. By means of a parallel guide piece the pick-up is swung as it traverses the record so



The "Loriadapter" and quadruple "Loriostat."

that it engages tangentially in the groove, a necessary condition to avoid record wear. A claw arm pivoted on double and enclosed ball races holds the pick-up, and in association with this arm is a large milled screw operating with an enclosed spring which controls the lift on the arm and adjusts for the pick-up weight. Another milled screw located on the turning point of the arm adjusts for the amount of traverse so that when the end of the record is reached, the motor is automatically tripped and the turn-table stopped. This device is beautifully finished in polished aluminium, and can be readily fitted to the top of any gramophone. It embodies a large amount of development work and sells for £1 15s.

A complete range of high- and low-tension battery eliminators for use with A.C. and D.C. supply has been introduced. They are housed in complete metal containers and are in every case fitted with control panels. As the company specialises in the manufacture of transformers and chokes there should be



The "Epoch" moving coil loud speaker to be seen on the stand of A. W. Stapleton.

no doubt as to the merit of these new products.

Next is a portable testing set designed essentially for checking the performance of valve receiving sets. Its three range Western voltmeter, to meet the requirements of L.T. grid bias and anode potential testing covers 10, 50 and 250 volts, and as it possesses the exceptional high resistance of 1,000 ohms per volt it imposes very little load on the circuit under test. A Western milliammeter is arranged to read 15 and 150 mA., as well as 3 amperes. The inclusion of a neon lamp with key is most valuable for testing insulation and continuity. A valve holder on the panel makes this set particularly applicable to valve testing.

R.I. and Varley have long specialised in the production of tuners, and an entirely new product of this class is to be found on this stand. It is a large single layer solenoid coil carried on a bakelite switch box so that the connecting leads are not exposed. One hole fixing secures the entire unit to the panel. A deep and attractive cover dial indi-

Stand to Stand Report.—

icates the reaction setting through a window. Reaction control is by a slow motion knob. A slide action switch beneath the dial gives the two wave ranges of 265 to 600 metres and 1,200 to 2,000 metres.

A valuable modification to the Bi-Duplex resistance coupling unit is the addition of the anode resistance feed

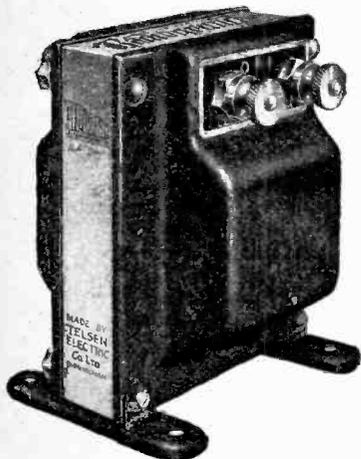


T.C.C. condenser in moulded case, arranged for either vertical or horizontal mounting.

scheme to prevent "motor boating" or distortion by incipient oscillation. This, almost essential refinement only adds 5s. to the cost of the resistance coupling unit.

Under the name of Anti-Mobo, a unit is produced comprising resistance and condenser for obviating "motor boating" trouble. In order that it may be used in any stage of an amplifier, the resistance is tapped to bear a suitable relationship with the valve resistance.

The new range of R.I. low-frequency couplings and chokes which are totally screened in attractively finished metal boxes meet the requirements of inter-valve transformer, double ratio output transformer, heavy current push-pull input transformer, double ratio push-pull



The Telsen Radiogrand L.F. transformer with removable fixing lugs.

output transformer, double ratio push-pull output choke and standard and heavy duty low-frequency chokes. Inductance and resistance values for given load are stated in respect of these components, where applicable.

For those interested in the construction of all forms of battery eliminators for using either valve or metal rectifiers is a vast selection of screened transformers embodying almost every combination for filament, anode and grid biasing potentials. One model is designed for a combination of directly and indirectly heated cathode valves, and includes windings for a high voltage rectifier, while conforming to I.E.E. requirements. This sells at £2 7s. 6d.

R.I. and Varley, Ltd., Kingsway House, 103, Kingsway, London, W.C.2.

RED DIAMOND. (261)

The exhibits of this firm are confined mainly to small components which readily lend themselves to a high degree of finishing such as is used in fountain pens, etc. The actual exhibits consist of a crystal detector, a two-way coil-holder, a battery switch, and a wall plug and socket, arranged for loud speaker extension work. This latter device, as will be seen from our illustration, is of extremely neat appearance.

Jewel Pen Co., Ltd., 31, Great Sutton Street, London, E.C.1.

REES MACE. (268)

This firm was one of the first, if not actually the first, to market a portable receiver for the reception of broadcasting, and has always kept to the fore ever since.

They are exhibiting a pentode three-valve receiver, incorporating one stage of H.F. aperiodically coupled to the detector, a pentode being used in the output stage. A "Double-Cone" loud speaker is included in the instrument. In addition, they are showing a "Baby Five" of the same dimensions as the "Pentode Three" mentioned above. This incorporates two aperiodic H.F. stages and a detector followed by two transformer-coupled L.F. stages. A "Grand" type of receiver employing the same form of circuit as above is also exhibited, using a large type loud speaker.

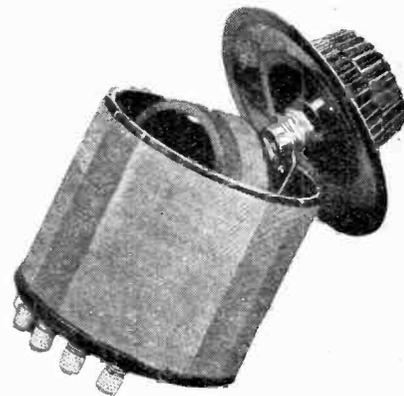
A "Screened" five-valve portable and various other models are also shown.

Rees Mace Mfg. Co., Ltd., 39a, Welbeck Street, London, W.1.

REGENTONE. (62)

Battery charging units and high-tension mains units for A.C. or D.C. supply are the specialities of the Regent Radio Supply Co. This season's models are all-metal enclosed with die-cast aluminium or antique copper oxidised end plates. Suitability to meet general home requirements is a feature of the high-tension units. They are reasonably compact and not readily damaged. For A.C. supply the rectifier in every case is of the Westinghouse metal type. The danger of shock is entirely removed, as it is impossible when handling to make contact with any of the con-

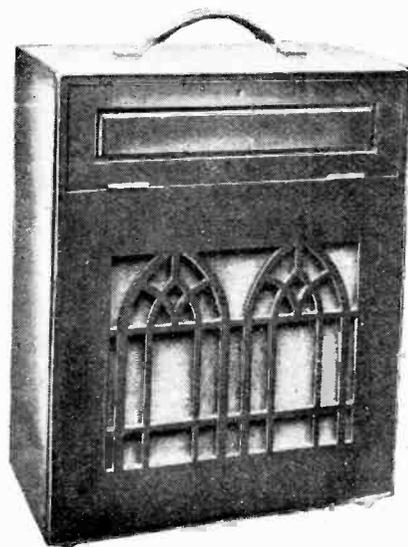
nectors of the input or output circuits. Plugs and sockets engage in recessed holes, so that the circuit is broken before the brass part of a plug is exposed. Provision is made in the A.C. model, by means of an auxiliary connector, to avoid overloading the rectifier when it is not required to give the maximum output. A small glass tube fuse, which is arranged



The "Tonatuna" replaces plug-in coils.

external to the eliminator, is not intended so much to prevent the blowing of house fuses as it is to effectively protect the instrument against overload. Precautions have been taken to avoid back couplings, so preventing the occurrence of "motor boating" so often associated with eliminators. Voltages are continuously adjustable by means of heavy duty variable high resistances. All mains transformers are fitted with an earthed screening winding between primaries and secondaries, and H.F. chokes are included in the main leads. Prices are moderate.

Regent Radio Supply Co., 21, Bartlett's Buildings, Holborn Circus, London, E.C.4.



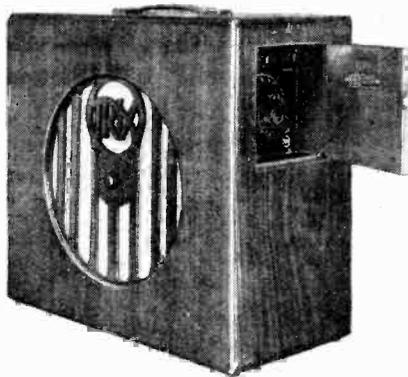
A typical example of "Triumph Cabinet Works."

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RHAPSODY-TWIN. (131)

At last year's show the receivers made by this firm attracted considerable attention on account of their lavish specification and superlative finish. This year finds a continuation of the policy to produce receivers of none but the highest quality for those who must have the best at all cost.

In designing the "Chairside" equipment, the comfort of the listener has been considered in every detail. Essentially it is a radio-gramophone receiver in two parts (1), the "stool," which contains a complete three-valve wireless set (screened-grid H.F. detector-pentode) and an electrically driven gramophone entirely operated from the mains, and (2) the "distributor," a coil-drive loud speaker housed in a corner cabinet for mounting in any convenient corner of the room. The "stool" is no larger than a coal box, and falls conveniently to the hand. If the wireless programme fails to please, gramophone records may be taken from the compartment at the side and played indefinitely without rising from the chair. The electric motor requires no winding, and stops automatically at the end of each



The "Trix" 5-valve portable.

record. When not required the "stool," which moves on ball castors, may be wheeled unobtrusively into any convenient corner, and a sliding door closes up the loud speaker cabinet. The prices of this particular model range from 75 to 79 guineas.

Similar equipment is assembled together in one instrument in each of the various cabinet models on view, the climax being reached in the "Full Grand" model in walnut at 125 guineas, which is equipped with seven valves.

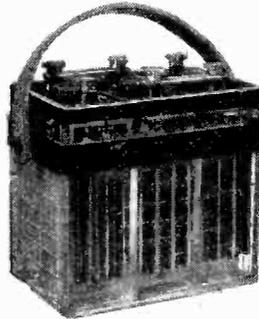
Reproductions, Ltd., 5-7, Dysart Street, London, E.C.2.

RIPAULTS. (24)

In the lateral-action condenser the moving vanes are not directly connected to the driving spindle but are operated *via* the medium of a cam. The shape of this determines the characteristic of the condenser, and square-law, straight-line frequency, or log-mid-line characteristics can be imparted to the component by the simple expedient of fitting a suitably shaped actuating cam. The models

shown this year have all been carefully redesigned and the few remaining drawbacks removed. A rigid die-cast frame is used and stouter washers have been fitted to resist the action of the operating springs.

Ebonite sheet and panels cut to standard sizes and finished either matt or polished black figure prominently among their exhibits. In addition, ebonite with a dual finish is shown also. This has the appearance of polished mahogany on one side, with the reverse side polished black, and should prove very popular. The



A "Tudor" "Monoblock" 6-volt accumulator.

electric strength of all Ripaults' ebonite is stated to be 47,000 volts per millimetre.

A wide range of ebonite tubes, rods and formers of various types are exhibited, the finish of these varying from black to various shades of mahogany, either plain or mottled. The reader can possibly call to mind many occasions when two or more fixed condensers, very closely matched in capacity, would have assisted him in certain experiments, and it is accepted generally that only the air-dielectric type can be relied on for this purpose. Those exhibited by this firm are extraordinarily well made, and should be found quite suitable for use in all cases where a component of this type is specified.

Ripaults, Ltd., 1, King's Road, St. Pancras, London, N.W.1.

ROLLS-CAYDON. (39, 104)

The association of these two well-known names in the specialised business of portable set manufacture has resulted in the production of some very fine sets, characterised by superlative finish and stable and well-tryed circuits. The leading model is, of course, the "Phantom" at 35 guineas. This is supplemented by the "Popular" model at 21 guineas, and the exceptionally neat and compact "Ladies" model at prices varying from 30 to 33 guineas, according to finish.

A new permanent receiver, the Screened Grid Five, is being shown for the first time, and is available as a "table model" at 50 guineas (less loud speaker) and as a de luxe cabinet model at 75 guineas complete with Celestion C14 loud speaker. Two stages of screened-grid H.F. amplification are followed by a detector, one resistance-coupled L.F. valve and a pentode. The overall amplification is, therefore, considerable, and frame aerial reception has been standardised,

though provision has been made for the use of an external aerial in exceptional circumstances.

This stand is also notable for what is probably one of the most original ideas in simplified set building for home constructors. The list of parts for a 3-valve set known as the "Minstrel" is supplied complete with a special 3-ply baseboard, upon which the position of every component is photographed direct on to the wood by a special process. Spigots are provided for locating the various components in position and wires complete with eyelets project through the base opposite each terminal. The baseboard is sent out completely wired on the underside, and all the purchaser has to do is to screw down the parts and attach the wires.

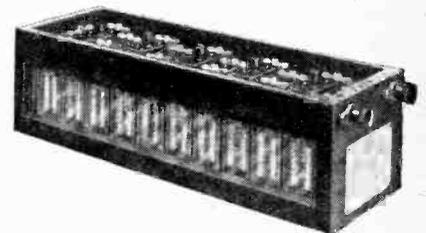
Rolls-Caydon Sales, 77, Rochester Row, Westminster, London, S.W.1.

RUNBAKEN. (244)

A very interesting display of battery chargers and apparatus appertaining to batteries and their care is being exhibited by this firm. One of the most interesting consists of a trickle charger for L.T. cells employing a dry metal rectifier. A relay is built in this instrument which puts the battery on charge when the set is switched off. This instrument can be obtained with an H.T. battery charger mounted on top, which is, however, not automatic.

Perhaps the most interesting charger, however, is the automatic H.T. and L.T. type, which employs a form of rectification requiring no valves, metal oxide rectifiers, or malodorous wet rectifiers. The "Quixo" battery tester, consisting of a voltmeter which imposes a "load" on the battery when its voltage is being tested, is a device which many might use with advantage. As is well known, if a battery is tested when not delivering current, a voltmeter may give a false reading.

Runbaken Magneto Co., Tipping Street, Ardwick, Manchester.



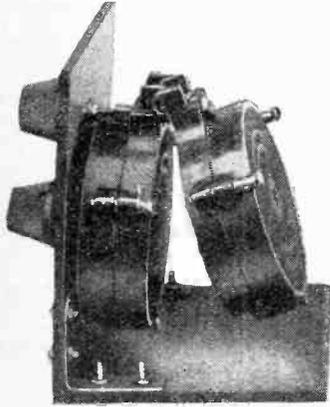
An H.T. accumulator by the Tudor Accumulator Co.

SELECTORS. (23)

In addition to their wide range of five-valve portable and transportable sets, this firm is exhibiting a three-valve self-contained set incorporating a screened-grid H.F. stage with tuned-anode coupling, a detector followed by a pentode output valve. The extraordinary characteristics of these new valves impart to the three-valve set a greater distance-covering property than is possible with the orthodox five-valve arrangement, so popular in the majority of portables at present on the

Stand to Stand Report.—

market. The adoption of the tuned-anode H.F. coupling greatly facilitates changing from one waveband to another, as it is necessary only to fit a simple two-way switch in each circuit, which brings into use the appropriate anode coil and adjusts the frame winding accordingly. The Screened-Three is a transportable



The "Tunewell" tuner with which it is claimed that the "dead end" problem is solved.

type of set enclosed in a handsomely finished mahogany cabinet. The back is hinged and gives easy access to the valves and batteries. The H.T. is derived from a 100-volt dry battery of generous capacity, and a two-volt unspillable accumulator is used for the filament supply. An Amplion cone loud speaker is fitted behind a grille in the lower portion of the cabinet, the batteries being suitably disposed round the speaker unit. Although there are two main tuning controls, the operation of the set will be found very simple, as each model is calibrated on the main B.B.C. and Continental stations, and the condenser setting recorded on a card supplied with each set.

Another new model is an attaché portable measuring only 13½ in. x 13 in. x 8½ in., and for a set of this type is extraordinarily light. The orthodox five-valve circuit is adopted, having two aperiodic H.F. amplifiers, a detector and two L.F. stages, a cone loud speaker, and frame aerial being built into the lid in conformity with usual practice in sets of this type. Provision is made for reproducing gramophone selections, the low-frequency amplifier and loud speaker being used for this purpose. Should occasion arise, a separate loud speaker can be used, as a jack is fitted which automatically disconnects the built-in instrument when the plug is inserted.

An unspillable L.T. accumulator is fitted, which, in common with all other Selector sets, can be charged *in situ*, a jack being provided on the panel for this purpose.

Selectors, Ltd., 1, Dover Street, London, W.1.

SELHURST. (172)

It is understood that the bar type permanent magnet loud speaker has been

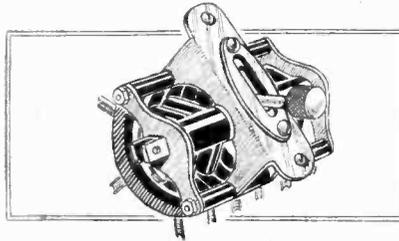
abandoned in favour of the pattern in which four large horseshoe magnets are used. The poles converge to form a circular gap ¼ in. wide and ⅜ in. long. This magnet assembly is bolted to a supporting frame, which forms a part of the cone cradle. Rubber washers are used in order that a certain degree of flexibility may be attained in setting the final relative positions.

Several models of the more popular current-energised types are available; steel is now being used in place of cast iron.

A good assortment of moving coils is on show, including one of 2,500 turns for pentode valves, as described in last week's issue of this journal.

A new centring device is likely to excite interest; it consists of a soft rubber disc with six projections. This is placed over the centre pole under a metal washer of slightly smaller dimensions. As a securing screw is driven home the rubber disc is expanded until the projections just touch the inside of the moving coil. Visitors can judge for themselves as to the efficiency of the Selhurst products, which are being demonstrated at No. 28, West Kensington Gardens, close to Olympia.

A. Baker, 89, Selhurst Road, London, S.E.25.



The new type Utility switch arranged for panel and baseboard mounting and with provision for linking to adjoining switches by means of rods.

SIEMENS. (164, 165)

Dry cell batteries form the principal exhibit on this stand, and visitors will have an opportunity of examining the interior arrangement of the cells before the top is sealed with bitumen. The reputation of Siemens Bros. for care in the selection of material is firmly established, and we see repeated evidence of attention to detail, which is the reason for the consistent reliability of their batteries. It is interesting to note that the material put into the construction of the cells for the Popular type batteries is of exactly the same quality used in the Standard cells, the difference in cost being accounted for by the fact that Standard cells are entirely filled with paraffin wax, which prevents leakage and crackling when the battery is nearing the end of its useful life.

Actually the only new batteries on show are the G9 Popular grid bias battery and the new large-capacity type 1075 H.T. battery for portables, but there are numerous interesting features among the ordinary run of batteries. For instance, the rechargeable L.T. sack

cell should appeal to people living in farms remote from charging stations. The shape of the zinc in this cell is interesting. It has been found that the chemical action at the bottom of a cylindrical zinc is negligible compared with that which takes place about two-thirds the way up the jar. Consequently there is little object in making the zinc more than one-third the depth of the jar, and by shaping it as shown in the photograph a further economy is effected.

The rechargeable H.T. cells are supplied with a special electrolyte known as "Siebrolyte," which jellifies when added to water and renders the cells unspillable.

Ordinary dry cells with a long shelf life and inert cells for use in the tropics are shown in the export section, while those of a mechanical turn of mind will be interested in the automatic radio alarm device for use in ships.

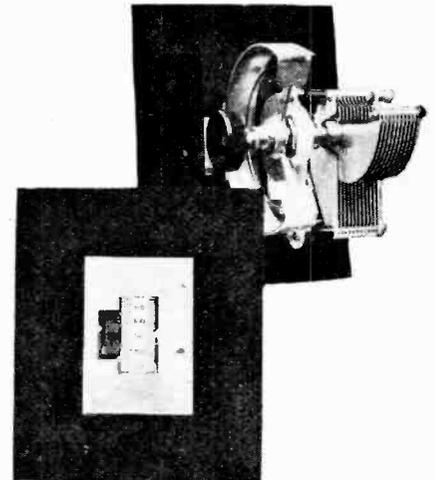
Among the accessories the short wander plug specially designed to fit Siemens sockets should be noted, and there are also some interesting radio testing instruments.

In the ebonite section a new mahogany faced panel is shown. The bulk of the panel is pure black ebonite and the mahogany veneer is moulded into one side only during rolling. The display of pure ebonite mouldings as distinct from bakelite will also be interesting to many.

Siemens Bros. and Co., Ltd., Woolwich, London, S.E.18.

SIMPLICON. (265)

Several new variable condensers of considerable interest may be examined at this stand. The ordinary general purpose condenser has been slightly modified since last season. There will also be shown drum-controlled condensers which incorporate the epicyclic ball gear and are obtainable in log and square law types. These condensers are obtainable for duplex mounting, a notable feature being that the vernier controls are so close as to be easily operated simultaneously with one finger.

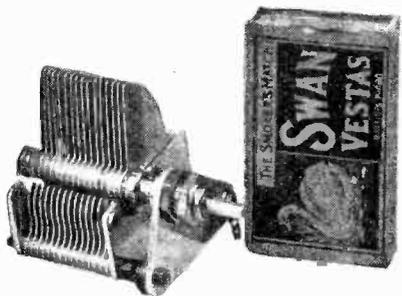


Front and rear views of a mounted new pattern Utility (Wilkins & Wright) variable condenser.*

Stand to Stand Report.—

A Visor condenser will also be shown which should have a wide appeal among those who prefer "something different." The instrument consists of the standard log law condenser fitted with knob and visor plate; the latter, which is simple to fit to the panel, is supplied finished oxidised silver as standard. The circular indicating disc of aluminium is inscribed with a double scale reading of 0.100 and 0.180.

Williams and Moffat, Ltd., Ladypool Road, Sparkbrook, Birmingham.



A component of special interest, the new Wilkins & Wright Mite condenser.

SIX-SIXTY. (42a)

A new range of valves is being shown, which includes the screened grid valve for 2- and 4-volt accumulators. These are of the new design, which is now accepted as standard, and wherein the anode is brought out at the top of the glass bulb. Two pentodes are available with filaments for 2- or 4-volt batteries; the magnification factors are respectively 80 and 60, which, combined with a high mutual conductance, give an excellent power output characteristic. Amateurs are advised to examine the constants of the S.S. 625 S.P. valve, which is a power triode capable of handling 45 volts grid swing at 150 volts H.T. Its amplification factor is 3.2, and its impedance 3,600 ohms.

A well-made turntable for portable sets sells at the modest price of 8s. 6d. A ball-race near the circumference takes the thrust, and a device embodied prevents any play between the upper and lower members. A cone loud speaker at a popular price is also being shown.

Electron Co., Ltd., 122, Charing Cross Road, London, W.C.

SOVEREIGN. (228)

This stand is devoted to a display of small components such as plug-in coils, six-pin coil bases, and formers, H.F. chokes and various other small products. The most interesting exhibit is a slow-motion dial possessing several quite good features.

J. R. Wireless Co., 6 and 8, Rosebery Avenue, London, E.C.1.

SPARTA. (158)

One of the most important products of this firm is a series of both horizontal and vertical non-spillable accumulators intended for portable receivers. The glass wool packing which absorbs the electrolyte acts also as a separator be-

tween the plates. There is also to be seen a range of cells with mass-type plates and ebonite separators; these can be supplied in a crate.

H.T. batteries are supplied in 20-volt crates and 10-volt blocks in glass containers; the latter are fitted with grease cup terminals which prevent "creeping."

A tantalum rectifier for accumulator charging is also marketed. It is mounted on a baseboard with a step-down transformer and flexible lead, and is designed to charge L.T. accumulators at 0.6 amp. If desired, it can be mounted in the crate containing the battery.

Fuller Accumulator Co. (1926), Ltd., Chadwell Heath, Essex.

STAPLETON. (211)

Apart from the display of the well-known products of this firm, such as the "Loriometer" and the single or multiple "Loriostat," there will be a fitting known as the "Loriadapter," which is a simple device for charging L.T. batteries from D.C. mains without extra cost, provided that charging is undertaken during



Walker Bros.' Gramophone Cabinet, which has accommodation for amplifier and loud speaker.

the evening at a time when the light would normally be used for its ordinary function.

The "Lorio" potentiometer volume control is another item that is bound to attract universal interest. It may be obtained in maximum resistance values of 150,000 ohms, 200,000 ohms, or 250,000 ohms, either with or without the inclusion of an anode feed resistance.

On this stand is also exhibited the "Epoch" moving-coil loud speaker manufactured by the Epoch Radio Mfg. Co., Ltd. This instrument is of good construction. Special arrangements are made for centring the cone. Various coils may be obtained to match valve impedances. The actual coil former is extremely light, and is quite unbreakable by any ordinary means.

The Wireless World coils made by Messrs. Lawrence and Hull are also exhibited on this stand. The workmanship is of a high order.

A. W. Stapleton, 19A, Lorrimore Buildings, Lorrimore Street, London, S.E.17.

SYLVEX. (175)

Artificial galena crystals marketed under the trade name of "Sylverex" are the principal exhibits of this firm. Their products are shown in three stages of manufacture: the raw crystal in the crucible; roughly broken; and, finally, cut to shape. A range of "Octron" valves, selling at 5s. and 6s. 9d., is also exhibited, together with super-power amplifiers at 8s. Another product is a semi-permanent detector of the cartridge type, in which synthetic zincite and tellurium crystals are used.

Sylvec. Ltd., 41, High Holborn, London, W.C.1.



The Watmel pick-up carrier.

T.C.C. (121)

An opportunity is afforded of examining all forms of T.C.C. condensers, and if the limited scope of condenser manufacture prevents the introduction of radically new designs, the very nature of the exhibit will give the visitor confidence in the product.

For home receiver construction two new condenser designs are to be found. The type S mica condenser is supplied in the smaller values, while the large type paper dielectric condensers are now available in green moulded cases. The introduction of an angle corner bracket permits of the condenser being screwed vertically to the baseboard or arranged horizontally underneath it.

Telegraph Condenser Co. Ltd., Wales Farm Road, North Acton, London, W.3.

TELSEN. (5)

The "Radiogrand" and the "Ace" type L.F. transformers have undergone considerable modification during the quiet



A Watmel radio-gramophone receiver; an 8-ft. logarithmic horn is mounted in the left-hand compartment.

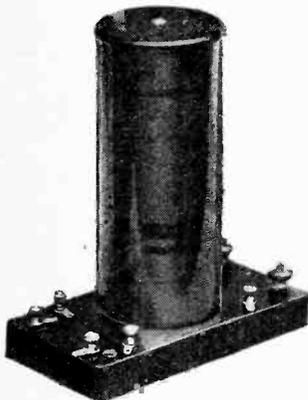
Stand to Stand Report.—

season, the outstanding improvement being in the method of winding the coils. These are accommodated on a larger core than used hitherto, and are air spaced, thereby reducing the self capacity of the winding and improving the overall efficiency of the component. The "Radio-grand" is fitted with detachable feet, thus enabling the transformer to be mounted in the most convenient manner. This is a great advantage when the component is used in portable or transportable sets where space is often restricted. Both types are obtainable in two ratios, a 5 : 1 and a 3 : 1, and are extraordinarily light considering the nature of the construction and the quality of the material employed. The "Ace" type weighs only 13ozs. and the larger model 1lb. 9ozs. The smaller component has been designed specially for use in portable sets where space and weight are of paramount importance, but these qualities have not been considered at the exclusion of all others as testified by its electrical properties.

Telson Electric Co., Ltd., 207, Aston Road, Birmingham.

TONATUNA. (266)

The star exhibit on the stand of this firm is the "Tonatuna," which is as its



Watmel two-range tuner, covering long and medium broadcast wavebands.

name implies, an instrument for replacing plug-in coils.

The general construction is on the American lines. The instrument shows thorough technical design coupled with good workmanship.

The Tonex Co., Walker Street, Blackpool, Lancs.

TRELLEBORG. (224)

This firm's stand is naturally devoted to an exhibition of ebonite sheet, rod, and tubes of their own manufacture, with examples of machining and turning in the material.

Of particular interest on the stand is ebonite with a wavy surface. The popularity of this firm's ebonite can readily be gauged by the large number of ebonite formers and other products which they display, which are easily recognisable as

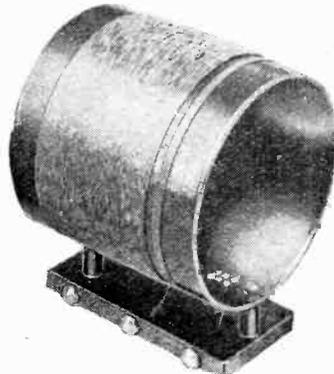
familiar formers, etc., used by various of the large manufacturers.

Trelleborg Ebonite Works, Ltd., Union Place, Wells Street, London, W.

TRIUMPH. (205)

This stand features cabinets exclusively. Cabinets for all wireless requirements are shown, from the small type to large console models. There are some specially handsome models for portable receivers, as our illustration shows. The workmanship is of a very high order.

Triumph Cabinet Works, Ltd. (T. H. Cosser and Sons), 548, Holloway Road, London, N.7.



Wearite interchangeable coil, with stud contacts.

TRIX. (255 & 256)

A large number of entirely new products are to be seen on this stand. The portable receivers which are exhibited are specially good. Undoubtedly the most attractive is the "Portette," an instrument of astonishingly small dimensions. The five valve portable receiver and the loud speaker are items which should on no account be missed.

Among the smaller components mention should be made of the small fixed condensers enclosed in bakelite, all of which are tested and guaranteed by Faraday House.

Special mention must be made of the three base system of set construction.

E. J. Lever (Trix), Ltd., 8-9, Clerkenwell Green, London, E.C.

TRUPHONIC. (134, 260)

This stand is devoted to complete receivers of which the most interesting is the Truphonic Screened Grid Portable Four at £24 15s. The circuit comprises a screened grid H.F. valve, detector and two stages of L.F. with ordinary valves. The valves and batteries are protected by a neat leatherette cover shaped to fit round the controls on the panel. Each set is calibrated for the reception of foreign stations and is equipped with Edwards unspillable accumulator and Siemens H.T. battery. An adjustable balanced armature loud speaker is mounted in the lid. There is also a compact cabinet portable—the Truphonic Portable five—with provision for a gramophone pick-up at the same price.

The Universal electric gramophone motor is sold separately at £4 4s. com-

plete with regulator and turntable. The demonstration model was always running steadily when we passed this stand and seemed to attract a good deal of attention.

Truphonic Wireless Co., 121-123, Rosebery Avenue, London, E.C.1.

TUDOR. (249)

On this stand a very complete range of H.T. and L.T. batteries in both glass and celluloid is shown. Special unspillable type low tension cells and slow discharge cells are shown. One of the most interesting features to be seen is shown in our illustration. It consists of a glass cased 5-volt accumulator, made in one case with moulded glass partitions. This monoblock L.T. battery is known as the "Monolt."

Tudor Automatic Co., 2, Norfolk Street, London, W.C.2.

TUNEWELL. (234)

The leading exhibits at this stand are "Tunewell" six-pin coils and bases, plug-in coils, etc.

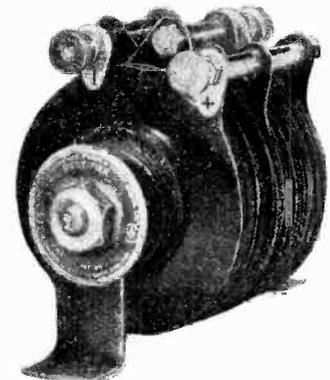
There is also a well-made two-range tuner, which is claimed to solve the problem of dead-end loss.

Turner and Co., 54, Station Road, London, N.11.

UTILITY. (152)

From the earliest days of broadcasting Utility change-over switches have found their way into numberless receiving sets. A new pattern anti-capacity switch with contacts moulded into Bakelite arcs and a lever which operates floating nickel silver spring blades makes its appearance this season. The capacity distribution, as well as perfection of insulation, permits of the use of this switch even in valve grid circuits. Provision is made for both baseboard and panel mounting and a most important feature is that one or more switches can be readily linked together by revolving rods.

Two new types of thumb dials have been added to the range of Utility products. One, a milled knob operating an



Westinghouse A.3 heavy duty L.T. rectifier.

edgewise scale through a positive friction wheel giving the usual ratio of 12 : 1 and the other, a more elaborate bakelite moulding, makes use of a modification of the friction drive system used in the standard Utility micro dials. The merit of the former is reliability with low cost,

Stand to Stand Report.—

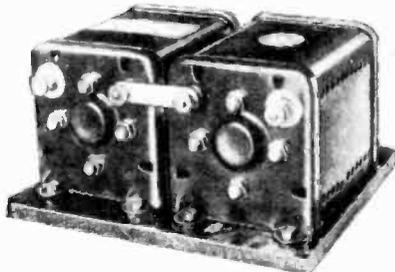
while the latter, which has a 70 : 1 reduction gear, fast and slow milled thumb controls and bakelite face plate, is a beautiful specimen of first-class moulding and design.

Those looking for a really small variable condenser of normal tuning capacity will find their requirement catered for at this stand. Low loss principles have been maintained and the shaft revolves on ball bearings. It is fitted with both soldering tags and terminals and will make a strong appeal to both manufacturers and amateur constructors.

Wilkins and Wright, Ltd., Utility Works, Holyhead Road, Birmingham.

WALKER BROS. (154)

This is the stand of a cabinet manufacturer where one can examine American pattern receiver cabinets, cabinet type cone loud speakers, cases for portable receivers, as well as containers for gramophone amplifiers. Much interest is being shown in a gramophone cabinet which is fitted complete with Collaro silent motor, turn-table and gramophone fittings while ample space is allowed in the base for the building of a gramophone amplifier. The lid is boxed so as to accommodate a cone loud speaker, and it is fitted on the inner face with an attractive grille as well as apertures on the side, in order that it may be used when closed. It is a strongly-built



Westinghouse type H.T. 2 rectifier unit ; output 0.1 amp. at 350 volts for supplying anode current to L.S.S.A. valves.

and well polished cabinet and will form the basis for the construction of an inexpensive electrical reproducing gramophone. The price complete with the gramophone equipment, in oak or mahogany, is four guineas.

The range of cone loud speakers being the work of a cabinet-making firm are of specialised design. Incidentally, they are fitted with four-pole balanced armature movements making them sensitive to small input and yet capable of giving considerable volume.

Walker Bros. (Guildford), Ltd., St. Joseph's Works, Bramley, Guildford.

WATMEL. (157)

The most arresting exhibit on this stand is the "Orthotone" gram-radio receiver. Housed in a large cabinet designed on pleasing lines, it comprises a radio receiver (detector and 2 L.F. stages, with reaction, dual impedance couplings, and parallel output valves), and a gramophone turntable. The set operates

with a short or full-sized aerial—the former when local broadcasting only is required. In the right-hand compartment a logarithmic horn, of the folded type, with a conduit 8ft. long, is mounted be-



Westinghouse type RP.10.D. charging set for L.T. accumulators ; output 0.4 to 3 amps. at 22 to 26 volts.

hind an ornamental grille. It is energised by a balanced armature movement. On the other side is the receiver, the tuning and reaction condensers being controlled through long extension rods connected to dials mounted alongside the turntable. The set is supplied with current from A.C. mains, indirectly heated cathode valves being used throughout. There is a change-over switch to make the circuit alterations appropriate to either method of reproduction, and a double-pole mains switch is fitted on the side so that, for wireless reception, the set can be put into operation without opening the lid, provided that tuning adjustments have been previously made.

This instrument includes a pick-up carrier which is sold separately (at 7s. 5d.). The arm is lightly pivoted so that it can move freely in either dimension, and obviously considerable thought has been devoted to the question of alignment and needle tracking. To ensure that the device will be properly fitted to an existing gramophone, a paper template is supplied, together with full instructions. The avoidance of excessive wear of the records is a strong point in the makers' claims.

The logarithmic horn loud-speaker already mentioned is sold separately, and is mounted in a large cabinet packed with flock wool in order to prevent resonance effects.

Another receiver, the "Baby Grand," is fitted in a piano-style cabinet; the controls are covered by the lid. The three valves operate as detector and L.F. amplifiers with reaction; there is a switch waveband change.

Among the components on show is a new two-range tuner, in which the grid coils for long and medium wavebands are connected in series; the former may

be short-circuited by a switch. The reaction winding is common to each circuit.

Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware, Middlesex.

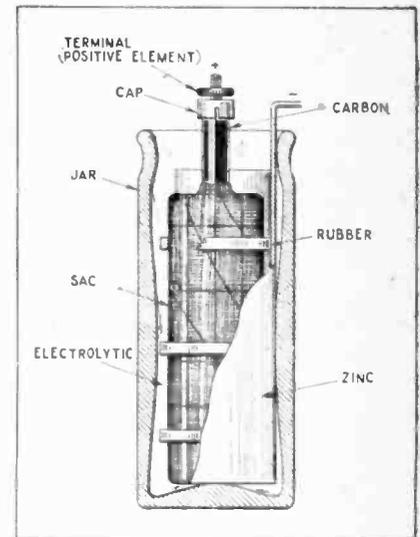
WEARITE. (251, 252)

A neutralising condenser of unusual design is exhibited on this stand. Its wide capacity range (3 to 70 microfarads) renders it suitable not only for balancing but also for reaction control. The full range is covered by a single revolution of the control knob, which, incidentally, is mounted on an extension knob; thus the component should prove useful in "Hartley" circuits, where hand capacity is always troublesome unless precautions are taken. A foot is provided for baseboard mounting as well as a one-hole fixing device for securing it to a control panel.

An H.F. unit, illustrated in last week's issue, is designed for operation with existing receivers of the detector-L.F. variety; it employs the parallel feed system, which is easily adaptable to this purpose. Instead of the usual pins, the interchangeable aerial-grid coil is fitted with studs which engage with phosphor bronze clips mounted on the base.

A range of jacks and plugs, in which pure ebonite is used for insulation between the springs, is a new departure for this firm. Some of them, used with an ebonite plug in place of the usual jack plug, could be used as switches for mounting on metal panels, thus avoiding the bushing which is generally necessary when ordinary switches are used.

Other exhibits which are likely to interest readers are an assortment of *Wireless World* coils, a flux gun, and improved grid bias battery clips made in springy phosphor bronze. The continued vogue of the switch-over set is likely to concentrate interest on the new "Wearite" anti-capacity switches, which are of a lighter construction than their



Details of the Wet H.T. battery cells. Note the rubber rings which position the zinc electrode.

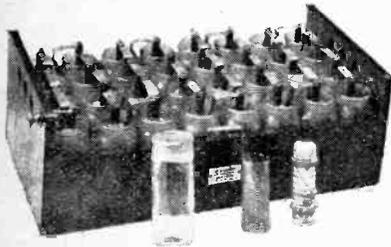
Stand to Stand Report.—

predecessors; incidentally, their price is considerably lower.

Wright and Weaire, Ltd., 740, High Road, Tottenham, N.17.

WESTINGHOUSE. (78)

The Westinghouse Company do not make complete eliminators for receiving sets but numerous examples of the applications made by other manufacturers are to be seen on the stand. Further, an instruction booklet has now been prepared for the benefit of amateurs who wish to construct complete eliminators for themselves. Free copies of this



A tray of Wet H.T. Leclanche cells. Each holds 32 cells and gives 48 volts.

"How to Build" publication may be obtained on application at the stand.

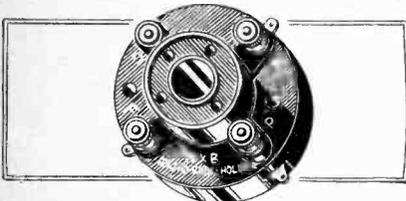
The principal additions to the Westinghouse range for the coming season are the type A3 heavy duty rectifier for use in L.T. eliminators using electrolytic smoothing condensers, the type H.T.2 rectifier for supplying the anode current to L.S.5.A. valves and the new G.B.1 unit for deriving grid bias from A.C. mains.

The stand also carries examples of complete charging plants for garages, etc., and a special 1,000-volt rectifier capable of delivering 1 amp.

Westinghouse Brake and Saxby Signal Co., Ltd., 82, York Road, King's Cross, London, N.1.

WET H.T. (7)

An H.T. battery built up from the wet type Leclanché cells is well worth the small amount of extra trouble required to keep it in order, though owing to the special construction of the "Standard" type, this is practically negligible. All primary cells suffer from one serious drawback, namely, creeping of the electrolyte, and to overcome this the makers provide a special oil to float on the top of each cell. This has an additional use



New Whiteley Boneham rigid valve holder.

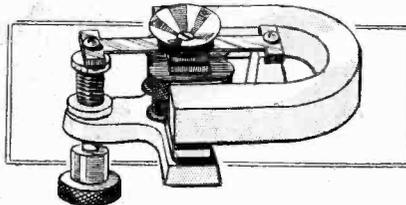
inasmuch as it also prevents evaporation of the electrolyte.

Treated properly, batteries of this type have a long life provided the discharge is kept within the limits stated for the

capacity of the cells comprising the battery. Batteries can be built up from three different sizes of cell; the No. 1 size allows for a maximum discharge rate of 7 milliamps.; No. 2, 14 milliamps.; and No. 3, 30 milliamps. A discharge of 50 milliamps. can be given to the No. 3 size, but, of course, the working life will not be quite so long at this heavy rate. For the convenience of the user, special trays have been developed which hold 32 cells each, giving 48 volts. These trays can be stacked one on top of the other, thereby forming a battery cabinet which can be accommodated in a reasonably small space. We are informed that the No. 3 size has a capacity of 10,000 milliampere hours when discharged at the maximum rate, though towards the end of its working life, on one charge, the voltage drops to about 0.8 volt per cell.

During the week of the Exhibition a demonstration will be given showing, as far as the limited period will permit, the reliability of this type of battery by subjecting a No. 3 size cell battery of 144 volts to a continuous discharge of 35 milliamps. This is being left on night and day and a voltmeter is permanently connected in the circuit, thereby enabling the condition of the battery to be checked from time to time.

An inexpensive but reliable little meter is shown for measuring voltages of 0.6 or 0.150 and 0.30 milliamps. The volt-amp. test meter is suitable for taking readings of the H.T. battery, thereby keeping a check on its condition, and the low voltage scale can be used either for checking the voltage of the L.T. accumulator or measuring the E.M.F. of each cell in an H.T. battery of any type. The D.C. resistance of the meter on the 0.150-volt scale is 5,000 ohms, and on the lower



Whiteley Boneham loud speaker unit.

range 200 ohms. The case is finished in crystalline-black, and the price is only 8s. 6d.

Standard Wet Battery Co., 184 8, Shaftesbury Avenue, London, W.C.2.

WHITELEY BONEHAM. (120)

A sign of the times is the reappearance of the rigid type valve holder. This is a new W.B. component and in a good-moulded mount for baseboard fixing sells as cheaply as 9d. The valve pins are not actually bedded solid in the insulating material but are merely loosely located at the top and held firm by eyelets or terminals on to the outer ring.

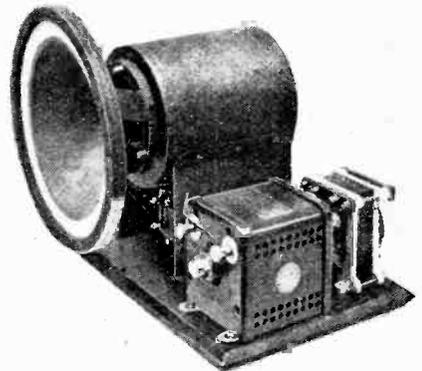
This year's cabinet model cone loud speaker is well finished, and from its design appears to be a thoroughly reliable production selling as cheaply as 47s. 6d. The cabinet is of clock-case design with circular open fret grill and gilded cone. Its unit, which sells separ-

ately at 18s. 6d., has a large thick magnet and the reed, which is stiff, is supported at both ends and is adjusted by a milled screw.

Whiteley, Boneham and Co., Ltd., Nottingham Road, Mansfield, Notts.

ZAMPA. (9)

Zampa moving coil loud speakers are assembled instruments and require only the addition of a baffle board before putting into use. A 6in. diameter cone is standard to all types and is firmly attached to a 1½in. coil, generally supplied with a low resistance winding and a built-in step-down transformer, but can



The Zampa moving coil loud speaker with Westinghouse metal rectifier and power transformer.

be obtained, if desired, wound to a high resistance. Special coils with 2,500 turns of 48 S.W.G. enamelled wire are available for use with a pentode valve.

Various models are exhibited, a low voltage type for which a 6-volt accumulator is required to supply the pot; a D.C. model and an A.C. model. The A.C. model is provided with a mains transformer and a Westinghouse copper-oxide metal rectifier, these being mounted on the base of the instrument. As there are many potential users of moving-coil loud speakers who have not the good fortune to have access to electric supply mains and might find the drain on the L.T. battery too much for them, a permanent magnet type of moving-coil loud speaker has been developed. In this model it has been found desirable to employ a narrower gap than in the separately energised types so that a low resistance coil is considered essential and a special step-down transformer built into the instrument. The width of the gap in the electromagnetic models is 5/64in. In all models the cone is mounted on split sheep-skin which has the necessary suppleness, but, unlike many other materials used for this purpose, does not sag and permit the coil to touch the sides of the gap after being in use for some time. The magnets are constructed from specially cast cobalt steel and maintain their magnetism for an exceptionally long period. The outside of the pot magnet and all metal parts are finished either in black or brown crystalline enamel.

Mic Wireless Co., Market Street, Wellingborough, Northants.



By Our Special Correspondent.

Will the B.B.C. Go West?—A Skilful Thriller.—Those News Bulletins.—Controversy Between Stations.—Geneva and Broadcasting.—A Chorus of 250 Voices.

Farewell to Savoy Hill?

"Where there is smoke there is fire" is as true as most proverbs, consequently the recent rumours anent a forthcoming B.B.C. evacuation of Savoy Hill contained just enough truth to keep them afloat. They still float.

Savoy Hill is crowded out. The lordly ones know it, and out of their confidential colloquies has emerged a scheme which, as far as I can gather, moves the B.B.C. headquarters one mile in a north-westerly direction to a spot as near to the Queen's Hall as is physically possible.

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Demolitions in West London.

Some interesting demolitions are taking place in this area. It is too early to prophecy what sort of edifices will arise in the desert places, but the progress of events will be worth watching.

o o o o

Skyscrapers in the Studio.

What is probably the last piece of constructional work to be carried out at the Savoy Hill headquarters is nearing completion. This is the transformation of the oldest studio from a sort of acoustic sepulchre into an airy little hall with an almost staggering colour scheme. The four walls have been denuded of draping, and now carry a design embodying what seems to me to be a collection of yellow skyscrapers against a background of blue sky and silver clouds.

It should help nervous broadcasters to feel that life is still worth while.

o o o o

That Thriller.

The best tribute I can pay to the attempts at realism in Mr. F. J. Mott's melodrama, "The Greater Power," broadcast from 2LO last week, is to mention that my neighbours in the next flat betrayed every symptom of anxiety. Not possessing a wireless set themselves, they were, I suppose, unable to account for the demoniacal laughter proceeding from my unlighted dining-room. Anyway, when the madman's daughter gave her heart-rending cry for pity, windows were opened, and there were whispered consultations. However, when I cut down the volume, the windows were shut and we were left to our fate. So much for neighbours.

G 21

Skilful Melodrama.

About the play itself. The author's difficulty, having created an apparently invincible and invulnerable madman capable of destroying the world, was to provide a means of frustrating him. He managed it quite skilfully with a little sentimental trick that would have done credit to the Lyceum. Where the British Navy failed, Love succeeded. Love—in the form of a long lost daughter pleading for humanity. A clever melodrama, well produced and well acted, but with some

FUTURE FEATURES.

London and Daventry (5XX).

- OCTOBER 2ND.—A Nonsense Programme.
- OCTOBER 4TH.—Leeds Festival Concert, S.B. from Leeds.
- OCTOBER 5TH.—"Chloe," a musical comedy, by Rodney Bennett and Gerrard Williams.

Daventry Experimental (5GB).

- OCTOBER 2ND.—A French Composers' Hour.
- OCTOBER 3RD.—B.B.C. Promenade Concert.
- OCTOBER 6TH.—"Way Down South." A selection of Negro Spirituals, Songs, and Choruses.

Cardiff.

- OCTOBER 1ST.—Women and the Arts. A programme in celebration of the Festival of Glamorganshire Women's Institutes.

Manchester.

- OCTOBER 1ST.—"Leaves from Ossian." Set to music by Liza Lehmann.
- OCTOBER 6TH.—A Gilbert and Sullivan programme.

Newcastle.

- OCTOBER 3RD.—"Les Cloches de Corneville," a comic opera. English version by H. B. Farnie and B. Reece. Revised version by Harold Simpson. Music by Robert Planquette.

Glasgow.

- OCTOBER 5TH.—"Gala." A programme by Tyrone Guthrie.

Aberdeen.

- OCTOBER 5TH.—A Scottish Programme.

Belfast.

- OCTOBER 6TH.—The Radio League Bazaar at the Ulster Minor Hall. Opening speech by the Lady Mayoress.

rather noticeable attempts at economy by the effects department. Why gramophone records?

o o o o

Those News Bulletins.

The news bulletins are still among the least satisfactory items on the programme. They are useful to country listeners without access to the evening newspapers, but that is all that can be said in their favour.

The matter will again come up for discussion in November next with the

termination of the present agreement between the B.B.C. and the news agencies, but it is unlikely that any changes will be introduced. Sooner or later, however, the present system will have to be abolished. The B.B.C. has to take what the news agencies offer; no alteration in the messages is permissible, and the only right that the B.B.C. can reserve to itself is that of censorship. Some of the bulletins could stand a good deal of censoring.

The alternative to the present system is the establishment of a B.B.C. news agency, with staff reporters distributed throughout the world, but the expense would be enormous.

o o o o

De Courville "Hours."

I hear that the first of Albert de Courville's "hours" is to be given on October 8th. There are to be six "hours" in all, at the rate of one a week. I understand that there are to be several original departures from the traditions set up by the "Charlot Hours," which have just concluded.

o o o o

Sir Thomas Beecham.

A "non-wireless" weekly paper stated the other day that Sir Thomas Beecham would soon be discovered throwing his magnificent enthusiasm into "a complete overhaul of the music affairs of the B.B.C."

A B.B.C. official denied this statement. "At present," he told me, "Sir Thomas's sole engagement with the B.B.C. is to conduct the first of our series of Symphony Concerts at the Queen's Hall on October 12th."

o o o o

Quarrelling "on the Air."

Four broadcasting stations in Pennsylvania have been punished for quarrelling. It appears that for months past the bulk of the transmissions have been devoted to the expression of personal animosity between the respective owners. So the Federal Radio Commission has stepped in and temporarily suspended their licences.

Why? It seems a shame.

o o o o

Why Not Over Here?

If a few of the B.B.C. stations quarrelled occasionally, it would help to restore the human touch that has been

steadily departing since the death of the old B.B. Company. What a night we should have if 2LO quarrelled with 5GB! All London would be flocking round the loud speakers, while the stalwart, hay-chewing denizens of Daventry would cluster round the 5GB masts and shake them in the hope of releasing the last available amp. on the path of victory.

Or there might be a contest between Aberdeen and Glasgow . . . but that would be a serious affair.

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Political Lights at the Microphone.

Two important political personages will face the microphone in a few days' time. Mr. Ramsay MacDonald's speech at the opening of a Bradford exhibition of paintings by the old Dutch Masters will be broadcast through the northern stations on Friday next, September 28th.

On Sunday evening the Home Secretary will broadcast an appeal from 2LO on behalf of the Stepney Infant Welfare Centre.

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Publicity ?

Is there a subject under the sun—except, of course, Mr. Bernard Shaw—that gets more Press publicity than broadcasting? In the eyes of the sub-editors, anything which touches upon broadcasting will tickle the public fancy; and the sub-editors know their business. Pick up any newspaper and you will find, often on the principal news page, a broadcasting "story." Sometimes these tales are rather tough (take last month's centenarian who ascribed her longevity to broadcasting and tobacco), but a little seasoning works wonders.

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The Poor Film Folk.

Now all this broadcasting publicity is very distressing to the film folk. Time was when every modest screen star could rely on her publicity agent for a nice little news splash at decent intervals. It took very little to get into the papers. Only a lost lipstick or two, or a few seconds before the camera with a proprietary wireless set. But broadcasting threatens to queer the pitch, and the conscientious screen star can only get into the "paps" by obtaining a divorce or learning English for the "talkies."

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No Indiscretions Needed.

What grieves the film publicity agents is that the masters of the microphone have no need of these expensive aids to publicity. They just slip into the news like threepenny bits into a collection plate.

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Broadcasting and International Politics.

Both broadcasting and the screen came up for consideration at the League of Nations Assembly last week. The Committee of Intellectual Co-operation had been advocating that the attention of Governments should be drawn to the danger of cinematograph performances inspired by a spirit contrary to that of the League. M. Munch (of Denmark) made the suggestion, which received unanimous assent, that broadcasting should be included in any such recommendation.

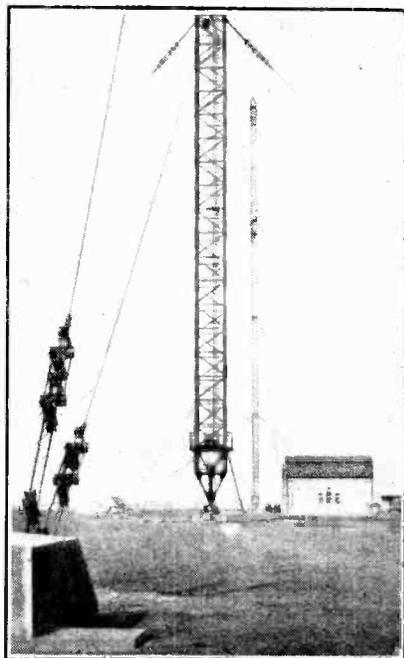
A Marvellous Neutrality.

Up till now broadcasting has preserved a rather marvellous neutrality in international politics. When we consider that the larger European stations have a "circulation" infinitely larger than the most influential European newspapers, we get an idea of the enormous responsibility that lies on the shoulders of these Grand Moguls of the ether.

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Exit Secret Diplomacy.

A single inflammatory speech could set a good many ears burning, and it would not be long before tongues were wagging in reply. Yet this has never happened. On the contrary, broadcasting has probably done as much for the cause of European peace as any of the confer-



THE VOICE OF HUNGARY. An unusual view of the two 480-foot masts belonging to the Budapest broadcasting station, which operates on a power of 35 kilowatts and can be heard nightly on 555.6 metres.

ences and *rapprochements* which have taken place since the war. And broadcasting is no friend to secret diplomacy.

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A Bouquet from the Author.

Miss Lilian Harrison, who is rapidly becoming one of the most popular of broadcast artists, is to give a poetry reading from 2LO on October 11th.

On a recent visit to Germany she met Herman Kesser, the author of "Nurse Henrietta," who was so delighted with her performance in the recent broadcast production of that monodrama, to which he had listened, that he handed her a collection of his plays for translation and adaptation for microphone performance on condition that she, and she only, took the leading parts.

Another B.B.C. Handbook.

The B.B.C. Handbook for 1929 is much heavier (in terms of *avoirdupois*) than its predecessor. Every conceivable activity of the B.B.C. is chronicled with ardour and skill. The technical section is presented very attractively, and I should not be surprised if many an old lady finds that there is more in choke modulation than this world dreams of.

Illustrations abound. There are some really amusing cartoons.

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A Favourite of Yesterday.

"The Man from Toronto" will receive its first broadcast from 2LO on October 3rd. This amusing comedy by Douglas Murray had a long run at the Royalty Theatre, London, some years ago, and has since been successfully revived. The action takes place in the parlour of Mrs. Calthorpe's seaside cottage at Teignmouth, Devon, and deals with the complications which ensue as the result of Mrs. Calthorpe impersonating her own parlourmaid.

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More Plays from 5GB.

Two plays will be heard by listeners to 5GB on October 9th. The first is called "Landing the Shark," by Vivian Tidmarsh, and will be played by Alfred Butler, Janet Eccles, and John Moss. This will be followed by "Temperament," described as "a radio fiasco," by W. H. Roberts. Musical interludes will be given by the Midland Pianoforte Trio.

Mr. Vivian Tidmarsh, by the way, will see his first full length stage play—"Fetters"—produced at the "Q" Theatre, Kew, on October 1st.

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National Chorus Complete

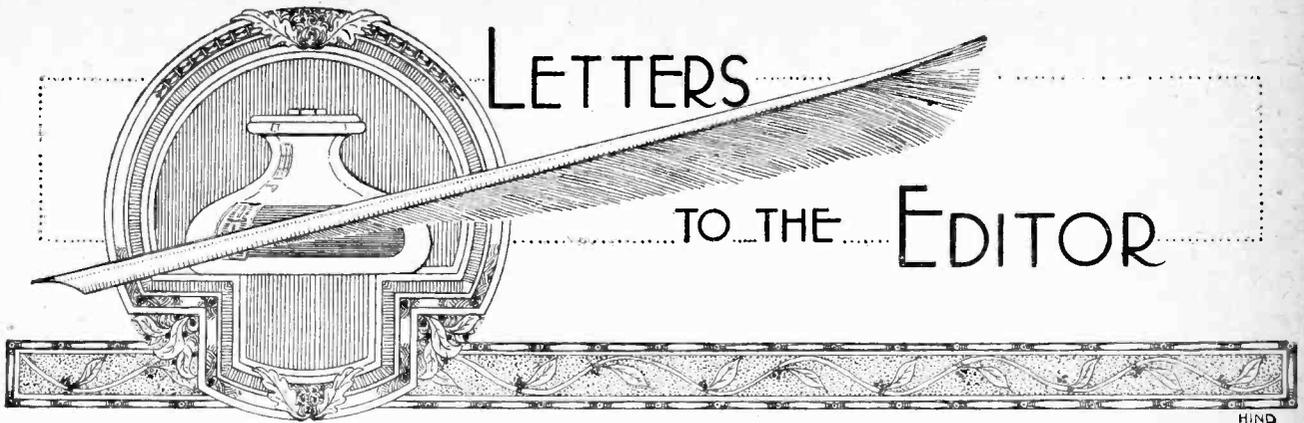
When amateur singers were first invited to join the B.B.C. National Chorus the response was rather disappointing, possibly because the appeal was launched during the holiday season. In the last week or two the pendulum has swung the other way, with the result that the list is now closed and many proficient choralsists have been turned away.

The new chorus, which comprises 250 voices, will perform for the first time at the concert on November 23, when it will take part in a first performance of a new work based on Bunyan's masterpiece, "The Pilgrim's Progress." The Chorus will be heard again in concerts on February 1, March 1, March 29 (Good Friday) and April 12, 1929.

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Broadcasting a School Magazine.

A new feature which is to be introduced into the transmissions to Scottish schools this winter is the Schools Bulletin. This will be broadcast every Monday afternoon and will take the form of a short bulletin of news about schools and their doings all over Scotland. The items will be contributed by the schools themselves and will include news about sport as well as more serious activities. The general style will be somewhat like an all-embracing school magazine covering all the schools in Scotland.



The Editor does not hold himself responsible for the opinions of his correspondents.

Correspondence should be addressed to the Editor, "The Wireless World," Dorset House, Tador Street, E.C.4, and must be accompanied by the writer's name and address

PUSH-PULL AMPLIFICATION.

Sir,—Your recent constructional article on the "DC5" has recalled to my mind a point concerning push-pull amplification which occurred to me some time ago, but which seems to have escaped general notice; at any rate I have never seen it mentioned before.

One feature of the push-pull scheme which has been mentioned is that the circuit does not produce back-coupling—in other words, A.C. potentials due to the speech currents are not thrown across the H.T. supply. The proof of this fact is very easily twisted round, and it leads to the interesting conclusion that A.C. potentials present in the H.T. supply are not thrown across the output choke or transformer. In other words, when drawing H.T. from D.C. mains, it is not necessary to have a smoothing circuit, not even a condenser. If it is required to reduce the voltage, a plain resistance is all that is necessary. Theoretically, of course, the two output valves ought to be matched, and also the two halves of the output transformer; the latter offers no difficulty and matched valves are obtainable. In spite of theory, however, I use two valves which, though of the same make, are decidedly different in characteristics, yet with the aerial disconnected there is perfect silence; these mains are D.C. and moderately noisy. This seems to indicate that with well-matched valves it ought to be possible to work straight off a full wave A.C. rectifier. It is probable that sufficient smoothing for the preceding valves could be obtained by means of condensers with plain resistances instead of chokes. A 100-henry choke has an impedance of about 30,000 w. at 50 cycles, and resistances greater than this would probably be required to reduce the voltage sufficiently for operating the detector and early L.F. valves. Considering the cost of chokes, particularly one to carry the current for two power valves without excessive voltage drop, the advantage of the suggested scheme is obvious.

P. G. DAVIDSON.

Stratford-on-Avon.

LOCAL ATMOSPHERE AND L.S. REPRODUCTION

Sir,—I was very interested in Mr. Pohn's letter in your August 29th issue, in which he refers to the influence of local atmosphere on loud speaker reproduction. I am afraid that if he is correct in his suggestions, all attempts at realism are foredoomed to failure through this cause alone. This is a subject which I happen to have studied as deeply as most, and I write to remove from the minds of your readers all apprehensions resulting from a perusal of Mr. Pohn's letter. Although I have studied acoustics for thirty years I do not know what Mr. Pohn means by the phrase "acoustic attenuation" as applied to wireless transmission and reproduction. The loud speaker converts the electric impulses into sound. Is it suggested that the impulses are attenuated? Then, as to the effect of "local atmosphere," this does not exist to any serious degree in a small room reasonably devoid of resonance. The sound waves generated by the loud speaker are received by

the ear unaffected by the local atmosphere, since no standing waves can interfere in time to vitiate the effect. In a large hall, especially a resonant one, standing waves can and do exercise a profound influence on sounds both produced and reproduced.

One has only to listen to the Westminster Abbey Evensong broadcast to be convinced of the truth of what I say. In an ordinary room the atmosphere of the Abbey predominates triumphantly. The atmosphere is produced by the speaker. There is no artificiality of local atmosphere. Westminster Abbey is projected into one's sitting-room!

This same phenomena occurs in the transmission and reception of drama. But as one increases the power of the reproduced version so one increases the range of local atmospheric interference. Consequently, volume must suit the dimensions of the receiving room.

At the same time, I cannot see that this question of atmosphere seriously affects that of realism. Go to Queen's Hall and listen to Sir Henry Wood's orchestra. Now the actual effect of the music depends on the position of the listener in relation to the performers. You may be uncomfortably near or almost inconveniently remote, though in Queen's Hall I prefer a seat "at the back." Yet I would not like to state that the famous conductor himself is cheated of a realistic effect because of his close proximity to the instruments. What I do say is that the "realism" of the conductor's platform is not the "realism" of the auditorium, but that both effects are realistic. Therefore, who is to pronounce the verdict of non-realism on my loud speaker at home? It is obvious that this question of local atmosphere is beside the point, and that our wireless enthusiasts may still feel that realism is not less within their grasp in the home than it is in the studio or the hall.

NOEL BONAVIA-HUNT.

Hampstead, N.W.6.

TRANSMITTING LICENCES.

Sir,—We are receiving numerous enquiries re design of apparatus to comply with the P.M.G.'s recent remarks on transmitting equipment.

The following articles in back numbers of *The Wireless World* and your sister journal, *Experimental Wireless*, have a useful bearing on the subject:—

"Goyder: Theoretical Account of a Successful Short-wave Transmitting Station." (*Experimental Wireless*, February and March, 1926.)

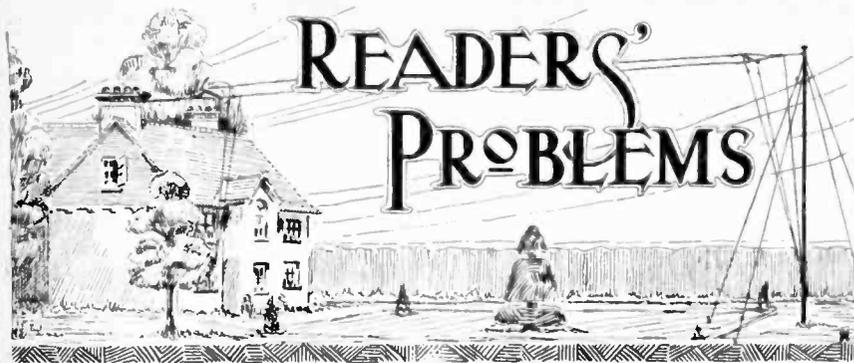
"Hinderlich: Use of Quartz Oscillator as Wavelength Standard." (*The Wireless World*, July 21st, 1926.)

"Goyder: Practical Description of a Successful Short-wave Transmitter." (*Experimental Wireless*, December, 1926, and March, 1927.)

"Bloxham: Details of 50-watt 45-metre Telegraphy and Telephony Set." (*The Wireless World*, April 13th, 1927.)

A. HINDERLICH.

London, N.W.2.



"The Wireless World" Supplies a Free Service of Technical Information

The Service is subject to the rules of the Department, which are printed below; these must be strictly enforced, in the interest of readers themselves. A selection of queries of general interest is dealt with below, in some cases at greater length than would be possible in a letter.

Negligible Resistance.

I am about to wire my house with extension leads for loud speaker connections in different rooms, and, if possible, should like to use 1/22 bell wire for this purpose. Do you consider that its resistance would be excessive?

D. H. F.

The resistance of even a long length of this wire would be almost negligible in comparison with the other resistances in circuit, and on this account you need not fear any trouble. It is possible, however, that capacity effects may be harmful, particularly if the conductors are run close together.

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An Aid to the Deaf.

I understand that it is possible to use a cone loud speaker (which I already possess) as a microphone; would it be possible to modify my receiver (detector and two L.F. stages) so that I could hear conversations in the same room? Although I am very deaf, I can hear the wireless programmes quite well on headphones with my set.

A. E. McE.

Some cone loud speakers work surprisingly well as microphones, and are often

sensitive enough to give signals which would almost certainly be loud enough for your purpose when used with a two-stage L.F. amplifier. We therefore think that it would be worth your while to experiment, and you should try the effect of connecting the loud speaker in the grid circuit of the first L.F. amplifier. If successful, we suggest that you should

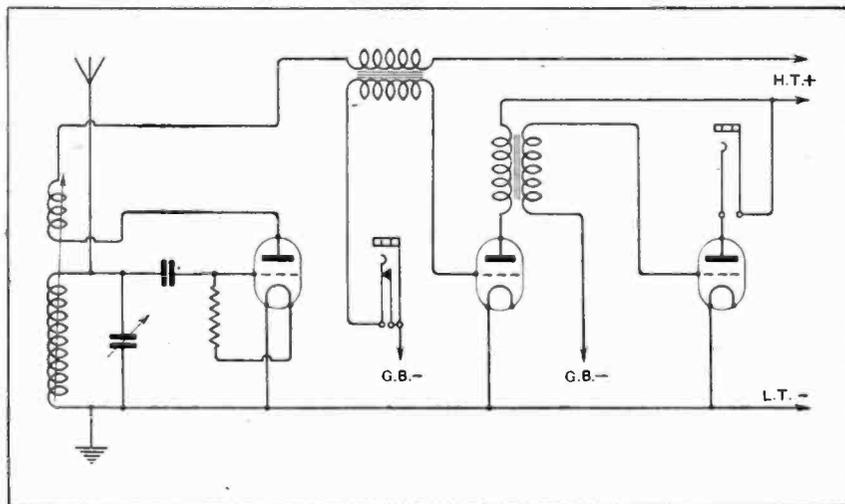


Fig. 1.—Connection of a jack for inserting a microphone in the grid circuit of the first L.F. amplifier.

modify your set by fitting jacks so that the instrument may quickly be changed over when it is desired to use it for wireless reproduction or for speech amplification. A suitable circuit is shown in Fig. 1.

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Ohm's Law Again.

I want to get 120 volts actually on the anode of a valve through a resistance of 80,000 ohms which is inserted in this circuit; what voltage must be applied?

L. A.

It is not possible to give a definite answer to your query without knowing the anode current passed by the valve at the desired voltage. However, you will

find no difficulty in working out the necessary extra voltage when you have ascertained this—from the maker's curve or by actual trial. The "voltage dropped" in the resistance is given by multiplying "current passed" (in amps.) by "resistance" (in ohms). To take an example, we may assume that your valve is found to pass 2 milliamps with 120 volts on the plate and normal grid bias; in this case the figures will be $.002 \times 80,000 = 160$ volts. This voltage must be added to that required, so you would need a total applied pressure of $120 + 160 = 280$ volts.

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Long-wave Frame Aerial.

My "Everyman-Portable" gives good results on the medium broadcast wave-bands, and has ample range, but I notice that signals from 5XX are considerably weaker than those from 5GB. This, I take it, is due to the fact that the frame aerial is "loaded" for long-wave reception; do you think it would be advisable to wind a separate frame for the other wave-band?—F. M. B.

The use of a suitable long-wave frame will certainly result in louder signals, but in an extremely compact set there is some risk of interaction between it and the other winding, unless special precautions are taken, and, in any case, the

RULES.

(1.) Only one question (which must deal with a single specific point) can be answered. Letters must be concisely worded and headed "Information Department."

(2.) Queries must be written on one side of the paper, and diagrams drawn on a separate sheet. A self-addressed stamped envelope must be enclosed for postal reply.

(3.) Designs or circuit diagrams for complete receivers cannot be given: under present-day conditions justice cannot be done to questions of this kind in the course of a letter.

(4.) Practical wiring plans cannot be supplied or considered.

(5.) Designs for components such as L.F. chokes, power transformers, etc., cannot be supplied.

(6.) Queries arising from the construction or operation of receivers must be confined to constructional sets described in "The Wireless World" or to standard manufacturers' receivers.

Readers desiring information on matters beyond the scope of the Information Department are invited to submit suggestions regarding subjects to be treated in future articles or paragraphs.

increase of range will not be very great. Unless you consider the reception of 5XX at the maximum possible distance as being essential, we do not recommend you to modify the receiver.

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Gilding the Lily.

With reference to the "Megavox Three," I should be glad if you would advise me whether it would be practicable to add another valve (super power) to obtain more volume.

H. B.

We would most emphatically dissuade you from attempting to modify the set in the way you propose; the addition of an L.F. valve would be most undesirable and unnecessary.