The Queensland RADIO NEWS

Featured in this Issue:—

The Screen-Grid Solodyne

The DX Transmitter

The Screen-Grid Booster

A MAGAZINE for the SET CONSTRUCTOR & BROADCAST LISTENER

6D

OCTOBER 1st 1928

VOL. IV NO. 9

Registered at the G.P.O., Brisbane for transmission by Post as a Newspaper.

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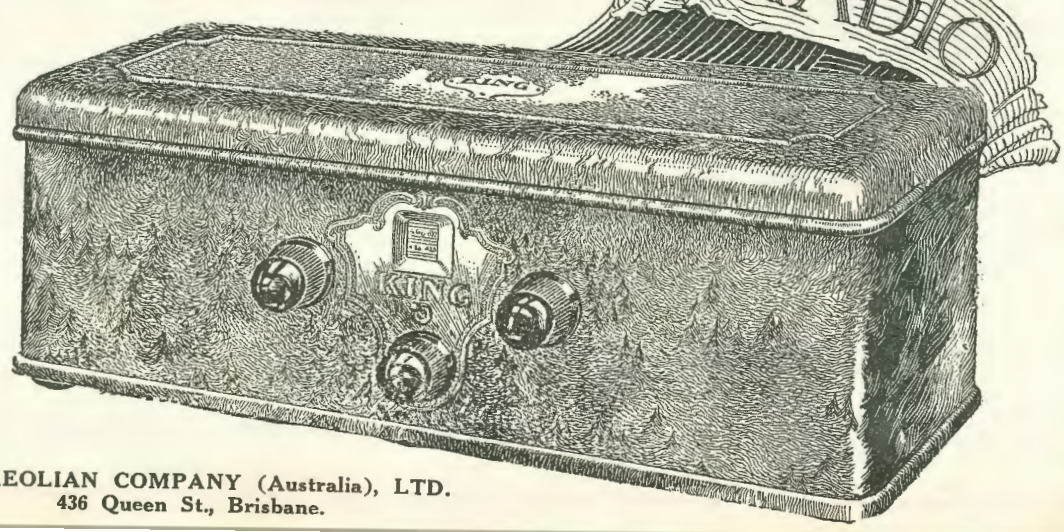

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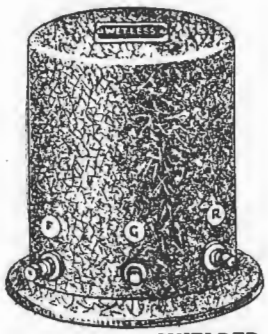

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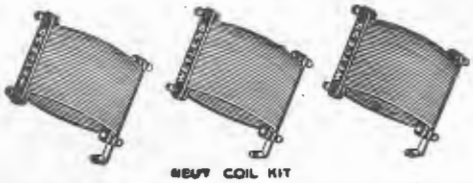

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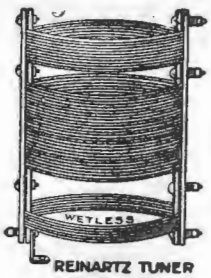

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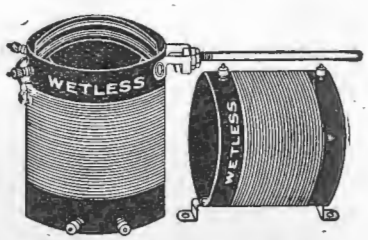

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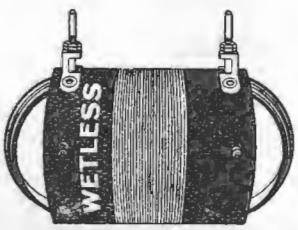

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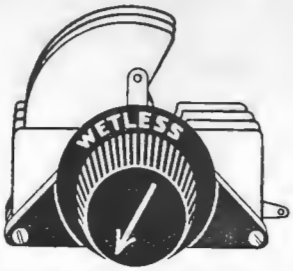

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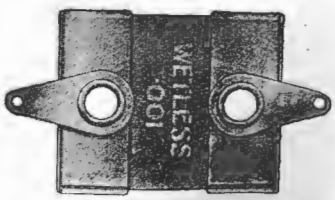

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.003	2/6
.004	2/6
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.0075	3/9
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.00025 (with clips), 2/6 each.

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ALFRED T. BARTLETT
Editor

LEIGHTON GIBSON
Technical Editor

The QUEENSLAND RADIO NEWS

MONDAY, 1st OCTOBER, 1928.

Radio's Highest Calling

THIRTY years ago, when Marconi, then a young and enthusiastic inventor, tapped his key and sent feeble wireless messages from hill-top to hill-top, he dreamed that some day his invention would be used to link together towns and perhaps even countries. As is the way of inventors, he allowed his dreams to carry him further into the realms of fancy, as he visualised what wireless might mean to ships at sea, to nations at war, and to people isolated in the remote parts of the earth.

Never for a moment did Marconi imagine that the magic waves flashing from his crude transmitter would, some day, be harnessed to carry wireless concerts into millions of homes the whole world over. Yet this has happened, and we who enjoy the wonderful companionship of radio in the home to-day, are too often prone to overlook the valuable humanitarian aspect of the service that radio telegraphy has rendered and is rendering to mankind.

If a roll could be called of all the souls that have been saved from death by the messages for aid so miraculously carried by "the divine spark," an astoundingly large and precious inventory of human lives would be accounted for. It is unnecessary for us to detail the proud record wireless telegraphy has to its credit upon the high seas and on the fields of battle. We will content ourselves by reminding our readers of something that happened in Queensland just nineteen months ago.

It will be recalled that, in February of 1927, Northern Queensland was stricken by a devastating cyclone accompanied by floods, resulting in some loss of life and much damage to property. Suddenly, land-line communication between the Northern and Southern ends of the State failed, and the flooded condition of the country made immediate repairs impossible. Grave anxiety was felt for the isolated North, as the last message received over the wires reported rising rivers and impending danger everywhere. Radio once again was commissioned to bridge the gap. Two amateur transmitters—4AN of Brisbane and 4BW of Mareeba (N.Q.) established contact and handled some 6000 words of traffic, keeping the authorities and the public in close touch with developments, and reassuring anxious relatives and friends.

This case is instanced to illustrate what a valuable force radio can become in the everyday life of our Australian people. With its millions of square miles of territory and sparce population, inter-communication between the people of the outback is most necessary. In this connection it is interesting to know that the Australian Inland Mission is using wireless apparatus extensively in its endeavours to maintain contact between the lonely outposts and the Mission's medical and hospital services. Already much suffering has been alleviated and many lives saved.

And so, as we sit in the comfort of our homes and tune in to the many delightful radio programmes that are "on the air," it is well that we should remember that the value of radio is not restricted to its now universal use as a medium of entertainment. Radio has an infinitely higher calling to fulfil: it is the saviour of human life.

The Greatest Broadcast Receiver of the Year!

Five Valves ~ Great Distance ~ Enormous Volume ~
Superb Tone ~ No Interference ~ Easy Tuning!
What more could one want?

The Screen Grid SOLODYNE

DESCRIBED BY THE TECHNICAL EDITOR

NOT long ago, one of our readers said to us: "The trouble with all you radio editors is that every receiver you describe is the 'best yet.' How are we to know which one really is the best in actual practice?" He was a friend, or perhaps he would not have been so refreshingly candid, but the fact remains that, allowing for a reasonable amount of exaggeration, there is a certain element of truth in what he said. Radio is progressing at such a truly remarkable pace that it frequently happens that what is new and wonderful to-day will be passing into the realms of disuse in less than a year, and each month brings forth new developments that cannot be ignored by those who seek to keep themselves abreast of the times. Obviously, it is the duty of any progressive journal such as "The Queensland Radio News" to keep readers posted regarding all that is new and best in the field of radio, and it is to this policy that our friend's remark applies.

It will be recalled that, last March, we featured the Improved Solodyne receiver—a splendid set, described by the writer as "the best five-valve receiver yet tested." Since that time we have published details of several outstanding broadcast receivers, all of them front-rankers, and each having its own particular points of interest. Now we present full construc-

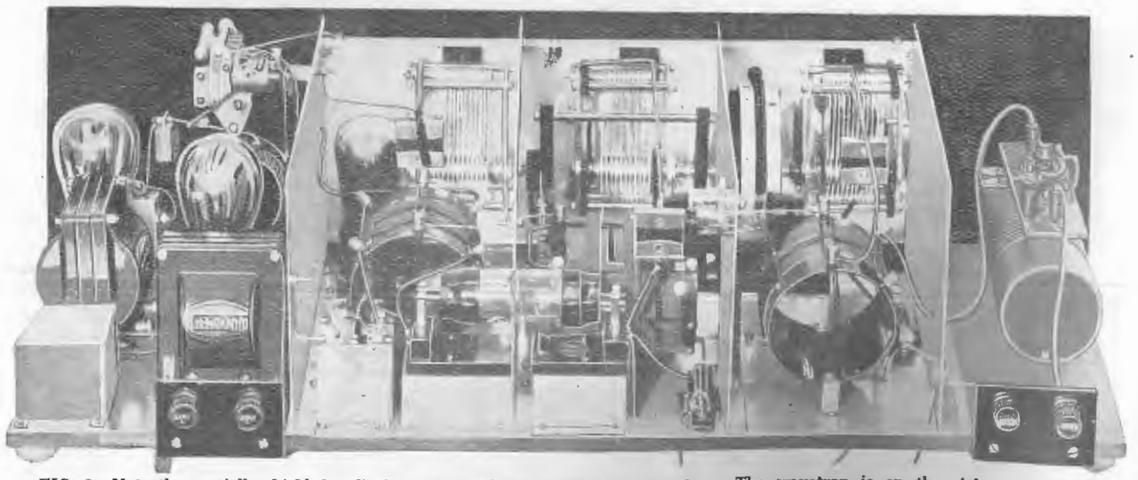


FIG. 2.—Note the partially-shielded radio-frequency and detector compartments. The wavetrap is on the right and the audio amplifier on the extreme left.

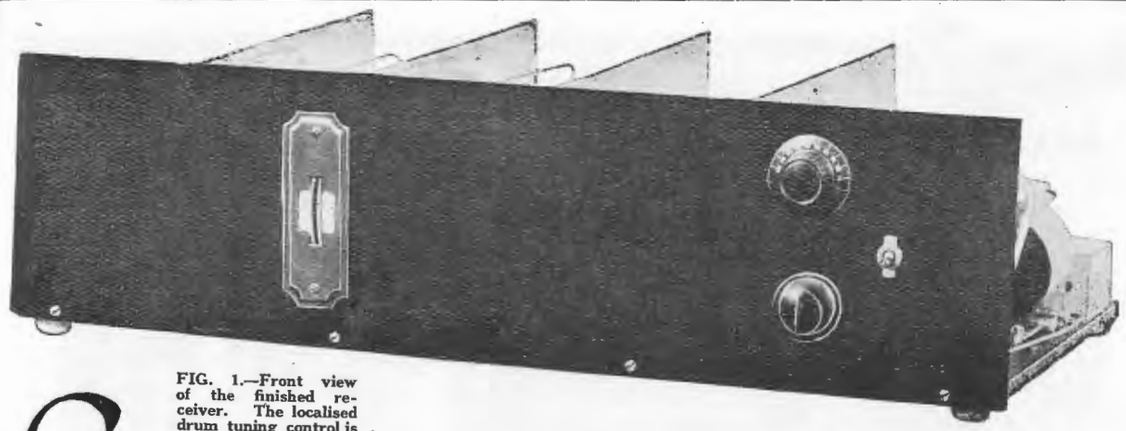


FIG. 1.—Front view of the finished receiver. The localised drum tuning control is plainly visible.

tional particulars of the latest Screen Grid Solodyne—a five-valve receiver destined to delight the hearts of many Australian radio enthusiasts—and again that hard-worked superlative must be brought into use. Yes; we say without hesitation that the Screen Grid Solodyne is the best receiver that has ever been tested by the technical staff of "The Queensland Radio News." This time, though, we amplify that statement by saying that it is not only the best in one particular feature—in sensitivity, power, selectivity, or tone quality; it is its **all-round** excellence that is so impressive—its ability to do all those things that a good receiver should do in theory, but very rarely does in practice.

No doubt you are anxious by this time to know something about the results obtained from the model constructed in our laboratory, and illustrated on these pages. First and foremost, we find an outdoor aerial unnecessary for ordinary entertainment purposes from Interstate stations. It is quite sufficient to utilise a thirty-feet-long indoor wire, tuning in the Southern stations one by one at full loudspeaker strength. Small class "B" stations located in Sydney and Melbourne sound very much more powerful than they are in reality, and the main New Zealand and Japanese stations are remarkably strong. As far as daylight reception is concerned, we find it possible to tune in 2FC and 3AR at 11 o'clock in the morning as a rule. Certainly they are not loud, but they are heard on the speaker, and we regard that as highly satisfactory for summer conditions, and for an area in which reception is at all times anything but ideal, surrounded as we are by a veritable network of electric tram, telephone, electric light and high-tension power lines, all contributing their share of background noises.

Strictly speaking, of course, the Screen Grid Solodyne is not by any means a selective receiver; yet, paradoxical as it may seem, there is not a trace of interference from 4QG when listening to 3LO Melbourne, at a distance of two miles from the local station. This desirable state of affairs is secured by the inclusion of a built-in wavetrap, which has the advantage of permitting an entire absence of interference from the local station, while the receiver is sufficiently broad to make the tuning-in of distant stations a pleasure. A comparatively unselective receiver of this type has another advantage in addition to the absence of critical tuning adjustments: in general, it is found that better tone-quality is obtainable from it than from a highly-selective set—particularly in inexperienced hands—as an improperly tuned "selective" receiver demonstrates a marked cut-off effect with regard to the side-band transmitted by a broadcasting station. Thus it will be seen that the unselective properties of the Screen Grid Solodyne impose no hardships on the operator; rather they have been turned by careful design into an advantage, as has been explained.

Entirely New.

It should be understood at once that the Screen Grid Solodyne is not merely an adaptation of the original Solodyne; it is new from beginning to end, employing components which, for the most part, have been developed especially for the circuit, and it embodies several important improvements over its popular fore-runner. The main innovation is, of course, the use of two screen-grid valves for the radio-frequency amplifying stages, resulting in the complete stability and extreme sensitivity which the correct use of these new valves makes possible. It is usual to secure the high plate-circuit impedance necessary for best operation by utilising the tuned-plate method of coupling between the radio-frequency amplifiers and the detector. In the Screen Grid Solodyne, however, a slight sacrifice has been made as far as amplification is concerned in the interests of stability; this course is justified, because the receiver has such enormous reserve power that the gain in stability is

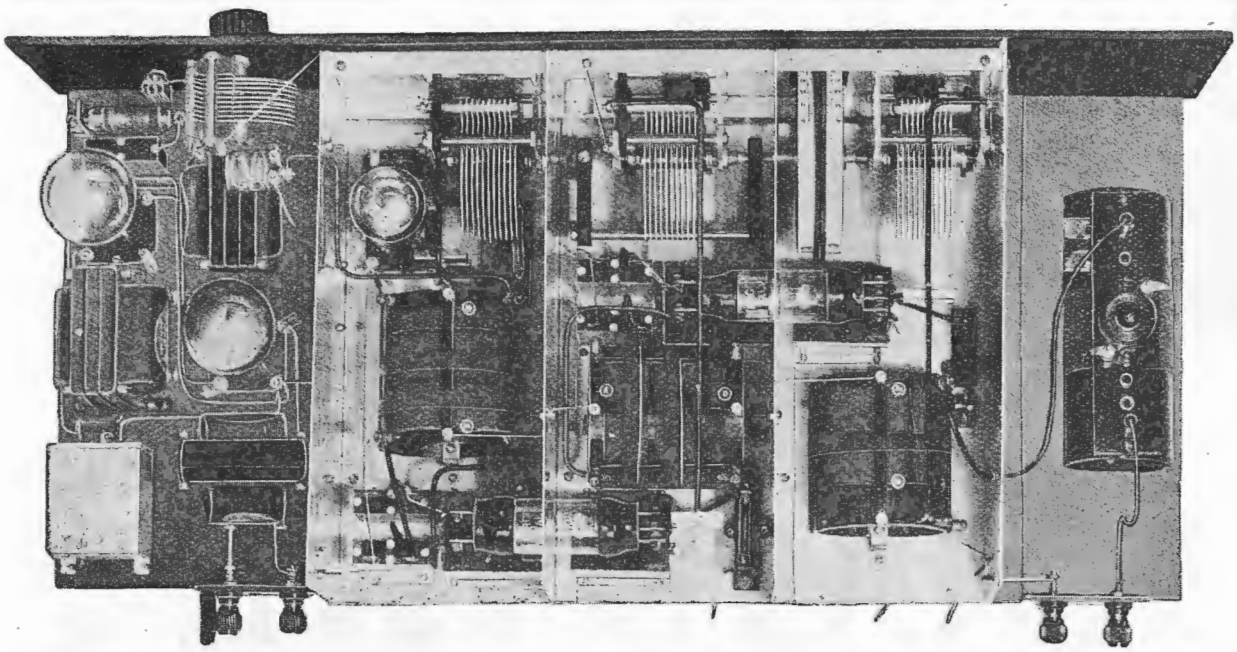


FIG. 3.—Looking down on the Screen Grid Solodyne. The audio amplifying system has been arranged so that very short leads are possible. Notice the horizontally-mounted screen grid valves, which pass through openings in the partition-shields.

well worth while. Radiokes, of Sydney, have placed a special kit of "astatic" coils in production, and these coils are very accurately matched.

In the original Solodyne, it will be remembered that the three radio-frequency input circuits were tuned by a three-gang condenser operated by a single dial. It is an undoubted fact that the task of accurately lining up three tuned circuits so that they will tune in resonance at all points of the wavelength range is practically an impossible one. The input circuits belonging to the second radio-frequency and the detector valves present no great difficulties, but with the first radio-frequency input circuit, it is a different matter. The loading effect introduced by the aerial comes into effect here, with the result that the circuit does not tune in step with the other two circuits. It follows, then, that a receiver in which these three circuits are tuned simultaneously must sacrifice a certain amount of efficiency, particularly at certain wavelengths.

The Screen Grid Solodyne has localised tuning controls, which is a little different from uni-control. The second r.f. and the detector input circuits are ganged, their respective tuning condensers being rotated by a single drum dial. The **first** input circuit, however, is equipped with an individual drum control, located directly alongside the other one, so that it is possible to rotate both drums simultaneously for rough tuning, and then to vary them individually for fine tuning. This is an excellent idea, and one which is found to work extremely well in practice.

It has been said that the Screen Grid Solodyne is not a selective receiver, and that is literally true. However, this defect—if it can be called that—is overcome in an admirable manner by incorporating an efficient wavetrap in the receiver itself. Once adjusted to eliminate an interfering station, this trap can be ignored, and the receiver tunes just as though it were inherently selective, with one noteworthy difference—the tuning on distant stations is not at all critical. In order to develop maximum sensitivity for the reception of weak distant stations, reaction is provided in the detector circuit, and a rheostat in the filament line to the two screen grid valves furnishes a means of reducing the volume—and incidentally increasing the selectivity—when listening to strong stations. In the detector circuit, the new resistance-feed method of supplying plate current at correct voltage is used, this system allowing the usual detector "B" battery tapping to be dispensed with. In the audio-frequency end, no trouble has been spared to secure the best possible quality of reproduction; two high-quality transformer-coupled stages are employed in conjunction with a 1-1 output transformer which isolates the speaker windings completely. For best results, some type of "power-valve" is essential in the last audio stage, and in our receiver Marconi valves have been used throughout.

Construction.

The foundation unit of this receiver is the Cyldon condenser and shield assembly which has been developed by this well-known English manufacturer especially for the Screen Grid Solodyne to the specifications of the inventor. All the necessary shields with the solitary exception of the base-plate are supplied in finished form, so that they may easily and quickly be assembled to form the three compartments containing the two r.f. and the detector stages. It is emphasised that **complete** shielding is not essential to satisfactory operation of the Screen Grid Solodyne; neither a top nor a back shield are used in this set, but the working of the receiver is in no way impaired. Thus it will be apparent that what gives every promise at first sight of being a complicated and difficult receiver to construct becomes, in reality, a job well

within the capacity of the average home-constructor, providing the right components are used and the directions and illustrations followed closely.

A comparatively large panel is required, because it is a great mistake to crowd the components unduly. In our own model, the Radion panel measures 27 x 7 x 3/16 inches, and has an attractive mahogany finish. If the receiver is to be used only in country districts—say, at distances greater than about twenty miles from a large station—the wavetrap may be omitted, and a 23 x 7 inch panel will then be adequate. Very little work is called for in preparing the panel; reference to the panel drilling diagram (Fig. 5) will show that there are only nine holes to be drilled, in addition to the rectangular opening for the drum controls, and the latter is easily made with the aid of the steel template supplied with the Cyldon condenser assembly. The panel is screwed to the edge of a stained pine baseboard measuring 26 x 12¼ x ½ inches, and four rubber feet are screwed to the bottom, one at each corner. On the panel are mounted the condenser assembly with its panel shield (these being secured by two bolts only), the miniature reaction condenser, filament rheostat and battery switch. The four vertical shields supplied with the condenser assembly are fitted into their respective slots and screwed down to the baseboard; before this is done, however, a piece of 24-gauge aluminium measuring 16 x 12 inches is laid on the baseboard, so that it will act as the bottom of the three compartments formed by the shields. All the screws then pass through this aluminium sheet into the baseboard.

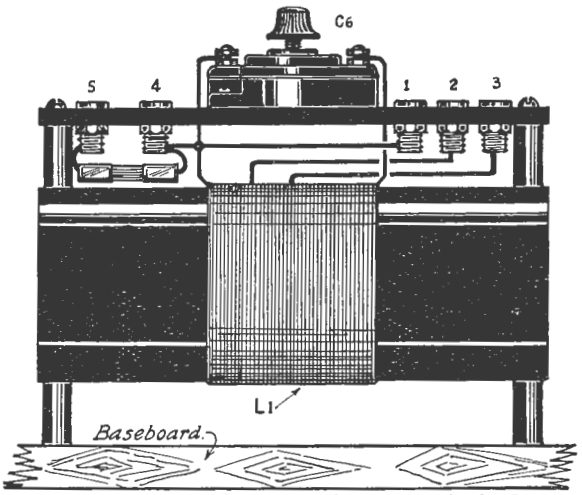


FIG. 4.—The Special Wavetrap incorporated in the Screen Grid Solodyne. This Trap may be used with any receiver with equal success.

The Wavetrap.

In the right-hand compartment (referring to Figs. 2, 3, and 6) will be seen the specially-designed wavetrap. This trap was designed in the "Radio News" laboratory, and performs its duties in a very thorough fashion. It is illustrated in detail in Fig. 4. Sixty turns of 24-gauge double-silk-covered wire are wound on a 6-inch length of 2¼-inch bakelite tubing, tappings being taken at the 15th and 25th turns. On top of the tube, but spaced ¾-inch from it, is mounted a bakelite panel 6 x 1½ inches. In the middle of this panel is mounted a Pilot "Micrograd" condenser tuning from .00015 to .0005 mfd.; this is a variable condenser of the compression type, the capacity being varied by screwing or unscrewing the small bakelite knob. There has been a shortage of these condensers, so that if one is not obtainable, a Cyldon .00025 "Bebe" variable condenser will do quite as well; in fact, any variable condenser having a maximum capacity of .00025-mfd. or higher may be pressed into service. It may not be possible to secure a large condenser to the small bakelite panel, in which case it may quite easily be fixed to the baseboard, or even to the front panel, if desired. At one end of the small bakelite panel are located two "Eagle" sockets ¾-inch apart, while three of the same sockets are inserted in the other end ½-inch apart. Note that socket No. 5 connects to one lug of a .00015-mfd. De Jur fixed condenser; socket 4 connects to the other side of this condenser and also to the beginning of the winding, to one terminal of the variable condenser C6, and to socket 1; the 15th turn tapping goes to socket 2; the 25th turn tapping to socket 3, and the end of the coil to the remaining terminal of C6. The bakelite tube supporting the coil is screwed to the baseboard with ¾-inch spacers interposed. Directly behind the wavetrap, a 3 x 2 inch piece of bakelite fitted with the aerial and earth terminals is attached to the back edge of the baseboard.

Assembly.

Now glance at the right-hand shielded compartment, looking from the back. In this section is housed the first radio-frequency stage, and it contains one half of the holder for the Marconi S.625 screen grid valve, the aerial and grid circuit coil L2, .001-mfd. grid condenser C5, and 1-meg. grid leak R2. Notice that both of the Marconi screen grid valves are mounted in a horizontal position, and pass right through clearance holes cut in the aluminium partitions. In the Cyldon condenser and shield assembly, these holes are already punched, as well as any holes necessary to pass the wiring.

Perhaps a word or two at this point regarding the screen grid valve holders would not be amiss. Unfortunately, the special two-piece valve-holders which several English manufacturers have produced especially for the Screen Grid Solodyne are not yet available in Queensland, so we have made arrangements for the supply of special aluminium supports to enable the Marconi valve-holders to be mounted at the correct height above the baseboard. As these holders are in one piece, it is necessary to cut their bakelite base-plate through the centre, and to bolt the two halves to the supports mentioned. If this is done, no trouble will be experienced in making a very neat and rigid job of the mountings. Be sure to screw down the end having **three** terminals

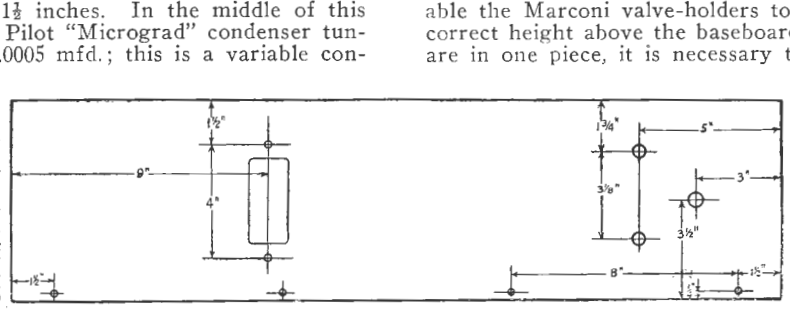


FIG. 5.—Panel-drilling-Diagram: The panel measures 27 x 7 x 3/16in.

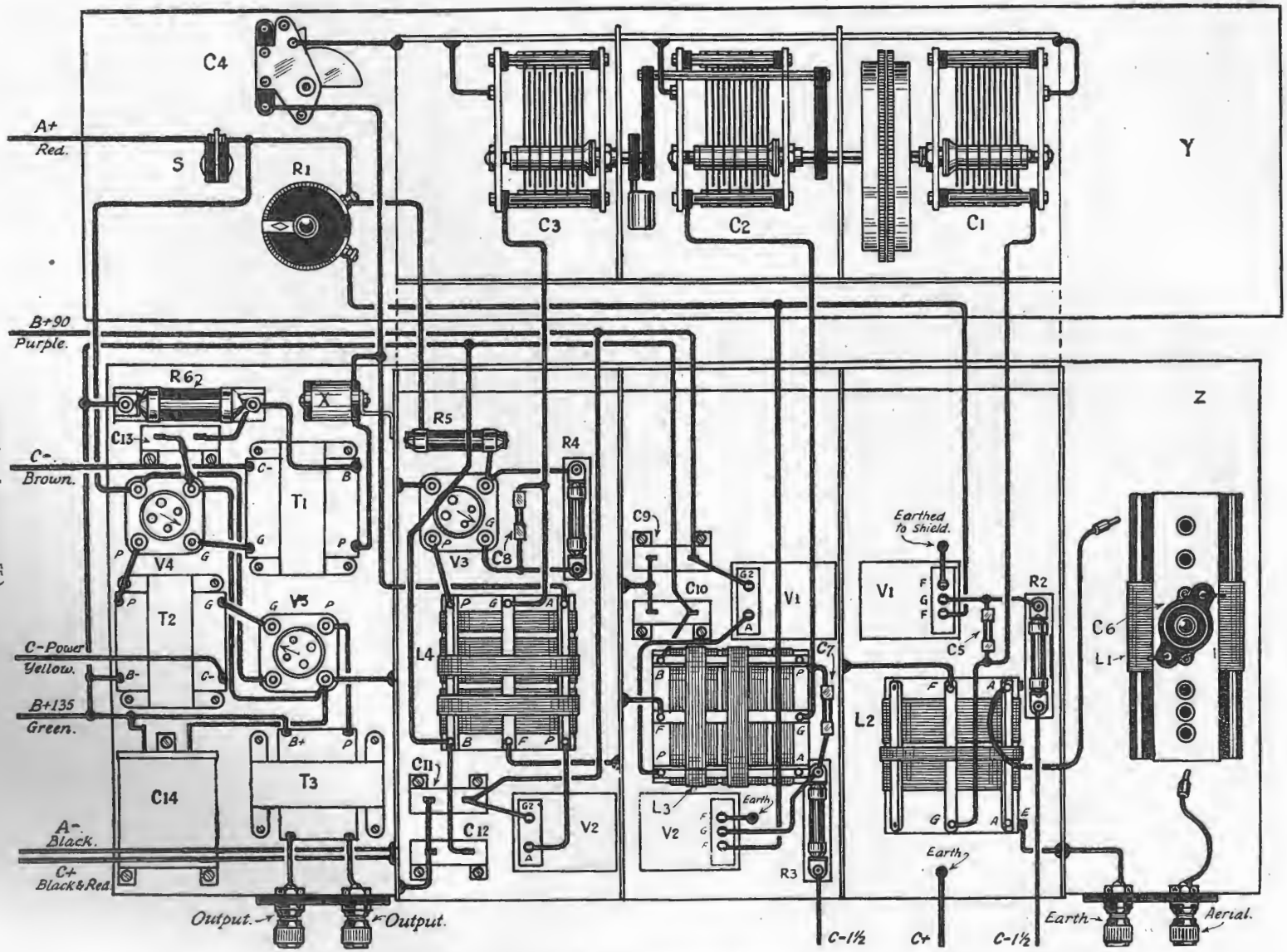


FIG. 6.—Pictorial Wiring Diagram: Every connection is shown, although the drawing does not indicate the exact location of each wire. Run the leads by as direct a route as possible.

(Continued on page 55.)

Why the Weather Affects Radio Reception

Some Facts and Some Unsolved Problems About the Atmosphere and the Pranks It Plays on Transient Radio Waves

By B. FRANCIS DASHIELL.

IF Mark Twain had been a "wireless" operator or a radio fan, he would have been fully justified in making his famous remark that, while everybody always talked about the weather, nobody did anything about it.

In the early days of "wireless" a very disgusted operator threw down his headset and turned to me with the remark, "I hope that some time someone will do something about this weather and climate mixing up with wireless signals." This remark, made on a night when static was bad and distant stations failed to respond to the most alluring adjustments of his detector, expressed for all time the universal and hopeless appeal of all operators and the millions of radio fans yet to come. Even in the first days of wireless telegraphy, there were definite conclusions that the weather and climate had their effect on wireless communication.

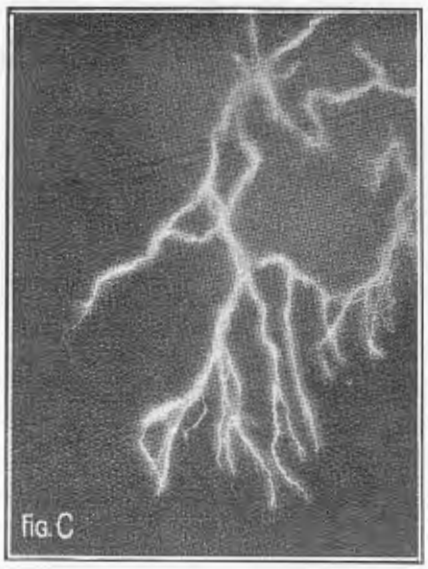


FIG. (c)—Each of these eight strokes caught by the camera, is a transmitter of "static" waves, caught by radio receivers at great distances.

Since that night many years have passed. But the conclusions that weather affects radio are firmly intrenched in the minds of radio people everywhere. And still nothing has been done about it in a remedial way. While more data have been gathered and the correlations have become more and more obvious we still have no sound theories which will stand scientific analysis by the radio engineer and the meteorologist. However, conclusion investigations show that some of these theories must be generally accepted, since they appear quite sound and reasonable.

Static, Fading & Co.

Of all the natural phenomena which affect radio operations, static is the most important for consideration. Static has taken up the attention of radio engineers from the time the first "wireless" apparatus was set up, over 30 years ago. Static will always interfere with radio, at least until some entirely new communication system is invented. No real cure for its persistent manifestations has been found, except at a considerable loss of signal strength. If static is to be entirely eliminated, we must cease using space and the atmosphere for a transmitting medium, and electromagnetic waves must be replaced with some other form of non-electrical energy.

Besides the annoyance of static the radio fan and operator has become familiar with the rapid variations in signal strength, or fading. There has been less observed obvious relationship between signal fading and the weather than in the case of static. Fading signals from a broadcast station are not at all regular; for on one night the fading will be bad, while on the following night none will be noticed. Scientists give many explanations for the causes of fading, some apparently quite accurate, but no one has suggested a real cure. A cure for fading, except for that caused by certain inherent faults in the apparatus, is hardly likely.

Another matter that greatly concerns radio engineers and meteorologists is the phenomenon of variations in signal intensity from day to day. This is a subject upon which many investigators cannot agree. The theories advanced have not held good in all cases, and the proportion of favourable results about balances the number of failures. This fact leaves the situation open for much discussion and future research, and the propounders of these tentative theories are left in a rather temporising position.

This has brought us to three great basic kinds of natural radio interference: static, fading and daily variations in distant-station reception. Each is entirely separate; there is no conclusive evidence that the things affecting one will also affect the others. Therefore, in order properly to discuss the effects of the weather on each, it is necessary to deal with them separately.

Static and Atmospheric Electricity.

We all know what static is, as far as its effects in our radio receiver are manifest, but it would be quite difficult to attempt to show what static actually is. In fact, the keenest minds of science cannot entirely explain all its ramifications and the reasons for its presence in the atmosphere. That it is a form of stray electric charge, wave or current, is agreed to by all.

One should not confuse static electricity with the atmospheric electricity that is known to exist between the surface of the earth and some point beyond. Atmospheric electricity exists above the earth, and has a very definite "potential gradient," increasing

normally in some point of elevation where it becomes constant. It is not believed that this normal potential is changed to any extent by changes in the weather or storms. This electrical potential gradient above the surface of the earth does not, so far as investigation can disclose, cause the stray or foreign static effects. Just what part it takes in radio activities is not known and, for the present, we might as well leave it out of this discussion. Static seems to be entirely free from atmospheric electricity, and of a different kind.

Composition of the Atmosphere.

The earth is surrounded by two great belts of atmospheric distribution. The lower one is known to meteorologists as the troposphere. The outer one is called the stratosphere. Between the two there is a region known as the tropopause. (See Fig. 1.) For instance, a study of recorded temperatures during an ascent throughout the two regions shows definitely that the temperature falls off rather sharply as the distance from the surface of the earth increases towards the tropopause. From that region temperatures remain constant and even are known to increase slightly out into space.

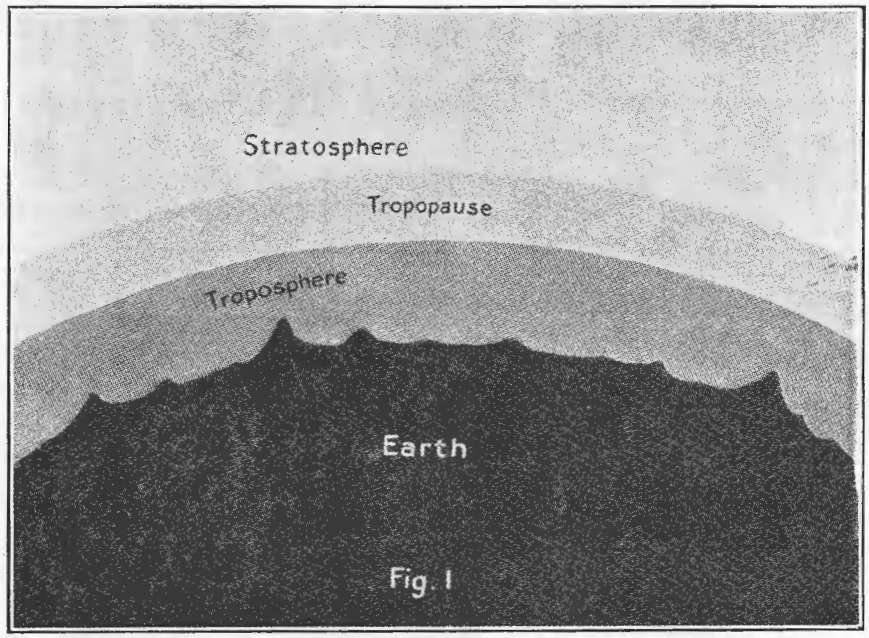


FIG. 1.—The stratosphere is a region above the weather, it does not change in temperature, but its radio "ceiling," the Heaviside Layer, moves up and down under the electrical influence of the sun's rays.

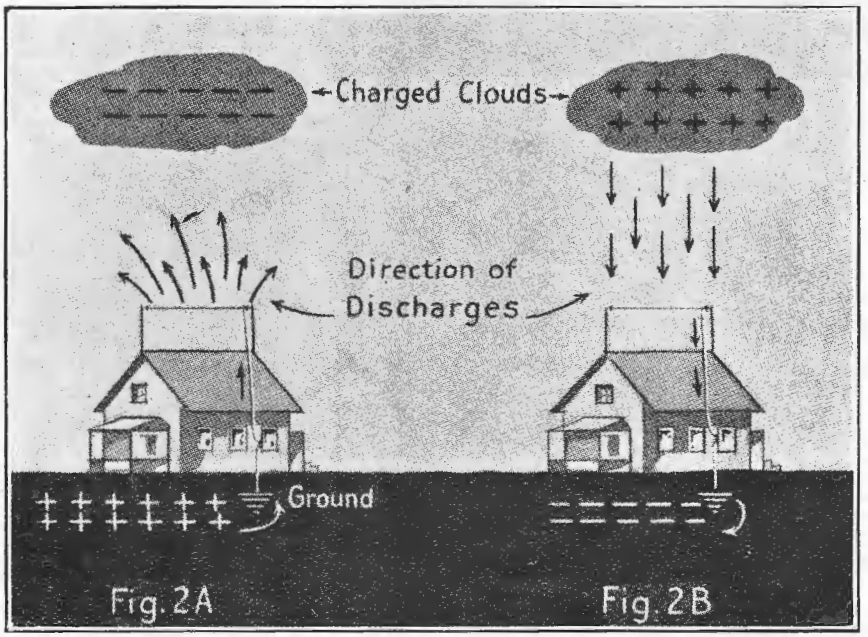


FIG. 2.—We may consider electricity as flowing from the ground to the clouds, attracted by the charge above, as well as in the opposite direction. A very slight discharge of electricity from the aerial into the atmosphere may cause a terrific noise in the speaker.

It is in the lower belt, the troposphere, that our familiar changes in the weather occur. It is believed that this region is the breeding place of atmospheric static and that little or none originates above the tropopause. This latter region, and the belt immediately above, the stratosphere, while not breeding static, affect transmission by the development of much ionisation by day beneath the outer boundary, the Kennelly-Heaviside Layer.

Static is not evenly distributed over the surface of the earth. At times it may cover a relatively small area, while a nearby region may be quite free from its interference. The tropics abound with static, while the polar regions probably never experience static as we know it. During summer static is much stronger and more persistent than in winter.

If we now reconsider the tropopause region, we find that in summer it will rise to higher elevations than in winter, that over the tropics it is always higher than over the polar or temperate regions, and that passing storms, cold waves, and other weather changes cause it to fluctuate in elevation. When the tropopause is relatively higher it means that the depth of the troposphere is greater and more static-producing atmosphere is present; and when the tropopause is lower, there is less static bearing area beneath.

Some believe that considerable static is produced through conflicting and neutralising earth-currents due to irregularities in the flow of normal atmospheric electricity to different portions of the earth, or due to uneven distribution of the replenishment of "ions" to the air from the earth. While it is quite plausible that some earth currents will flow in sudden pulsations up the grounding wires into the radio sets, such is not the rule; rather, it is the exception. The fact that underground antennas eliminate static pulsations to a great extent shows the fallacy of this line of reasoning. On the other hand, aviators and balloonists carrying radio sets while on flights have experienced intense static reception while in the clouds, and often when in clear sky. In fact, aerial receivers, while many hundreds or thousands of feet above the earth's surface, have become so charged with electricity that the antennas had to be disconnected, an operation accompanied by severe sparking and shocks to the aeronauts. It is, therefore, perfectly reasonable to believe that practically all known static is of atmospheric origin.

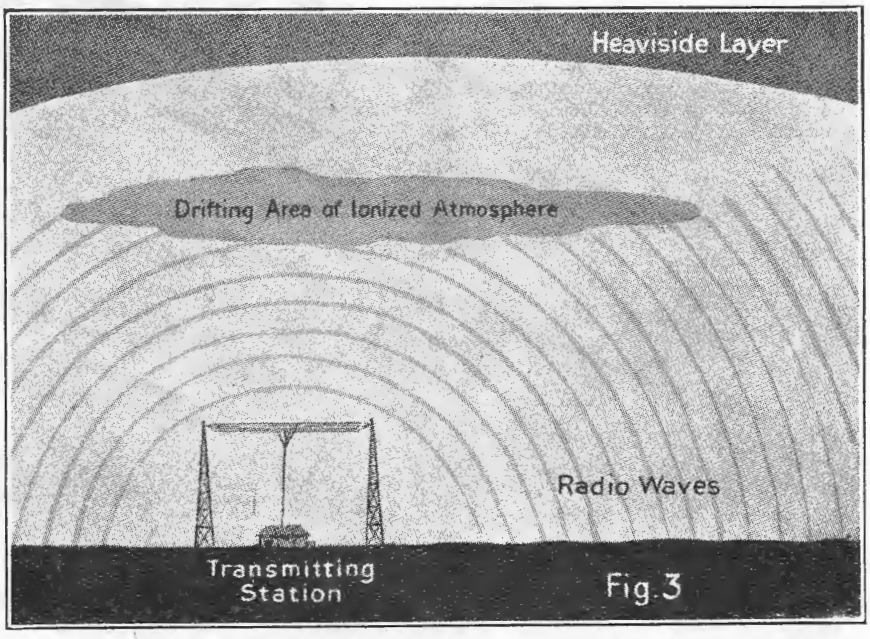


FIG. 3.—The natural boundary of the waves is the Heaviside Layer; but they may be stopped or turned aside by electrified masses of air, very much lower.

No one has been able to determine how atmospheric static is actually produced, except to state that certain meteorological events cause intense ionisation in the atmosphere. If there is any static produced by causes other than weather, those causes have not been fully determined. Of course, this is exclusive of "static" produced by modern electrical and mechanical apparatus.

Ionisation of the Air.

We know that the atmosphere is constantly in a state of agitation. There are warm and cold winds, ascending and descending air currents, dry and humid regions of atmosphere, and underlying land and above. These conditions affect the ionisation of the atmosphere. Whenever the moisture content of the air is great, or when dust is excessive, ionisation may be quite heavy; since ionisation depends upon the presence of electrically-charged atoms and electrons and ions in the atmosphere. The natural gases of the atmosphere may become ionised, but when additional matter is present, in the form of much water vapour or dust, the ionisation is much denser.

Atmospheric ionisation is believed to be caused by impact and friction between atoms and electrons, the electrical charging of the small globules of moisture deposited upon minute dust particles, and the breaking of raindrops, snowflakes or ice particles.. Falling rain may produce great ionisation due to the impact between drops, and their constant breaking and recombining. The drops themselves bring down to earth considerable positive electricity, while the fine spray from breaking drops, when thrown off into the atmosphere, gives a negative ionisation.

From this we see that the atmosphere becomes filled with many millions of small patches or areas of atmospheric gas which is ionised to some degree. Each area, therefore, has its individual electric charge. This charge is sufficient, when it comes into contact with an antenna, to discharge through the radio set with a loud static crash. Even a discharge in the air between oppositely-charged areas at some little distance away will set up a minute electromagnetic wave that will be heard by all sensitive receivers within range. In severe conditions. when the atmosphere is very highly charged, perhaps a thousand or more drifting areas of charged atmospheric gas might drift past an antenna within a minute, each giving off its excessive electricity in the form of a static discharge.

Storms.

When this charged atmospheric condition becomes greatly excessive a thunderstorm will develop. Whenever we have a hot and humid ascending air current which comes into cantact with low-running cooler air currents from above, dense clouds are built up as this rising air condenses into heavy, dark and wet fog. When there is violent cloud activity the electrical ionisation is heavy, and soon the clouds

become charged with a potential of millions of volts. When this potential between clouds having opposite charges, or the clouds and the earth beneath, becomes too great, the strain and stresses in the intervening air space cause a breakdown in the natural insulation and a lightning flash occurs. Powerful electromagnetic waves are sent out for great distances, and affect all radio receivers within the area.

The electrical discharges in a thunderstorm are many and varied. Some are very short and occur between fragmentary portion of one cloud, others between the earth and clouds, and still others between clouds entirely separated. Some lightning flashes are often more than a mile in length. It has been believed that a lightning flash is oscillatory in action, and perhaps some actually are; but recent discoveries have given good indications that it is a one-way current flow creating an electrical surge rather than an oscillation. In any case, whether oscillatory or surging, the current has its powerful electrical field which induces current surges with a static crash in all radio receivers within range.

When we consider the vast amount of electrical energy liberated by a lightning flash, and that it has been estimated that about 1,500 flashes are occurring each minute throughout the world, it is no small wonder that a little static may be heard in sensitive receivers at nearly any time.

Thunder, which is the sound of air expansion due to the heat liberated by the lightning flash, travels as a sound wave, while the lightning flash travels as a light and electrical wave. One may see a lightning flash and hear it as static simultaneously, while the thunder will be heard many seconds later.

Types of Static.

When a charged cloud or other area is passing overhead, it attracts or induces an opposite charge in the ground area beneath. As the attracted charge flows along the earth's surface at the same rate as the cloud's travel, some of it flows up the ground wires of radio receivers and discharges into the air through the antennas. (See fig. 2A). These momentary surges of the earth charge give rise to severe static crashes in the receiver. Induced current in the antenna also produce similar symptoms as they flow down into the earth. (See Fig. 2B.)

Static noises have been classified into a few different types, such as "grinders," "clicks," "hisses," etc. It is obvious that each classification is produced by an entirely different source. The static crash of lightning is different in sound from the little clicks and hisses caused by patches or areas of drifting electrified atmospheric gas, such as may be noticed on clear, hot and dry days in summer.

Intense static may be produced by hot dry winds. These winds carry a great deal of dust, and there are cases on record when the air has been so highly charged that ignition systems of automobiles have been serious interfered with; and fences, windmills and other metal objects have become charged to such a high potential that severe shocks were experienced by those touching the objects. During such occasions radio sets produced a constant static roar and much greater interference than during a thunderstorm.

The fact that atmospheric static is produced while the air is undergoing changes that precede and accompany rainy or generally bad weather has been used as a method of forecasting weather. When a night of static freedom is followed immediately by increasing static noises, it is safe to assume that a change to unsettled or bad weather will result within twelve hours or more. With the use of a directional loop antenna, an expert might be able to locate approaching storm centres a day or so in advance with some fair degree of reliability. However, this is merely an experimental matter which cannot be relied upon as accurate.

What is Fading ?

Signal fading, that peculiar phenomenon which causes radio signals to rise and fall in intensity, at times with remarkable regularity, but mostly with an uncertain and irregular periodicity, seems to be not of meteorological origin. Without doubht, fading eventually will be found to be directly related to changing conditions in the conductivity of the total atmosphere, especially the outer ionised portion of the stratosphere, variations in the height or level of the Heaviside Layer, or perhaps to some extent in counter earth-currents which may affect the uniformity of the transmitted earth wave to some slight degree.

However, it is likely that a certain amount of fading is due to atmospheric conditions. This is an assumption only, although years of meteorological and radio correlations seem to indicate that such may be the case. It appears that this form of fading results from large movements of ionised atmosphere drifting past transmitting or receiving stations, mostly the former. It is quite likely that the conductivity of the mass of ionised air is of sufficient importance to affect the transmission of the electromagnetic waves being broadcast out from the antenna of the transmitting station directly below. The action is that of an absorbing and deflecting blanket spread over the transmitter, which effectively prevents all of the power of the emitted wave from passing on and up toward the Heaviside Layer. (See Fig. 3.) Thus, the variations in the transmitted wave are similar to power variations; and the result is that the received signal will vary in intensity. This form of fading is slight compared to that produced through other natural phenomena.

Much has been said about the effect of whether on the intensity of radio signals. It seeks to be true that this occurs; but the correlation is generally associated with temperature more than with air pressure, except that pressure and temperature always are directly related. In other words, reception is best, and reaches over greater distances, during clear cold weather, and is not so satisfactory, relatively, in warm and stormy weather. Regardless of the time of year, temperature is higher during cloudy and stormy periods and lower when the whether is clear and the air pressure higher. Clearing weather is associated with a fall in temperature, and is decidely more favorable to the best radio reception and freedom from static.

The Weather Map and Radio.

Some investigators have found that, when two different weather areas, or centers of differing air pressure, are indicated on a weather map, reception will be best along a line drawn connecting the centers of the two pressure areas. Such a line will then cross the "isobars," which are lines connecting points of equal air pressure. There is no sound reason for

this theory. Certainly there is nothing known to meteorology to justify it, yet on the face it is quite obvious. However, exceptions to the rule are such that the theory cannot be accepted as conclusive.

In this case, we might best consider temperature lines or "isotherms," which are lines connecting points of "equal temperature," and their relation to air pressure. Isotherms and isobars are seldom parallel; the former being mostly at right angles to the latter. Therefore, if we are to say that reception is best along a direction which is across the isobars, it is then best in a direction mostly parallel to the isotherms, or at least through an area of equal temperature. While the continuity of isotherms is often broken, due to local temperature conditions, elevation, etc., the writer holds that reception is best through an area of equal temperature, which may or may not be across the isobars.

Summing up the meteorological effects which stand out as the most obvious, we have:

Sources of Radio Trouble.

Static produced by drifting, and irregular densities, of charged atmospheric gases coming in contact with the antenna.

Static produced through wave effects created by electrical discharges between the differing potentials of charged masses of gas, clouds, and the earth's surface below (lightning).

Static produced through surges of earth currents due to attraction of overhead atmospheric and cloud charges.

Static produced through induction in the antenna and receiver because of passing overhead cloud and atmospheric charges.

Fading produced by great drifting ionised masses in the atmosphere, which, after the normal conductivity of the air and prevent all of the power of the emitted wave from passing on up toward the Heaviside Layer.

Fading produced by ionised areas interfering with the deflected portion of the received wave as it comes down from the Heaviside Layer.

Fading produced by earth currents and surges up the ground wire in opposition to, or partial neutralisation of, the radio wave because of the attraction of passing overhead atmospheric and cloud charges.

Good Radio Weather.

Good reception will be noted during clear and cold weather with little static disturbance.

Poor reception, as a rule, during warm and cloudy weather with much static interference. Even when distant reception is good, the noise level is too great for good reception.

Good reception, as a rule, when the direction is through an area of equal temperature, parallel to isotherms, or across isobars.

Eucharistic Congress Broadcasts Cause Radio Stir

Apart altogether from the religious significance of holding such a great gathering as the 29th International Eucharistic Congress in Sydney, the event has focussed world-wide attention on Australia through the medium of broadcasting.

The response from countries situated in every part of the globe received by the N.S.W. Broadcasting Company constitutes a record as the comments on the short wave transmissions have been received from Canada, U.S.A., several of the South American Republics, Mexico, Japan, Java, India, South Africa, and from several European countries. In every instance the message was of a congratulatory nature.

Not alone did the congratulations come from overseas countries, but every State in Australia, New Zealand and the Pacific Islands have notified the broadcasting stations controlled by the N.S.W. Broadcasting Company Limited of the wonderful success of the transmissions of the Eucharistic Congress. Not only have beams, telegrams, and cables reached the company, but the letters of thanks and congratulations which still continue to pour in every day in the company's mail, promise to create a record.

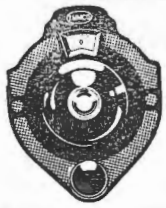
To those outside the immediate precincts of the broadcasting stations, little is known of what a colossal task the transmitting and relaying of the Congress constituted. To carry out this work well over 2000 miles of land line was used, quite apart from the rebroadcasting that was done direct by air. Every State in Australia was linked up, while the overseas countries had the opportunity of relaying on short waves of either 31.7 or 28.5. In some instances at night time, relays were also carried out by air from the long wavelengths.

Another phase which called for a considerable amount of labour, was the actual wiring of St. Mary's Cathedral and the showground, so that the best results from an acoustic point of view could be secured. Never before had such a battery of microphones been brought into use, and some of the management and engineering staff of the N.S.W. Broadcasting Co. Ltd. spent days in co-operation with the authorities of St. Mary's Cathedral, testing out the capacity of the microphone to give the best results when broadcasting massed choral music. But that this work was not in vain is demonstrated by the constant references in all the correspondence received by the company, to the wonderful success of the broadcasting of the massed music.

TESTED AND RECOMMENDED

A Department of Investigation, conducted for the benefit of our readers. Every piece of material featured on these pages is subjected to a rigorous and searching test before publication. No remuneration is received for the publication of these paragraphs.

EMMCO VELMO VERNIER DIALS.



The Electricity Meter Manufacturing Company has specialised in the manufacture of vernier dials, and Emmco vernier dials have been used on thousands of radio sets, both amateur built and factory-made alike. Three types hitherto have been in general use—the Standard, the De Luxe, and the Back Panel Dial. Now the factory has introduced a new general-purpose model made in two sizes, called the Velmo. This latest addition to the line, with a metal rotor, not celluloid, is designed for both clockwise and anti-clockwise movements, fitting any condenser without alteration. The gear ratio in both sizes is 10 to 1, a reasonable reduction, and one which has been found most convenient in actual service.

The mounting is simple, a set-screw in the rotor locking on to the condenser spindle, the moving parts being neatly hidden by a nickel cap in the centre of the attractively designed escutcheon plate, which is available in bright black or mahogany bakelite. The regular size model takes up a panel space of 5¼ inches by 4¼ inches, while the Baby Velmo measures only 3½ inches by 2¾ inches, and is especially suitable for use on portable sets.

Our samples are from the manufacturers, Messrs. Electricity Meter Manufacturing Co., of Sydney.

* * * *

MAGNAVOX DYNAMIC POWER SPEAKERS.

In the United States of America, the trend in modern loudspeaker design appears to be towards the electro-dynamic cone, according to figures recently published in an American journal. The name Magnavox has long been associated with the best type of dynamic speaker, and that this famous company has not lagged behind in the race for supremacy is amply proven by the performance of their latest models. The distributors for Magnavox (Messrs. Mick Simmons Ltd., Queen Street, Brisbane) have just opened up a shipment of the new 1929 models of Magnavox dynamic power cone speakers, and, at their invitation, we have been able to subject a sample of the Dynamic 80 Model, fitted in a "Beverley" cabinet, to a searching test. In these days of so many "good" loudspeakers, a really outstanding standard must be reached to merit the title of "best." Under actual operating conditions, however, the Dynamic 80 attained to an almost unbelievable pinnacle of excellence, and we can honestly say that it gave better all-round results than we have heard from any other speaker so far tested.

The electro-dynamic type of reproducing unit incorporates a field solenoid which requires a source of direct-current supply to energise it. Magnavox manufactures four distinct types of unit: Dynamic 7 operates from 110 to 220-volt D.C. mains, many country towns having a direct-current power supply; Dynamic 6 draws its field current from a 6-volt accumulator—from the receiver "A" battery, if desired; Dynamic 8 requires a 6 to 12-volt battery supply, but will work on a small battery charger of the "dry" type; Dynamic 80 includes a transformer and rectifier, enabling it to operate from the ordinary 240-volt A.C. house-lighting mains.

Due to the inherent properties of the dynamic unit, the Magnavox dynamic cones will handle almost unlimited volume with no trace of distortion, and the bass notes are not only audible—they are as clear and distinctly defined as the treble. The result is a balance and fullness of rendition which must be heard to be appreciated. Certainly these speakers are a little more costly than the average cone—that is to be expected—but for those who want the absolute best and are prepared to pay for it, they will be of considerable interest. Illustrated here is the "Beverley" Dynamic 80 Model, tested in the "Radio News" laboratory.

* * * *

H. & H. VALVE SOCKETS.

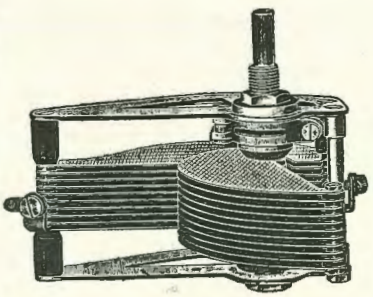
Formerly two models of valve sockets, known as the "Suregrip Pussyfut" sockets in bakelite and porcelain, were manufactured by Messrs. Hart & Hegeman Manufacturing Co., who are large electrical and radio accessory manufacturers. While originally designed for the old U.V. base valves, the Suregrip sockets, by reason of the special nickelled springs fitted—springs which embraced two sides of each valve-pin, making a rubbing, smooth, clean contact—were equally suitable for U.X. base valves. Enormous numbers of these sockets were sold in Australia, and are still being used and sold; in fact, many amateurs and set builders will affirm that there has never been a better socket.

Now Messrs. Hart and Hegeman have introduced two new models, which conform more to present day practice, fitting the U.X. base valves and being flat on the top, with the correct sized holes for the pins of this valve. However, it is good to note that the excellent contact springs which were the feature that made the older model sockets such great favourites are still retained exactly the same as in the original model, while the same distinctive terminals which suit either fingers, pliers, spanner, or screwdriver, are also part of the equipment. Both bakelite and porcelain models are made, and both have our fullest recommendation. Messrs Edgar V. Hudson are the distributors.

* * * *

JACKSON VARIABLE CONDENSERS.

From Messrs. A. Beal Pritchett (Aust.) Ltd., we have received a sample of the Jackson condenser, manufactured in England by Messrs. Jackson Bros., of London. The Jackson condenser is a high-grade instrument of excellent design electrically and mechanically. The specially shaped plates give the wide wavelength range and overlap of the ordinary condenser, while retaining the ease of tuning usually associated with condensers of much smaller capacity. The plates and spindle are of brass, the bearings of steel, and the end-plates are highly finished in nickel-plate. A very small amount of hard-rubber insulation is used, located as far as possible from the most intense portion of the electrostatic field, while provision is made for either single-hole panel mounting or baseboard mounting by means of two screws. A cleverly-designed band-brake permits just the correct amount of "drag" being applied to the movement; this is a splendid feature, particularly when the condenser is to be used with a vernier dial that is inclined to slip. Positive contact between the rotor and the end-plates is assured by the use of a braided copper pig-tail, and the terminals are equipped with soldering lugs. Altogether the Jackson condenser is an extremely attractive job, and can be recommended to set builders who require condensers of high quality at a medium price.



A Resume of

October Programmes from 4QG

MONDAY, October 1st.—George Sampson's party; studio concert.

TUESDAY, October 2nd.—Olsen and Goodchap's concert; Cadenza Plectral Club.

WEDNESDAY, October 3rd.—Dance music by the Studio Syncopators; studio concert.

THURSDAY, October 4th.—Mr. Erich John's party.

FRIDAY, October 5th.—Band music by the Federal Band; Mr. Arthur Sharman's party of radio artists.

SATURDAY, October 6th.—Orchestral music from the Savoy Theatre; recital by the London Trio.

SUNDAY, October 7th.—Morning and evening services from St. John's Anglican Cathedral; band music by the Citizens' and Municipal Concert Bands.

MONDAY, October 8th.—A recital by Gladys Frost (piano) and Lena Hammond (contralto), followed by a studio programme.

TUESDAY, October 9th.—A Kipling recital; Studio Instrumental Quartette.

WEDNESDAY, October 10th.—A dance night by the Studio Syncopators, interspersed with vocal items.

THURSDAY, October 11th.—Band music by the Municipal Concert Band.

FRIDAY, October 12th.—Mr. Sydney May's party will give a special programme from the studio.

SATURDAY, October 13th.—Commercial Travellers' Association smoke concert.

SUNDAY, October 14th.—Morning and evening services from St. Stephen's Roman Catholic Cathedral; band concerts—afternoon and evening.

MONDAY, October 15th.—A radio play, "The Jewel Ring of Mahomet," followed by a studio programme.

TUESDAY, October 16th.—Mr. Eric Hayne's party; Brisbane Apollo Club; gramophone recital.

WEDNESDAY, October 17th.—Dance music by the Studio Syncopators.

THURSDAY, October 18th.—Programme by Mr. Erich John's party.

FRIDAY, October 19th.—A concert programme relayed from the Methodist Hall, Coorparoo.

SATURDAY, October 20th.—London Trio; Speedway broadcasts and dance music from Lennons.

SUNDAY, October 21st.—Morning and evening services from St. Andrew's Church of England; Federal and Municipal Concert Bands.

MONDAY, October 22nd.—Tivoli Operatic Orchestra, followed by a nautical night.

TUESDAY, October 23rd.—Brisbane Municipal Concert Band.

WEDNESDAY, October 24th.—Concert by the Brisbane Apollo Club.

THURSDAY, October 25th.—Radio play, "The Jewel Ring of Mahomet"; Studio Instrumental Quartette.

FRIDAY, October 26th.—Dance music by Alf. Featherstone and his Orchestra.

SATURDAY, October 27th.—Portion of the St. David's Society Eisteddfod will be relayed from All Saints' Hall; Speedway broadcasts and dance music from Lennon's ballroom.

SUNDAY, October 28th.—Complete morning and evening services from St. John's Anglican Cathedral; afternoon and evening band music.

MONDAY, October 29th.—One-act drama, "The Reprobate"; studio concert.

TUESDAY, October 30th.—George Sampson's party; studio concert.

WEDNESDAY, October 31st.—Dance music by the Studio Syncopators; studio programme.

Radio Dealers Here is a messa

IN every town, district or centre where we are not already represented we want authorised RADIOLA Dealers.

¶ RADIOLAS are built by Australia's foremost radio organisation, of the highest quality material possible, and carry a definite twelve months' guarantee. The New RADIOLAS sell readily because of their efficiency — outstanding performance, purity of tone, and simplicity of control. They have a wide range. and can be had both as Battery operated or all-electric models.

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As RADIOLA Dealers we want those who will energetically work their territory, and those who can properly instal the RADIOLAS they sell.

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(Please mention this Advertisement when Writing)

DIOLA DEALER

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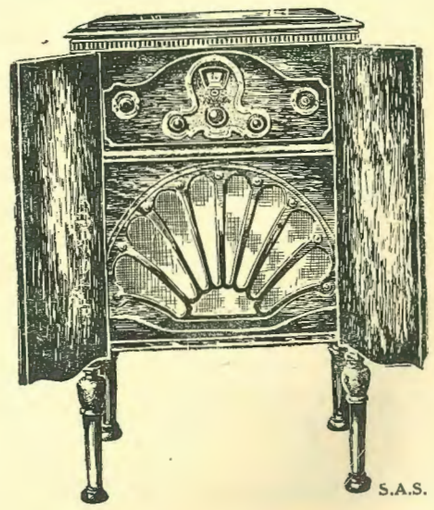
Amalgamated Wireless (Australasia) Ltd.



S.A.S.

FRESH from the factory!

Throughout the Commonwealth, "Ever-Ready" Radio Batteries—"A," "B" and "C"—are famed for their long life, all-round reliability, and unequalled economy. So keen has been the appreciation of their worth that, to-day, "Ever-Ready" sales are greater than ever before—an infallible indication that these wonder batteries justify in full measure the confidence reposed in them by hundreds of thousands of users all over Australia.

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Write us now for the interesting folder, in two colours, about "Ever-Ready" Radio Batteries. It contains many valuable economy hints for "B" battery users. Name and address of nearest dealer gladly posted on request.

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Why Pay More?

EVER-READY RADIO BATTERIES

SAFETY FIRST — UTILITY ALWAYS

LOOK FOR THE TRADE MARK

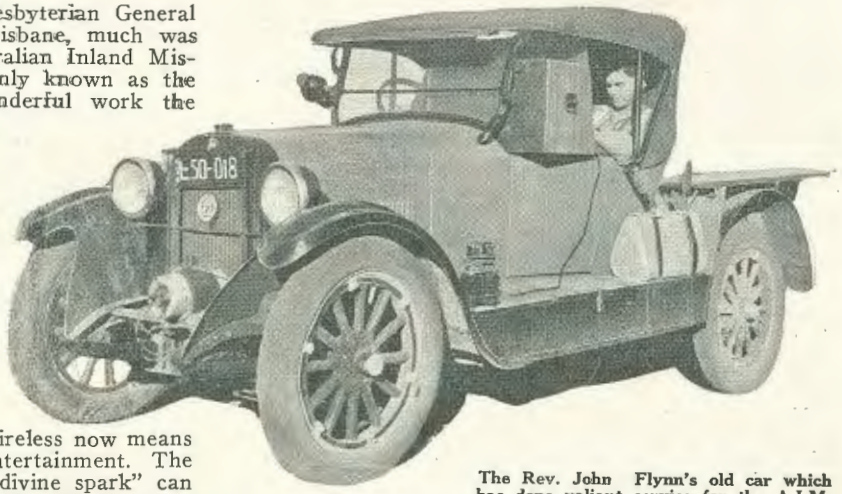
Linking up the Lonely Outback

The Australian Inland Mission finds Wireless of Great Assistance in Rendering a Wonderful Service to the People of the Lonely Outback

DURING the recent Presbyterian General Assembly, held in Brisbane, much was heard about the Australian Inland Mission (or more commonly known as the A.I.M.), and the wonderful work the officers of this organisation are rendering to people in the lonely outback.

The main objective of the A.I.M. is to provide an Aerial Medical Service to isolated outback districts, and to link them up with existing ambulance and hospital services.

To assist in the attainment of this objective, wireless has been called into service, and already has been the means of relieving many sufferers and saving many lives. To these lonely bushmen, wireless now means something more than a source of entertainment. The A.I.M. has shown them how "the divine spark" can serve a very valuable purpose in keeping him in touch with civilisation. By installing small transmitters and teaching bushmen a knowledge of the Morse code, the A.I.M. has provided these hardy pioneers with a link with which they may call for assistance or information whenever they feel the need.



The Rev. John Flynn's old car which has done valiant service for the A.I.M. in the backblocks.

The photograph shown at the top of this page depicts the Rev. John Flynn's car, in which is housed the A.I.M.'s Portable Wireless Station 8XT (formerly 8AC). This car travels around the north of South Australia, Central Australia, and South-western Queensland. The generator, which can be seen mounted between the dumb-irons, is driven from an extension of the crankshaft, whilst the transmitter and receiver are accommodated in one cabinet, which is set up against the windscreen. The power supply is controlled by and provided through the ignition switch and self-starter of the car. The operator seated at his post can work for hours at a time without discomforture. Low-tension current is provided by the car battery for both receiver and transmitter.

Officers of the A.I.M. testing out a transmitter.

The second picture shows one of the small transmitting and receiving sets used, temporarily, by the A.I.M. for outlying stations. Mr. Alfred Traeger, chief operator, is at the key and standing (right to left) are Messrs. E. Gollan (assistant wireless operator), George Towns (hon. wireless assistant), and the Rev. George Scott (Patrol Padre of the A.I.M. for Western Queensland).

The A.I.M. have published a booklet entitled "The Inlander," and in it is set forth a record of experiments

and accomplishments the organisation has to its credit. Written by the Rev. John Flynn, Superintendent, it describes the history very clearly and, perhaps, we could do no better than quote his remarks on the subject:

For practical purposes, the Inland is dumb ! Those who dwell beyond the tiny townships, or larger sheep stations on the fringes, are too far apart from neighbours either to speak across the fence (which generally is an imaginary line only) or to exchange visits. The usual method of having a yarn with one's neighbours is to go to the races, which are held once a year—if there isn't a drought on, and if there has been no earthquake lately in local politics. . . . . .

To alter conditions by multiplying official telegraph stations is not practicable, owing to the absence of real community centres. Although more official stations must come, the only effective remedy is a wireless transmitting station at every isolated habitation.

A counsel of perfection? Well, perfection is not a bad ideal. And, in view of the fact that an Aerial Medical Service would be 75 per cent. futile without something of the kind, the A.I.M. has been studying the possibilities for the last ten years.

It was not till early in 1925 that any method of promise—for efficiency and inexpensiveness—came into view. Our Superintendent then planned to arrange for action the following year, when certain urgent tasks had been disposed of.

Yet, within a month, came developments. Mr. George Towns happened to hear of our plans, and offered his services (in an honorary capacity) to try out wireless apparatus in the field.

Such an offer could not be declined! Preparations were immediately put in hand for Mr. Towns to join Mr. Flynn on a journey via Beltana, Innamincka, Birdsville, back to Marree, thence to Oodnadatta and Alice Springs. Mr. E. T. Fisk, managing director of A.W.A., hastened to fulfil an old promise to arrange the gift of much valuable apparatus whenever it could be used; the wireless amateurs of Sydney, Melbourne and Adelaide rendered enthusiastic service—we would have to name an army, but dare not start. Messrs. Barker and Kauper, of Adelaide, handled most of our traffic during following experiments.

Of the trials that beset our start we do not speak, save to remark that we set out to investigate difficulties and found them all twice over. That was fortunate, for it made us hasten slowly before recommending anything to anybody. Amid the weariness of "small hours" and disappointments galore, we were able to point to morse messages safetly put over the air from Beltana, Innamincka, Cordillo Downs, and Birdsville, etc.; all from gear (8 AC) hastily assembled (some beautiful, some "junk") and set up temporarily by the wayside as we travelled. Our day of triumph was at Oodnadatta, when we learned (a month after the event) that our speech through wireless telephone from Cordillo Downs station (80 miles north of Innamincka) had been successfully picked up by Mr. Hall—a visitor with a roughly made receiving set at Murnpeowie, about 300 miles by air.

Further experiments, intended to be carried out at Alice Springs (8 AB) with more powerful gear had to be deferred, owing to delay in establishment of the electrical equipment at the Nursing Home, so Mr. Towns returned to Sydney without the satisfaction of handling a set with some "punch."

But the main fact was reached. No one with a car (with a bank behind) need be dumb in the bush. Yet it was all too expensive for our purpose.

Search and thought were continued, by all concerned, for some inexpensive means by which any "bush battler"—with no "power plant"—could make himself heard over the air for a distance of 100 miles or so.

Choice finally passed by telephony altogether, in favour of a spark coil (for "interrupted continuous" high tension current on the plate of the valve) fed by a battery of Edison primary cells, as specially designed for use in railway automatic signalling. The same cells provided current for filaments of valves, both in transmitter and receiver, while the usual dry battery cared for plate current in the latter.

So, late in 1926, Mr. Alf. Traeger, of Adelaide, joined Mr. Flynn to test out the latest "hope." Again we wallowed in minor troubles and disappointments; but eventually 8AB, telephony, was heard regularly as far as Adelaide, and quite easily at our two field stations—Hermannsburg (8AD) 80 miles west, and Arltunga (8AE) 70 miles east. Morse signals from the "baby" stations generally came in well during evening, always in early morning. Good work was done during some tests (morning) between 8AD and 8AE direct.

Thus the second fact was established. We had a wireless station completely self-contained, transmitter and receiver, working over 150 miles each morning (as far as tests went, in the worst time of the year), and costing well under £100.

So our vision grew—a sprinkling of "Mother" stations, each in charge of some good-natured persons, generally honorary, able to send out telephone messages and news, or advice, at certain times of the day (mostly early and late), and all around each a medley of "Baby" stations—squeaking out brief questions and thanks for replies, etc., in morse (which, however slow, gets there all the same and more so!)

But we were not satisfied. Gear was clumsy, comparatively expensive in packing, freight and maintenance. Search was continued for something with all those simple virtues, without the bulky and fluid batteries, etc.

Experiments have been continued "in the laboratory" ever since those field tests were completed. It

is too soon to speak until more field tests are concluded. But hopes are strong that our ideal is within reach, viz., an efficient wireless station, transmitter and receiver, absolutely self-contained, with a range of 100 miles for part of each day (morse messages), fairly fool-proof, costing no more than £50, and weighing (packed) not more than a half-cwt.

We have arrived? No, alas! We have not even started! Such baby outfits would be useless without a fairly complete system, in which they are units only. Wonderfully patient "Mother" stations would cost much more to reply with messages always easily audible in telephony. And beyond and above all is the necessity of some agency to teach the bush people —first, to touch wireless at all; second, to operate the gear well enough to receive telephony on low wavelength (80 metre band) and to transmit brief messages in slow morse; third, to maintain the gear in working order.

The sympathy of the Postmaster-General's Department is assured; in fact, we might say it is overflowing. More official stations are certain, but the peculiar conditions of life out there call for every man (and every woman) to master the art of long-distance conversation. **They need this comfort every day, and more so every night.** After all, powerful stations for official use are no "comfort" daily—only useful helps in rare days of trouble. We wish to end that deadly dumbness of the outer bush; we think it can be done, but it will be hard to do; just how it is to be done is not yet quite clear, but we are continuing to feel for the way.

Words can hardly convey thanks to Mr. Harry Kauper, our laboratory Godfather, and Mr. D. Wyles, now of New Zealand, who helped so much in early years to open up a practical plan of experiment. Messrs. Towns and Traeger have won our deepest gratitude; wireless amateurs everywhere have shown a ready, sporting co-operation that compels admiration, and ensures success; the staffs both in A.W.A. and in the Postmaster-General's Department have never failed with patient assistance in any problem placed before them. Thanks to all!

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Its high place in the universe of Radio Efficiency will be maintained owing to its exceptional features.

The Maxum is designed to operate sets up to and including seven valves.

Weighing only 15 pounds, it is complete in a metal case measuring 8½ x 5 x 8½ inches. A cable provides for seven fixed voltages with the leads marked for B—Det. Radio, Ground, Audio—Intermediate audio, and B positive maximum. By the knob control on the top of the case a variation of 20 volts for all tappings, together with the total output, is obtainable. This control is invaluable in checking line voltage variations.

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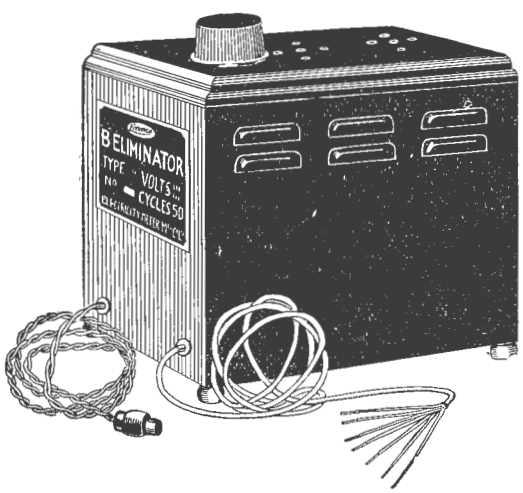
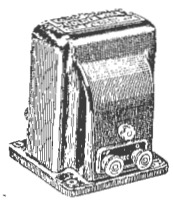


The products shown on this page are the very latest from the largest radio parts' manufacturers in the Commonwealth. Eliminators and transformers, all carrying the well-known Emmco guarantee, and proving their worth to an ever-increasing army of radio users.

GOLDEN VOICE



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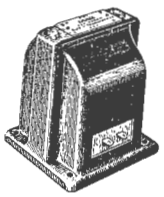

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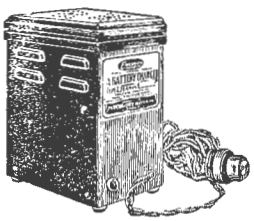

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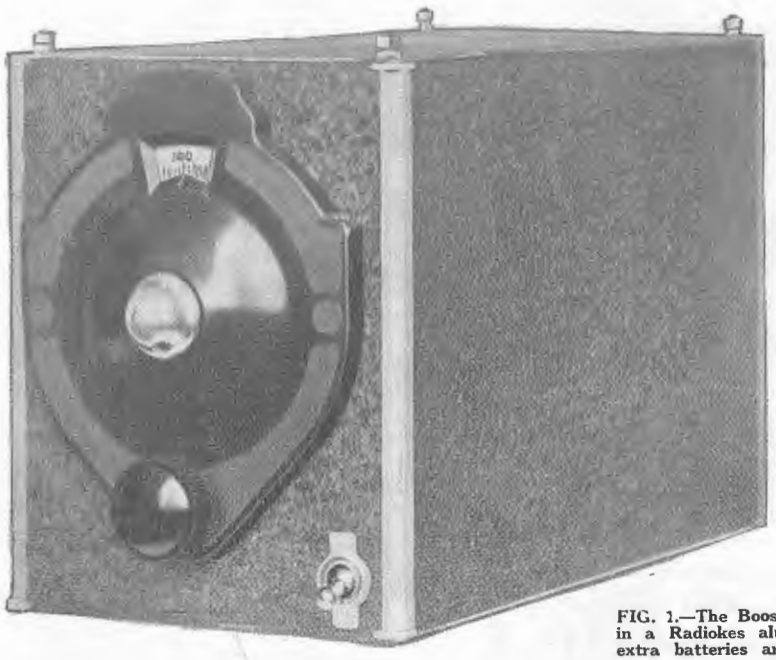


FIG. 1.—The Booster is totally enclosed in a Radiokes aluminium Shield. No extra batteries are needed.

The Screen Grid Booster

For Your Broadcast Receiver

In the following article we present constructional details of what we consider to be one of the most valuable pieces of apparatus yet described in these pages. A midget in size, but a giant in performance— that is the only adequate description we can think of for the "Q.R.N." Screen Grid Booster. Read on, and see what this remarkable new unit will do when connected to your broadcast receiver.

By the TECHNICAL EDITOR.

THE introduction of the screen grid valve has opened up a great new field for development in the realm of radio-frequency amplification. Not only has this type of valve an amplification of something like ten times that of a valve of the ordinary three-electrode type, but the very small effective capacity which exists between the control grid and the plate makes for extreme stability, so that in many cases neutralisation of a screen grid amplifier is unnecessary.

We must adjust ourselves to the idea that the screen grid valve is here to stay. This does not mean that the three-electrode valve will rapidly become obsolete; on the contrary, this old friend which has served us so well, still will be called upon to do so in many ways. For some purposes, however, the screen grid valve offers so many advantages that its claims cannot be ignored.

There is one feature of the screened valve which militates against its use becoming universal for some time to come—it is not interchangeable with a valve of the ordinary type, and for that reason, it is not feasible simply to remove, say, your old 201.A radio-frequency amplifying valves and replace them with U.X.222 (screen grid) valves. In order to extract the greatest benefit from its use, the valve and its associated coils and condensers must be carefully shielded—that is, enclosed in a metal compartment which ensures that there shall be no undesirable interaction between the circuit so shielded and any exterior circuit.

While carrying out experimental work with the radio-frequency unit of the "Globe Trotter

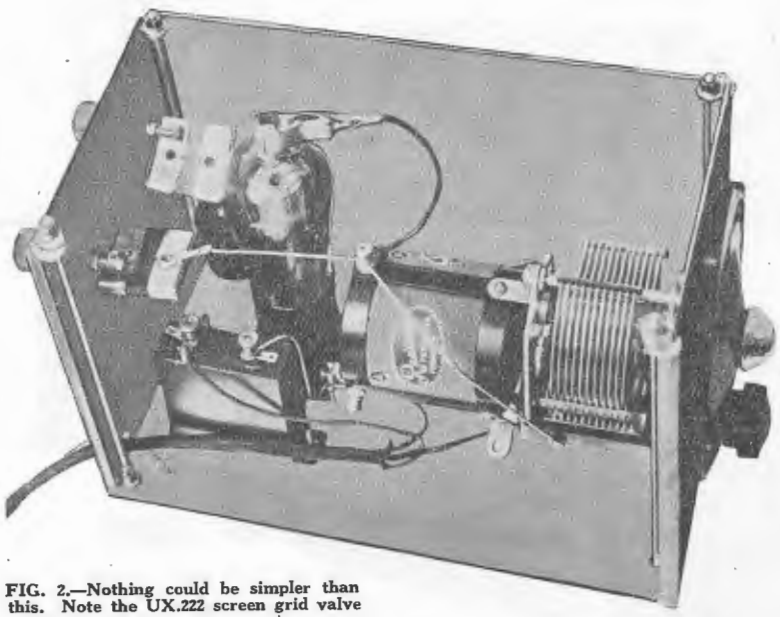


FIG. 2.—Nothing could be simpler than this. Note the UX.222 screen grid valve

Screen Grid Four" (described in our last issue), the idea occurred to us that a similar unit adapted to suit the broadcast wavelengths would be of immense value to those who already have good unshielded receivers. The next step was to design such a unit—one that would be sufficiently flexible to enable it to be easily adapted to almost any existing broadcast receiver, would give a high degree of amplification, be simple to construct, requiring no bothersome fitting or machine work, and, above all, a unit that would be inexpensive to build and maintain.

By dint of careful design, it has been possible to embody **all** of these things, to the Nth degree, in the "Q.R.N." Screen Grid Booster.

Knock-down Shields.

The construction of aluminium compartments is a difficult business to the average man, and a job that is often shirked. Realising this, we were particularly pleased to find that the kit of knock-down shields recently placed on the market by the Radiokes people proved to be just the thing for our purpose—in fact, one would think it had been designed especially for the Booster. This kit comprises all the material required for the assembly of a particularly neat aluminium box measuring 9 x 6 x 5 inches. The parts are already drilled, slotted and machined, and the exterior is finished in a handsome black crystalline lacquer.

There is not much to describe in the circuit, which is illustrated diagramatically in Fig. 3. Fundamentally, it is a straightforward radio-frequency amplifier circuit using few parts. The aerial is capacity-coupled to the tuned input circuit L1—C1, while the radio-frequency output of the valve is fed to the existing receiving set via the fixed isolating condenser C3, plate current being drawn through the choke X. Surrounding the plate of the valve will be seen the screen grid, represented by the dotted lines. Following standard practice, this grid is biassed positively, a connection being made with a suitable tapping on the ordinary "B" battery, while the bypass condenser C4 takes of any radio-frequency currents. The earth terminal is connected to the shield itself, and a switch is provided to control the valve filament.

Simple Layout.

It is most convenient to drill the panel, back and bottom of the aluminium box before it is assembled, and this will be found much less tiresome an operation than drilling a bakelite panel. The spindle of the tuning condenser is located 3¼ inches from the bottom edge of the front panel, in the middle, while the battery switch—which should be of either of the two makes specified in the list of parts—is ⅝-inch in from the right-hand side, and the same distance from the bottom. The holes for the condenser screw-holes are marked from the template supplied with it, and the same applies to the vernier dial. In the back of the box, three Belling-Lee bakelite terminals are mounted in line, 1½ inches apart and 4½ inches from the bottom edge. The two outside terminals must be insulated from the aluminium, which is the reason why these particular terminals were chosen. It is merely necessary to drill a hole large enough to accommodate the bakelite shoulder, and to slip a washer made from a scrap of bakelite on the inside, after which the brass washer and nut are run on. Of course, it is possible to utilise ordinary terminals by drilling clearance holes in the aluminium and mounting the terminals on a bakelite strip. The middle (earth)

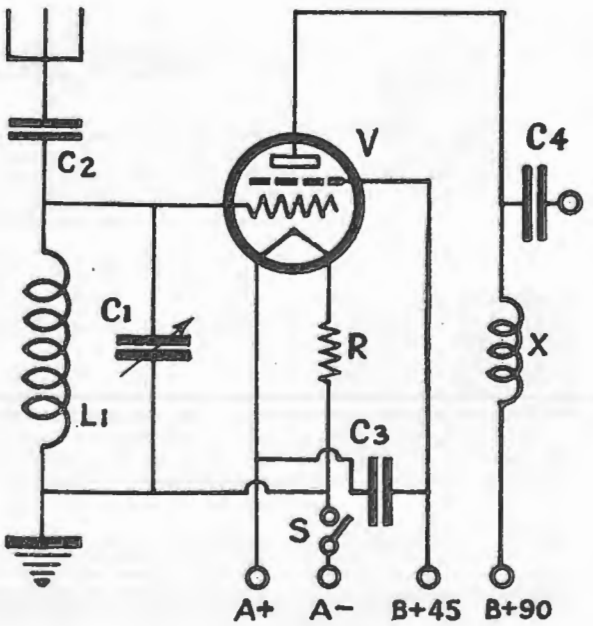


FIG. 3.—Conventional Circuit Diagram.

terminal is **not** insulated; a brass washer is used on the inside so that it will make contact with the aluminium. At the bottom right-hand corner (looking from the back) a hole is drilled to pass the battery cable, and it is just as well to make this on the large side.

The valve socket V, by-pass condenser C4, and Tempryte R should now be laid out on the bottom of the box in the approximate positions shown in the illustrations, and the screw-holes marked and drilled; one hole is sufficient for each. Make sure that the arrow on the valve socket points in the direction shown in the pictorial diagram (Fig. 4).

Before mounting these parts permanently, the coil L1 has to be considered. In our own model of the Booster, we used the antenna coil from a Radiokes Master Browning-Drake coil kit. This coil is ideally suited to the purpose, and, we understand, is available separately at a reasonable cost. A suitable coil can, however, be produced at home by winding 65 turns of 26-gauge D.C.C. wire on a bakelite tube 2 inches in diameter. There are no tappings, but a brass bracket should be fashioned to permit the coil being attached to the back of the tuning condenser.

The brass foot of the radio-frequency choke is attached directly to the plate terminal of the valve socket, thus eliminating a screw-hole. It will be seen in the pictorial diagram that the two fixed condensers C2 and C3 are secured to their respective terminals, the lug being clamped under the nut.

When all the components have been securely mounted, the instrument is ready to be wired; we used 18-guage tinned copper wire for this purpose. As only four battery wires are used, one must be removed from the five-wire cable. Just cut it off short at each end, being careful that you cut the same one. The wires in our cable were coloured red, black, brown, green and yellow. We eliminated the brown wire, and used the others as follows: Black (A—) to one side of the battery switch S; Red (A†) to one filament terminal of the valve socket V; Green (B†45) to the by-pass condenser C4. Yellow (B†90) to the r.f. choke X. The remainder of the wiring is explained by the pictorial diagram, but it should be noted that a flexible wire equipped with a clip runs from one end of the coil to the grid terminal on top of the valve. It is convenient when wiring the Booster to remove one side from the box, replacing it afterwards. When the unit has been completed and tested the top is clamped on tightly by means of the nuts furnished with the shields.

The Booster in Operation.

Throughout this article, we have taken it for granted that a Radiotron U.X.222 valve, similar to the one we have employed, shall be used by the constructor. It is, of course, possible to utilise any of the well-known makes of screen grid valves with good results, but, as no standard design with regard to mounting has so far been adopted, some changes would have to be made. It is not proposed to go into this matter here; it is a minor point, amounting merely to the transposition of one or two wires on the valve socket, and can easily be accomplished by anyone with average intelligence, capable of following the instructions issued with the valves.

The Radiotron U.X.222 valve used in the Booster illustrated gives excellent results, and the drawings are correct for this particular type. Before ordering the parts, however, one must be sure as to what size of "A" battery is used for the receiver to which it is intended to be connected. If a 4-volt battery is used, the Tempryte must have a resistance of 5 ohms; if the battery is of the 6-volt type, a 20 ohm Tempryte must be inserted in the clips. Make quite certain about this point—it is most important.

The screen grid Booster, as previously mentioned, will operate satisfactorily in conjunction with almost any valve receiver. We have tested it with Browning-Drakes, Neutrodynes, three-valve sets of various types, Solodynes, and several commercial receivers, and the results have been excellent in every case.

To connect the Booster to your receiver, proceed as follows: Remove aerial and earth wires from your set, and attach them to the terminals so marked on the Booster. The Booster should be placed as close to the receiver as possible, and an insulated wire (to

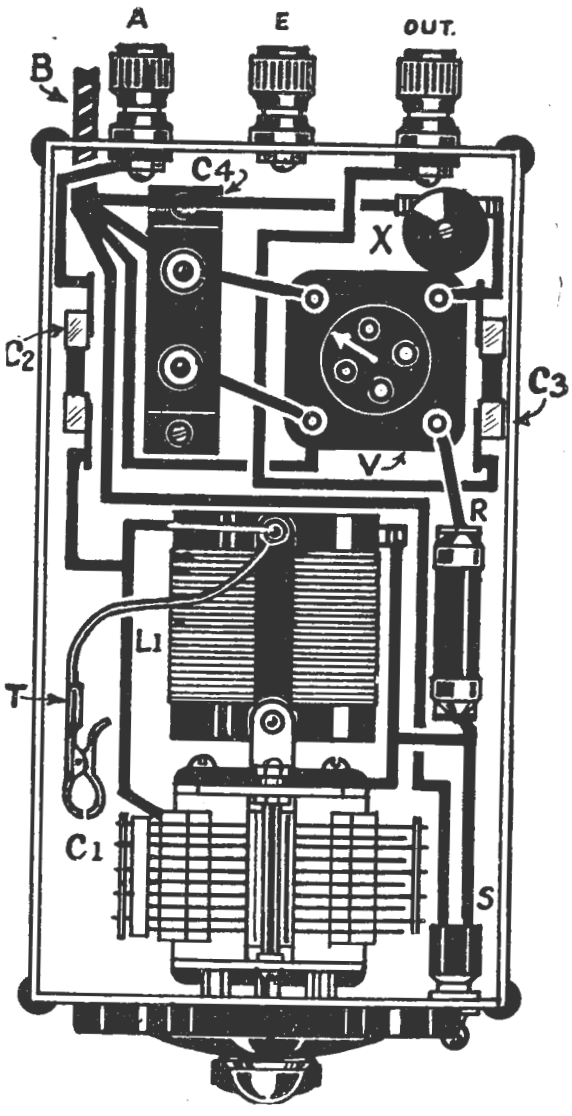


FIG. 4.—The Symbols on this Pictorial Diagram agree with those appearing in the list of parts.

which a clip has been attached) is run from the "output" terminal of the Booster **to a terminal or wire connected with the fixed plates of the variable condenser in your set which is nearest the aerial end.** The battery cable is then connected:—"A—" to the negative terminal of your "A" battery, and "A†" to the positive terminal, **leaving the battery wires from your set untouched.** "B†90" goes to the maximum "B" battery voltage you have; 90 will do, but 135 is much better. "B†45" is connected to a tapping on the "B" battery that gives somewhere about half the voltage applied to "B†90," or a little less; try varying this for yourself.

Tuning with the Booster.

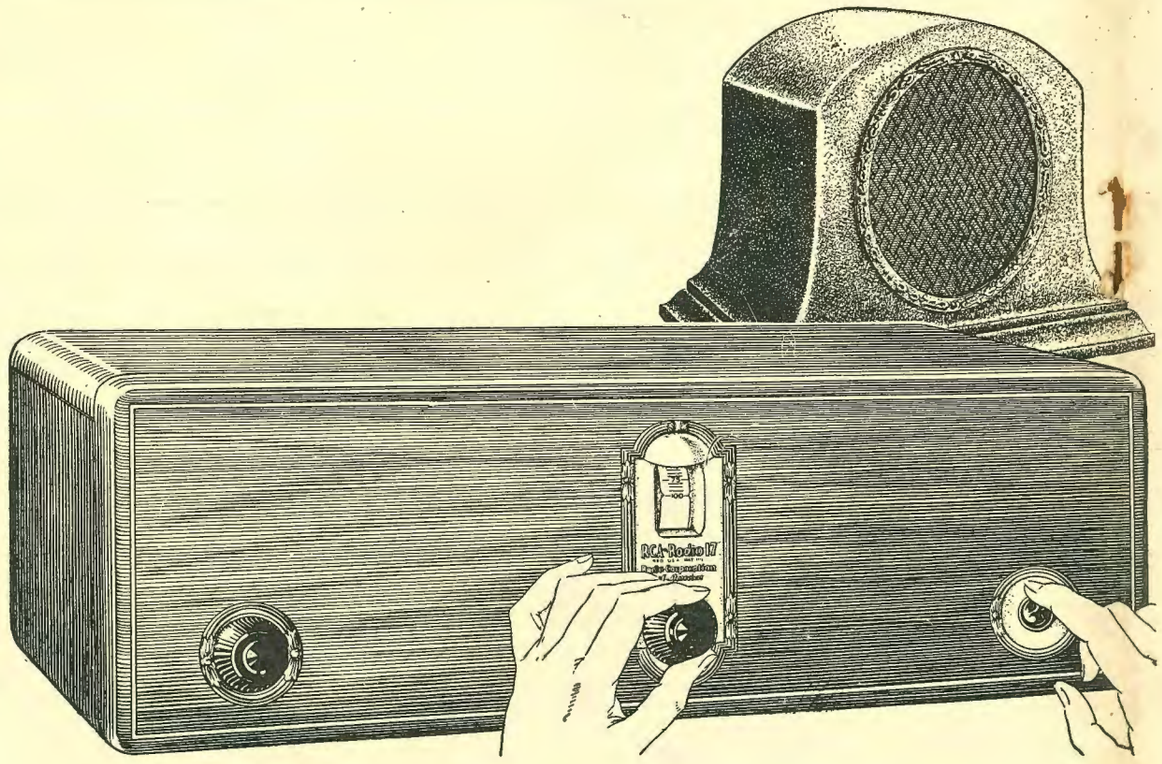
Turn on your receiver in the usual way, and switch on the Booster. Set the controls of your receiver to the positions at which you are accustomed to hearing a certain station—say 2FC. Now rotate the dial on the Booster until that station is received at maximum intensity, at the same time re-tuning with your usual tuning controls. After one becomes accustomed to its operation and has logged the Booster dial readings for the various stations, it is possible to tune-in with no trouble. The Booster amounts to one extra control—that is all. Don't forget, when finished listening, to switch off the Booster as well as your set.

With the summer static season almost upon us, the value of this Screen Grid Booster is increased. Used with the Technical Editor's broadcast receiver—a five-valve set of well-known American manufacture—it has enabled the outdoor aerial to be dispensed with, with the result that static is eliminated to a very great extent. Even with the indoor wire 25 feet long, the strength of the southern stations is many times greater than it was previously using the outdoor aerial. As an experiment, the earth was removed entirely, and a piece of wire five feet in length was used as an aerial. 2BL, 3LO, 2FC and 3AR still came in at very good loudspeaker strength!

To sum up, the addition of the "Q.R.N." Screen Grid Booster will convert most three-valve sets into the equivalent of many five-valve sets, with a corresponding improvement when coupled to larger receivers, and will effect a considerable improvement as far as selectivity is concerned. Strong claims? Perhaps they are; but the little unit described in the foregoing article does all that, and more. It would be worth building if it cost twice as much.

Use these parts for the "Booster"

C2—Emmco .0005-mfd. "Stratelyne" condenser
C2—De Jur .00015-mfd. fixed condenser
C3—De Jur .00025-mfd. fixed condenser
C4—Dubilier Mansbridge .5-mfd. condenser
E —Belling-Lee bakelite terminals—ANT., GND., OUTPUT
L —Antenna coil from Radiokes "B.-D." Kit (see text)
R —Cyldon Tempryte, 5 or 20 ohms (see text)
S —H. & H. or Cutler-Hammer battery switch
V —Benjamin U.X. socket
X —Wetless r.f. choke
Y —Radiokes knock-down shielded unit
Battery cable, five wires
Emmco Velmo vernier dial
2 Small battery clips
2 Large battery clips
18-Gauge tinned copper wire
Radiotron U.X.222 valve



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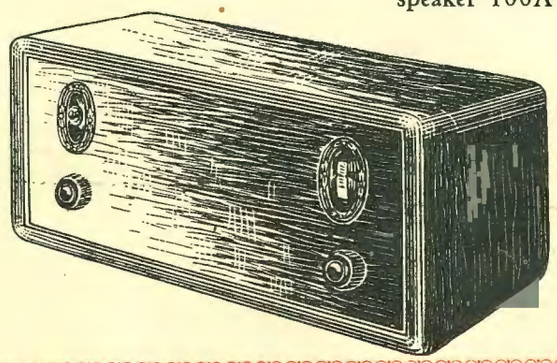
This world-famous Loudspeaker is an essential part of the equipment of both R.C.A. 6 Valve Receivers. It is the "voice" which utters their magnificent music and brilliantly clear speech. Finished in handsome dull bronze, this loudspeaker can also be obtained separately from the Receivers, its price being £10/10/



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Germany's Super Spy

A Thrilling Tale of German Intrique and Cunning

by ROBERT WARE

(Continued from September Issue)

Synopsis of Opening Chapters:

Lieutenant Ivan Vorensky arrives in London bearing letters from the Russian Premier (Count Poltich). He has with him a mysterious black box which proves to be an "F" ray machine.

Vorensky and Robert Hilton (Chief of the Naval Intelligence Department) accompany the British Prime Minister (Lord X) to the latter's magnificent country home to test the Russian's invention. These tests prove the machine to be completely successful in exploding ammunition by means of a wireless wave. Vorensky informs Lord X that, because of German intrigue in St. Petersburg, Poltich desires Britain to purchase the invention from Russia and manufacture "F" ray machines for the Allies. The purchase price is twenty millions sterling and the rebuilding of the Russian Baltic Fleet—which has been almost swept out of existence by German submarines.

Vorensky stipulates that before the British give their answer three important officials must witness an "open sea" test of his machine, when he will use a moving "target."

Lord X is so impressed with the tremendous value of the "F" ray machine that he mentally decides to acquire it for Britain at all costs. He therefore tells Vorensky that the British Government will buy his machine—and carry out the conditions of purchase—without any further tests.

Vorensky, however, insists upon the "open-sea" test being carried out at some lonely island, explaining to his Lordship that Count Poltich's orders must be implicitly obeyed in this respect. Lord X thereon decides to return to London immediately and consult his Cabinet.

Fair Island is chosen as the scene of the final test, and Vorensky, Hilton and Captain Chisholm of the War Office, set out for the North of Scotland in the requisitioned yacht "Sapphire." On the way up the coast the "Sapphire" is attacked by an enemy submarine. Hilton endeavours to get Vorensky to use his machine, but the Russian becomes panic-stricken and faints. The British submarine K.2 torpedoes the German vessel.

Just before reaching Fair Island, the "Sapphire" picks up the crew of the "Olaf"—the captain of which tells a harrowing story of German barbarity.

Vorensky, Hilton, Chisholm and Svalson (the skipper of the "Olaf" survivors) carry the "F" ray machine ashore.

As the test is about to commence, the island is shaken by a terrific explosion, and Vorensky announces that a German submarine has just torpedoed the "Sapphire" and Hilton and Chisholm are his prisoners.

Hilton produces a compressed-air pistol and tells Vorensky—who is now known to be Von Hagen, Germany's remarkable spy—that, on the contrary, he must consider himself a prisoner.

A second explosion rocks the island, and Hilton calmly informs Von Hagen that the German submarine has been blown up by the British submarine K.2—which followed the "Sapphire" all the way from London.

The Germans are surrounded by a Naval Patrol which Hilton had planted on Fair Island, and the party return to the shore and embark on the K.2.

Now read on.

XII.

The K.2 swung slowly out of the little bay on the eastern side of Fair Island—her crew consumed with a wild desire to know the meaning of the strange behaviour exhibited by their sunny-faced, boyish commander—her latest passengers mentally reviewing the almost incredible turn of the wheel of fate during the past hour.

Hilton was with the young submarine commander in the latter's small cubicle—generally given the realistic appellation "The Rabbit Hutch."

After what seemed an interminable age, the tall British Naval Officer emerged from the "Rabbit Hutch" and walked slowly down the narrow confines of the Chart Room to where Chisholm was sitting smoking furiously at his pipe, wondering whether Von Hagen had really landed in England with the whole audacious scheme ready planned, or whether it was merely a gigantic piece of bluff on the part of Lord X. and Hilton.

The more Chisholm thought of Hilton's riposte about being "Robinson Crusoed" the more certain he felt that both the Prime Minister and Hilton had been aware of Von Hagen's identity the whole time—and that they were merely playing the German's game for their own satisfaction.

And what a goat he had been himself! These two Britishers who understood each other so intimately had the threads of the puzzle already unravalled before they even commanded his presence. Now he could see why they all were compelled to endure the anguish of the old "Sapphire's" "dog-trot" up the coast—now he could see through Hilton's apparently foolish remark about the K.2 being his "Deus ex-Machina"—and—good heavens, now, of course, he knew why Vorensky, the Russian inventor, fainted rather than open his box of tricks. Ye Gods! what a joke—the damned Vorensky "F" Ray machine was never on board the "Sapphire!"

Strangely enough, the full significance of these finer details in the game had not struck him until now.

"But where the hell did he put it?" Chisholm exclaimed to himself.

"Precisely what I want to know, my worried and thoughtful friend," laughed Hilton as he slapped the War Office man on the shoulders.

Chisholm, who had lost all sense of his present surroundings in his deep concentration, gave a startled jump and pulled Hilton to the trestle on which he was himself sitting.

"For goodness sake put a man wise, you owl-faced, Ananias-tongued sphinx!" he gasped.

"My dear fellow, your rudeness is simply disgusting," protested Hilton with a boisterous laugh as he sat down. "What exactly is it you want to know?"

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"Tell me just exactly when you tumbled to the fact that Vorensky had no more been sent from St. Petersburgh than I had?"

"But, my dear old ivory-head, Vorensky **was** sent from St. Petersburgh to England with his 'F' Ray machine. Didn't his Lordship obtain confirmation of the fact?"

"Then how the ——?"

"As I remarked before, precisely what I want to know," interrupted Hilton, dryly. "Vorensky undoubtedly left St. Petersburgh with the identical machine we used at 'Templecombe,' and moreover, with Poltich's blessing and instructions to sell it to England," continued Hilton. "But, somehow, Von Hagen arrived in his place, with all his papers, his instructions, his history, and his machine. Where, why, and how the substitution took place I intend to find out from Von Hagen, but there is no doubt that it was his idea to 'bag' the Prime Minister, myself, and as many important officials as possible in his carefully laid net."

"Well when did you know that Von Hagen was not Vorensky?" persisted Chisholm.

"About two hours before the Cabinet meeting which Vorensky—or Von Hagen—duly attended."

"Then why in heavens name didn't you arrest the blighter then and freeze on to the bally machine?"

"For three reasons: Firstly, because we wanted to catch Von Hagen's associates; secondly, because we wanted to know what had become of Vorensky; and thirdly,—"

"Yes, thirdly?" was Chisholm's eager urging.

"Thirdly," responded Hilton in a dreamy, far-away voice, "the bally machine, as you call it, was no damned good at a range of a quarter of a mile."

"How'd you know that?"

"Simply because in the midst of planting the test targets at 'Templecombe,' I hopped the fence and dropped a few bombs and things in a wood on the other side of the road."

"Well, I'll be jiggered. Whose was the brilliant brain-wave, if I may ask the rude question?"

"Sparkles—er—I beg your pardon—I should say, it emanated from the far-seeing brain of the cleverest woman in Great Britain—the Hon. Cynthia."

"Well, I'll be—"

"So you said a moment ago." chimed in Hilton as he gazed in amusement at the War Official's look of blank astonishment. "Moreover, it was the same clever lady who found out that Vorensky was short and dark—whereas the German spy imposter is tall and fair."

"How the blazes did she find that out?"

"Very few people are aware of the fact, but each British Embassy in Allied or neutral countries is equipped with a high powered low-wave wireless installation, and although all private wireless stations in Great Britain have been dismantled and sealed up there is a duplicate high-powered low-wave set at Lord X.'s country home, 'Templecombe.' The Hon. Cynthia, moreover, is one of the most skilful operators in the country and knows a damned sight more about wireless than anyone but her father and yours truly would ever believe. Now you can piece things together and build your own story of what we knew and how we knew. For your own edification I may as well tell you that the idea of concealing a Naval Patrol on Fair Is.—each man armed with a powerful air-gun to avoid accidents—was also the result of vibrant grey matter behind those same beautiful violet-coloured eyes and smooth white forehead."

Hilton finished his recital with a happy grin on his strong sun-brunt face. Chisholm slowly stretched out his hand, and in an almost reverent tone said:

"Old man, you're a living blinkin wonder, and with every atom of respect in my nature, so is the Hon. Cynthia."

XIII.

"Look here, Von Hagen!" rapped out Hilton, "what did you do with Vorensky?"

"Haven't you discovered that trifling piece of information yet?" prevaricated the German.

"No, I haven't. You might as well tell me or, by heavens, I'll make things hot for you."

"Really, there is no need to get so annoyed over Vorensky's wherabouts," persisted the spy with calmness, "and as for making things 'hot' for me—well, I really fail to see what else you can do but put me with my fellow countrymen at Castle Donnington."

"Castle Donnington, be dammed!" exploded Hilton. "You'll not go to such a free and easy feather-bed camp if I can help it."

"But, my dear fellow, I'm just an ordinary prisoner of war after all, and you can't put me anywhere else but amongst my fellow countrymen who have been taken prisoners of war."

"And when did a spy in a false uniform become a prisoner of war?" demanded Hilton in a hard, merciless voice. "My clever friend, you're booked for no less an honour than the Tower of London."

"The Tower!" gasped Von Hagen with a gleam of terror in his eyes. "You don't mean to say you'd put me there?"

"Precisely what I do mean," was Hilton's cold response, "and if I can find any evidence that harm has befallen Vorensky, you'll follow your fellow spies, Roger Casement and Carl Eichorn, and be shot."

"But nothing has happened to him; he's quite safe and sound. Hilton, I swear to you that he is alive and well."

"That remains to be proved," commented the Britisher suavely.

"Look here, Hilton, send me to Castle Donnington and I'll give you my word of honour to tell you the truth of the whole matter," pleaded Von Hagen.

"A spy's word of honour!" cried Hilton in derision. "How much faith can I put in that?"

"I swear on my honour as a nobleman of my country to tell you nothing but the truth, if you will give me your word to send me to Castle Donnington. You know the high position my family occupies in Germany; spare me the degration of the Tower, and I'll tell you how I came to impersonate Vorensky and, in addition, I'll tell you where his machine is at the present moment—it has not yet gone to Germany—it is still in England."

"Is that so?" queried Hilton with uplifted eyebrows and quickening pulses. Despite the third reason he had given to Chisholm, Hilton knew that Vorensky's "F" ray machine was the model from which a much larger and more powerful machine could be fairly easily constructed.

"Will you promise me Castle Donnington if I tell you?" Von Hagen eagerly demanded.

"I might," demured Hilton. "Tell me first, and I'll consider the matter."

"No. Promise to treat me as an ordinary prisoner of war, or else I'll let the machine go to Germany, and I'll go to your damned Tower of London."

"You're very brave Von Hagen, aren't you? However, to put you in the Tower means no more to me personally than to send you to Castle Donnington, for you'll be quite safe there; they'll take special care of you, and what you can tell me—or, if necessary, be made to tell me—will possibly be of value to me in the very near future."

"Shake hands on it, then," cried Von Hagen as he excitedly put out his handcuffed hands towards the Britisher.

"No thanks, Von Hagen, I'm not absolutely trusting you, remember, but I'll bring Chisholm in and let you see that I'll give you a fair go—provided I'm satisfied with what you tell me."

Hilton went to the door of the "Rabbit Hutch" and called Chisholm, who had by now given up all attempts to fathom the mysterious actions of his senior officer.

"Captain Chisholm," began Hilton as the War Office man sat down and commenced filling his beloved pipe. "You are now to be a witness to as strange a bargain as you ever could imagine. You will hear a captured enemy spy offering certain information to a responsible British Naval Officer, the consideration being that he be treated as a prisoner of war taken in open warfare."

"Prisoner of **what?"** almost shouted Chisholm.

"Prisoner of war, I said," responded Hilton coolly.

"But what about that damned Russian uniform; what about the forged letter of credit; what about—hell!—what about the whole damned thing? Prisoner of war! Well, I'll be———"

"But, my dear fellow, he's going to tell us exactly where the Vorensky "F" Ray machine is reposing in England at the present time," interposed Hilton.

"But he said it's in Germany or, at least, on its way there."

"That, apparently, was a mere anticipation of the actual facts, and if I give my promise that he will not go to the Tower as a spy, he will tell me just where the machine is."

"Wouldn't trust the blighter as far as I could throw him," growled Chisholm with a scowl at Von Hagen.

"I'm afraid Captain Chisholm is not very favourably disposed towards you," commented Hilton airily, turning to the German.

"I'm not worrying in the least about **his** disposition," returned Von Hagen. "I tell you that Vorensky's machine is still in England—where I left it—and if you send me to the Tower you'll never see it again."

"I hardly expect to in any circumstances," was the nonchalant reply. "But being naturally curious about such experimental machinery, I've decided that if your story of how you obtained possession of Vorensky's machine, and what has happed to the Russian inventor, strike me as being within measurable distance of the truth, and if I recover Vorensky's machine, you shall go to Castle Donnington instead of the Tower."

"You've safeguarded yourself pretty well, haven't you?" sneered the spy. "However," he resumed, "as I value my good name amongst my own countrymen more than the impracticable machine built by this Russian visionary, I'll tell you what you so ardently desire to know."

"Go on," commanded Hilton.

"In the first place, then—whether you like the information or not—Vorensky is himself extremely pro-German, and we hatched our charming little plot together. When he left Poltich with his machine and his instructions, he came straight to my lodgings on Nevsky Prospect and handed over everything to me. The next morning I presented myself to the commander of the 'Irkutsk," who naturally accepted me as the man I represented myself to me—Lieutenant Ivan Vorensky.

"The manner in which your Secret Service men went on board the 'Irkutsk' and cross-questioned him after his arrival in the Thames, almost resulted in a breach of diplomatic relationships. Naturally, he knew no more than that I was the Lieutenant Vorensky he had been ordered to carry safely to England. I took good care to let everyone know that I was leaving Antwerp in one of our submarines, but higher up the coast I boarded a seaplane and flew to Copenhagen. From there my entry to St. Petersburgh was easy—as was the question of a Russian Naval uniform—and, as you have probably heard, I am somewhat of a linguist, so, passing myself off as a Caucasian, I easily hoodwinked the commander of the Russian cruiser 'Irkutsk.'

"So much for that. The rest you know. Having passed everything over to me, Vorensky decided to seek refuge in Germany and, what's more natural than he should retrace my steps. He is at present on the Island of Norderney building a larger and more powerful 'F' ray machine."

"So that's why you value your good name amongst your countrymen more than the impracticable machine built by this Russian visionary?" interjected Hilton in sarcastic tones.

"Well, I promised to tell you the truth, you know."

"Go on," again commanded Hilton.

"And," went on Von Hagen with a vestige of a smile, "the model you saw me operate at 'Templecombe' is, at the present moment, reposing in the Left Luggage Office at Fenchurch Street Railway Station. That's all."

"Where is the ticket for the machine," demanded Hilton.

"One of my friends is holding it pending my return," replied Von Hagen calmly.

"The name of your friend?" rapped out Hilton.

"Dr. Vander Koen."

"His address?"

"Fifty-five Stockwell Park Mansions."

"I'll give you credit as being the most consumate liar in Europe. Your information is given too readily, my clever friend, to admit of easy assimilation," commented Hilton as he gazed hard at Von Hagen.

"Nevertheless, I assure you it is the truth," said the spy quietly.

"Well, Chisholm," Hilton remarked with a bored air, "I'm not going to subject you to another long sea journey. To-morrow morning we shall be safely in Thurso Harbour, and from there we go to London by train. The sooner I interview Dr. Vander Koen the quicker I shall be on the trail of this Russian visionary's machine."

XIV.

Within half an hour of disembarking from the submarine K.2 with his prisoners, Hilton had sent long messages in code to the Prime Minister, and that evening orders were issued for systematic air attacks to be carried out on Norderney—to the utter astonishment and amusement of the whole of the Air Force.

"Demonstration practice," was the ironic comment of these adventurous birdmen. "Why there isn't a blessed gun on the whole of Norderney; we could land there and play marbles. Why the hell can't they let us mix in with the chaps on the Western Front? Bomb Norderney indeed—just a waste of petrol and high explosives."

On reaching London, Hilton's first care was to place Von Hagen in the Tower of London, where he would be safe until the truth or otherwise of his statements could be ascertained. Hilton's next mission was to unearth in Fenchurch Street Left Luggage Office the innocent-looking black box he remembered so well.

Yes, a black box had been left there about a week ago—the clerk remembered it quite well. But it had been handed to a tall, scholarly gentleman the next day.

"Damn!" swore Hilton with all the meaning he could infuse into the well-worn epithet. 'But it's really no more than I expected. It was foolish to expect Von Hagen to have made most detailed arrangements beforehand," he soliloquised.

Further inquiry revealed that Dr. Vander Koen had gone on a visit to his relation in Amsterdam, having departed but a few days ago. This, of course, was to be expected.

The next problem to be solved was the manner in which the Dr. smuggled the black box out of the country—if, indeed, it had left the country. All luggage was searched by both the police and the customs offices, and Hilton felt sure that attempts to get the machine past the barrier of inspection would have raised a considerable amount of suspicion.

"However," he said to himself, "to make certain, we'll have careful inquiries made at Harwich.

The same day, to his great amazement, Von Hagen was transferred from the Tower to Castle Donnington Concentration Camp of enemy prisoners of war.

XV.

The Defence of the Realm Act—commonly known as "Dora"—laid down the most stringent laws regarding private wireless installations, yet Hilton felt convinced that communication between England and spies in Germany was of daily occurrence, and his "sixth sense" indicated very plainly that illicit communication regarding Vorensky's machine was, at the moment, being vigorously persued.

Perhaps it was the result of mathematical analysis—the rejection of the known avenues—or it may have been purely intuition, but he decided to place two of his listening-in stations on the trail of his latest "brain wave."

"Doncar and Orwood will search below twenty metres to the lowest wavelength possible," was the urgent instruction he sent.

The necessary adjustment were quickly made by the two stations, and Hilton turned to his multifarious problems, feeling sure that something would eventuate from his latest move.

Nor was he disappointed. Late the same evening an urgent report came from Orwood.

"Message in enemy code passing on 10.5 metres—too weak to pick up on direction-finder—tuning very sharp, but messages fade and reappear at rapid intervals!"

Scenting something that was not usual, Hilton drove to Orwood without waste of time, not one of the sleeping inhabitants of the little Essex village knowing or caring about his headlong dash along the deserted main road which led to the dismal stretch of swamp on which he had perched his latest "interception post."

Eager tongues and minds welcomed him into the diminutive, wooden hut which nestled at the foot of a three hundred foot pole, and without loss of time a pair of earphones were thrust into the "chief's" numb hands.

"Listen, Sir! He's going now—thirty-five words a minute—he's 'some' sender."

"Have you picked up the station he's sending to?" queried Hilton.

"Not yet, Sir. There doesn't seem to be anyone answering him on that wave."

"We must find out where he's sending to—it will help use to get an idea of how to D.F. him," replied Hilton in the dreamy far-away tones which eloquently told of another inspiration having been born.

"Quiet a minute!" he suddenly commanded, listening intently.

"Who's this on now?"

"The same blighter, Sir," answered the keen-eyed operated, "changing codes as he sends."

"Not on your life, sonny. It's the answer in matched tone—damned good match, too—get everything he sends. Here, Richardson!" he rapped out to the senior operator who was standing near him, "you couple up that spare set with clips and get the stuff while I go through what Gossage has already received."

Eager hands soon "clipped on" the spare receiving set, and soon the first operator was able to take off his headphones and gather up the carefully kept records of what the strange station had been transmitting to one another.

Hilton worked for some time on the messages with a systematic procedure which betokened expert knowledge of code methods, but could not make head or tail of the jumble of letters and mathematical signs.

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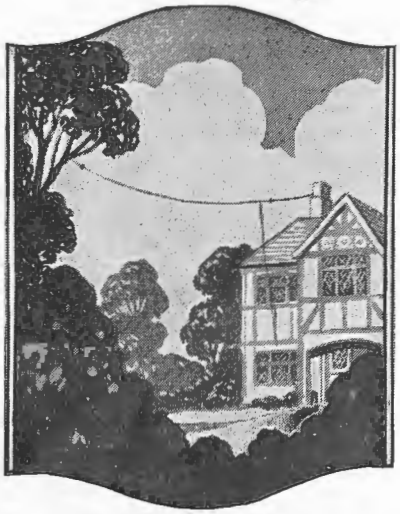

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"No code that I know fits any of the damned stuff!" he growlued after a long interval. 'Sure you got it right, son?"

"Yes, Sir; it's O.K. I didn't have any interference."

Right-o. They must be in a code with an individual key to each sign. I'll take these with me and see if I have anything at A.Y. which will decode them. In the meantime, get everything these chaps send—I notice you haven't got any call signals."

"No, Sir, they don't seem to use any. A series of V.S. and B.S. precede the messages—it seem to be the same chap tuning his transmitter."

"I see. On a wave of that length there wouldn't be any need for call signals; no one else would ever dream of coming in on such an absurdly short wave," laughed the Chief of the Naval Intelligence Department. The joy of having discovered another enemy trick which his wits and knowledge had to solve and overcome, shone in his eyes, and, with a final instruction to the effect that the youngsters should not miss a single signal, Hilton left Orwood Station and drove leisurely towards London. He felt "in his bones" that he was on the verge of discovering another little link which would help to complete one more chain of knowledge regarding the secret operations of the enemy—and that feeling brought him great contentment.

XVI.

"Ye Gods and little fishes!" muttered Hilton, "what a stroke of luck!" Hours of patient, heart-breaking experiment had at last brought their reward—and, seated before his favourite table—now littered with myriads of pieces of paper—the "Chief" was surveying the result of his handiwork with evident satisfaction.

"Construction ..... ly hampered by English air ..... disastrous. ..... killed by explosion and ..... machine completely wrecked stop ..... must find means ..... model ..... Germany or neutral ..... soon as ..... urgently. ....."

"What luck!" once again gasped Hilton. "That infernal Vorensky machine must still be in England. Now, where the devil is it—where is this secret wireless plant—and Vorensky dead and the machine he was building in Norderney completely wrecked. Truly, there is more than brute force and 'intelligence' in modern warfare."

Hilton, however, was never the man to indulge in day-dreaming when work was on hand. Rising quickly to his feet, he told Cox to order the car and advise the commander of the Flying Base at Croydon that he would arrive that afternoon.

A straight call over the specially erected telegraph line at Orwood enabled him to ascertain that no further traffic had been picked up on the 10.5 metre wave—nor had any short-wave stuff been heard since he left the station the night before.

"Watch that ten and a half metre wave like hawks and give your call on this line immediately he commences tuning. The line will be kept clear, and I shall be waiting," he concluded.

Calling his commissionaire N.C.O., he gave most detailed instructions, ending with the threat: "If you lose one minute between the time Orwood signals 'O.W.D.' and getting in touch with me at Croydon—well, I'll dam-well disrate you."

"Very good, Sir," replied Cox, who knew the threat would never be carried out, for the "Chief's" eagerness to frustrate enemy machinations was not one whit keener than his own.

Hilton found everything in readiness when he arrived at the huge aerodrome. The trim Bristol Fighter was wheeled out of the hangar and mechanics were busily making final adjustments. Being one of the few "Brass Hats" who "mixed" yet did not interfere, Hilton was a well-known and very popular figure at the flying base, and Flight-Commander Newton—the O.I.C.—hurried to minister to the needs of the "cleverest man in the British Navy."

"I'm sorry Derwent cannot take you up to-day, Sir," apologised Newton. "He tackled a couple of Gothas last night and limped home with a badly shattered forearm—flying one-handed."

"Sorry to hear that, Commander," replied Hilton gravely, "I wanted the boy for special duty over Norderney, too. However, it can't be helped I s'pose. Give him by regards; he's the gamest kid we've got. Who's my pilot?"

"An Australian—Lieutenant Curtis—he's only been in training a few weeks, but he took to the joy stick like a duck takes to water—he's natural 'bird-man," replied the aviator with enthusiasm.

"He'll do, then," commented Hilton. "Tell him to stand by; I shall want to take off at a moment's notice. If you want me I shall be in the staff room hanging on to the telephone," he laughed.

"Aye, aye, Sir," replied the other as he saluted and made his way across the flying ground.

Hilton had sat wrapped in a deep study, before the little office table for almost an hour, when the telephone suddenly interrupted his reverie.

"O.W.D. calling now, Sir."

"Thank you, Cox."

With a bound Hilton was at the door and vigorously pulling at the lanyard on the lesser warning

bell. Immediately three diminutive figures dashed across to the Bristol, and a spluttering roar rent the air. Hilton was himself running towards the machine —official dignity cast to the winds. That was the reason for the "Chief's" phenomenal popularity with all who came in contact with him. Distinguished and clever—a Mandarin amongst even the "Brass Hats"—he could, nevertheless, forget himself and his own importance and slip from officialdom into just plain human nature in a flash—running, shouting, swearing and fighting like the very least-favoured man amongst them. A giant in intellect, but a boy at heart—a man amongst men—and men loved him.

"Jump in, Sir," yelled the pilot almost beside himself with excitement, for when Commander Hilton ran—well, there was "something doing."

Rapidly the Bristol rose and sped over the hangars, zooming over the treetops, while Hilton donned a cumbrous headgear which effectively shut all outside noises—even the roar of the powerful engine being eliminated. To Hilton's surprise, however, not a single whisper of the elusive signals on the short-wave could he pick up. Adjustment upon adjustment he made without the slightest sound breaking the silence. Switching to the bigger waves the air was seething with squeals, shrieks, scratches, groans, grunts and howls, which indicated wireless traffic, but abysmal silence reigned on 10.5 metres.

Swiftly the Bristol raced through the air, past Chatham, over Queenborough and Sheerness, without a spark from the mysterious station having been audible. Convinced in his mind that the place he sought lay in the metropolis, Hilton was about to surrender the day's attempt and return to Croydon, when his "sixth sense" whispered "Harwick!" These subconscious "hunches" were late to the "Chief's" conscious mind, and the aeroplane's course was immediately shifted from due east to north-east, and Hilton strained his ears and focussed every nerve on 10.5 metres.

Hush! What was that? A tiny, almost inaudible note was singing in his earpieces. The engine or the magneto? Hilton carefully changed the wavelength. No, it was something going on exactly ten and half metres.

"Let her out, son!" he called to the pilot. 'Nor'-east as hard as she can lick."

With a grin the youngster gave the engine all he could, and the racing machine leapt forward with even greater speed.

Yes; it was the chap he was after, sure enough. Signals were coming in almost strong enough to operate the direction-finder. Suddenly, Hilton switched and whirled the radio compass rapidly to and fro.

Strange—the damned station read 315, north-west of them, and was gradually growing in strength and moving to the west.

With Colne Point on the port bow the signals came through with surprising strength, and a number one reading left the dial at 270—practically due west.

Hastily drawing bearing lines on a section map, Hilton gave a grunt of satisfaction.

"Keep her as she is until you are abeam of Sunk Lightship, sonny—I'll be certain by then"

A triple flash from a small signal lamp in the cockpit told him that the pilot had arrived "at station" and was asking for any change of instructions.

"Righto, son," the Chief shouted into the speaking tube. "Let me take another bearing before you turn."

With extreme care, Hilton once again D.F.'d the strange station: "245—now, let's see; so the blighter is definitely located in that little arm on the south side of the Blackwater Estuary—and, my godfathers! —right under the very nose of Orwood. Swing her in line for Chelmsford, son!" he called, "and turn due sou'west just after passing Mersea."

Obediently the 'plane swung inland, and Hilton gazed at the land below through his powerful binoculars. Now they were passing over the Island of Mersea, and, a little while later, headed for the centre of Blackwater.

Suddenly, Hilton stiffened and gripped his glasses tensely. Away below—up the first little backwater—was an old dilapidated house from which seemed to emerge a white streak. And at the end of that white streak—ye gods and little fishes!—a blanky submarine.

Staring intently, Hilton saw two small dots emerge from the house and walk along the white streak.

"Dive, sonny—quickly!" he called.

As the Bristol swooped from the sky the two dots stopped moving. Then one sped back to the house and the other hurried towards the long, cigar-shaped submarine.

The earth rose to meet the 'plane at an alarming rate, but Hilton never shifted his gaze from the house and its surroundings.

Down—down—the machine literally fell—and Hilton, with a start, saw that the second figure was "lugging" a big black box.

"Vorensky's machine!" he gasped with sudden intuition, "and they're taking it aboard that submarine!"

To be continued.

The Model 33

6 Valve Receiver

The Model 33 Six-Valve Receiver is one designed for use in remote localities or in a large city. It is extremely selective, remarkably sensitive, and the Acme of engineering design and workmanship.

Excellent Loudspeaker Results Guaranteed

Excellent loudspeaker results are obtainable on a small indoor aerial, whilst with an outdoor aerial good loudspeaker results are obtainable under favourable conditions from the main A class stations in Victoria, N.S.W., and Queensland during the greater part of the day.

Easy to Carry

Being compact, it can be carried in a suitable travelling case, which is a big factor should it be necessary to take the set from place to place.

Have You Heard **REAL** *Radio Yet?*

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ATWATER KENT

Re-creates Music & Speech

HEAR IT!

Six and Seven Valve ONE Dial Receivers, £25/10/- to £37/10/-, *without* valves or equipment. Radio speakers, £3/15/-, £4/10/- and £8/15/- (New Model E). Complete outfits from £43/10/-, also Console and Writing Desk models.

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SEND FOR FREE LITERATURE

H6

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Price complete with Standard Equipment, including Model H. Speaker.

WIRELESS HOUSE LTD.

City Buildings, Edward Street, BRISBANE

KFI
(LOS ANGELES)
ON THREE MULLARD VALVES

EXTRACT FROM "WIRELESS WEEKLY"

KFI ON THREE VALVES.

Dear Sir: While not wishing to skite, I would like those other 3-valve cranks to know that there are other threes in existence. This is my log, using 1 PM3 and 2 PM4's:

5KA, 3BY, 2KY, 2UE, 4ER, 3YA. 2GB, 3UZ, 1YA, JOAK, JOBK, JOCK, 4QG, 5CL. 5DN, 2YA, 4YA, 7ZL, 3AR, 2BL, 2FC. and 3LO. At mid-day 3LO. 2FC, and 2BL are received at fair loud-speaker strength.

My latest pick-up was on Sunday night, July 29th, when I received quite clearly on headphones KFI, Los Angeles, U.S.A., broadcasting "Midnight Follies."

Yours, etc.,
"ANOTHER CRANK."

THESE THREE

One P.M. Three		Two P.M. Fours
0.1	fil. current amps	0.1
3.4	„ „ Volts	3.7
50-125	Anode Volts	50-100
20 m/A	Electron Emission	20 m/A
16,000 ohms	Impedance	7,000 ohms
0.86 MA/V	Mutual Conductance	0.86 MA/V
13.5	Amplification Factor	7
13/6		**13/6**

Mullard

BRINGS IT HOME TO YOU

The Mullard P.M. Valves are obtainable from every Radio Dealer

G AND G

The Transmitting License

(By Q.R.N.)

No. 1.

Just two years ago we published the first of a series of articles dealing with the Amateur Operator's Proficiency Certificate Examination. It is universally acknowledged that the series comprised, without doubt, the most comprehensive and authentic instructional course yet published in Australia, and it has been instrumental in helping not a few "budding hams" to gain their A.O.P.C. "Tickets." Since the series has drawn to a close, requests for the complete course have been received from amateurs in every Australian State and New Zealand. Our supply of back numbers is now exhausted, and in view of its popularity, we have decided to republish the complete series in a revised form.—Editor.

POSSIBLY the most satisfactory manner of introducing this series of articles would be to give a few details of the Amateur Operator's Proficiency Certificate Examination itself. This examination, which is the recognised amateur standard of proficiency in Australia as laid down by the Federal Wireless Regulations issued by the Postmaster-General's Department, is held at frequent intervals throughout the year by the Wireless Branch of this department. In Brisbane, as in the other capital cities, the examination is conducted by the State Radio Inspector. In other parts of the States the test is arranged by the local postmaster. Intending examinees are required to apply to the Manager of Telegraphs and Wireless, Postmaster-General's Department, Treasury Gardens, Melbourne, for permission to sit, enclosing with such application an examination fee of 5/- (per candidate). The Department at Melbourne notifies its decision to the candidate, and the local Radio Inspector later advises the candidate of such arrangement as may have been made for his examination. In Brisbane it has been customary to so arrange the date of examination that about five or six candidates present themselves together.

Now, as to the examination itself—suffice it to say that it is searching but not severe. Any enthusiast who has taken the job seriously should get through without undue trouble. Seventy-five per cent. of the total marks are required in each of the three papers for a pass, which provision is only to be regarded as reasonable, for it ensures that only such candidates will be successful as may be reasanably regarded as capable of running a transmitting station efficiently.

To my mind, the only way to satisfactorily set about this examination is to do the work with a friend who also is keen on getting his ticket. I know of the case of three members of a Brisbane radio club who made up their minds in a burst of enthusiasm one evening to sit for the A.O.P.C., and had actually sat for the examination in six weeks. Later on they were all advised of their success. However, the time was very short, especially for people whose knowledge of the code was negligible, and whose ideas about transmitting were crude. Speaking later to one of the three candidates, he attributed their succes to the fact that they had worked for three hours almost every night—one hour on the key and two hours listening to a lecture by one or other of the candidates. I consider the scheme excellent, for it means that the lecturer who, mind you, is dealing with unfamiliar matter, must have the subject well conned and the fact well-marshalled and the cross-fire of question and answer that pervades the lecture is usually the means of covering much more ground than is traversed by a mere reading of a text-book, especially so as most of the questions are put across on the spur of the moment. But—one word of warning—(if any readers considers the scheme worthy of emulation)—never fail to treat the lecture seriously—one hour of deliberate debate is worth more than a day of frivolous talk.

Now let us go a little further. I said above that there were three "papers." The word was used for want of one more suitable. There are two written papers—I speak of the Queensland examination—and one practical Morse test. The first of the two written papers covers the signalling and traffic procedure as laid down by the Radiotelegraphy Convention of London, 1912—usually five or six questions—while the second paper (of ten questions, of which eight must be attempted) deals with the erection and maintenance of an amateur transmitter; that is to say, it covers the theory of low-power valve transmission.

The articles of this series are intended to cover in detail the subject matter of both papers, as well as giving such instruction as may be possible in Morse telegraphy. It is proposed to make them sufficiently technical to enable a beginner to take the A.O.P.C. course and then sit for the examination without putting him to the expense of buying other text books. The whole course will be much more detailed than any other that has hitherto appeared in the pages of an Australian radio journal. The first few articles will deal with the Morse code, and with standard transmitting procedure, and later articles will cover the theoretical side of amateur transmission, including transmitting circuits, modulation, chokes, power supply, and the like.

The Morse Code.

The Federal Wireless Regulations lay down that a candidate for the A.O.P.C. shall read and transmit Morse at the rate of not less than 12 words per minute. Counting the usual five letters to a word, this speed, allowing for spaces, works out at somewhat more than a letter per second. Candidates for the examination should read at about 15 or 18 words before sitting for the test, as such a speed allows a margin to cover nervousness and the necessity of

reading a strange hand. Further, quite lengthy practice will be necessary to enable the novice to read comfortably at this speed. Practice is the whole secret of success—practice, and then more practice.

As most readers know, there are two Morse codes. The International Morse Code is, however, the one in general use. It, as also the second type, consists of a conglomeration of short and long symbols, known respectively as dots and dashes. Let us look at a Morse alphobet in the International Code. Here it is:—

A . —	N —.
A (German) . — . —	N (Spanish) — — . — —
A (French) . — — . —	O — — —
B — . . .	O (German) — — — .
C — . — .	P . — — .
CH — — — —	Q — — . —
D — . .	R . — .
E .	S . . .
E (French) . . — . .	T —
F . . — .	U . . —
G — — .	U (German) . . — —
H	V . . . —
I . .	W . — —
J . — — —	X — . . —
K — . —	Y — . — —
L . — . .	Z — — . .
M — —	

The spacing and length of the various signals is as follows:—

(1) A dash is equal to 3 dots.

(2) The space between the component parts of each letter is equal to 1 dot.

(3) The space between two letters is equal to 3 dots.

(4) The space between two words is equal to 5 dots.

Now, just for comparison, we will look at the old Morse code, which consists of dots and dashes and spaces.

A .—	J —.—.	S ...
B —...	K —.—	T —
C .. .	L ———	U ..—
D —..	M ——	V ...—
E .	N —.	W .——
F .—.	O . .	X .—..
G ——.	P	Y .. ..
H	Q ..—.	Z ... .
I ..	R . ..	

Candidates are not, of course, expected to learn this code, but it is of interest in showing how the present International Morse Code has been built up. Notice how spaces are introduced into various letters (compare H Y Z, etc.), and think how such would tend to slow up transmission. It is also of interest to note how the old F has changed into the current R, the J into our C, Q into F, and to see how T and L in the old alphabet are rendered by dashes of varied length.

Let us go back to our International Morse Code and consider how best to master it. It cannot be regarded as learnt until the learner can pick up each letter immediately by ear without mentally analysing it into its component parts—but once this stage is reached the goal is virtually won. Of course it would never do to practice for a telegraphist to say, when receiving a message: "Now, let me see—dot, dash, that's A, and dot, dash, dash dot, that P, and so on. After a few weeks' practice the beginner will learn to recognise various letters, and it is noteworthy that letters like F, Q, C and X, probably due to their rhythmic formation, usually stand out from their fellows and are more recognisable.

Now, as for learning the code. I personally consider that the best way is to tackle the whole lot just as it stands. However, another method that was greatly in vogue a few years ago, and which may appeal to some readers, relied on certain key sentences in which the initial letter of each word represented Morse symbols arranged according to an easily memorised system. Such sentences, with the relative Morse symbals, were:—

. Each	— Tell
... Individual	—— Mother
... Scout	——— Our
.... Has	—. New
. — A	—.. Dog
..— Unit	—... Begs
...— Value	
	.—— Will
——. Guard	.——— Japan
——.. Zealously	.—. Resent
—.—— Your	—.— Keenly
.—.. Land	—.—. China's
..—. From	.——. Proposed
——.— Quakers	—.— Xpansion.

The sentences quoted have remained in the writer's memory for years, and though their form is anything but classical, they serve a purpose, and readers may find them interesting. The reader can see for himself exactly how each sentence runs, either in an increasing series of dots or dashes or in opposites, or in a combination of the two. The numerals are easily learnt, for they are formed according to definite plan of increasing dots and increasing dashes. In each case they consist of five symbols, and are as follows:—

1 .————	6 —....
2 ..———	7 ——...
3 ...——	8 ———..
4 ....—	9 ————.
5	0 —————

As well as the numerals here given, there is what is known as the short system of numerals, which runs as follows.

1 .—	6 —....
2 ..—	7 —...
3 ...—	8 —..
4 ....—	9 —.
5	0 —

These short numerals (compare them with the list of ordinary figures to see wherein the difference lies) must be used (so says Appendix II. of the P.M.G.'s Handbook for Wireless Telegraph Operators) "in official repetitions and in the preamble of radiotelegrams." They are often heard, however, and a listener-in is likely to be caught for the first half-dozen times. By the way, too, the preamble of a radio-telegram is, of course, the introductory part prior to the address, and contains such service information os number of words, route, date and time,

Monda

"Receive
Double dash
able from
and text from
Note of Interrogation or
End of Message
End of Work (closing down)

A GOOD

To enab

You
use

SIGNALS from this transmitter have been clearly heard in America. Truly the very acme of efficiency.

metal base, 11½ by 8 inches, the latter having about 1 inch turned up at the back to form a terminal strip. In the transmitter illustrated the panel and base are composed of 16-gauge brass, silver-plated and buffed. This makes an ideal job, and one having a very fine appearance, but it is suggested that 16-gauge aluminium would be perfectly satisfactory and considerably cheaper. The large oval opening cut out of the front panel serves to view the valves, and adds quite a lot to the ...earance of the set. However, it is ... means indispensable, and can be ...f the task of cutting the hole ... little beyond your capa-

...e to the ... entire- ...of the ... ...d ...on- ... and ...ectively. ...are of the ..."stable" type, ...hich means that they are intended to be adjusted to the best operating point, and then left alone. Each condenser consists of a plate of silver-plated brass (aluminium will do), bolted to two Radion strips measuring 4 by ⅜ inches. A pad of spongy rubber ¼-inch in thickness separates these Radion strips at each corner from the metal panel, bolts being passed right through the strip, pad and panel, and fitted with a nut on the inside. By referring to the diagram (Fig. 6), it will be seen that, normally, these rubber pads keep the plate separated about ¼-inch from the panel, but this distance may easily be reduced by tightening down the four nuts, so that the rubber pads are compressed. In order to increase their capacity, and to increase the voltage at which they will break down, each condenser has a sheet of thin mica interposed between the plate ...ivat...

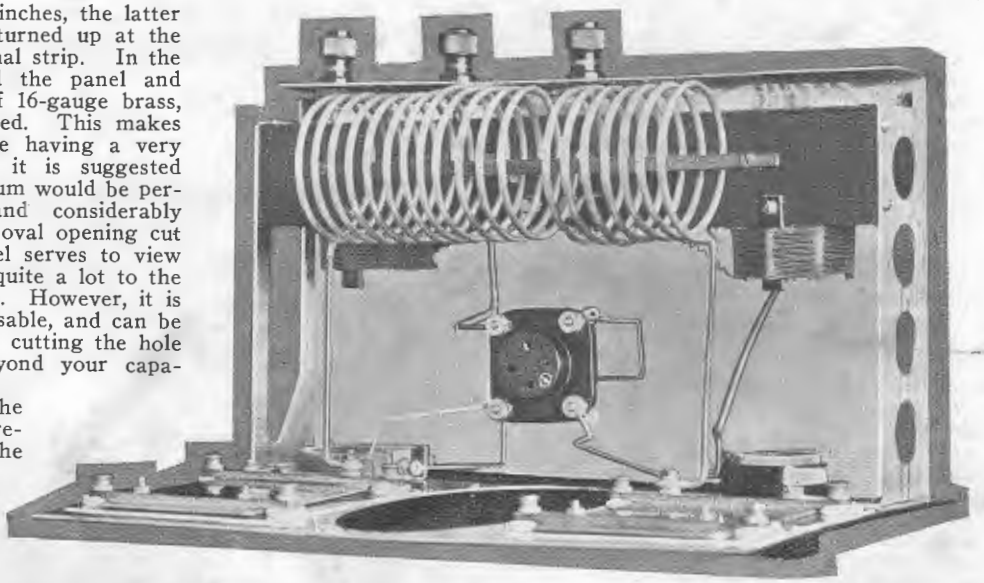

FIG. 2.—Top view of the Transmitter. Notice how extremely simple the design has been made.

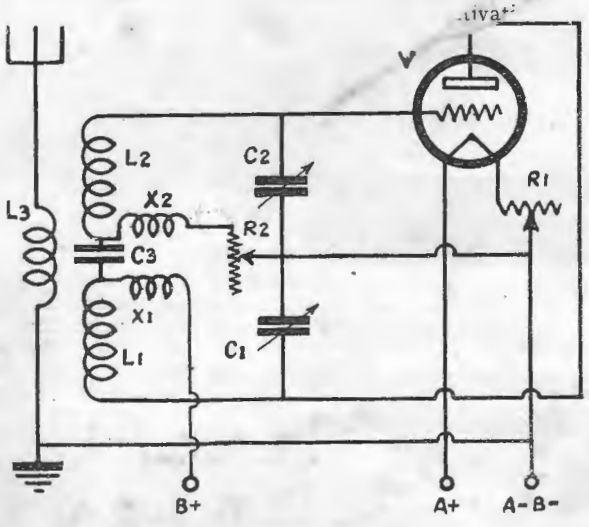

FIG. 3.—Conventional Circuit Diagram.

and the panel; it is held to the panel by means of the four bolts already mentioned, but does not, under ordinary conditions, come in contact with the moving plate. In each case the metal panel, of course, acts as one plate of the condenser, and the 4 by 3 inch plate as the other. Reference to Fig. 6 should make the construction of these condensers clear, but it should be mentioned that the corners of the "moving" plates should be rounded off—these plates should, in fact, be entirely free from any sharp projections or edges.

On the lower part of the panel are mounted the 6-ohm rheostat (R1) and the variable grid leak (R2). This latter consists of an Electrad Royalty variable high resistance, having a range of 500 to 50,000 ohms. Here it is that the value of the metal panel and chassis is apparent. The framework is connected to earth, and therefore can be utilised throughout as the "earth" bus-bar. Refer to the circuit diagram (Fig. 3), and you will see that one terminal of each of the plate and grid tuning condensers, as well as of the filament rheostat and the variable grid leak, is connected to earth, either directly or indirectly. This has been taken care of in the case of the tuning condensers, as the panel actually forms one plate of each, as we have seen. In order to fulfil the same condition in the case of the rheostat and the variable grid leak, it is only necessary to mount them directly on the panel, as the brass centre-bushing will make the required contact.

Now for the coils: There are three of these, and they are wound on some sort of former about 2 inches in diameter, of 8-gauge silver-plated copper wire. Again the plating is not absolutely essential, but certainly is very desirable. Two coils each having seven complete turns are wound, and one of five turns. It will be found that the coils, on being removed from the former, show a tendency to "spring" and thereby increase slightly in diameter. In the transmitter described, the finished coils have assumed a diameter of 2⅜ inches. Fig. 5 shows the method of mounting

the coils between two bakelite strips. This clamp is made by drilling 18 holes of suitable size in a strip of bakelite measuring 8½ by 1 by ¼ inches, and then sawing the strip right through the line of holes. A long thin bolt passed through each end clamps the strips together, and holds them securely to a bakelite platform 11½ by 2, which in turn is secured to the two sub-panel brackets.

Two radio - frequency chokes are to be made; they are wound of 28-gauge double-silk-covered wire basket fashion, on a former consisting of 8 nails set in a two-inch circle. A small piece of bakelite bolted to the platform already referred to provides adequate support, and the coils are cemented to them as an extra precaution. On the turned-up part of the metal base, three Belling-Lee bakelite terminals are mounted. The two outside terminals must be insulated from the metal, while the one in the centre of the strip (marked "Earth" in Fig. 4) is attached directly to the metal, so that it makes good contact with it. The series condenser (C3) may consist of a Sangamo fixed condenser of .001-mfd. capacity; both this condenser and the valve socket are supported only by the wiring attached to their terminals.

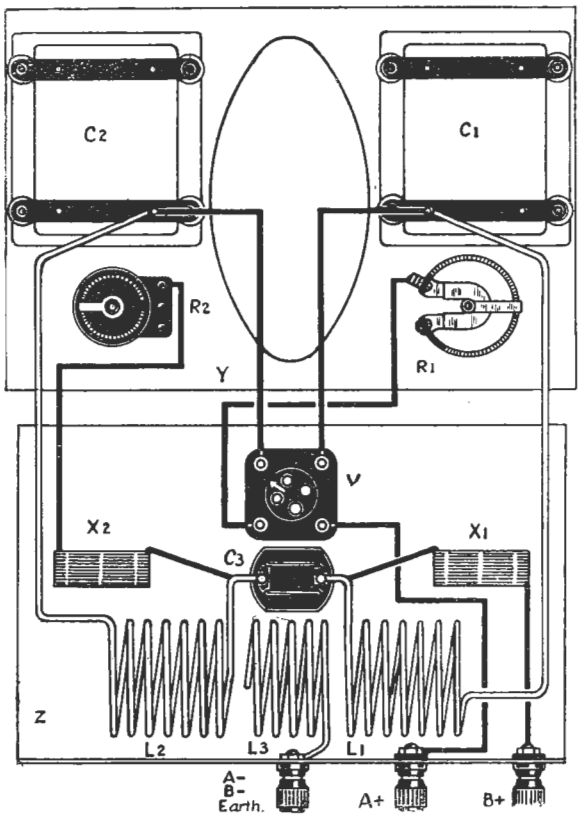

FIG. 4.—Pictorial Wiring Diagram. Note that the "A+" and "B+" terminals are insulated from the metal strip.

Wiring.

The wiring is carried out with 16-gauge tinned copper wire; it will be seen that there is very little of it, and the connections are made clear by the pictorial diagram, Fig. 4. Make sure that only the terminals of the rheostat and the grid leak as shown are utilised. Notice that no connection is indicated as going to one end of the aerial coil (L3). Connection to this point is made by means of a clip attached to the end of the aerial lead-in, so that it is possible to vary the number of turns clipped into circuit at will.

Operation.

With the coils specified, the wave length range of this little transmitter is from approximately 15 to 60 metres, this being varied by adjusting the tuning condensers C1 and C2. For most purposes, however, a wavelength of 32 metres is recommended, as this channel falls within the narrow band alloted for Australian amateur use, and is capable of producing splendid results as far as DX (or distance) is concerned. It is almost impossible to give any definite directions with regard to the settings of the two tuning condensers for a given wavelength. However, as a rough guide it may be mentioned that, for 32 metres, the moving plates in the transmitter illustrated are spaced approximately 1/16-inch from the panel.

Although this transmitter is intended really for low-power work, inputs as high as 50 watts may be used with a UX.210 Radiotron valve. For a start, it is advisable to use a single 201.A valve, with the ordinary 6-volt filament supply. This supply may be derived either from a 6-volt accumulator, or even from a small transformer of the bell-ringing type, but the battery is the better method.

Now, there are several different ways of securing a suitable plate supply. To begin with, three 45-volt "B" batteries may be used, and they will enable quite respectable distances to be covered under good conditio.— The writer frequently has communicated with s——ns in Sydney and Melbourne when only 90 volts of "B" battery was used on the transmitter, which shows what can be done with an efficient set, careful adjustment, a good aerial—and last, but not least, a good operator at the receiving end.

FIG. 5 (above).—Detail of coil mounting.

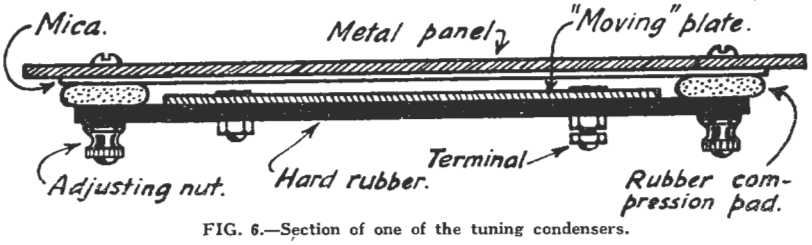

FIG. 6.—Section of one of the tuning condensers.

A "B" eliminator delivering 180 volts forms an excellent plate power unit for short-distance (Interstate) work, while the ordinary 240 volts A.C. house-lighting supply also may be pressed into service. This last, however, gives a note of very indifferent character if used "just as it comes from the socket," and one must be

extremely careful in seeing that the "live" wire of the circuit is connected to the "B†" terminal of the transmitter; this is easily identified by means of an ordinary lamp. In our next issue, we shall go more fully into the question of power supply, describing an excellent transformer-rectifier-filter system for use with any low-power transmitter.

Let us assume for the time being that the transmitter is to be tested with a "B" battery power supply. The 6-volt "A" battery will, of course, be connected to the "A—" and "A†" terminals, it being noted that one terminal is common to "A—," "B—," and "Earth." The negative of the "B" battery goes to "B—," while the positive of the "B" battery is connected to one terminal of a morse sending key, the other terminal of this key being joined to the "B†" terminal.

For best results, an aerial which has been especially designed for use at the operating wavelength should be used. Particulars of such a radiating system will be given in our next issue—space will not permit us to go into details here. However, it is possible to obtain quite good results simply by employing an ordinary aerial and earth system, "shock-exciting" it at the wavelength to which the transmitter is tuned. For this purpose, the aerial should be clipped onto the free end of the aerial coil (L3).

An accurate wavemeter really is an essential piece of equipment for any amateur station, and is of incalculable value when adjusting and tuning a transmitter. Still, it is scarcely likely that readers building the "DX Special" will be the happy possessors of such a useful instrument, so here is a rough method of settling on the desired wavelength by making use of your short-wave receiver.

If you are at all familiar with the short waves, you will no doubt have a pretty good idea of the point on your tuning dial that represents a wavelength of 32 metres. The problem now before us is to adjust the tuning condensers of the transmitter until it is oscillating most strongly at that wavelength. If your receiver is situated fairly close to the transmitter, you must not expect to hear your signals as they will sound to a distant listener—you will merely hear a series of very loud clicks as the morse key is manipulated.

With the filament rheostat and the grid leak each turned about half in, and the tuning condensers set with 1/16-in. spacing, make a series of short "dashes" with the key, and "search" on your short-wave receiver until the clicks are strongest in the phones. Note the position of the tuning dial; if it is higher than the 32-metre point, increase the spacing in the transmitter condensers slightly, and try again. If below the 32-metre position, screw down the condensers, and listen again. Eventually a position will be found at which the key-clicks are heard with greatest intensity on 32 metres. Now the next thing to be done is to arrange with a nearby amateur to listen for your signals, and to make various adjustments while he stands by and reports on the result. Don't be afraid to ask for a helping hand in this way; there is a "brotherhood" of "hams," you know. As a tribe they are cheery souls, ever ready to extend the right hand of friendship to a newcomer to the ranks. But —do get your license first !

[See next issue for more details of the "DX Special" Short-Wave Transmitter. Aerials and power supply units will be dealt with.]

Big Broadcasting Scheme

A Radio Eisteddfod

The New South Wales Broadcasting Company has set itself the ambitious task of conducting musical competitions on a large scale, in the belief that radio in future will play an important part in cultivating a higher artistic taste.

This scheme is a comprehensive one, in which entries from all parts of the State are invited. The syllabus which has been prepared allows for thirty-four different sections for competitors, the most important of which is that for the best original Australian composition—vocal, pianoforte and violin. Entries are also invited from vocalists of all types of voices, bands, choirs, instrumentalists, radio sketches, radio revues, comedians, etc.

There is a dearth of first-rate material for plays and sketches suitable for broadcasting, and this eisteddfod will be the means of discovering fresh talent in this direction.

Substantial prize moneys are given in each section, and the winners will, in addition, be given contracts for broadcasting.

The adjudication will continue until the finalists are heard on the air between 3rd and 8th December, and the winners appear in the Sydney Town Hall on 18th December.

Brisbane's Radio Bazaar

AT TRACKSON'S.

Something of an innovation for Brisbane has been introduced by those progressive radio people, Messrs. Trackson Brothers Ltd., of Elizabeth Street, Brisbane, in the form of a Radio and Electrical Bazaar. At the invitation of Mr. Trackson, we visited the bazaar last week and were greatly impressed with the practicability of the idea.

The lengthy counters at Trackson's are now fitted with scores of plateglass trays in which are displayed all manner of radio accessories. Above the trays are stands for carrying the price tickets of the various articles. The scheme affords an ideal method of selecting radio components at leisure, and also saving salesmen's time. Upon the occasion of our visit we found that quite a large number of radio enthusiasts were making full use of this novel method of shopping, strolling around the bazaar, inspecting the wide range of goods displayed and making their selections as they went along.

The bazaar is permanently established at "The Radio Rendezvous," and readers of this journal are invited to pay the store a visit. Special price reductions on many lines are announced in order to popularise the idea among the radio public.

Radio in Great Britain

Some Interesting Viewpoints of an Australian

SOME few weeks ago we had the pleasure of a visit of Mr. A. Beal Pritchett, managing director of A. Beal Pritchett (Aust.) Ltd., of Sydney, distributors of Mullard, Ferranti and Jackson products, who, in the course of an interview, told us of some of the impressions he gained during a recent extensive trip of Great Britain and the Continent.

In this interview Mr. Beal Pritchett tells us quite a lot of interesting facts about radio in the United Kingdom. His remarks on British Broadcasting are particularly interesting.

"The thing which impressed me most about British broadcasting, said Mr. Pritchett, "was the magnificent programmes and perfect transmissions, coupled with the public's dissatisfaction with what they were getting."

"The broadcasting entertainments given by the British Broadcasting Corporation, taken from both a classical and general point of view, are undoubtedly the best in the world," continued Mr. Pritchett. "In fact, in quite a number of hotels and private houses visited suited to Australia, receiving conditions here being somewhat similar to those of U.S.A.

"The B.B.C. is doing its utmost to give a 100 per cent. service, yet the great British public does not know when it is well off, which leads me to think that relatively, in Australia, the broadcasting services are not so bad as some people would have us think, considering the meagre resources at the disposal of the stations.

"From the point of view of reception, it must be admitted that conditions are very much better in England than in Australia, because the problems of neither distortion nor interference has to be contended with. On account of the almost complete absence of static, reception is always clear, and because of the use of only two wavelengths (widely separated), interference does not exist.

Revival of Amateur Set Construction.

"About a year ago the amateur constructor appeared to be waning in his enthusiasm, and the demand of the public swung over to factory-made sets.

"But about six or seven months ago, there was a great revival of set building in the home, and when I left England, the more important manufacturers of radio components, were extremely busy owing to the effect of this change.

Radio Universally Popular.

"One thing which astonished me was the almost universal use of radio. On entering any large city a forest of aerials would greet one's gaze. In passing through the suburbs, houses without wireless were conspicuous. Owing to the small distance over which reception is effected, crystal sets are much more popular than they are in Australia; indeed, there are very few sets of more than three valves. These sets are universally fitted with a change-over switch which enables listeners to listen on the high or low wavelengths at will.

Possibility of Export Trade Remote.

"The possibility of export for manufacturers of British receiving sets to Australia, in my opinion, is not great, owing to the Australian conditions being vastly different to those for which the British manufacturer builds his products.

"The situation in regard to the exporting of British radio sets is somewhat akin to the English motor car manufacturers sending English cars to the Commonwealth, as the bulk of his production is particularly suited for his home conditions, they do not suit us. As the American car is more suited for Australian road conditions, just so are American factory-made sets more suited to Australian receiving conditions here, being somewhat similar to thos eof U.S.A.

"Are electrically-operated receivers popular in the Old Country?" queried our representative.

"Not yet," replied Mr. Pritchett. "The fully electrically-operated receiver is not to be seen in England, although manufacturers are experimenting along this direction. In Holland and Germany there are several of these sets giving good service.

"The general appearance and construction of the Continental sets and components are not suitable for Australian conditions, and I do not think that there is any danger of what British trade we have here being supplanted by the products of the Continent of Europe.

"I travelled extensively throughout the United Kingdom and various European countries, and was gratified to find that those firms which I represent in Australia are doing the majority of British business. I was particularly impressed with the sales organisation of the Mullard Radio Valve Company for the selling of valves only. They have a chain of branch depots throughout the provincial centres, and it was a revelation to think that any firm could enjoy large enough sales of one commodity to enable them to maintain such a huge organisation.

"Some idea of the immensity of the radio industry in England may be gathered when I state that I saw 4000 people in one room of the Ferranti Company, manufacturing and assembling audio transformers. Ferranti transformers are used in quite a large number of factory-made sets. It pays the set manufacturer in England to put the best obtainable compon-

ents for audio amplification, for by so doing he can reach that perfect tone which to-day the English listener is learning to appreciate rather than the 'crash volume effects' he was striving for a short while ago.

"A newcomer to Australia is the Jackson condenser, a masterpiece of British radio engineering. Naturally, such a piece of apparatus is not cheap—but it is wonderfully efficient. In England it is to be found in a many specified circuits, and also in large numbers of factory-made sets.

"There is really such a small difference in the total price of a radio set (whether home-built or factory-made) using cheap components, and one using more expensive main components, that, considering the world of a difference that the better components yield, the few shillings 'saved' can safely be considered as false economy.

"With the products of a manufacturer who, in order to get down to a price, must sacrifice quality, results are never satisfactory. I realise that a lot of the prejudice that exists against radio has been caused by the reproduction of inferior radio receivers and loudspeakers. If radio is to survive it must be regarded wholly and solely as a faithful reproducer of music and speech. Such results can only be secured by the use of good components, and so convinced am I in the logic of this reasoning that I have definitely decided to associate myself only with radio components of outstanding excellence.

"I feel sure the Australian listener would just as soon operate a good set which costs him a little more money as a cheaper instrument which invariably sounds 'cheap.' In this matter the buyer is often in the hands of the supplier, who thinks for his customer—and very often thinks wrongly."

"I am indeed glad to be back in Brisbane," concluded Mr. Pritchett. "I have some old and esteemed friends in Brisbane, and it is just like old times to see them all. I was glad to be able to join in the golf afternoon arranged by the Electrical Employees' Association the other day. It seemed as though it had been specially arranged for me—so welcome was I made—but of course Queenslanders—and the people of Brisbane in particular—are noted for their hospitality to those of us who come to visit them."

An Important Sales Conference

A photograph taken at an important Sales Conference between representatives of J. B. Chandler and Co. and Amalgamated Wireless (A.'sia.) Ltd., upon the occasion of the former company taking over the Queensland distribution of the latter company's products. Mr. J. B. Chandler (who presided) is seated at the far end of the table. A Radiola "Straight Six" receiver is shown in the centre of the photograph.

ERRATA

In the description of "The Globe-Trotter Screen Grid Four" short-wave receiver published in our last issue, an unfortunate error crept in with regard to the types of Philips valves specified, and we desire to make the following corrections:

The Philips screen grid valve is known as the type "A-442," while the special last stage "Penthode" valve used in socket V4 is a "B-443."

In the list of parts, the third line should read "3 Sangamo .006-mfd. fixed condensers, C4, C5, C9."

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THEY ARE THE NEAREST TO PERFECT AND MOST DEPENDABLE YET CONSTRUCTED.

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TYPE OP 2, 41/-

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N.

(Continued from page 8.)

(grid and two filament) in the right-hand compartment, and to place the coil with its terminals corresponding to those shown in the pictorial diagram (Fig. 6). A valve is now passed through the holes in the shield and the prongs inserted in the three clips, with the centre prong **down,** after which the remaining end of the valve holder is moved into position and screwed down. It should be remarked that the small metal shields supplied with the valve holders are discarded, their place being taken by the aluminium partitions.

In the centre shielded compartment are located the plate and screen grid end of valve holder V1, the grid and filament end of valve holder V2, coil L3, two .25-mfd. fixed condensers C9 and C10, grid condenser C7, and grid leak R3. In the left-hand shielded compartment are mounted the plate and screen grid end of valve holder V2, the detector socket V3 (the ordinary UX type), coil L4, two .25-mfd. fixed condensers C11 and C12, grid condenser C8, grid leak R4, and Tempryte R5. At the extreme left-hand end of the baseboard—the unshielded portion—is the audio-frequency amplifier system, comprising the radio-frequency choke X, Ferranti transformers T1 and T2, Ferranti output transformer T3, valve sockets V4 and V5, Ferranti 100,000-ohms detector feed resistance R6, .25-mfd. fixed condenser C13, 2-mfd. fixed condenser C14, and a 3 x 2-inch terminal strip bearing the two output terminals. In the shielded compartments, all of the components are mounted directly on the aluminium base plate, as there is no necessity for insulation here. Great care must be taken to screw down the various pieces of apparatus in such a position that their terminals face in the direction indicated by the lettering in the drawing, as a great deal of time was spent in evolving an ideal layout, and we believe the present one cannot be improved upon.

The Wiring.

All that now remains to be described is the wiring, and this is not nearly such a difficult matter as it appears at first sight. The most satisfactory material to use for this particular receiver is 18-gauge tinned copper wire, covered with spaghetti tubing. This wire is very easily soldered and bent to shape, and makes an excellent job, mechanically and electrically. The pictorial diagram makes all the details of the wiring clear with the exception of one point, and a little explanation is called for here. All the wires belonging to the battery circuits of the receiver are passed through holes drilled in the baseboard directly beneath the terminals to which they are connected, and are taken to their destinations **underneath** the baseboard. This eliminates the need for extra holes being drilled through the aluminium partitions, and, in addition, gives the set a particularly neat finish. For instance, one filament terminal of valve holder V1 is connected directly to the earthed shield by joining it to a screw inserted in the baseboard shield. The other filament terminal, however, has to be connected to the filament rheostat R1. In the drawing the connection is shown in the clearest possible way, no attention being paid to the real postion of the wire. Actually, it is taken down through the baseboard and base shield immediately below the valve holder, runs along under the baseboard until it is joined to a wire coming down from valve holder V2, and then continues on its way until it is taken up through another hole and connected to the rheostat. Sufficient insulation is provided by the spaghetti tubing where the wires pass through the baseboard and shield.

The seven wires comprising the battery cable are treated in the same way; the cable is clipped to the **underneath** of the baseboard, and the various wires taken up through holes to the terminals to which they are connected. This system must not, of course, be applied to the radio-frequency portion of the circuit, but only to the "A," "B" and "C" battery circuits. However, only two wires require to be taken through the aluminium partitions, and holes are already drilled to accommodate these. Where a wire is shown terminating on a shield in a black semi-circle, it may be taken that it is connected to the shield—"earthed"—at that point. As the shield, in addition to being connected to earth, forms the "A" battery negative bus-bar, quite a number of connecting wires are thus eliminated. At the wavetrap end, a flexible wire equipped with an "Eagle" plug is joined to the aerial terminal. Another similar lead is connected to one of the three "A" terminals on the coil L2. The purpose of these will be explained under the heading of "Operation." Notice that three separate flexible leads protrude from the back of the receiver near the right-hand end. These are for the purpose of applying a grid bias to the screen grid valves, and are quite separate and distinct from the "C" battery leads included in the battery cable.

Operation.

In our receiver, we have used a Marconi DEL-610 valve in the detector socket V3, a Marconi DEP-610 in the first audio socket V4, and a Marconi DEP-610 in the final audio socket V5. These last two valves operate quite nicely on the full six volts, so no Tempryte is inserted here.

For "B" supply three 45-volt heavy-duty "B" batteries are required, delivering 135 volts in all. Two

4½-volt "C" batteries are needed for the audio amplifier, and one 4½-volt "C" battery for the radio-frequency bias. The battery connections are clearly indicated by the markings on the battery cable wires, which are shown, for the sake of clarity, projecting at the left-hand side of the pictorial diagram. However, we give them here just to make assurance doubly sure:

The wire marked "A—" is connected to the negative terminal of the 6-volt accumulator, and a wire runs from here to the "—" clip of one "B" battery. The "A†" wire goes to the positive accumulator terminal. The three "B" batteries are, of course, connected in series—that is, the "†45" clip of the first battery is connected to the "—" of the second, and the "†45" clip of the second joined to the "—" clip of the third. Now, the wire marked "B†90" goes to the 90-volt point, which is the "†45" clip of the **second** battery. The "B†135" wire connects to the full 135 volts point, which is the "†45" clip of the **third** battery.

Now for the "C" batteries: Two of the 4½-volt "C" batteries are connected in series—the "†" terminal of one to the "—4½" terminal of the other. The battery cable wire marked "C†" is joined to the "†" terminal (the one that has no connection on it) of one "C" battery. The "C—" wire goes to the "—3" terminal of the same battery, while the "C—Power" wire goes to the full 9 volts—that is, the "—4½" terminal of the second "C" battery. We must now attend to the three wires projecting from the back of the set, which supply a "C" battery voltage to the grids of the screen grid valves. Connect the wire marked "C†" to "—3" terminal of the remaining "C" battery, and both the wires marked "C—1½" to the "—4½" terminal. By this means a 1½-volt negative biassing potential will be applied. It is possible that better results will be obtained with no bias at all here; in that case, the three wires will simply be twisted together.

The aerial and earth connections are self-explanatory, and the loudspeaker is connected to the two output terminals. The audio amplifier system of this receiver is of such superb quality that only the best of loudspeakers can do justice to it. A good cone speaker is recommended.

The plug attached to the flexible wire leading from the aerial terminal may be inserted in one of the three sockets on the near end of the wavetrap. Inserted in the socket adjacent to the adjustable condenser C6, the wave trap is disconnected entirely from the circuit. In the next socket, only part of the pick-up coil is connected, while the third socket connects the whole coil, thereby rendering the trap most effective.

The plug on the other flexible lead may be inserted in either of the two sockets shown. In the one adjacent to the condenser C6, the .00015-mfd. aerial series condenser is shorted out of circuit; in the remaining socket, the series condenser is connected in circuit, with a consequent increase in selectivity. The other end of this lead is connected to one of the three aerial terminals provided on the Radiokes coil. As far as results are concerned, there is not a great deal of difference between these terminals, but it is just as well to try each one while the set is in operation, leaving the wire connected to the terminal that gives best results.

Tuning the Solodyne.

After turning on the battery switch and turning the rheostat nearly full on, it is only necessary to rotate the two tuning dials in unison until a station is heard. If interference is experienced from the nearby station, the plug connected to the aerial terminal must be inserted in either one of the two sockets which connect the trap in circuit (as previously explained), and the condenser C6 varied until the interference is eliminated.

It will be noticed that the two drum dials do not read alike for the best reception of a given station, but, for rapid tuning, it is usually possible to rotate them approximately in step until the station is picked up, when a final individual adjustment may be made. The reaction condenser is used to increase the sensitivity of the circuit for distant or daylight reception, and the rheostat should be turned as low as possible consistent with good results. Selectivity is greatly affected by the adjustment of this rheostat, and it is well worth while experimenting with it. Once the dial adjustments have been logged, it is always an easy matter to return to the station.

Build this receiver carefully, use it correctly, and you will surely agree with us that the Screen Grid Solodyne is undoubtedly "the receiver of the year!"

Parts and Accessories for the Screen Grid Solodyne

1 Cyldon 1928 Solodyne condenser and shield assembly, C1, C2, C3.
1 Cyldon .00025-mfd. Bebe reaction condenser, C4.
1 Pilot .00015 to .0005 mfd. Micrograd condenser, or Cyldon .00025-mfd. Bebe condenser, C6.
1 De Jur .00015-mfd. fixed condenser.
2 De Jur .001-mfd. fixed condensers, C5, C7.
1 De Jur .00025-mfd. fixed condenser, C8.
5 Hydra .25-mfd. fixed condensers, C9, C10, C11, C12, C13.
1 Hydra 2-mfd. fixed condenser, C14.
1 Radiokes 1928 Solodyne coil kit, L2, L3, L4.
1 De Jur 6-ohm rheostat, R1.
2 De Jur 1-meg grid leaks, R2, R3.
1 De Jur 2-meg. grid leak, R4.
1 Cyldon 5-ohm Tempryte, R5.
1 Ferranti 100,000-ohms. resistance, R6.
1 H. & H. battery switch S.
2 Ferranti AF-5 audio transformers, T1, T2.
1 Ferranti 1 to 1 output transformer, T3.
2 Marconi screen grid valve holders, V1, V2, with special aluminium supports.
3 Emmco UX balanced sockets, V3, V4, V5.
1 Radiokes radio-frequency choke, X.
1 Radion mahogany panel, 27 x 7 x 3/16 inches, Y.
1 Stained pine baseboard, 26 x 12½ x ½ inches, Z.
1 Aluminium sheet, 16 x 12 x 24 gauge.
2 Bakelite terminal strips, 3 x 2 x 3/16 inches.
1 Bakelite wavetrap panel, 6 x 1½ x 3/16 inches.
1 Bakelite tube, 6 x 2½ inches diameter.
4 oz. 24-gauge green D.S.C. wire.
5 Eagle sockets with two plugs.
4 Belling-Lee bakelite binding posts (aerial, earth, output, output).
3 De Jur single leak mountings.
1 Battery cable, 7 wires.
4 Perdriau rubber basin buffers.
6 Lengths spaghetti tubing.
Wire, screws, bolts, nuts, etc.

ACCESSORIES:

2 Marconi S-625 screen grid valves.
1 Marconi DEL-610 UX valve.
2 Marconi DEP-610 UX valves.
1 6-volt accumulator.
3 45-volt heavy-duty "B" batteries.
3 4½-volt "C" batteries.
Loudspeaker.

Wooloowin Radio Club ~ 4WN

The past month has been a fairly active one for this club. The new officers are finding their places and everything looks very promising for the coming year. The bank-balance is—well, you should see our worthy treasurer as he rubs his hands and collects the shekels each meeting night. Our funds are in so satisfactory a condition that at a recent meeting it was decided to expend a little of our horde in the construction of a complete new club station. This is under construction at present, and if the working bee remain as enthusiastic as they are at present, the finished job should be quite presentable. Friend Nolan is becoming a radio mechanic and now arrives at meetings, either in Vic. Bouchard's car, together with vast quantities of timber, wire, -ply, etc., or else staggering under an enormous tool bag.

Yes, the members **are** enthusiastic—so much so, that when, at a recent meeting, our treasurer arrived with his key and buzzah—er, I mean buzzer—they immediately joined him in a morse seance. The concentration was too much for Nolan, who was carried off on a shutter. This, unfortunately, brought the morse class to a close, as Geo. Payne (now hon. sec.) was dispatched on his iron horse—er, goat I mean—for an anti-headache compound.

It is hoped that by next month the club station will be in regular operation, though much testing has yet to be done. Mr. Vic. Bouchard very kindly presented the club with a gramophone which will be very useful. With Vic rendering long series of gramophone solos, assisted by Friend George's banjo mandolin, a good programme is assured. A 250-metre helix has also appeared, and, believe us, it is **some** helix. Ask the A.R.T.L. boys. Rumour hath it that several of these youths—ahem, I was among the culprits!—decided that this fine business should not be allowed to waste. A start was therefore made to divide it up, but I am sorry to say the scheme fell through, as there was an uneven number of turns thereon.

We are very sorry indeed to lose from among our active members, Mr. Anthony Thomas, who has been transferred "bush." We will miss Tony very much and the space occupied in the club-room by his cheerful "dial" will take a little filling. Well, Tony, what about getting a transmitter to keep in touch with the club??

We watch with great interest our new friend and rival—the Indooroopilly Radio Club. This very active body, I feel sure, has a very bright future, and I feel sure if 4WN should have any say, will live long and die—well, no, never die at all. Our other friends, 4TC, are rather quiet lately, but their quiet periods usually precede a storm—so look out, 4WN.

Toombul Radio Club

The members of the club conducted some interesting radio experiments in the vicinity of Mount Edwards. The trip was made per motor cycle, and the members carried a portable receiver and transmitter. The high tension supply for the Xmitter was supplied from a Ford ignition coil, and was supplied to a Mullard P.M.6 receiving valve, working on the 85-95 metre amateur band. The experimenters report having an enjoyable time.

The club's 240-metre transmitter has been operating every Sunday evening, and reports on reception have come to hand from practically every suburb of Brisbane, invariably reporting good modulation and strength.

Lectures are being delivered every meeting night by members on subjects interesting to radio enthusiasts. The club-rooms are situated at the corner of Eton Street and Sandgate road, Nundah, meetings being held every Wednesday night, and visitors and members of other radio clubs are always welcome.

A Newcomer Among the Radio Clubs

Central Technical College Radio Society

That the fascinating properties of radio are prevalent among the students of the Central Technical College is borne out by the fact that a number of radio enthusiasts at the College approached Mr. R. J. Lydon (Chief Instructor, Electrical Branch, Department of Technology) to discuss the possibilities of the formation of a radio club. These people were desirous of investigating, and possibly solving, some of the intricacies of electrical and radio phenomena.

Mr. Lydon was immediately in favour of the suggestion, and after a consultation with the Principal of the College, Mr. Wearne, arrangements were made for the use of part of the College building to commence operations.

So that, in July of this year, the first inaugural meeting of the Central Technical College Radio Society was held in the main building of the C.T.C.

At this meeting a constitution was drawn up, various rules were made, officers and committees elected, and usual formal business discussed. It was decided to ask Mr. Wearne to officiate as Patron to the club. He has since accepted the position. Our popular friend, "Bill" Rhode, was elected secretary-treasurer.

The authorities of the College promised assistance, both materially and financially. The members were then notified that a room in the "Wool" block had been allotted for the use of the club, and an inventory of radio and electrical equipment to be presented to them from the College, was handed to the secretary. He was also informed that all electrical apparatus, including meters, machinery, etc., at the College, were at the disposal of the club.

With this very encouraging start it was decided to erect, from gear on hand, a temporary 80 metre transmitter. The construction of this piece of apparatus, in the hands of enthusiastic workers, did not take long to complete.

The next step was to erect a temporary aerial. Supports were made on the roofs of the Domestic Science and Wool blocks, respectively, and an aerial was stretched across. The operations were carried out by fourth year electrical students.

With everything ready for a test, it was decided that some of the members should journey to various parts of Brisbane by motor car and make observations on a two-valve receiver. The transmissions were carried out under the call-sign 4MF, Mr. Winterford being a member of the society.

The results were most successful, and during the following week two-way communication was worked with 4FK.

At a meeting held shortly later, a working syllabus was drawn up, and it was decided to divide the members of the club into three sections to attempt the following work:—

(1) Construction of receiver;
(2) Construction of transmitter;
(3) Installation and maintenance of electrical equipment, including batteries, motors, generators, etc.

It was decided to construct a Schnell receiver.

The transmitter under construction is a 30-200 metre tuned grid, tuned plate, series feed.

Application has been made to the Public Works Department for the erection of two 35ft. masts to replace the present supports.

During the month, the Radio Inspector, Mr. Armstrong, paid a visit to the College, and after viewing the apparatus, was greatly impressed by the activities of the "students" of the club. He wished them every success.

Application was made to the Postal Authorities for the call-sign 4CT.

Perhaps we now speak with a certain amount of optimism, but this scribe predicts a great future for the club, and sincerely hope that its formation will be another stepping stone to the advancement of radio in general.

Success to the "Techites" !

This department is conducted for the benefit of our readers. We cannot answer queries by mail, but if a special diagram is required, we will supply it at a cost of 1/-.

Questions Answered

By the TECHNICAL EDITOR

Questions received before the 20th of the month will be answered in the following month's issue. Queries arriving after this date are deferred until the next issue.

"Perplexed," Darra.—"In the description of many sets which have appeared in the 'Radio News' during the past two years, oscillation is spoken of as highly undesirable, and means are discussed which will prevent it occurring. In one set published in an issue of the 'Radio News' which I have before me, oscillation is described as the 'bugbear' of radio-frequency amplification. Now, in other sets, oscillation appears to be highly desirable, and must be present before the set can be considered properly adjusted. How is this? (2) A short earth-wire is always recommended. How can one have a short earth wire if the set is in the upper stories of a high building? Must a counterpoise be used in this case?"

Answer.—Your question is an interesting and reasonable one, and the subject must have perplexed many people; nevertheless, it is easily answered. Oscillation is nearly always undesirable in radio-frequency amplifiers, for the reason that the degree of amplification obtainable from a valve used in this capacity is, to a certain extent, determined by the point at which self-oscillation becomes evident. That is to say, by changing the constants of the circuit (principally altering the dimensions of the coils), the amplification obtainable may be increased until a point is reached at which self oscillation is present. At that point, the valve becomes useless as an r.f. amplifier. Now do you see why self-oscillation is so often referred to as the "bugbear of r.f. amplification"? In the case of a valve that is doing duty as a detector, however, the matter is altogether different. In this part of the circuit, some means is deliberately introduced in order to promote oscillation, **but at the same time, to keep it under control.** The reason is that a valve detector operating close to the oscillation point is at least twice as sensitive as a non-oscillating detector; in fact, the latter may be regarded, for all practical purposes, as little more sensitive than a good crystal detector. Oscillation, to be of any value, must always be under the direct control of the operator, and in the detector circuit it is quite a simple matter to arrange this. So, you see, the position of self-oscillation is somewhat akin to that of fire in its service to mankind—"a good servant, but a bad master." (2) A short earth-wire usually gives better results than a long one, but the position of a listener located in an upstairs room is by no means a hopeless one. If the building is of the steel frame type, as most of our modern city buildings are, the frame of the building may quite reasonably be looked upon as "earth," and a connection taken by as direct a route as possible to some portion of the plumbing fixtures, or to a metal window-frame. However, in a high brick or wooden building, better results often are secured by using a counterpoise, erected preferably directly under the aerial, and having similar or larger dimensions.

"XYZ," Warwick.—"With reference to the Globe-Trotter Screen Grid Four described in your September issue, there are a few questions I would like to ask: You specify four-volt valves, but as I already have a 6-volt set and 6-volt battery, I should want 6-volt valves. What screen-grid valve would you recommend? (2) I have a Bremer-Tully short-wave coil kit, and B-T 13-plate condenser. Could I make use of these by procuring another B-T coil kit? (3) Where are the parts you list obtainable, such as Cyldon Logmidline condensers C1 and C2?"

Answer.—You can quite easily utilise 6-volt valves if you wish, though there is nothing to prevent your using the valves specified with higher values of Amperites, so that the set could be run on the 6-volt battery. The Marconi S-625 screen-grid valve (as used in the Screen Grid Solodyne appearing in this issue) will give good results, or you may use the Philips A.442 in conjunction with a type "6V-199" Amperite. (2) Yes; use the B-T kits by all means, but your B-T condenser is too large in capacity. It would be OK for the reaction condenser C3, but I don't think it would fit in the space available. Would advise you to use the condensers specified for C1 and C2. (3) You should be able to purchase these parts from any reliable dealer, as they are all of standard make and are well-advertised lines. If your dealer does not stock all the material, he can easily get it in for you.

"J.B.," Indooroopilly.—Will reply to your questions by mail in a few days' time.

"R.S.," Gordonvale.—"In using a Morse key, is it usual for the contact points to constantly become corroded by the formation of a black coating which seems to prevent proper contact? Is there any metal I could use for contact points that does not cause such corrosion to form?"

Answer.—Keys equipped with genuine platinum contacts give very little trouble from this cause, but the ordinary tungsten contacts usually require to be rubbed over with a fine file or piece of emery paper occasionally. This is particularly the case if the key is used to break a heavy current, or one carrying a highly inductive load (such as a power transformer), which has the effect of causing excessive arcing or sparking at the contact points. You might try shunting the points with a 2-mfd. fixed condenser, or, better still, by a 2-mfd. condenser in series with a 30-ohm rheostat.

"A.S.," Gladstone.—Writing to you this week.

"A.L.M.," Millaa Millaa.—September issue mailed to you.

"C.G.," Brooklands.—Many thanks for writing as you did. As far as the rheostats are concerned, you are quite alright. You don't say what transformers you are using, but if they are twelve months old, it is possible that the new A.W.A. "Ideal" (which have superseded the "Superaudio") will give you better tone quality. Have written you.

"Subscriber," Tweed Heads.—"I am using a Gilfillan Neutrodyne receiver, but I wish to get some of the "extras" on the air, and would be glad to know what can be done towards adding any improvements to increase the range. Can the new screen grid valve be added to the set in any way? (2) Can reaction be added? (3) Can you recommend a valve combination for best results?

Answer.—The best thing you can do is to build the Screen Grid Booster described in this issue, and add it to your set. It will give you all you want in the way of range and increased volume. The cost would be, roughly, between £5/10/- and £6, including the screen grid valve. (2) Would not advise you to add reaction; it will be unnecessary with the Booster, anyway. (3) It's a very difficult matter to recommend a good valve combination—there are so many excellent valves on the market nowadays. You do not say if you are using a 4-volt or a 6-volt accumulator, nor what type of "B" eliminator. Let me know these, and also what valves you are using at present, and we'll see what can be done.

NEW RECEIVERS REVIEWED

In response to many requests from our readers, we have inaugurated this department. It is our intention to test each new receiver at it appears upon the market, and to offer candid criticism upon its performance.

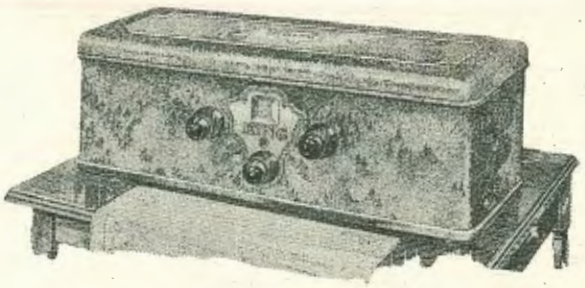
The Radiola Screened Six

See Illustration on Page 19)

Representative of the latest advancements in electric-set design and a worthy product of a famous Australian factory, is the Radiola Screened Six, manufactured by Messrs. Amalgamated Wireless (A.'sia.) Ltd., and distributed in Queensland by Messrs. J. B. Chandler and Co., 45 Adelaide Street, Brisbane. The Radiola Screened Six, as its name applies, is a shielded six-valve tuned radio-frequency receiver, incorporating three r.f. stages, detector and two transformer-coupled audio stages. As far as power supply is concerned, it is absolutely self-contained, valves of the latest A.C. type being utilised in conjunction with an appropriate system of transformers, rectifiers and filters. The power line plugs directly into the nearest light or power socket.

In performance, the Radiola Screened Six is, to say the least, remarkable. Up to the present, few of the A.C. operated receivers have demonstrated a sensitivity comparable with that of a good battery-operated set of similar size. With the Radiola, however, it is hard to decide which feature creates the greater impression—its superb tone quality or its great range. In our tests, conducted over a period of a week, the receiver was used with only a short indoor aerial. Nevertheless, no trouble was experienced in tuning in all the Australian stations—"A" and "B" class—at night on the speaker, a built-in Amplion Cone, and, at 5 o'clock in the afternoon we were surprised to find that both the Sydney "A" stations came in at good speaker strength. At night time, it was rarely necessary to make use of the receiver's great reserve of power when listening to the "A" stations, and 1YA (New Zealand) was received at astounding consistency and strength. On one occasion, the Japanese station JOCK was heard at fair loudspeaker volume, and, although this could not be expected as a regular performance, it will serve as a good indication of what could be done were an outdoor aerial used.

The exterior appearance of the Radiola Screened Six is charming, with its handsomely toned oak cabinet (floor model), and tastefully designed control panel. A single illuminated slow-motion control rotates the four variable condensers in unison, a balancing condenser being provided for ultra-fine tuning. A power switch, reaction control, and a modulator for weakening nearby stations, completes the tuning equipment. This last control is cut into circuit by means of a switch located inside the cabinet, the action being to change the first r.f. stage from a tuned circuit to a resistance-coupled circuit. Using the tuned circuit for distant reception, splendid selectivity is attained; 3LO is at all times received with no trace of background from the local station. We feel justified in saying that the Radiola Screened Six is by the best electrically operated receiver that has yet come into our hands.



The King Model "G" Neutrodyne

From the Aeolian Company (Aust.) Ltd., 436 Queen Street, Brisbane, we have received a sample of the Model "G" Neutrodyne manufactured by the King Quality Products Company, of Buffalo, N.Y., a branch of the great King-Hunter Sewing Machine Company. Even before we had tested it, we were strongly attracted to this receiver by its uncommon beauty. It is assembled in a pressed metal cabinet, beautifully moulded and finished in a fine crystalline bronze enamel that is most striking. Only three controls appear on the beautifully designed and finished escutcheon plate—the main tuning knob with its illuminated drum indicator, calibrated directly in metres, a seldom used vernier tuning control, and a much-used volume control.

The performance of the "King" Neutrodyne comes well up to what its handsome appearance would lead one to expect. The three tuned stages of neutralised r.f. amplification give all that one could wish for in the way of volume from the distant stations, and the receiver is delightfully free from any equeals or howls. High-grade transformers are used, in addition to a large power valve in the last stage, and the result is a quality of reproduction that is very fine indeed. As regards selectivity, the King receiver is well above the average. Using an outdoor aerial of overage dimensions at a distance of two miles from 4QG, 3LO was received without interference, and the strength of the small Southern "B" class stations was quite surprising.

An inspection of the interior construction reveals the fine design and construction upon which the factory prides itself. The whole assembly is affixed to a rigid metal chassis, and all windings and resistors are rendered impervious to moisture by sealing them in a special wax compound. An unusual feature is the jack which is furnished for the addition of an electric phonograph pick-up, if desired. After subjecting the receiver to careful tests, we are confident that this newcomer will quickly take its place among the front-rankers of radio sets on the Queensland market.

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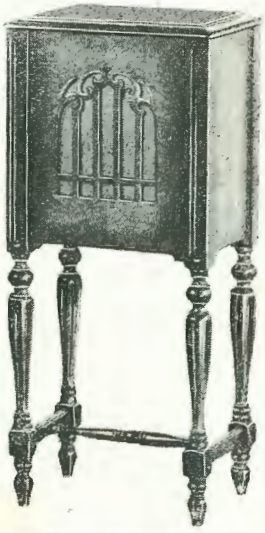

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AC

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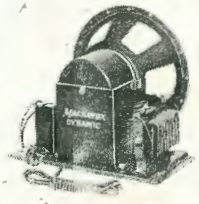
6 to 12 volts D.C. field, at 1.1 to 2.2 amps. Operates from dry rectifier or from 1 or 2 6-volt accumulators.

UNIT, £8/10/.



DYNAMIC 80.
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UNIT £12

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DC

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