The Queensland RADIO NEWS

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The HOLIDAY PORTABLE

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The QUEENSLAND RADIO NEWS

SATURDAY, DECEMBER 1st, 1928.

Taking a Backward Look

AS the ebbing waters of 1928 flow gently from our gaze, it is well that we should pause for a moment to review what has truly been an epoch-making year in the progress of radio. Briefly, the more notable advancement made during the past 12 months are centred around the electric receiver, the development of television, short-wave accomplishment, valve and loudspeaker design, the shielded receiver, and the electrical reproduction of gramophone records. Receiver design has not suffered any great change. Apart from the adaptation of last year's Solodyne and Browning-Drake to accommodate the Screen Grid Valves, nothing new in circuit design has been presented by radio engineers.

The efforts of the world's greatest laboratories have been focussed upon the development of the batteryless receiver and the new A.C. valves. The first models of the electric receivers now featured by the larger set manufacturers are such a tremendous advance over the battery-operated receiver, that we are compelled to wonder to what heights of perfection the electric receiver of the future will soar.

Television is coming into its own so quickly as to fairly sweep us off our feet. At the time of writing, eight broadcasting stations in the U.S.A. are transmitting television programmes regularly. Just when a service will be inaugurated in Australia cannot at the moment be forecast, but some indication of the rapidity with which events are moving may be gained by this significant fact: An influential company styled as The Television and Radio Laboratories Pty., Ltd., recently registered in all Australian States, including Queensland !

The amazing achievements of short-wave transmission during the past twelve months need not be discussed here. Those successful Empire broadcasts gave the listening public of the world their first idea of what a tremendous power short waves are to exert upon broadcasting of the future.

The improvements in reception and reproduction, made possible by the new four- and five-element screen-grid valves, the exponential horn loudspeaker, the improved dynamic power speaker, the extensive use of metallic shielding, etc., etc., have played a most important part in the advancement of the science. Ideas undreamed of this time last year are now accomplished facts—so who can say what achievements will be recorded upon this page when we take a backward glance twelve months hence ?

The Holiday Portable

By the TECHNICAL EDITOR

FIG. 1.—The Holiday Portable, as it appears in use. The loop aerial is wound inside the lid, which also holds the cone speaker.

HOW many of our readers have wished for some form of entertainment on their holidays, or during week-end jaunts to the seaside, or into the country? Surely quite a large number, and no doubt they have found that a portable gramophone, if one is available, only partly fills the gap. A radio set undoubtedly forms the ideal entertaining medium for these occasions, chiefly on account of its versatility. Unlike the gramophone, its scope is not restricted merely to the playing of a comparatively small number of records—many of which the owner probably has become tired of hearing through frequent reptition at home. The radio receiver, even though its reception is limited to one station, will give varied programmes during the day and in the evening, and in addition makes available the latest news of the day—a welcome feature at a time when one is unwilling to spend too much time in reading newspapers. So much better, of course, if it can reproduce not only the programme from the nearest station, but those from the distant Southern stations as well.

The ideal portable set must, obviously, be self-contained as far as possible, and it must be small enough to fit conveniently into a car or under the seat of a railway carriage. It must contain its own power supply, and should be equipped with a loud-speaker of reasonably good design. It must be sufficiently sensitive to provide good distant reception when operating on a relatively inefficient aerial system; it must be easy to tune; it must be economical as regards current-consumption, and, above all, it must deliver loudspeaker reproduction of good quality and volume.

What a formidable task to attempt to compress all these features into one receiver! A year ago it would have been "a consummation devoutly to be wished," but impossible of achievement—a compromise would have had to be made and some of the requirements ignored. Nowadays, however, it is possible by dint of careful design, to incorporate every one of these features, so rapidly has the science progressed, and so great the improvements that have been made in the radio apparatus field within recent months. New valves with many times the efficiency of types of a year ago; high-amplification, distortionless transformers; cushioned sockets; low-loss coils; small cone speakers; compact, well-made variable condensers—all contribute their share towards making possible the construction of a radio set that is really portable, and is not just the toy that so many alleged "portables" have proved to be.

Five-Valve Results with Three.

In the Holiday Portable, full advantage has been taken of the remarkable properties of the new screen-grid valves, both in the radio and audio-frequency stages. Because of the consideration of current-consumption, it was deemed advisable to make three valves the maximum number allowable. The Philips A-442 screen-grid radio-frequency amplifier, connected in a tuned-plate circuit, gives a degree of amplification approximately equal to that of two of the ordinary valves. Next is an A-415 high-sensitivity detector, with variable reaction control. Then follows a single transformer-coupled audio stage, using the new Philips B-443 Penthode—a five-electrode valve having three grids, and capable of giving as great an amplification as the usual two-stage audio amplifier. The result is a standard of performance that is surpassed by few five-valve receivers of earlier design.

It will be noticed that only partial shielding is provided. This is found adequate to ensure complete stability of the radio-frequency amplifier, the vertical inter-stage shield preventing interaction between the radio-frequency and the detector sections. In order to secure maximum results from these screen-grid valves, it is essential that a comparatively high "B" battery voltage be used. In the Holiday Portable, two 60-volt light-duty blocks are connected in series, thus furnishing a plate voltage of 120, this potential being applied to the plates of both the radio-frequency and audio-frequency valves, in addition to the screening grid of the Penthode. The total filament consumption is but .3 ampere at 4 volts, this being supplied by three standard-size dry cells. Two small 6-volt "C" batteries provide the necessary 12 volts negative grid bias for the audio valve.

Construction.

A novel feature of the Holiday Portable is the one-piece aluminium panel and base. The advantages of this form of construction are several. First of all, the weight is reduced to a minimum; secondly, the shielding effect assists in maintaining stability; and the wiring of the receiver is greatly simplified on account of the fact that the panel and base act as the negative "A" and "B" bus-bar, thus eliminating a large number of connections. This panel and base may be obtained ready cut and bent to the dimensions shown from any dealer, who will be able to procure it from Messrs. Edger V. Hudson, 53 Charlotte Street, Brisbane. At the same time the aluminium inter-stage shield should be procured; an idea of the dimensions and shape of these two parts will be gleaned from Fig. 7.

The panel should be drilled according to Fig. 5, the burr being carefully filed off each hole. Notice that the six terminal holes have a small V-shaped niche cut or filed at one side in order to accomodate the bakelite wedge, moulded in the body of the Belling-Lee insulated terminals. The mounting holes for the two tuning condensers (C1 and C2) and the two tuning dials are marked off from the drilling templates packed with them by the manufacturers. It will be seen that the dials and the terminals are mounted in what, under ordinary circumstances, would be an "upside down" position; this is due to the way the receiver is fitted into the carrying-case, and is important if the dials are to face the operator under actual receiving conditions.

After the various panel components have been mounted, the remaining parts should be laid out on the base in the approximate positions indicated in Fig. 8, care being taken that the terminals of sockets, coils, etc., lie in the correct relative positions, corresponding with the indicating letters shown in the drawing. The mounting holes are then marked directly from the instruments themselves, using a scriber or a fine nail. The inter-stage shield is bolted to the base about a quarter of an inch distant from the extremity of condenser C1, its edge fitting as closely as possible to the panel. Five of the six terminals are insulated from the aluminium panel; the remaining one—the earth terminal—is mounted directly on the panel, so that it makes good contact with it. With the Belling-Lee terminals, the moulded bakelite shoulder fits into the panel, thus effectively insulating it; a small bakelite or radion washer must be made for the back of each insulated terminal, its purpose being to insulate the metal washer and nut from the panel. This system makes a particularly neat and efficient job, and one that is very easy to carry out.

In the radio-frequency compartment—which is to the left of the inter-stage shield in Fig. 8—are situated the tuning condenser C1, primary and secondary coils L1 and L2, valve socket V1, four terminals, and by-pass condenser C4. To the right of this shield is the detector section, comprising the plate and reaction coils L3 and L4, plate tuning condenser C2, reaction condenser C3, valve socket V2, blocking condensers C5 and C6, grid condenser C7, grid leak and mounting R1, rheostat R2, and radio-frequency choke X. At the right-hand end is the audio-frequency amplifier, consisting simply of the 5 to 1 audio transformer T, valve socket V3, two output terminals, and by-pass condenser C8. Adjacent to certain of the terminals, clearance holes are drilled, through which will be passed the various battery connecting wires. These holes should be quite large, so that there will be no danger of chafing the insulation off the wires. A piece of aluminium angle is bolted to the under side of the

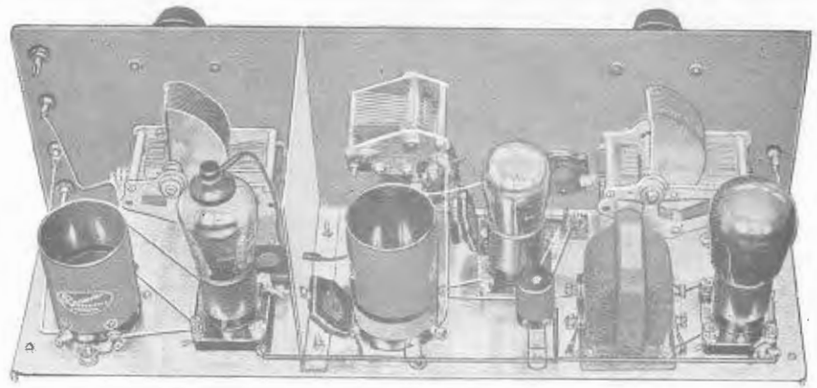
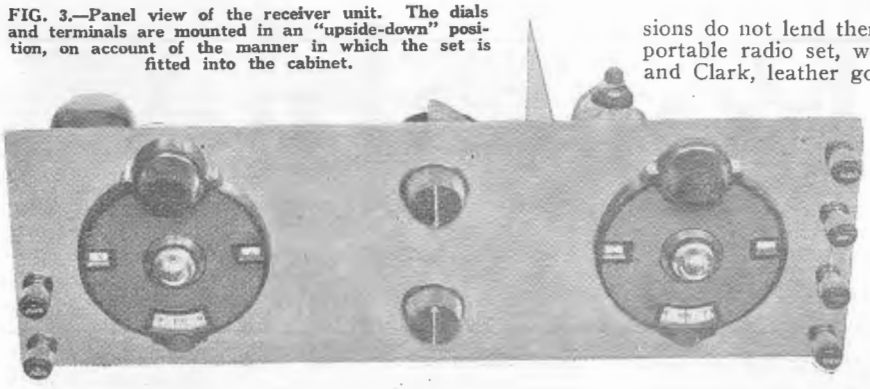


FIG. 2.—Rear View of the Receiver. All the parts are mounted directly on an aluminium panel and base, no insulation being necessary. Extreme lightness is thus secured with no sacrifice of efficiency.

FIG. 3.—Panel view of the receiver unit. The dials and terminals are mounted in an "upside-down" position, on account of the manner in which the set is fitted into the cabinet.



base at each end, thus providing a means of securing the receiver into the carrying case.

Wiring.

The wiring of the Holiday Portable is carried out with 18-gauge tinned copper wire, with the exception of the battery leads and the wires going to the exterior terminals of the two screen-grid valves, which are of flexible material. On the positive filament line spaghetti tubing insulation was used, otherwise the connections are bare. As we remarked before, the aluminium shielding forms the negative filament line, which explains the reason for the number of connections which are taken directly to the shielding. The positive filament wire, which can be seen in the foreground of Fig. 2, passes through a small hole drilled through the inter-stage shield in the bottom outside corner. Two other holes are drilled through this shield—one for a bolt to which the connections from two by-pass condensers are joined, and a larger hole through which the flexible insulated lead from the plate terminal of the screen-grid radio-frequency valve passes.

Take particular notice of the filament rheostat; only one wire is connected to it, the return connection being made via the metal panel, through which the mounting bushing of the rheostat passes. The rheostat must be mounted in the position shown, or rather the terminal shown with no connection to it must be left blank, or the rheostat will be inoperative. In our model of the Holiday Portable, a seven-wire battery cable having rubber-covered wires was stripped of the outside braiding, thus leaving seven separate flexible wires. These are used for the battery connections, passing through the holes mentioned previously. They should be left long until the set is finally fitted into the case and the positions of the batteries determined, when they may be cut to a convenient length and have lugs attached to the ends.

The Carrying Case.

Because of the fact that suit-cases of standard dimensions do not lend themselves to the requirements of a portable radio set, we commissioned Messrs. Bonney and Clark, leather goods manufacturers, 99 Elizabeth street, Brisbane, to build us a special "Flaxite" carrying case which holds everything nicely. This case is very light in weight and quite inexpensive, and makes a very satisfactory job. The dimensions of our case are shown in the drawing, Fig. 6.

The valves must be inserted in their sockets before placing the set in the case permanently. The A-442 goes in socket V1, and it should be noted that a flexible connecting lead is attached to the **plate** terminal on top of the valve. In the socket marked V2 is inserted a Philips A-415, and a B-443 in socket V3. Another flexible lead is connected from the "B+120" wire (where it is attached to the "+" output terminal) to the screen-grid terminal on the side of this B-443. The receiver is fitted into the case next to the handle side, and held in place by means of two bolts passing through the case and the aluminium angle strip at each end. The aluminium base thus forms the partition dividing the receiver from the batteries. Two small bolts passed through from the outside secure the Philips Baby Grand speaker inside the lid of the case, the lid being made much deeper than usual for this purpose.

Before the speaker is mounted in the lid, however, the loop is to be wound. This consists of 20 turns of "Goldtone" special loop wire wound around the inside of the lid, two small strips of wood being screwed into each corner for the purpose of holding the wire in place. The turns should be spaced a distance of roughly the diameter of the wire from one another, and the ends left long enough to reach to the terminals on the left-hand end of the panel. If desired, the loop may simply be wound around the outside of the lid, using 18 turns in this case; this aerial probably will be slightly more efficient than one wound inside the lid, but naturally does not improve the appearance of the set.

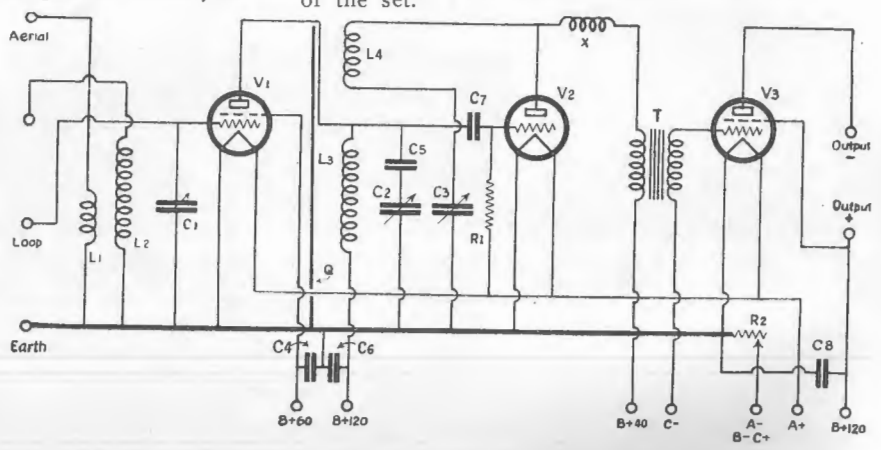


FIG. 4.—In this Circuit Diagram, the heavy horizontal line represents the metallic panel and base, which form part of the circuit. The heavy perpendicular line is the inter-stage shield.

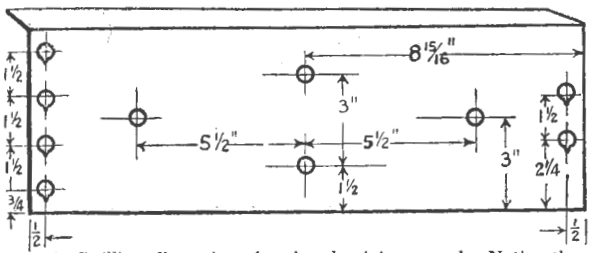


FIG. 5.—Drilling dimensions for the aluminium panel. Notice the irregular shape of the terminal holes. In every case, centre-to-centre measurements are given.

Connections.

After the set, loop aerial and loudspeaker have been fitted into position, the batteries are packed into place and connected. This last is an operation calling for a certain amount of care, as it is very easy with an aluminium panel and base to let a wire touch where it will cause damage to valves or batteries. It is a good idea to cut a piece of heavy cardboard the same size as the aluminium base, punch holes in it for the battery wires, and fit it against the base so that it will act as an insulating partition.

The three dry cells comprising the "A" battery are first connected in series—that is, the positive (centre) terminal of one to the negative of the second, and the positive of the second to the negative of the third. The wire marked "A+" in the pictorial diagram (it is marked just where it passes through the base plate) is now joined to the unused positive of the "A" battery, while the "A—" wire goes to the negative terminal. To this same terminal is joined a piece of insulated flexible wire which is taken to the "—" terminal of one 60-volt "B" battery, and from this terminal of the "B" battery another piece of wire goes to the positive ("+") terminal of one 6-volt "C" battery. The wire marked "B+40" is connected to the 40-volt clip on the "B" battery, and the "B+60" wire to the 60-volt clip of the same battery. From this 60-volt clip is also taken a wire to the "—" clip of the second 60-volt "B" battery, and the two wires marked "B+120" go to the 60-volt clip of the same battery. The "—" terminal of the first "C" battery is joined to the "+" terminal of the second "C" battery, and the wire marked "C—" to the "—" terminal of this same battery.

These directions may seem somewhat complicated, but no trouble will be experienced in connecting the batteries if they are followed one point at a time. The three dry cells are placed on their sides in the right-hand corner of the case, and in our set are jammed into place by means of the three cartons belonging to the Philips valves. The two "C" batteries come next, then the two "B" batteries.

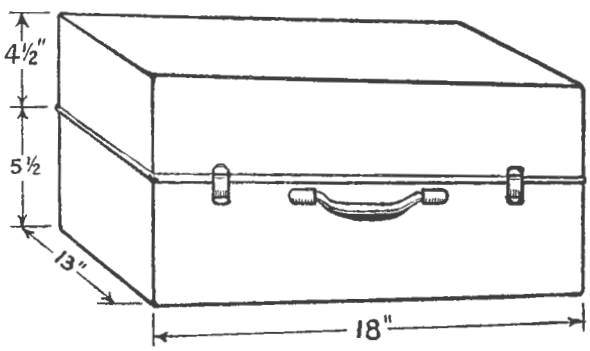


FIG. 6.—Particulars of the specially-built case. The dimensions are the inside measurements—this is most important.

The loudspeaker is connected to the two "Output" terminals, and the loop aerial is connected to the terminals marked "LOOP" and "EARTH." Whenever possible, particularly for Interstate reception, we strongly recommend the use of a single-wire aerial and earth connection or counterpoise instead of the loop aerial. For this purpose, we always carry two coils of "Electron" aerial wire, one of which is used as an aerial, and the other laid along the ground as a counterpoise in the absence of a direct earth connection. It is nearly always possible to elevate the aerial a few feet above the ground—the branch of a tree, the top of a tent-pole, or the hood of a car suggest themselves as possible improvised "masts"—and it will be found that distant stations are much stronger with this type of aerial system than with the loop. When it is desired to use the single-wire aerial, the loop wires are disconnected, a connecting link joined between the "LOOP" terminal and the blank terminal, and the aerial and counterpoise (or earth, if one is available) to "AERIAL" and "EARTH" respectively. Do not forget the shorting link between the two centre terminals.

Tuning.

It would be difficult indeed to find an easier tuning set than the Holiday Portable. The rheostat is also the on-off switch, all power being disconnected when it is turned as far to the left as it will go. To operate the set, this rheostat is turned nearly full to the right. The reaction knob (immediately below the rheostat) is turned to the right until oscillation is present, this being indicated, as usual, by a soft "thump" followed by a faint hissing sound. The right-hand dial is then rotated slowly until the carrier or "whistle" of a station is picked up, and the left-hand dial then moved until the strength increases up to maximum. The reaction control is then retarded—turned in a counter-clockwise direction—until oscillation ceases and the music or speech is clear. After that, a slight re-adjustment with both tuning dials and the reaction will bring the

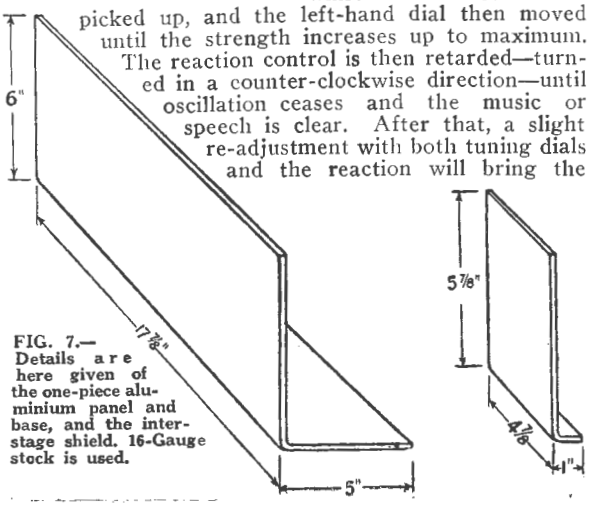


FIG. 7.—Details are here given of the one-piece aluminium panel and base, and the inter-stage shield. 16-Gauge stock is used.

signals up to the best point. Finally, the filament rheostat should be retarded until the signal strength begins to diminish; in the interests of long valve life, the rheostat should always be advanced just far enough to give maximum reception, for above this point there will be no increase in volume, but the life of the filaments will be seriously curtailed. When using the loop aerial, a distinct directional effect will be noticed, due to the characteristic of this type of aerial. The set must be turned about for best results from each station, and it is often possible to eliminate an interfering station entirely by this means alone.

With loop operation, our Holiday Portable brings in the main Southern stations with fair to good loudspeaker volume in Brisbane during the early part of the evening. Later in the night, the strength is all that could be desired for a small room—in the case of 2FC, indeed, the volume is ample for most home requirements. Using the single-wire aerial and counterpoise described, the volume from the Interstate stations is enormous—quite equal to that from most five-valve sets. Selectivity is not good—it could not be expected from a single stage of screen-grid amplification—but that is not of paramount importance in most cases. If the set is to be used in close proximity to a powerful station, some form of wavetrap can be connected in the aerial lead. This has been actually tested, with excellent results.

The receiver portion of the Holiday Portable will make a splendid home set if fitted into a suitable cabinet. For this use, however, the two tuning dials and the terminals should be mounted differently, as the base of the set will then be at the bottom instead of the top. Whether used as a portable or not, the batteries need not be disconnected when the set is not in use; a turn of the rheostat towards the left will automatically ensure that everything is disconnected. For carrying purposes, it is recommended that a strap be placed around the case in order to reinforce it, as it is purposely made of light material. A leather case would, of course, be preferable if it is within the means of the contructor.

Although the filament consumption of the Holiday Portable is so small, it is well-known that the ordinary dry cell cannot withstand for any length of time the severe treatment imposed by lengthy periods of continuous discharge. To those who own cars, the starting and lighting battery offers a simple solution to the problem; two long flexible leads fitted with clips can be attached to the receiver and clamped on to the car battery—**using two cells only,** as only four-volt current is required. This will ensure ample filament power at all times, and the car battery will not suffer any adverse effect.

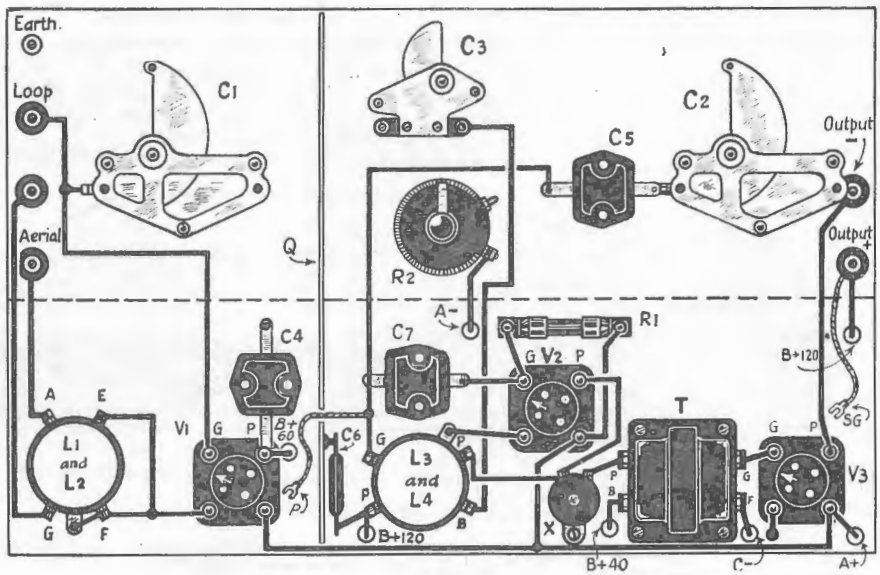


FIG. 8.—Every connection is clearly illustrated in this Pictorial Diagram. It will be seen that several connections are made directly to the metallic shielding, while the battery wires pass through oversize holes in the base.

MATERIAL FOR THE HOLIDAY PORTABLE:

2 A.W.A. Logarithmic condensers, .0005-mfd., C1, C2.
1 Cyldon Bebe Reaction Condenser, .00025-mfd., C3.
4 De Jur-Amsco condensers, .006-mfd., C4, C5, C6, C8.
1 De Jur-Amsco fixed condenser, .00025-mfd., C7.
1 Radiokes Portex coil kit, primary L1, secondary L2, tuned-plate L3, reaction L4.
1 De Jur metallised leak, with mounting, R1.
1 Electrad rheostat, 10 ohms., R2.
1 Emmco Puratone audio transformer, 5-1 ratio, T.
3 Emmco balanced valve sockets, V1, V2, V3.
1 Aluminium panel and base combined, dimensions in Fig. 7, Y.
1 Aluminium inter-stage shield, see Fig. 7, Z.
6 Belling-Lee insulated terminals, "Aerial," "Earth," "Loop," "—," "Output +," "Output —."
2 Emmco mahogany de luxe vernier dials, anti-clockwise.
2 Emmco mahogany arrow knobs.
1 Radiokes radio-frequency choke, X.
1 Rubber-covered seven-wire battery cable.
1 Special "Pyramid" brand Flaxite carrying case.
18 Gauge tinned copper wire.
1 Length spaghetti tubing.
2 Pieces aluminium angle strip, 4¾ inches long.
20 Nickelled round head brass bolts, ¼ x ¼-in., with nuts.
7 Nickelled round-head brass bolts, ¾ x ⅜-in., with nuts.
6 Nickelled round-head brass bolts, ½ x 5/32, with nuts.
1 Coil 100 feet Goldtone loop aerial wire.

ACCESSORIES:

1 Philips A-442 screen-grid valve.
1 Philips A-415 detector valve.
1 Philips B-443 Penthode valve.
3 Deal 1½-volt square dry cells.
2 Eltax light-duty 60-volt "B" batteries.
2 Eltax small 6-volt "C" batteries, with 2 plugs each.
2 Coils Electron aerial wire.
1 Philips Baby Grand cone loudspeaker.

The Marvels of the EDISON Age

By HERBERT N. CASSON.

THIS is the Edison Age. We, who are now alive, are slow to realise this, because of the amazing fact that Edison—the creator of the Age we live in—is himself still alive and still at work.

Founders of Epochs are not usually appreciated until the century in which they lived has slipped into the past.

The Age of Steam—of James Watt—began in 1769 with the invention of the first steam engine, but few people were aware of the fact until a hundred years had passed.

THOMAS A. EDISON

And this new Edison Age began about fifty years ago. It began when Edison found new ways to give the world light and music and time and power and communication.

It has now superseded the Age of Steam, just as steam superseded slave-power, and slave-power superseded savagery and the reign of the lower animals.

This is not the Age of Electricity alone. It is rather the Age of Miracles, in which electricity plays its part. And the chief of the miracle-workers is still alive. We have celebrated his 80th birthday this year.

Such miracles—such fairy tales come true, have never been known or imagined in any other period of human history.

Talk about Aladdin and his Wonder Lamp! His wonderful lamp was a flickering tallow candle. It was a childish toy compared with Edison's wonderful electric lamp, which has given daylight to a world at night, and which has magically created such palaces of trade and commerce as Aladdin never imagined.

Talk about the miracle of a camel going through the eye of a needle! What is that when compared with the Edisonian miracle of a whole grand opera going through a needle's point?

Talk about the Delphic Oracle, whose ambiguous words mystified the ancient Greeks! What child's play was it when compared with the words that are heard and remembered and spoken by another Edisonian miracle—the supreme miracle of the Ediphone?

Edison was not appreciated as a boy. His teacher said he was "addled." He was not appreciated as an employee. His employer said he was "lazy." The world often scoffed at his inventions and said, "It can't be done."

And yet we know that he was the least addled and the least lazy and the most highly skilled and creative person whom the human race has ever produced. It is only at mid-night that we appreciate the sun.

The fact is that we live and move and have our being in the midst of these Edisonian miracles. They are for the pleasure and the profit of the poor as well as the rich. They are the only sort of miracles that have been democratised. They have become so universal that we take them for granted, as though they were the work of Nature, and not of one man, who is personally known to many of us.

As for Edison himself, this lack of praise and full appreciation does not trouble him. He is too busy creating new miracles. Praise, in fact, falls off him like water off a duck's back. He looks up, for a moment, in surprise and confusion, when the spotlight falls upon him, and then goes on with his work. If you give him a gold medal, he is apt to forget it on the ferry-boat, on his way home. His mind is on something else.

Again and again, he has been robbed of the praise and the profit, both. He has had to fight 200 law suits to protect his patents from being snatched away. His inventions, under alien names, are being marketed in every country in the world. But this does not halt him nor slacken his energy to create. He was at work to-day and he will be at work to-morrow, inventing some new surprise to please and benefit the world.

Such a man! If you mention his 1,200 inventions to him, he only gives you one of his whimsical smiles and says—"Well, I have been mixed up in a lot of things, haven't I?"

What a life! Born in a shingle-maker's cottage, in an Ohio village which remains unknown for any other reason, educated by his mother, and out in the world to shift for himself when he was barely twelve.

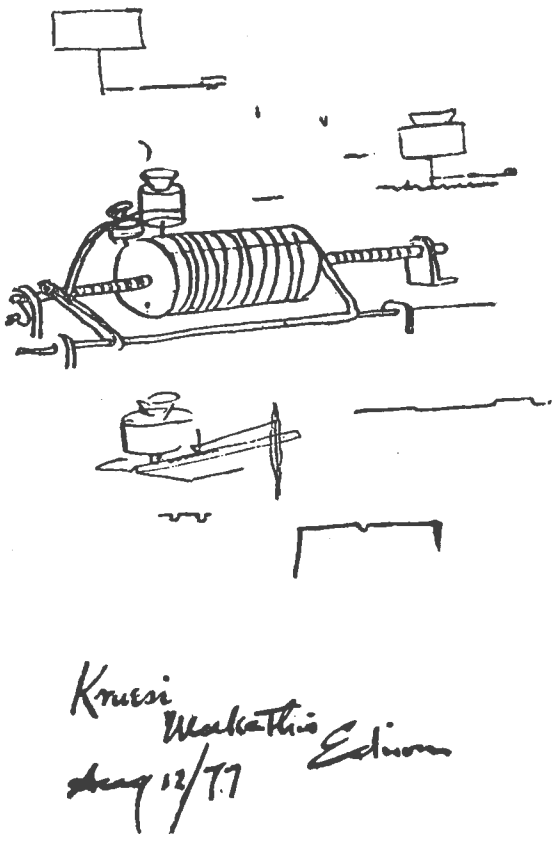
Always a reader of great books, he had studied Gibbon's "Decline and Fall of the Roman Empire" and Hume's "History of England," at a time when most boys are trying to understand decimals.

At 18, he had bought and studied the complete works of Faraday. Also, he had developed his imagination on the works of Jules Verne and Dumas and Victor Hugo and Shakespeare. What boy had ever a better education than that?

His creative career began when he learned telegraphy. It was taught him as a labour of love by a station agent, who never guessed at the part that he was playing in the progress of the world. The station agent had a son. This son was a great favourite with young Tom Edison. One day, Tom Edison saved the life of this boy. In gratitude, the station agent taught telegraphy to young Tom. From that moment, Tom Edison knew what was to be the main direction of his life.

He began to invent. When he was 23, he invented a new stock-ticker, and to his amazement, the company paid him 40,000 dollars for it.

From that moment, he worked in his own miracle factory. He gave all his time—16 hours a day of it—to the Herculean task of repairing and creating whole trades and industries. He has never had any help from Governments. He has never asked for any. All he has wanted is to be left alone with his experiments.



A facsimile of Edison's original instructions to John Kruesi for building the first experimental phonograph.

A list of his inventions would fill this and many more pages. There was the multiplex telegraph system, and the microphone, and the phonograph, and the incandescent lamp, and lighting system and the electric railroad, and the dynamo, and the storage battery, the tube for the radio, and the motion-picture camera, and the fluoroscope, and the cement machinery, and the Ediphone.

In 1875, Bell had invented the telephone. To tell the truth, he had only half invented it. It was like a man limping along on one leg. It was a good receiver but a bad transmitter. So, Edison stepped in and created the carbon transmitter, which put the telephone on both feet and sent it prosperously on its way.

Of all his inventions, the phonograph and the ediphone have always remained favourites. He gave to them many years of his life. He took out over 100 patents on improvements which have kept them beyond the point of competition.

It is now exactly 50 years since the phonograph and the ediphone were born. Their invention was no lucky accident, as many inventions are. Edison was at that time improving the automatic telegraph. He found that he could reproduce the Morse dots and dashes on a revolving cylinder.

"If dots and dashes," he thought, "why not the human voice?" This was a new idea. No other human brain had ever conceived of such a thing.

True, there were prior inventions that had made the phonograph and the ediphone possible. There were at least Morse's telegraph and Bell's telephone. But neither Morse nor Bell ever dreamed of a machine that would make a permanent record of a human voice or of any other sound.

It was in June, 1875, that Bell first sent the twang of a clock-spring over a wire. That was the birth-cry of the telephone.

"Why not make two dics of iron," said Bell, "and link them together with a wire?" He did. Then, on March 10th, 1876, this wire carried the first spoken words—"Mr. Watson, come here, I want you."

But the telephone made no record. It had no memory. It spoke once and once only. It had no voice of its own. It was a mere medium for the conveying of a voice. Edison thought of this and wondered if there could not be something better.

As a result of his thoughts on the matter, in August, 1877, he made a design of the first phonograph. He gave it to a Swiss mechanic named John Kruesi. Kruesi made it, but not without a protest. He declared that it was the most ridiculous idea he had ever heard of.

Certainly, it looked absurd. I have seen this first phonograph in the Science Building of the Victoria and Albert Museum, in London. It consists of a brass cylinder, three inches wide, revolving on a cast-iron base. The cylinder has a spiral groove cut in it and is turned by a handle.

On either side of the cylinder is a disc of sheet-iron, with a needle in the centre. A piece of tinfoil is wrapped around the cylinder. The words were spoken in at one disc and afterwards reproduced by the other disc. The discs were pushed forward into contact by a screw.

John Kruesi made it, and when it was finished, Edison spoke into its mouthpiece. Not being an orator and feeling somewhat confused by the scornful looks of John Kruesi, he could think of nothing better to say than: "Mary had a little lamb, its fleece was white as snow."

Then he screwed back the receiving disc, turned back the cylinder, screwed the reproducing disc and turned the handle.

The machine spoke. It said very plainly: "Mary had a little lamb, its fleece was white as snow."

"Mein Gott in Himmel!" shouted John Kruesi, nearly falling to the floor in his amazement.

Even Edison was startled. "I was never so taken aback in my life," he confessed later.

That night, Edison and Kruesi did not go to bed. They made improvements on the new machine. They tried to turn the handle more steadily and to put on the tinfoil more tightly.

The next day Edison wrapped the baby phonograph in a piece of paper, and took it to New York to show to Mr. Beach, editor of the "Scientific American."

"What is it?" asked Beach. "Turn the handle," replied Edison. "It can speak for itself."

Beach turned the handle. The machine said: "Good morning! What do you think of the phonograph?"

No other invention has ever created such a furore as "Edison's Talking Machine." At once, the whole world knew it. Special trains were run to his workshop. Doubters, who thought it was ventriloquism, came to be convinced.

Edison took it to Washington and showed it to President Hayes and Mrs. Hayes and the whole Cabinet. It amazed and delighted everybody, from log-cabin to White House.

Lecturers were licensed by the famous Redpath Lyceum Bureau to go into all parts of the United States and Canada to exhibit these "Edison Talking Machines."

It so happened that I attended one of these exhibitions in 1881. I was then a lad of 12, in a small Canadian village called Parry Sound, 70 miles from a railroad, in the northern wilderness.

I was with several other boys on the front bench in the small hall. During the performance, the lecturer asked any boy to go on the platform and talk into the machine. I went. I began to recite a poem called "Casabianca"—

"The boy stood on the burning deck,
Whence all but he had fled——"

At this point the other boys made me laugh and I broke down. The lecturer pushed me off the platform, arranged his cylinder and his discs and in two minutes the machine repeated what I had said, with a laugh at the end. It was the talk of our village for weeks.

About 23 years ago, Edison conceived the idea to develop the phonograph into the edpihone. There were at the time several machines, known by various names, that were supposed to take down dictation and reproduce it. But they were far from perfect.

He made it move at a touch, without any foot-pedals. He made the capacity of one cylinder 12000 words. As a cylinder can be shaved 100 times, you can now dictate every word in the English language to a couple of cylinders.

He added a sound modifier and a speed control and an electric repeat. He made it simple and foolproof, so that anyone can use it. He made it patient and very polite. It will repeat a sentence as often as you like. It will tell you what you said ten minutes ago. It never forgets. It is fifty inventions in one.

His basic idea was that the voice should be used as a pen. There was no word in any language for such an idea. He called it "voice-writing."

When the Patent Office received his original application on the phonograph it granted him a patent without reference, as no one else had ever even tried to invent such a thing. A machine that would listen and remember and talk! A machine that would make a permanent record of any talk in any lanuage, and repeat it whenever you wished, either loudly or softly! This was a new and welcome idea in the business world.

When he had brought the ediphone up to the highest point of perfection, Edison turned again to his phonograph.

He was determined to create an instrument and record that could not be distinguished from the performance of the living artist when heard in direct comparison.

For over five years he toiled, experiments alone costing 3,000,000 dollars. A phonograph, he said, should have no tone of its own—only the tone of the artist. So he abolished metallic music. He prroduced tones as pure as those of any prima donna. "At last," he said, "here is a phonograph with a soul."

"In recent days he has developed the new Edisonic —the realisation of his fondest dream. Full volume as well as natural quality have been re-created so faithfully that the listener becomes absolutely unconscious of the existence of the instrument. a

"He—a deaf man—has thus created the two amazing machines that can hear and talk—the ediphone and the phonograph. His inner ear, it seems, is peculiarly sensitive, as it has been protected by deafness from millions of noises."

He has put the most perfect music and song within reach of millions of homes. He has catered to pleasure as well as to trade and commerce. He has given a finer and nobler meaning to the joy of life.

Truly, this Seer of Science, as he works to-day, in the midst of his thousands of workmen, is the most notable figure of our generation, or perhaps of our century. He has spent his whole life in exploring the No Man's Land that exists outside of books.

"I have to begin where the books end," he once told me, when I talked with him in his great laboratories.

Where he goes there is no path. There is seldom even a sign-post. He battles against the impossible and the unknown. He has to make a path for the human race as he goes forward. He is the supreme pathmaker of the world.

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A Three Stage Resistance-coupled Amplifier

By the TECHNICAL EDITOR

THIS article is the second of a series dealing with the design and construction of modern high-quality audio-frequency amplifiers of various types. The amplifiers will be described as complete units, capable of being incorporated in newly-constructed receivers or of being added to any existing type of set, including the crystal receiver. Quite apart from this, the information furnished will be of value to those who are interested in the latest developments in this important branch of the science. In last month's issue we described a two-stage transformer-coupled unit.

IN the quest for the perfect amplifier, the resistance-coupled type—or, as it is sometimes called, the resistance-capacity amplifier—has achieved a large measure of popularity. It has done this in spite of several inherent disadvantages—disadvantages that are not thoroughly understood by the majority of radio enthusiasts, but which we shall attempt to explain in a moment or two.

First let us see why the resistance-coupled amplifier has come to be so widely used in the reception of radio broadcasting, for it is evident that it must have some claim to the excellence with which it is almost universally credited. Because of the fact that a correctly designed amplifier of the resistance-capacity type gives a practically uniform response over a very wide band of frequencies, the output from such a device is remarkably pure and free from distortion. It must not be imagined, however, that almost any combination of resistances and condensers connected together in the customary way will demonstrate this highly desirable characteristic. Far from it; an amplifier designed without a knowledge of the principles underlying its operation and one using components of incorrect values is, as likely as not, going to give a badly distorted output and waste a great deal of valuable battery power.

In the usual transformer coupled audio amplifier, there is a definite and quite appreciable step-up in voltage due to the transformers themselves, which, added to the gain attributable to the valves, is responsible for a very high overall amplification in an amplifier of two stages. In the resistance-coupled type, on the other hand, there is no such step-up in the coupling devices. The grid of each successive valve has impressed upon it the voltage generated in the preceding valve, and that alone; indeed, there is a slight loss in the process of transference from one stage to the next, due to unavoidable causes. It is clear, therefore, that we must depend entirely upon the amplification obtainable by means of the valves themselves, and must so arrange matters that the highest possible degree of efficiency is attained. By employing specially designed valves having a comparatively high amplification factor (thus giving a large gain per stage), and using three stages instead of the customary two, it is quite possible to obtain the desired overall gain.

In any type of audio-frequency amplifier, a high plate voltage is essential for high-quality reproduction, but in no case is this such an absolute essential as with the resistance-coupled type. This is accounted for by the fact that the first two valves have a resistance of large value connected in their plate circuits, which results in a considerable drop in voltage. This, of course, means that only a small part of the original

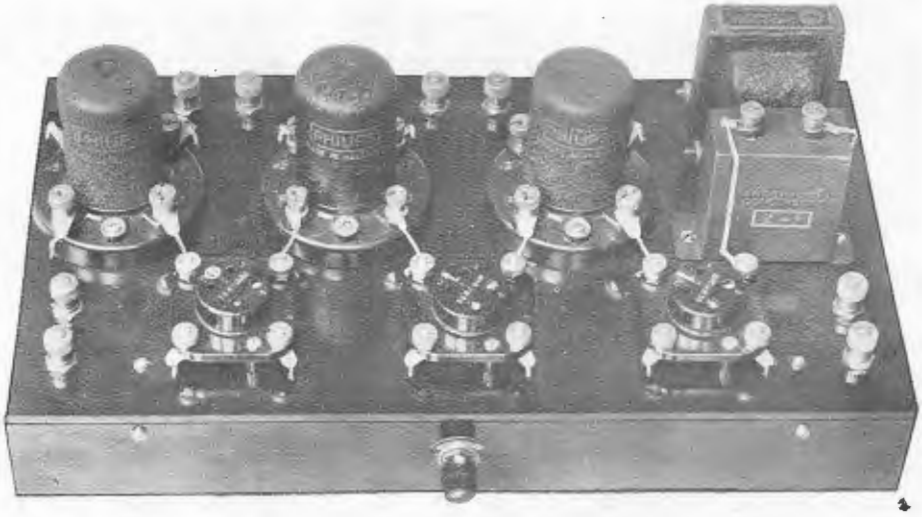

FIG. 1.—A photograph of the completed Amplifier. The input end is at the left, while the condenser and choke comprising the output filter may be seen at the right. The battery switch is in front.

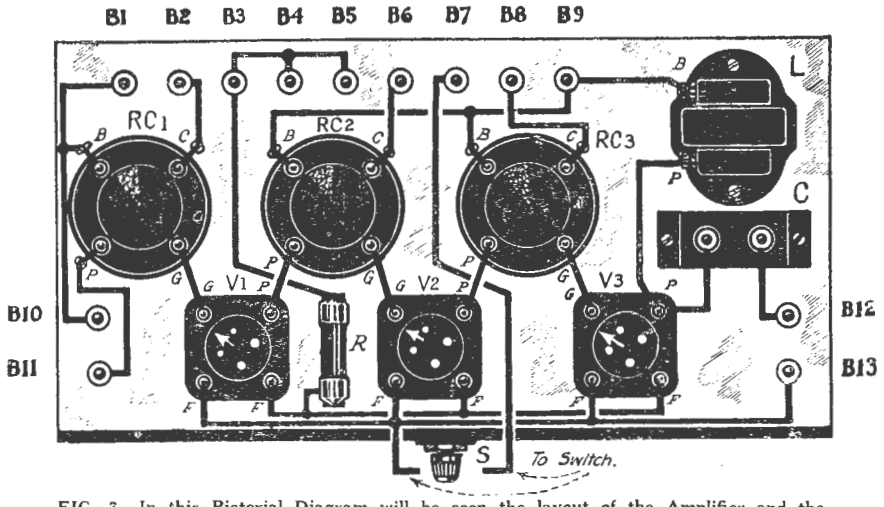

FIG. 2.—In this Pictorial Diagram will be seen the layout of the Amplifier and the various connections. Each wire does not, of course, occupy the exact position shown—much of the wiring is below the sub-panel, as explained in the text. The connections to the battery switch are plainly marked.

"B" battery voltage actually reaches the plates of these two valves; hence a sufficiently large "B" battery must be provided to insure that the potential applied to the plates is high enough for distortionless operation. It should be said that, although it is such a common thing to hear the requirement of high values of plate voltage emphasised, a point not generally understood is that a high plate voltage is but a means to an end. Without delving too deeply into the theory of valve operation, and resorting to a discussion of the much-used "characteristic curve" (which conveys little to the average man), we use a high plate or "B" battery voltage in order that we may increase the negative grid bias or "C" voltage to a point where the valve will take the voltage that is to be impressed upon its grid without distorting.

Distortion is inevitable the minute the grid of an amplifying valve is allowed to become positive in relation to the filament. We overcome this by connecting a "C" battery in such a manner that it applies a constant negative potential to the grid. As an illustration, suppose a 4½-volt battery is used, and the grid thus assumes a potential of minus 4½ volts. Everything is all right so long as the positive signal impulses passed on from the preceding valve do not exceed a value of plus 4½ volts. The instant they do, a condition is brought about within the valve that results immediately in the presence of distortion. It would seem that this condition may be rectified by the simple expedient of increasing the value of the negative "C" battery voltage, and this would be so, were it not for the fact that it is impossible to raise the "C" voltage indefinitely without increasing the "B" battery voltage also. In this phenomenon lies the reason for the inclusion in most "Radio News" receivers of separate "C" battery terminals for each audio stage, for it will be evident that the "C" voltage required by each valve for proper operation is dependent upon the strength of the signal that is being applied to it, and this, naturally, increases with each successive stage.

To sum up, we may conclude that the great advantage of the resistance-coupled type of audio amplifier is its ability to provide a distortionless "straight-line" amplification with a more-or-less even treatment of bass, treble and harmonic frequencies. Its drawbacks are that it requires a high "B" battery voltage, the use of three stages for best results, and its power-handling capacity is somewhat limited. In very many cases, none of these disadvantages are at all serious, so we may best put the case for the resistance-coupled amplifier in this way: If you want absolute purity of reproduction and only moderate volume (by this is meant volume sufficient for a large room, but **not** for a hall), and are prepared to use anything from 135 to 180 volts of "B" supply—either from an eliminator, which may supply the "C" voltage at the same time, or from three or four "B" batteries—then you will be delighted with the performance of the unit described in this article.

Factory-built Coupling Units.

In our opening remarks, we touched upon the importance of using components of faultless design and having the right values for the position they are intended to fill. Fortunately, the day of the graphite resistance is past, and fixed wire-wound resistors are

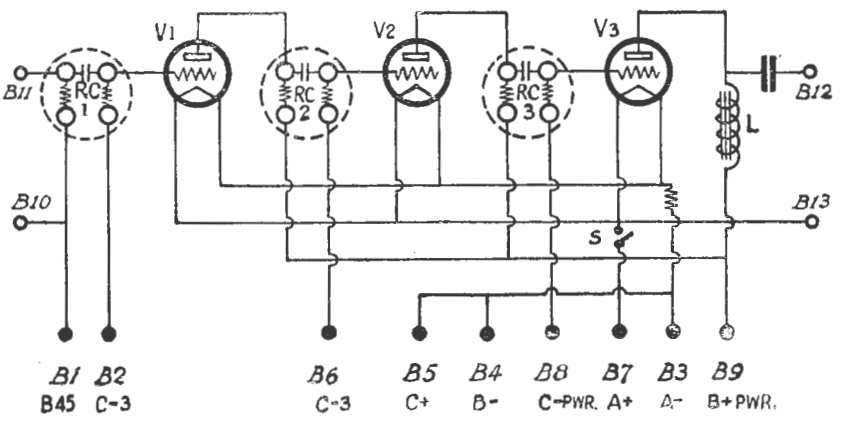

FIG. 3.—A Conventional Diagram of the Circuit. Compare this with Fig. 2.

an actual fact. Nowadays, there is no need to experiment with various values of resistance and capacity in order to determine the combination that gives the most satisfactory results. All this has been done in laboratories equipped with the finest of modern radio apparatus, and a product evolved that embodies all the results of extensive research work on the part of highly-qualified engineers.

In the amplifier described and illustrated in these pages, three of the well-known Philips resistance-capacity coupling units have been utilised. They are splendidly designed and constructed, and each unit embodies not only heavy-duty plate and grid resistors of correct size and a large-capacity coupling condenser, but also an ingenious device that prevents the passage of any radio-frequency energy into the audio-amplifier system, with a consequent freedom from the annoyance of "motor-boating" and other disturbances frequently encountered when a "B" eliminator plate supply is used. An output filter consisting of an iron-core choke and fixed condenser is provided in order to protect the loudspeaker windings from the heavy plate current that may be drawn by a power valve in the last stage, and also to obviate any possibility of distortion due to saturation of the speaker magnet. There is very little else in the amplifier—three valve sockets of the balanced type, an automatic filament resistance, a battery switch, 13 terminals, and the necessary mounting panels.

The design is such that the complete amplifier, as a unit, may be placed behind the panel of a receiver if desired, with the battery switch projecting through the main panel of the receiving set. The illustrations provide most of the data required to assemble and wire the unit. The sub-panel is attached to the small front panel by means of two Airzone sub-panel brackets, these forming supports for the whole unit. It will be seen that all of the instruments, with the exception of the battery switch, are mounted on the top side of the sub-panel, while practically all of the wiring is concealed on the under side of the subpanel. This style of layout gives a neat, clean appearance, and makes it possible to have connections of minimum length. Notice in Fig. 2 how extremely short the grid and plate connections have been kept—an important point in a resistance-coupled amplifier.

The various components are secured to the subpanel by small nickelled brass bolts and nuts, due care being exercised in the placing of the instruments so that the markings on the terminals will correspond with the indicating letters on the pictorial diagram. Small holes are drilled adjacent to some of the terminals, through which the connecting wires are to be passed. So that everything will be as clear as possible, the two connections to the battery switch are shown in front of the switch; in actual practice, of course, they are attached to the terminals of the switch under the sub-panel. In our own model, 18-gauge tinned copper wire has been used, with a small piece of spaghetti tubing slipped on wherever there is any likelihood of wires touching. All joints are soldered, using resin-cored solder with the addition of a little Fluxite on untinned surfaces.

Parts for the Resistance-Coupled Amplifier

- 13 Terminals, B1 to B13 inclusive.
- 1 Dubilier 2mfd. Mansbridge condenser, C.
- 1 A.W.A. Superaudio choke, 25 henrys, L.
- 3 Philips resistance-coupling units, RC1, RC2, RC3.
- 1 Cyldon Tempryte, see table, R.
- 1 Carter battery switch, S.
- 3 Benjamin UX sockets, V1, V2, V3.
- 1 Bakelite sub-panel, 14 x 7 x 3/16in.
- 1 Bakelite panel, 14 x 2 x 3/16in.
- 1 Pair Airzone sub-panel brackets.
- 18 Gauge tinned copper wire.
- Spaghetti.
- 25 Nickelled round-head brass bolts, 1 x ¼ in., with nuts.
- Valves and batteries.

This amplifier may be connected to any existing crystal receiver by coupling the phone terminals of the set to the input terminals (B10 and B11) of the amplifier. It may be connected to a single-valve set in the same way, and it should be noted that in both of these cases the "B+ Detector" terminal (marked B1) must be left blank. When the amplifier unit is being built into a new receiver, B1 is used for the "B" battery tapping, but B10 is neglected, the plate lead from the detector valve being taken to B1, which connects with the "P" terminal of the first resistance-coupling unit. An electric phonograph pick-up will give splendid results if connected to B10 and B11, while the loudspeaker is connected always to B12 and B13, which are the output terminals. Thanks to the output filter, it does not matter in the least which way round the loudspeaker is connected.

Use a High-Mu Detector Valve.

When this, or any other amplifier of the resistance-coupled type is used following a valve detector, the detector valve should be one of the "high-mu" type designed for resistance-capacity amplification. This is a very important point, seemingly little understood by the majority of radio-enthusiasts—and by many so-called "experts," for that matter. A valve having a high resistance (which is almost invariably associated with a high amplication factor) can always be used advantageously when either a highly inductive load or a high resistance is connected in its plate circuit. When a resistance-coupled amplifier follows the detector, it can easily be seen that the plate circuit of the latter includes the first coupling resistance, which is of the order of 100,000 ohms. The detector valve may be of the same type as those used in the first two stages of the amplifier, the detector plate voltage being increased, if necessary, up to the point at which the reaction control (if any) operates satisfactorily. The increase here is called for by virtue of the fact that the resistance is responsible for an appreciable voltage drop, as explained previously. Used under these conditions, the amplification obtainable from a valve detector and resistance-coupled amplifier is enormous, resulting in comparatively weak signals being boosted up to good loudspeaker strength, and the tone quality unimpaired. Don't forget—never use a "general purpose" detector valve with a resistance-coupled amplifier—the discrepancy between valve resistance and load resistance is so great that satisfactory operation is an impossibility.

Now for the battery connections. The negative (—) and positive (+) terminals of the "A" battery (which may be either a 2, 4 or 6 volt accumulator, depending on the type of valves used) are connected to terminals B3 and B7 respectively. B4 goes to negative "B," B1 to 22½ or 45 volts "B," assuming that a valve detector is being used, as mentioned above. B9 connects to the maximum "B" voltage—something between 135 and

180 volts for best results. B5 joins to the positive terminal of the "C" battery, B2 to about 1½ volts negative, B6 to about 3 volts negative, and B8 to the "C" battery voltage required by the last valve. This last will depend on the value of "B" battery voltage used, and will be indicated on the leaflet supplied by the valve manufacturers.

As regards the Cyldon Tempryte automatic filament rheostat, a resistance must be fitted that will take care of the particular combination of valves utilised. At the end of this article, therefore, we are printing a table giving suitable combinations of valves for use with this resistance-coupled amplifier, together with appropriate values of Tempryte resistance for each combination.

Just a few words in conclusion with respect to the batteries. In using this amplifier, make sure always that your batteries are well up to the mark—"A," "B," and C." - A 45-volt dry "B" battery should be discarded when it drops to 37 volts, or 35 at the lowest. Materials of such excellent quality are used that no other troubles are likely to occur under normal operating conditions. When you have built this amplifier, you will have a true musical instrument; see that you do not spoil it by using a poor loudspeaker. Use either a good cone or an exponential horn type speaker, and you will be given a new conception of the meaning of radio entertainment. Add an electric pick-up and you will have the ultimate in phonograph record reproduction.

VALVE COMBINATION TABLE FOR THREE-STAGE RESISTANCE-COUPLED AMPLIFIER.

FOR USE WITH 2-VOLT "A" BATTERY.

Mullard PM-1A	Mullard PM-1A	Mullard PM-2	2
Mullard PM-1A	Mullard PM-1A	Mullard PM-252	1½
Cossor 210-RC	Cossor 210-RC	Cossor 215-P	1½

FOR USE WITH 4-VOLT "A" BATTERY.

Valve for First Stage (V1)	Valve for Second Stage (V2)	Valve for Third Stage (V3)	Tempryte, Ohms.
Mullard PM-3A	Mullard PM-3A	Mullard PM-4	3
Mullard PM-3A	Mullard PM-3A	Mullard PM254	2
Philips A-425	Philips A-425	Philips B-403	3
Philips A-425	Philips A-425	Philips B-405	3
Philips A-425	Philips A-425	Philips B-406	4
Philips A-425	Philips A-425	Philips B-409	3
Cossor 410-RC	Cossor 410-RC	Cossor 410-P	3

FOR USE WITH 6-VOLT "A" BATTERY:

Mullard PM-5B	Mullard PM-5B	Mullard PM-6	3
Mullard PM-5B	Mullard PM-5B	Mullard PM-256	2
Philips A-630	Philips A-630	Philips B-605	3
Radiotron UX-240	Radiotron UX-240	Radiotron UX-201A	2
Radiotron UX-240	Radiotron UX-240	Radiotron UX-112A	2
Radiotron UX-240	Radiotron UX-240	Radiotron UX-171A	1½
Cossor 610-RC	Cossor 610-RC	Cossor 610-P	3

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In the city, selectivity has been the ideal for which the designers have striven, and in accomplishing this most difficult goal (using but three valves), they have just cause to be proud of their product.

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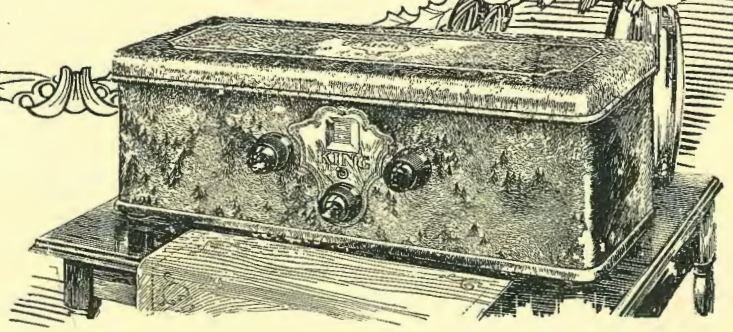

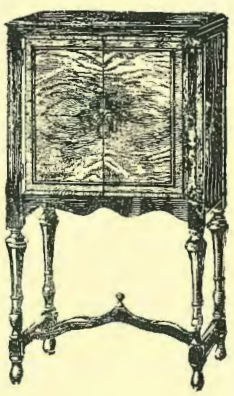

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With Model "F" £49 10 0
With Electric Model £65 0 0

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MODEL "G"—6-Valve Genuine Neutrodyne built into rich bronze-finished metal case as illustrated above.
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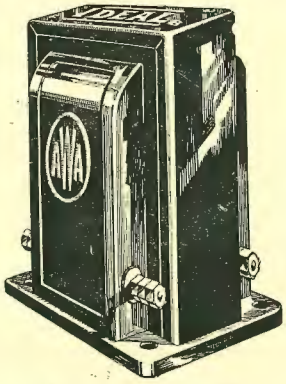

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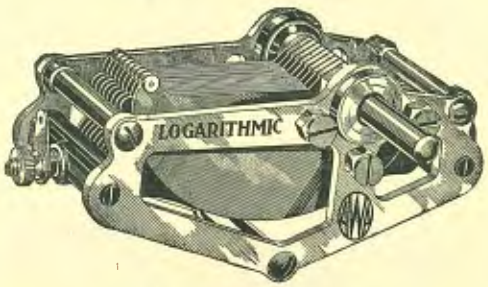

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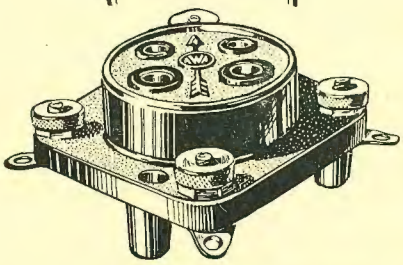

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This Australian Socket incorporates the improved spring suspension principle, which fully protects the valve as well as eliminating all microphonic noises. Each terminal is plainly marked and fitted with soldering lugs.

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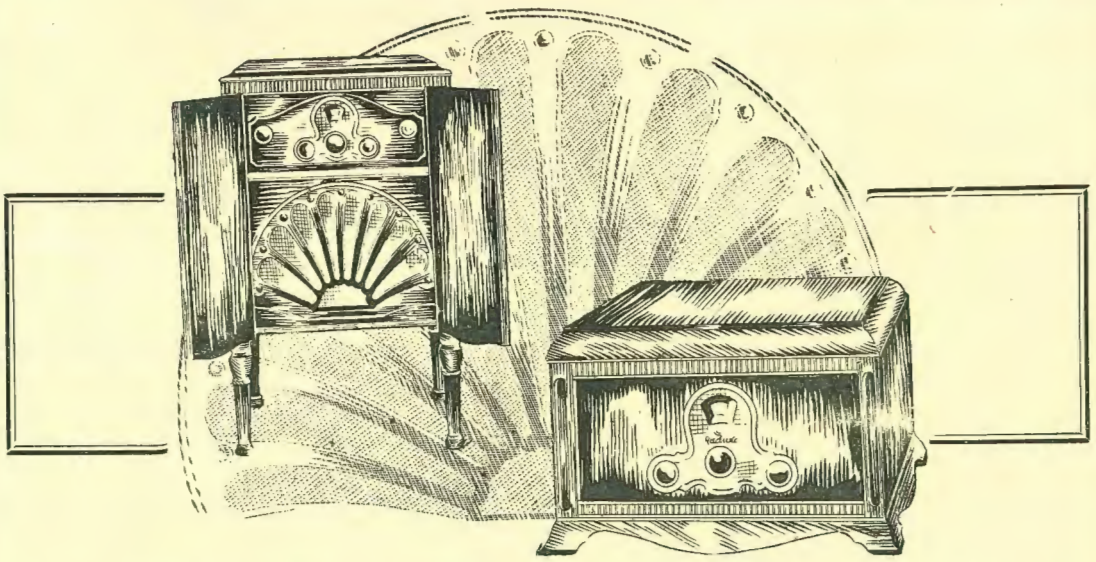
S.A.S.



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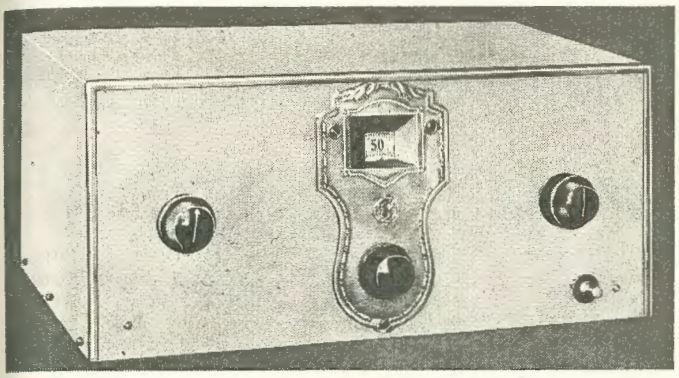
S.A.S.

NEW RECEIVERS REVIEWED

As each new receiver appears upon the market, a sample is thoroughly tested in the "Queensland Radio News" Laboratory. For the benefit of interested readers, we offer in this department, a candid and unbiassed criticism of its performance.



THE CRAMMOND SUPER THREE.

No one who attempts to keep abreast of the latest developments in the realm of the home broadcast receiver will dispute our contention that the day of the shielded receiver has arrived, and that this type of set is here to stay. Complete shielding offers so many advantages that more and more manufacturers of high grade receivers are looking to it to provide that last ounce of efficiency from their products.

Up to the present only the larger sets appear to have received serious consideration from this angle—possibly because of the additional expense that must be incurred by effective shielding. However, one progressive Brisbane radio firm has gone very thoroughly into the question of complete shielding in its application to a three-valve receiver, with some remarkable results.

We refer to the Crammond Radio Manufacturing Company, Queen Street, Brisbane, manufacturers of the well-known "Crammond Three." Good as this receiver was, the performance of the firm's new "Super Three" certainly justifies their action in resorting to shielding. The task of testing the "Crammond Super Three" was a most congenial one; the receiver was a positive delight to handle, and we know of no set that permits easier tuning. Beyond giving a few details of its test performance, we can say little except that it seems to do all that a first-class receiver should do—and a bit more.

Used with a good cone loudspeaker, the quality of reproduction will satisfy the most exacting, and volume is there in plenty. In conjunction with the set, we used the beautiful little Crammond Shielded Wavetrap, the resulting selectivity being such that it was possible to tune in 5CL (Adelaide)—not loudly, of course—while 4QG was on the air, without interference. Body-capacity was totally absent, as one would expect, and the reaction control so smooth that we were able to turn from station to station by means of the tuning dial alone, without touching the reaction knob. The interior of the receiver is an excellent piece of work, while the exterior appearance is uncommon and distinctly attractive, the nickel-plated panel being fitted into an oxidised brass cabinet of unusual but pleasing design.

Altogether, our considered opinion is that the Crammond Super Three is a receiver of which the manufacturers have every reason to be proud, and we believe it ranks with the best that can be produced anywhere in the world.

Short Waves for New Guinea

Recently we had the pleasure of a visit from Mr. C. Claussen of New Guinea, who called in to enter his name as a subscriber to "Q.R.N.," and to tell us some interesting facts about wireless on the island.

Mr. Claussen is Technical Instructor to the Lutheran Mission at Finchaven, his duties consisting of the training of native boys for their respective trades—principally house building. He is greatly impressed by the splendid and valuable service short wave transmission is rendering to the Australian Inland Mission, and is anxious to carry a similar scheme to New Guinea, where intercommunication between the mission stations is very primitive and dangerously slow.

Mr. Claussen is greatly interested in the DX Short Wave Transmitter, described in the October issue of "The Q.R.N.," and intends to construct an experimental set along the lines of this model immediately upon his return to New Guinea. He asserts that a chain of short wave stations would connect up at least 20 stations in the New Guinea mission field.

Speaking of broadcast reception, Mr. Claussen told us that he enjoys remarkably good reception from all Australian stations, excepting 4QG where distortion is still very pronounced. He is using a 3 valve P1 home assembled set.

The filament supply is taken from an old battery, charged by a motor car generator, driven by a windmill built by Mr. Claussen from an old threshing machine—rather a novel idea, but Mr. Claussen assures us that it fills the need admirably and costs him nothing for battery re-charges.

Mr. Claussen has promised to forward details of his short wave experiments on the island, and we feel sure that all readers will be interested to learn of his success along this line.

What Governs the Power Handling Capacity of an Amplifier

By A. R. WILSON

AS the novelty of radio has gradually disappeared, and more interest is taken in it purely as an instrument to reproduce with fidelity both music and speech, the listener and engineer have given more and more thought to the tonal qualities of the broadcast receiver. The vast radio audience to-day is first of all concerned in how **well** it can hear. How **far** is a secondary consideration.

It would seem to the average listener inexperienced in radio experimentation that all that is necessary to increase volume is the addition of a stage or two of audio-frequency amplification to his existing equipment. This is true to a certain extent, but as we are interested only in **quality volume,** the design of the apparatus used in the "stage or two" of audio-frequency amplification is of great importance.

A speaker, which does the actual reproducing of sound, is an energy operated device and as the energy is derived from the last audio valve alone, the undistorted volume obtainable from a speaker is wholly dependent upon the energy output of this valve and no other, the energy being measured in milliwatts.

In order to secure the maximum power output that a valve is capable of delivering, it is necessary that a sufficiently large voltage be placed on the grid of the valve to operate it at its maximum output. At the same time certain conditions, however, must be satisfied to prevent distortion in the valve itself. First, the grid must not be allowed to become sufficiently positive to draw any appreciable amount of grid current, and second, the plate current must at no portion of the cycle be allowed to fall so low that distortion be caused by curvature of the plate current curve. The input voltage which may be applied safely to a valve without causing grid distortion is fairly well indicated by the grid bias voltage. Actually the effected grid swing permissible in volts R.M.S. is $\sqrt{2} \div 2$ or .707 times the grid bias.

The solution of the problem of **quality volume** is threefold, embracing valves, transformers and speakers wherein distortion of various sorts and causes tends to develop. It may be well to state here that there are two apparent forms of distortion to guard against in any audio amplifier: frequency distortion and wave-form distortion. Frequency distortion, which really is not distortion at all, but the relative differences in the amplification of different frequencies is caused by one of two things, either a coupling device that is not capable of even performance over the audio range, or the improper matching of impedances of the different circuits. It is extremely important from a frequency viewpoint that the impedances of the various circuits bear a definite relation to each other. To secure a maximum transfer of voltage from one circuit to another (and we are interested in this respect only in voltage and not in energy), the impedance of the transformer primary should be at least two or three times that of the valve circuit at the lowest frequency which we wish to amplify. Wave-form distortion in the amplifier itself is caused by either an overloaded valve or saturation of the core of the audio transformers. With the present-day standards of transformers, however, the latter from a practical standpoint may be entirely disregarded. Obviously the remedy for an overloaded valve is the reduction of the input signal or the increase of grid bias and plate voltage, thus permitting the valve to be worked on the straight portion of its grid voltage plate current curve.

Assuming one to have an audio amplifier and valves of the standards of two or three years ago, the most radical improvement in quality would be brought about by the replacement of the last audio valve by one of the new power valves. This would increase the power handling capacity of the amplifier, perhaps 50 times, and this power handling capacity of an amplifier is something that is not very well understood by the average man, yet it is extremely important if faithful reproduction is to be obtained. In order to produce the same intensity to the ear, say at 60 cycles, many times as much power is required as at 1000 cycles. A somewhat disconnected yet fitting illustration would be the comparison between a tuba player and a cornet player in a brass band. The tuba player expends much more energy, but to the ear the cornet is louder. In the case of the loudspeaker far greater power is needed to supply the energy than was heretofore thought necessary to reproduce bass notes properly, and it is even very doubtful if the valves on the market to-day are capable of supplying to the speaker enough energy to reproduce these low frequencies with the same intensity as the higher frequencies, unless a 50 or 100 watt power valve is used. This would require a type of plate supply device, which from an economic point of view, would be entirely out of the question.

While it would seem that increasing the energy output of an amplifier would result in extremely loud reproduction, this is not necessarily true. A loud sound may be doubled in intensity—that is, the energy doubled—and the ear may hardly detect the change. This fact will explain in some measure why many people are not able to note the difference in the volume produced by a very large power valve and a smaller one, although, everything else being equal, the reproduction when using the former should appear much better on the lower frequencies.

The power handling capacity of an amplifier using

present day transformers is more or less limited by that of the valves used, since the largest possible portion of the negative side of the grid voltage plate current curve is available for the actual plate voltage used. While resistance or straight impedance coupled amplifiers are better from a purely frequency standpoint, the power handling capacity is decidedly limited, as there is a certain rectifying action of a strong signal caused by the time action of the grid condenser and leak, and their purpose, even from a frequency standpoint, is often defeated by the improper use of valves. A man will quite frequently pay from £5 to £10 for an impedance coupled amplifier only to use a small valve in the last stage, and it is very doubtful if the improvement in quality in this case is even noticeable to the ear. This is only another example of insufficient power required to reproduce bass notes, although the frequency characteristic of an impedance or resistance coupled amplifier is essentially a straight line from 50 cycles upward. A very interesting laboratory experiment along these lines proved that where a pure 60 cycle note from a valve oscillator was fed directly into the grid of a UX-210 valve, the full output of this valve did not produce even an audible sound at this frequency. All low frequencies are not entirely lost, however, as their harmonics are reproduced, but with much less intensity, and the fundamental pitch is usually obtained by the beat note of a second and third harmonic.

In reviewing the subject of power handling capacity of an amplifier, there are many other more important phases to consider than the particular method of coupling (transformer, resistance, or impedance). It is a well-known fact that no better quality can be expected than is radiated from a broadcasting station or that can be faithfully reproduced by the loudspeaker—regardless of what coupling method or combination of methods may be used.

Bearing in mind that the frequency range of the better broadcasting stations is something like 80 cycles to 5000 cycles, and the better loudspeakers cut off at 80 cycles at the lower end and 7000 cycles at the upper end, also remembering that the better transformers in use to-day are capable of even amplification between 60 cycles and 6000 cycles, the selection of the amplifier and proper operation for maximum efficiency of those valves should receive more consideration than is generally given to amplifier valves, particularly the last stage valve from which the loudspeaker is operated.

A SHORT STORY

The Life Circuit

By ROBERT WARE

IN the struggling poverty-stricken, yet egotistical days of my youth, I ridiculed anything and everything which savoured of the supernatural. Nothing, I maintained, could possibly happen which had not a perfectly sound, reasonable explanation. I was a dogmatic, methodical rationalist—needing either ocular or physical demonstration before accepting any theory or hypothesis as a concrete fact.

This mental attitude, I reasoned, with no small satisfaction, was quite in keeping with what the world expected from a senior student attending L'Ecole Pasteur, the great, free academy in the Quartier Latin which had enabled so many sons of the peasantry to reach the highest ranks of medical science.

Notwithstanding this fact, however, I was bound by a strange tie of friendship to one who thoroughly believed in the existence of phenomena which occurred contrary to, and in spite of, all existing natural laws. I took, moreover, an intense interest in my friend's experiments—possibly in the hope that one day I should conclusively prove to him that there is nothing more in heaven and earth than can be accurately accounted for in our sciences and philosophies.

The friendship which existed between Professor Trembot and myself was the source of much amusement and good-natured raillery, but in common with the rest of Paris south of the Seine, our associates saw no real cause for wonder in the existence of a bond of mutual attraction between men apparently so antithetical to each other.

Although a student, as I have said, I had obtained my medical degree some years previously, and had filled minor medical positions at various hospitals. My desire to indulge in pathological research—and a totally unexpected legacy of a few hundred francs a year—turned my feet towards the massive granite edifice, as naturally as two magnets will link their opposite poles and spread a pile of iron filings in concentric circles.

Professor Trembot was a thin, lanky person, whose ill-fitting garments betrayed a total lack of personal pride. His lean, sallow face; his burning, coal-black eyes which were deeply set beneath beetling, black eyebrows; his stock of wiry black hair and pointed black beard, made a picture which can only be described as—saturnine. Yet his goodness of heart endeared himself to all who knew him, and his remarkably daring, analytical, deductive brain had already made him notorious—if not famous—throughout the medical fraternity of France.

His great passion was the relationship of electrical phenomena to plants, animals and human beings—in the research of which he had assembled experimental apparatus, the use of which would have confounded any other scientist or physicist in the world.

Long before the world war, he had been one of the most methodical and persistent experimenters in the propagation of aetheric waves—the science which is known to the man in the street as "wireless"; and on the cessation of hostilities, had immediately returned to his beloved laboratory to continue his work.

When the broadcasting of speech and music was in its earliest stages, Trembot was amongst the first in the country to obtain a reception permit—and the maze of wires and insulators which focussed at his laboratory window would have been the wonder and despair of any wireless engineer.

About 4 p.m. every day I would gravitate to Trembot's laboratory with unfailing regularity, and we would, by common consent, dismiss for the next hour, all thoughts and references to our studies within the academy, and talk politics.

Trembot knew more about international politics than any other scientist I have ever met—that particular study affording him complete mental relaxation from the exhausting, nerve-racking concentration he brought to bear on his work.

One miserably cold, wet evening we were sitting in his workshop enjoying our pipes and a cheery fire, when, suddenly, he referred to our before-dinner talks with a fierceness which almost alarmed me.

"Do you know, Dornleve," he remarked in a curiously tense voice, "if it wasn't for you and the amusing antics of diplomatic celebrities, I really believe that I should become mentally unbalanced. I am within a hairbreadth of achieving my life's ambition—and if I succeed I shall be the greatest benefactor to mankind the world has ever known or ever can know."

The whimsical smile with which he delivered this preposterous—and very unusual—boast, took the "raw edge" off what would, in any other man, have been regarded as purely egotistical bombast. Nevertheless, to repress my quizzical smile was an utter impossibility.

"No, Dornleve, although my experiments have produced some of the most bewildering results, I still retain a vestige of my normal sanity. And, I think I may safely claim that I have never shown any evidence of being burdened with a sublime 'superiority complex.'" Suddenly the tenseness dropped from his speech, and he proceeded in a dreamy, far-away voice:

"The evening broadcasting sessions will commence about eight o'clock, and I shall then have the honour of showing you something which no living man—excepting myself—has ever conceived possible. Before we go and eat, however, I shall request your attendance in, what we may term, a professional capacity."

As he spoke, he rose to his feet and walked towards a dimly-lit corner of the laboratory in which, as I knew, he kept the many "pets" which were so necessary in his researches.

Ablaze with curiosity and suppressed anticipation, I stood by his side as he opened the door of a cage, and, after a few seconds' poking and fumbling, with-

drew a beautiful specimen of long-haired, white Belgian rabbit.

"A remarkably healthy subject, eh, Dornleve?" laughed Trembot as he held the kicking animal by its ears at arm's length.

"Very healthy," I acquiesed, impatiently waiting for the words which would disclose my friends' intention. Suddenly he bent down and replaced the animal in the box and, dusting his hands together, drew himself erect.

"Now, my dear friend, we shall go and enjoy some chicken and hot coffee in our usual, placid manner."

"But—but——" I stammered.

"Yes," he laughed.

"Where do my 'professional services' come in?" I gasped.

"Merely, my dear fellow, in certifying that the rabbit I just showed you is healthy and in full possession of its senses and energies. It is my latest addition to my collection, and cost me twenty francs—I bought it this morning. Don't you like him?" was Trembot's enigmatic reply.

CHAPTER II.

During our evening meal Trembot was unusually amusing. Sparkling witicisms, scintillating epigrams, and brilliant repartee flowed from his brain in bewildering, admiration-compelling profusion. Never had I seen him in so effervescent a mood—he was simply bubbling over with joy—suppressed excitement.

For my part, I could not, under the circumstances, maintain my usual ironic, inconoclastic attitude—I was simply lifted upon the stupendous wave of amusement which he radiated, and struggled with my repressed curiosity as best I may.

This was precisely what he desired—and sub-consciously realising his decision to think and talk of anything but what was to follow when we returned to the laboratory, I did not make any effort to question him on the subject nor forestall the anticipated pleasure by wild hazards and imaginings.

Presently he called the waiter, and, in spite of my protestations, insisted upon assuming the financial obligations of the evening—presenting Jacques with a gratuity which caused that worthy person to gaze at Trembot in dumbfounded astonishment.

"If you are ready, we shall now return to my humble 'workshop,'" remarked my friend, rising suddenly and buttoning his cloak around his neck. The cold, impersonal aloofness with which he uttered the words caused me to throw a quick glance of apprehension at the Professor, but he was not looking at me, being immersed in the business of arranging the folds of his cloak, an action upon which he was bestowing an undivided, meticulous attention quite unwarranted under the circumstances.

I did not make any reply to his authoritative pronouncement, but continued to gaze steadfastly at the man for whom I had conceived greater affection than I ever could have done for another person, however "friendly" he might have been.

Trembot still refused to look at me—and was literally playing with his cloak in a way which indicated that his nervous system was quivering under a high tension.

Suddenly, the truth dawned upon me—the evening's gaiety had not been the result of anticipated triumph on the part of an egotist—it had been merely a mask assumed to effect the temporary obliteration of an unwelcome subject.

Trembot was afraid!

Filled with an indefinable dread, I laid my hand on the Professor's shoulder and begged him to forget about his "workshop" and accompany me to the Folies Bergere or some other place of amusement.

"No, my friend, the stage is set, unfortunately; and what I have looked forward to as the hour of victory is at hand. I confess I would rather postpone it, but the big experiment has to be attempted, or else all my work will be wasted."

So saying, he took my arm and led me into the street.

CHAPTER III.

The long flight of stone steps which led to the corridor seemed more depressing than usual that evening. The shrieking wind had blown out the light near the door, and the open gas jet at the head of the steps flickered and spluttered in a dismal, foreboding manner.

We climbed the worn steps in silence, and, on reaching the top, I felt a sickening shudder shake my friend. I looked at him quickly, and, in the dim light, saw with alarm that his face had assumed a ghastly expression. Following his glance, I could see a couple of figures standing outside the "workshop" door—away at the end of the corridor.

For a second, Trembot faltered—then, apparently having mastered his fear, he strode towards his room with quick, firm footsteps.

Before we reached the waiting men I had perceived that they were gendarmes and that they had brought with them a police ambulance. On recognising my friend the gendarmes saluted and said that Monsieur Le Prefet was expected every moment.

"I cannot make the experiment without his presence," remarked Trembot. "But we can get everything in readiness," he continued as he opened the door and motioned the gendarmes to wheel the ambulance into the laboratory.

My wonderment at the unlooked-for presence of the police was interrupted by heavy footsteps in the corridor, the sound of which brought a sigh of relief and satisfaction from Trembot.

"Dornleve," he said, when the visitors had arrived, "I think you are already acquainted with these three gentlemen, so no introductions are necessary."

My curiosity and apprehension were unbounded when I saw that the newcomers were no less personages than the Prefet of Police, the Senior Prison Doctor and the Police Chaplain.

"Be seated, gentlemen," cried Trembot with a graceful sweep of his arm towards the fireplace which still contained a mass of glowing coals. The seating accommodation of the "workshop" was taxed to the utmost as the quaintly assorted audience prepared for the mysterious experiment.

Professor Trembot, who had been negligently lounging against the work-bench, suddenly stood erect and, with all the fire and earnestness of a scientific zealot, plunged into his subject.

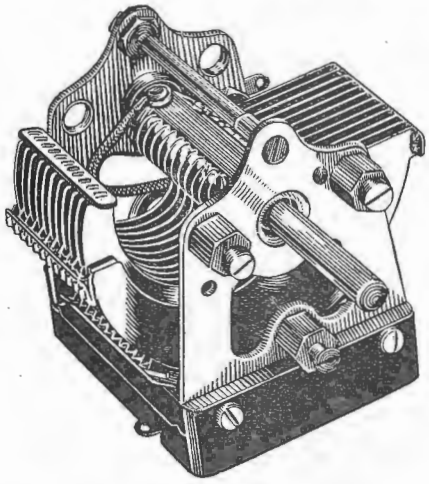
"Gentlemen, for the sake of my friend, Dornleve, I will explain your presence in my laboratory this evening.

"In this police ambulance lies the body of Henri Formesne—the apache who was sentenced to death last month. He was to be guillotined the day after to-morrow, but took his own life last night by means of prussic acid, which he had either secreted on his person or which had been smuggled in to him. How he obtained the poison is not for us to decide now—

Continued on page 57.

CONDENSERS

of PRECISION and EFFICIENCY



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The POWER BUZZER

More Information from Ex-Signal Corps Readers Concerning this Interesting Subject

Beerburrum, 12th Nov., 1928.

(To the Editor, "Qld. Radio News.")

Dear Sir,—Please permit me space in your paper to thank Mr. R. Browne 4RB for the detailed description and circuit of the "Power Buzzer."

This low power transmitter and receiver was a most useful part of the A.I.F. signal equipment in France, and although I have only known it to be used for short-distance work, I think it would be quite possible with the two-valve amplifier with which it was fitted to receive say 50 or 60 miles.

This form of wireless communication could be used with advantage even at the present time. Will you please inform me, through your paper, if it would be essential to obtain a transmitting license to operate this "Power Buzzer."

Yours etc.,

WM. BARBER.

November 3rd, 1928.

(To the Editor, "Qld. Radio News.")

Dear Sir,—I was very interested in 4RB's description of the power buzzer as used in the services during the war.

Shortly after the cessation of hostilities, I came into contact with a few of these buzzers, which were obtainable from ex-Government stores in London for a mere song. When the experimental transmitter started his activities in England in 1920, quite a few of them were using these power buzzers on the 200 metre band for ICW communication. Unless I am mistaken, they were known as the "TVT Unit." A three-valve amplifier (type C MK 3) was also obtainable with them at a price of £4.

The TVT unit is very interesting to me, because I used it for a long while at my old station, G-6XG, for communication with French, Belgian, Italian, Dutch and Finnish amateurs. 6XG put up many records with this until the local BCL's rightly sent a petition to the P.M.G. to stop me using it as the QRM spread from 100 to about 1000 metres for three or four miles!

I used the TVT for the plate supply to a valve oscillator; I think the voltage was somewhere near 10,000 at 30 ma.

These little TVT units would certainly make a good low-power H.T. supply for ICW work on shorter wavebands, but it is ruled out as we want all the pure D.C. we can get in 1929. The "Lizzie" coil does similarly, but does not, like the TVT, give 30ma. I believe there was a 100-watt TVT, but never saw one.

Yours faithfully,

DON. B. KNOCK (2NO),
Technical Editor, "Radio," Sydney.

Christie St., Sth. Brisbane, 1/11/28.

(To the Editor, "Qld. Radio News.")

Dear Sir,—As the "Power Buzzer" has been mentioned in the last two issues, the following notes may be of interest:—

The "Power Buzzer" was, I always believed, a French scheme. At any rate, the first power buzzers and their accompanying amplifiers were of French manufacture. Being very simple and requiring no adjustments, beyond replacing contacts and plugging in a battery, they could be operated by anyone who had a knowledge of Morse. They were used for emergency forward communications between the front line and advanced battalion headquarters. Between this point and brigade, wireless communication was carried on by means of so-called "Trench-sets," also known as "B/F" sets. The significance of the initials was a bit of a mystery, although we had our own opinions on the matter!

The official range of the set was given as 2000 yards, and with three valve amplifiers as receivers, good communication was easily maintained, provided there was not too much interference. Owing to the telephone system in use, which almost invariably used an earth return, a tremendous amount of telephone conversation was picked up. A running stream between the transmitter and receiver was supposed to stop the signals, but in the Ypres sector, which was nearly all water, the sigs. came through as usual. The nature of the intervening soil has some effect on the signals, but usually no difficulty was experienced in working up to a mile.

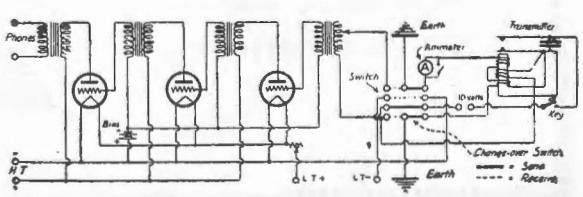
Just before the Armistice a combined power-buzzer and amplifier was introduced. This was of British manufacture, and a very fine piece of instrument work. However, "loop sets" were introduced almost simultaneously, and practically superseded the power-buzzer. These were simple short-wave C/W sets, working on a wavelength of about 60 metres, as far as I can remember.

The military authorities seemed prejudiced against the use of wireless in any shape or form, probably because it could be overheard by Fritz. As all messages were sent in code, this was a mistaken view on their part, as nearly all forms of communication were liable to be intercepted. Consequently I'm unable to quote any incident in which the power-buzzer played a meritorious part. It undoubtedly had possibilities, but in our section, at least, it never had a chance. Some of the battalion sigs. may be able to prove that the power-buzzer "did its bit."

I am enclosing a rough sketch of the circuit of the combined power-buzzer-amplifier, which, when redrawn, may be of sufficient interest for publication.

Yours sincerely,

"SAPPER."



A CRITERION!

The Baby Grand Piano! A term that immediately suggests a piano gracing the home of one who demands the best as his right.

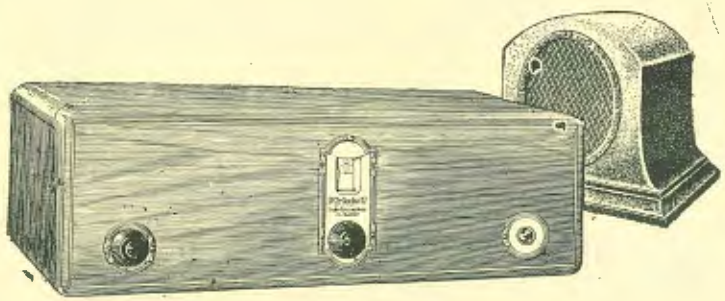
Appreciating this, we unhesitatingly named our unique septagonal speaker the "Baby Grand," for here was a reproducer which glowed with personality whose sheer beauty was obvious from but a cursory glance, a speaker that stood gloriously apart from its fellows.

Its frank and unswervingly faithful reproduction, have, in but a few months, made it a loudspeaker respected and admired by all, as something "different"—something not to be compared with, but rather to be compared by—in short a criterion.

PHILIPS
LOUD SPEAKERS

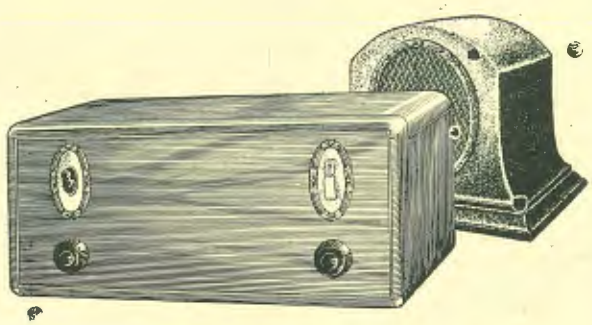
R.C.A. 6 VALVE SERIES Radio

For a MERRIER 'Xmas and a HAPPIER New Year



NO batteries. No battery eliminators. The R.C.A. 6 Valve Receiver at the left works direct from the ordinary house lighting current. Plug in. Snap a switch, turn a single dial and listen. Here's the new radio, full twelve months ahead of anything yet developed. At **£75** (which, remember, includes the cost of the ten-guinea R.C.A. Loudspeaker 100A), this model offers remarkable value. Ask any of the best radio dealers to demonstrate.

FOR those whose homes are not on the electricity supply, R.C.A. has developed a 6-Valve Battery-operated Receiver. Like the Light-socket Operated 6-Valve, this Receiver is capable of enormous amplification, magnifying the tiny fragments of energy it receives from the broadcasting station over 2,500,000,000 times. Its performance on long-distance reception is amazing. Like the Light Socket Operated R.C.A. Receiver, this model is finished in a handsome polished Mahogany Cabinet, and comes complete with the distinctive dull bronze R.C.A. Loudspeaker 100A. The price is **£55.** Hear it at any of the best radio dealers.



AUSTRALIAN GENERAL ELECTRIC

Australian General Electric Company, Ltd

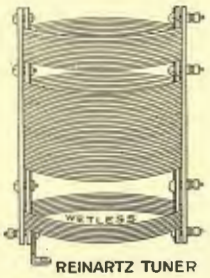
Atcherley House

Corner QUEEN and ADELAIDE STREETS, BRISBANE

And at FLINDERS STREET EAST, TOWNSVILLE

GUARANTEED "WETLESS" RADIO PRODUCTS

High Grade Products selling at a LOWER PRICE than you are asked to pay for other makes



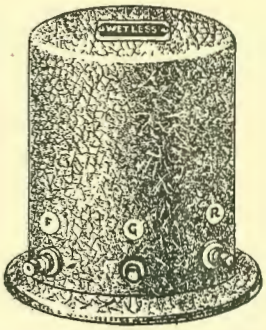
REINARTZ TUNER

"Wetless" Reinartz Tuner. Price ..... 10/6 each

NEUT COIL KIT

Neutrodyne Kit

"Wetless" Neut. Kit, with two neutralising condensers. Price ..... 35/- per kit.



SOLODYNE SHIELDED COIL.

"Wetless" Solodyne Kit with two Neutralising Condensers. Price ..... 65/- per kit

SINGLE ROTOR TUNER

"Wetless" Single Rotor Tuner. Price ..... 13/- ea.

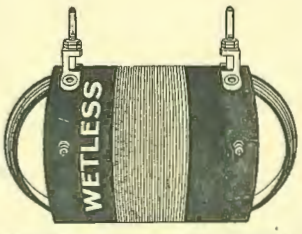
FROM ALL RADIO DEALERS

or from the Distributors

Trackson Bros. Ltd.

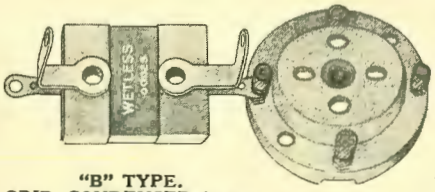
157-159 Elizabeth Street, BRISBANE

"Wetless" Radio Frequency Choke,— 5/6 each



DOUBLE ROTOR TUNER

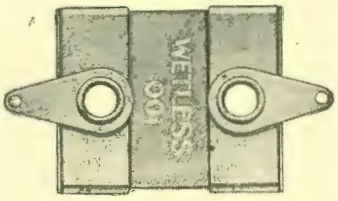
"Wetless" Double Rotor Tuner. Price ..... 18/6 ea.



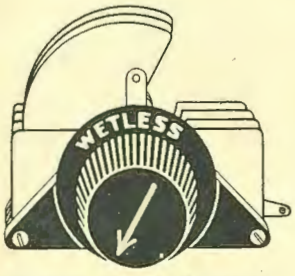
"B" TYPE.
GRID CONDENSER is specially made for attaching directly to valve socket terminal.

BROWNING DRAKE

"Wetless" Browning-Drake Kit with Neutralising Condenser. Price ..... 35/ per kit



"B" TYPE.



MIDGET CONDENSER

"Wetless" Midget Condensers, 3-plate, 4/3; 5-plate, 4/9; 7-plate, 5/3; 9-plate, 5/6; 11-plate, 5/9; 13-plate, 6/6; 15-plate, 7/-; 17-plate, 8/-; 19-plate, 8/6.

"WETLESS" MICA CONDENSERS

"A" Type, 1/6 Each	"B" Type		"B" Type, 2/- Each
.0001			.0001
.00015	.003	2/6	.00015
.0002	.004	2/6	.0002
.00025	.005	3/-	.00025
.0003	.006	3/6	.0003
.0004	.0075	3/9	.0004
.0005	.01	5/-	.0005
.001	.02	5/6	.001
.002			.002

.00025 (with clips), 1/9 each. .00025 (with clips), 2/6 each.

Manufactured by **J. WETLESS, 28 King St., Rockdale, Sydney**

The Importance of Core-Material in Audio Transformers

An illuminating discussion of the advantages and disadvantages of the standard Silicon-steel core as compared with the nickel alloys when used for audio work.

By "W.H.L."

Interesting details of developments in loudspeakers made in recent months have been prepared by the General Radio Laboratories (America), which show that instruments which extend the reproducable range of frequency by some 75 to 100 cycles downward are capable of production. At the same time there has been a downward extension of the frequency range transmitted by broadcast stations. These factors have combined to revise the requirements for satisfactory performance of audio transformers.

A year ago there was little justification for audio transformers reproducing frequencies much below one hundred cycles, since none of the speakers then available were capable of producing an audible sound at such frequencies, even had it been present in the broadcast transmission—which it was not.

As a result of these developments, the low frequency cut-off of audio transformers has been moved steadily until transformers are demanded which will amplify 60. or even 30 cycles.

The design of such transformers has not involved any new basic ideas, but rather the overcoming of practical difficulties involved in the adaptation of existing knowledge. The problem of raising of the lower end transformer characteristic is primarily one of increasing the input inductance of the transformer although the lowering of the plate impedance of the valves has had the effect of improving the characteristics of transformers of earlier designs.

The inductance of the transformer depends upon three factors, the number of turns of wire on the coil, the size of the core, and the permeability of the core material. The gain in inductance which may be had by adding primary turns is limited by the fact that the secondary turns must also be increased unless the turns ratio is lowered. The result is the loss of high frequencies as a result of coil capacity.

The high permeability nickel alloys are being used to an increasing extent for audio transformers. These alloys of nickel and iron have the property of high permeability at low flux densities, the conditions encountered in audio transformer primaries.

These alloys have, however, some disadvantages. The high permeability is maintained over a rather limited range of flux density, and falls off rapidly at higher or lower values.

Simply stated, such cores saturate easily. This difficulty is becoming more important as the plate currents of valves are increased. A more serious objection yet is that the transformer is permanently damaged by an increase in field strength such as might result from accidental connection in a circuit without a "C" battery, or where a "C" battery was run down or where the plate current was abnormally large for any other reason. Such temporary increase in flux through the core permanently changes the characteristics of the material.

Silicon steel on the other hand is not permanently affected by increases in flux. The frequency characteristic of the transformer is, of course, affected by core saturation while it exists, but the effect is not lasting. These considerations render the nickel alloy transformers particularly valuable for special laboratory work, or in commercial installation where care is taken to insure proper operating conditions.

The ruggedness of the silicon core type of transformer, however, recommends it for general experimental use where conditions are frequently hard upon delicate apparatus. All the electrical advantages of the nickel alloys may be obtained with silicon steel by adjustment of other factors in the design.

It was found that when the lower end of the characteristic had been extended as desired, by changes in the coil and core, there was a tendency to resonance at high frequencies as well as a falling off of amplification. These difficulties were overcome by changes in coil design. The resonance effects at high frequency are due to leakage reactance, i.e., flux not linking both primary and secondary coils, and by coil capacity.

The loss of amplification at high frequencies is due to internal coil capacity, principally in the secondary. It was found possible to reduce both these effects by a form of coil construction which sandwiches the primary between two sections of the secondary. This type of winding not only reduces leakage reactance by increasing the coupling between primary and secondary, but also reduces the internal capacity of the secondary by breaking it up into two sections.

"EXCUSE ME WHILE I ASK LONDON."

A Melbourne business man has acquired an entirely new conception of wireless. Recently he received a message from London via the Beam Service. Desiring the date of origin confirmed, he telephoned the Beam Office and made his request. "Excuse me while I ask London," was the reply. "But I can't hold on here all that time," he said. "Don't hang up, won't keep you long," came the voice again. Within 70 seconds the clerk reported: "The date of your message is correct as shown on the form." In those 70 seconds the Melbourne Beam official had called up London office direct, the London clerk had looked up the file and confirmed the date to Melbourne, and the business man had received the answer to his request. Twenty-eight thousand miles of space crossed and a small query answered while he waited. The whole thing done just as though one were seeking information by telephone from an office in the city.

Australia Speaks to U.S.A. and Java

Successful International Tests

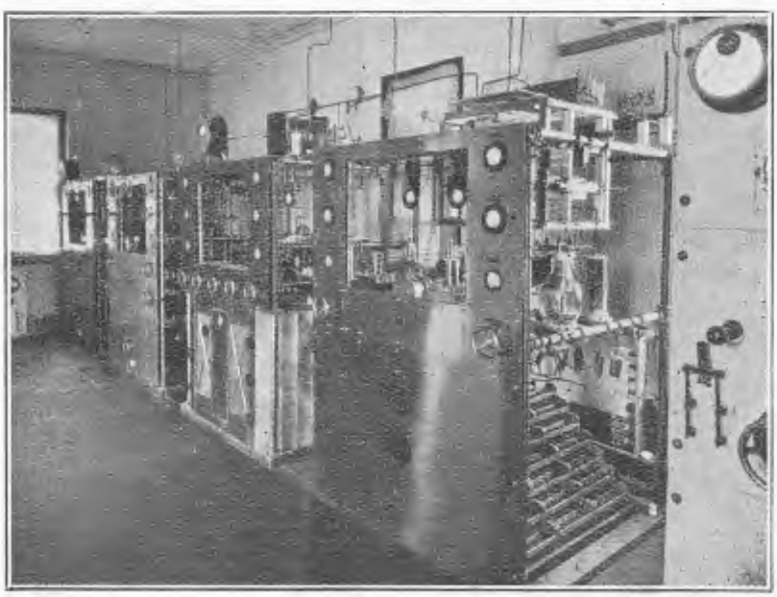
RADIO history was made on November 1st, and in the making of it Mr. E. T. Fisk, Managing Director of Amalgamated Wireless (Australasia) Ltd., added still another achievement to the many brilliant pioneer demonstrations of the company.

Before a large number of representatives of the leading Sydney newspapers, the first demonstration of two-way wireless telephony between Sydney and Schenectady (New York) and Sydney and Java, was given by Mr. Fisk. A number of distinguished citizens and newspaper men had the unique and wonderful experience of telephoning to New York and Java, the voices from overseas being heard as clearly as if the speakers were talking from Melbourne or Brisbane.

In order to give the newspaper representatives a better idea of the wireless apparatus used in the tests, they were taken over the A.W.A. receiving centre at La Perouse in the afternoon by Mr. E. T. Fisk, and shown the operation of the receiving apparatus there. The opportunity was also taken to demonstrate the Trawler Telephony Service. Mr. Fisk asked an operator to call up a trawler operating off the N.S.W. coast, and in less than two minutes a reply was received from a trawler off Montague Island, 150 miles away. The words of the operator on the trawler came through very distinctly. The party was next shown over the Headquarters of Amalgamated Wireless, 47 York Street, where a telephony test was made with Melbourne, and each member of the party had a chat with the Melbourne manager of A.W.A., Mr. Mulholland.

A visit was next paid to the A.W.A. Transmitting Centre at Pennant Hills—the largest station in the Southern Hemisphere—and an inspection made of the new 20 k.w. telegraphy and telephony transmitter, designed and manufactured by A.W.A. and utilised in the tests under review. After that the party returned to A.W.A. Headquarters to take part in the big tests. Mr. Fisk, seated in his office, asked La Perouse Station to get Bandoeng Station, Java. Within a few minutes the operator put the station over the land-line telephone to Mr. Fisks' office, and for more than half an hour Mr. W. G. Conley (Director of John Fairfax & Sons, Ltd.), representing the "Sydney Morning Herald," talked with Mr. Rupte, of the Java Station, and exchanged greetings and news. Mr. Lawton, Consul-General for America in Sydney, then sent greetings to the American Consul-General in the Dutch East Indies, and to the American colony.

Shortly before 10 p.m., it was announced that the line was clear to Schenectady, U.S.A., where the huge radio station of the General Electric Co., WGY, is located. At this hour dawn was breaking in New York, and most of the speakers at WGY had travelled hundreds of miles to take part in the experiment. At the table in Mr. Fisk's office sat Mr. E. M. Lawton, Consul-General for America, and Mrs. Lawton; the representatives of the Sydney newspapers and Messrs E. T. Fisk, Managing Director; C. P. Bartholomew, Director; L. A. Hooke, Deputy General Manager; and M. McDonald, Chief Engineer, of Amalgamated Wireless. Mr. Fisk spoke for a few minutes and then introduced the Consul-General for America, Mr. Lawton, who spoke over the telephone to Mr. Dow, Secretary of the Australian Commissioner's Office in New York. Mr. Dow sent greetings to the former Australian Commis-



The 20 K.W. Short Wave Transmitter installed at Station 2ME, Radio Centre, Pennant Hills, Sydney, and utilised in the recent successful telephony tests by Amalgamated Wireless (A/sia.) Ltd., between Sydney and Schenectady (New York), and Sydney and Java.

sioners to the United States, Sir Henry Braddon, Sir Mark Sheldon, Sir James Elder and Mr. McKinnon, and also to Mr. Garrels, the United States Consul-General at Melbourne. Mr. Lawton replied and spoke to friends of the General Electric Co., stating that he was pleased to take part in such a history-making episode. He said it was a remarkable experience to talk over a distance of more than 10,000 miles, and added that international telephony would do much to bring the American and Australian people closer together. Mr. Dow also thanked Amalgamated Wireless for having made this epoch-making achievement possible.

The newspaper men then talked with representatives of the New York "Times," the Chicago "Tribune," the American representative of the Australian Press Association (Mr. A. D. Rothman) and Mr. A. D. Hawkins, of the United Press. In addition to the general conversation, the American Pressmen read aloud the latest news in the New York papers. It was only after the Sydney newspaper representatives had been talking for a few minutes on the wireless telephone, that they realised how easy it was to speak to New York in a natural tone of voice. When this was used the listeners on the other side of the world at once intimated that they were following the conversation easily. The whole newspaper Press of America was keenly interested in the experiment, and at the close of the proceedings representatives of the different papers asked for the initials of the speakers, and these were checked over with the utmost facility.

The test was, in every way, an undoubted success, representing probably one of the most remarkable wireless achievements that has been carried out in Australia or, indeed, in the world. The demonstration of throwing the voice across the Pacific undoubtedly was as noteworthy in the realms of wireless as the blazing of the aerial trail across the Pacific by Kingsford Smith in the field of aviation. In carrying out the tests, credit is due to the General Electric Co. of America, and also to the Dutch East Indies Radio Company, who willingly consented to co-operate with A.W.A.

It is gratifying to Australians to know that the test was organised by an Australian company, that all the transmitting and receiving equipment was designed and manufactured in Australia, and that Amalgamated Wireless (Australasia) Ltd.—Australia's national wireless organisation—is leading the world in wireless development.

Successful telephony tests were again carried out on Monday night, November 5th, between Amalgamated Wireless Headquarters, Sydney, and Schenectady New York. The Consul-General for the Netherlands, Sydney (Mr. P. E. Teppema) spoke with the Consul-General for the Netherlands, New York, and during the evening the La Perouse Station of Amalgamated Wireless also switched on the radio station at Java, and Mr. Teppema conversed with Mr. Hillen, Chief of the Telegraph and Telephone Service in Java. Later WGY, Schenectady, was again switched on and Mr. John W. Hicks, junr., Managing Director of Paramount Pictures in Australia, spoke to Mr. Albert Deane, an Australian attached to the New York Office of Paramount Pictures. The voices from U.S.A. and from Java came through with great clarity, and the demonstration was in every way a perfect success.

The Australian Stations.

Shortly after Amalgamated Wireless was entrusted with the development of wireless in Australia, it became apparent that in order to easily develop wireless, it would be necessary for the capital cities to provide many services, and it also appeared that this would make it necessary to erect many stations This not only meant great expense, but it greatly increased the possibility of interference and there was the real difficulty of securing suitable sites accessible to the cities. Mr. E. T. Fisk, Managing Director of Amalgamated Wireless, abandoned the old practice of separate stations and evolved a new scheme of centralising the activities into three groups—a transmitting centre, a receiving centre, and a control office. This system has been developed to such a state of efficiency that it has become possible for practically all the wireless stations of New South Wales to be placed at two sites and operated from a central control office. Under the old arrangement, on the other hand, it would have been necessary to have had a separate site for each of the nine services conducted from Sydney.

The transmitting centre is located at Pennant Hills, and on a site on the coast of La Perouse, Botany Bay, is erected the A.W.A. receiving centre. Apart from the economy, both in equipment and personnel, the operating efficiency of all the services has been vastly improved by the centralisation of all activities. Another important feature of the Sydney system is that even if the station is using any or all of the various transmitters, it can be interrupted by a ship desiring immediate attention arising out of distress. In order to overcome the necessity of repeating and to minimise the possibility of mutilation, the transmitted and receved signals are controlled from a central point. By this means both transmission and reception can be carried out simultaneously from A.W.A. Headquarters at Wireless House, York Street, Sydney.

All the apparatus at A.W.A. Radio Transmitting Station at Pennant Hills, and at the receiving station at La Perouse, was designed and fabricated by the company's engineers. A.W.A. transmitters at Pennant Hills were used for the first Empire broadcast, and so successful was the result, that the Managing Director (Mr. Fisk) decided to institute a series of world-wide telephony tests. Great Britain was the first country approached, but up to the present time, A.W.A. has been unable to arrange tests with the old country; America, however, readily agreed to conduct a series of such tests.

In our last issue, we published a complete description of the great Pennant Hills Radio Centre, together with photographs illustrating the various transmitters.

Batteryless POWER

By C. TURNER,
Chief Radio Engineer, Electricity Meter Manufacturing Company, Sydney.

TO dispense with all batteries for all time—to supply direct from your light socket into your set—to supply "A," "B" and "C" power—enable your set to operate for hour after hour at practically negligible cost—to dispense with all worry in radio reception—to give uniform current and unchanged voltage; that is what the Emmco "A-B-C" eliminators make it possible to do. They eliminate the heavy four- or six-volt accumulator which, on the ordinary set, requires recharging periodically; they dispense with expensive dry batteries with their constant replacing cost; they do away with the dry "C" battery; and, above all, they allow you to use power valves in multi-valve sets without considering battery cost. Either of the Emmco "A-B-C" eliminators is simply plugged into the light socket, and by simple adjustment of the knob, you control the correct voltages for your plate, filament and grid currents. The Raytheon rectifying valves used in this eliminator will rectify enough current to operate any multi-valve set, and your total battery cost for the current consumption will be less than **one penny** for a full evening's entertainment. The simple changes in the wiring of your receiver to adapt it may be easily accomplished. These are fully explained in the diagrams and instructions, while particulars for installing a power tube with this type of eliminator will be found under the heading, "How to Wire the Set."

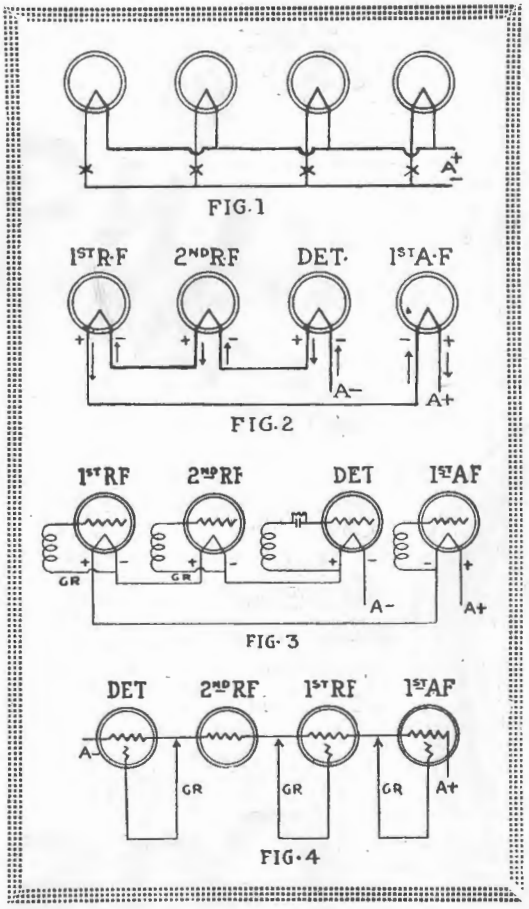


FIG. 1

FIG. 2

FIG. 3

FIG. 4

Conversion of Set Wiring for "A-B-C" Eliminator Operation.

Fig. 1.—In Fig. 1 is shown a rough diagram of the principle of the ordinary set wiring where the filaments are lit by an accumulator or dry batteries.

Fig. 2.—In Fig. 2 is shown a typical example of the series filament wiring which is used in conjunction with the "A-B-C" eliminator. A study of this diagram will show that the "A—" filament goes through the filament of all the other valves before it reaches the "A" battery supply again at the "+" end.

Fig. 3.—The filament wiring should then be carried out on the system shown in Fig. 3. It is necessary to take the "A—" lead to the detector first, as this is the most sensitive portion of the circuit as regards picking up a.c. hum, and this tendency is materially lessened when the detector is at the lowest —or earth—potential.

Fig. 4.—In Fig. 4 the diagram of Fig. 3 is shown as in a straight line from "A—" to "A+". The filament of each valve represents a resistance which is shown enclosed in a circle, and the whole of these resistances constitute a series resistance.

Fig. 7.—This is more clearly shown in Fig. 7 where a bias of "C" volts is obtained by connecting the grid return of 1st audio tube to between the 1st and second radio. In series wiring the valves must all have the same filament consumption —i.e., a .06 amp. valve will not work with a .1 amp. valve, but at the same time, you can use 3-volt and 6-volt valves together so long as their filament consumption does not exceed .06 amp., or .25 amp., according to the eliminator being used. In general we would recommend using Philips A-609 valves in sets using our 85 M.A. type eliminator, and Philips C-509 in sets using our 350 M.A. type eliminator.

Fig. 9.—In Fig. 9 the method of connecting a power valve is shown. This is only possible with our eliminator equipped with a power valve filament winding and a "C" bias control.

Adjustment of By-Pass Resistance.

Assuming that the wiring of the set has been completed in accordance with the foregoing instructions, give a final check to the wiring,, using the standard diagram as a guide. Now unscrew all the rheostats

KINGS OF THE AIR

Queensland Factory Representative:
T. H. MARTIN, B. & F. Chambers
Adelaide St., Brisbane.
Queensland Distributors;
HARRINGTONS LTD.,
Queen St., Brisbane.
J. B. CHANDLER & CO.,
Adelaide St., Brisbane.

Obtainable at all High-Class Radio Dealers throughout Australasia

After five years COSSOR still stands pre-eminent among valves. The famous COSSOR Kalenised filament—the first ever to operate without visible glow—is still acknowledged to be without equal for strength, long life and economy.

Even if you know nothing about Radio, you'll sense COSSOR superiority the moment you start using COSSOR Valves. Such wonderful tone—such majestic volume—such freedom from irritating background noises, that every COSSOR user quickly becomes a staunch enthusiast. Remember this when you buy your next valves—demand COSSOR Valves, and be satisfied that you'll get valves which will serve you well, which will cost little to run, and which will give you the most perfect broadcast music.

A full range of types is available.

Cossor
the melody maker

Inserted by A. H. CARTER, 20 Clarence St., Sydney, Australian Representative, A. C. Cossor Ltd., London

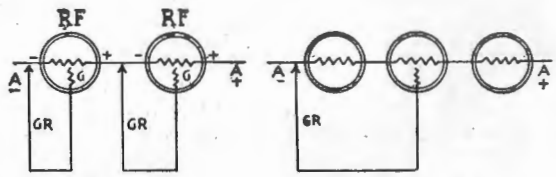


FIG. 5 FIG. 6

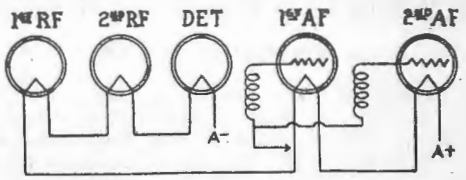
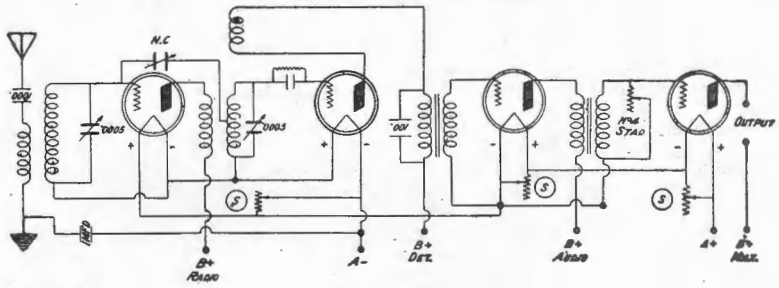


FIG. 8

ADAPTATION TO USE A.B.C. ELIMINATOR WITH THE BROWNING DRAKE CIRCUIT.



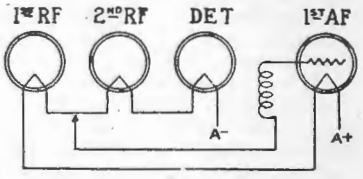


FIG. 7

(S) = N°2 EMMCO STADS FOR USE WITH 85 M.A. A.B.C. ELIMINATOR. IF 350 M.A. A.B.C. ELIMINATOR IS USED THESE STADS MUST BE N°1A.

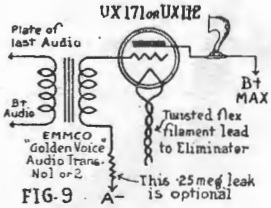
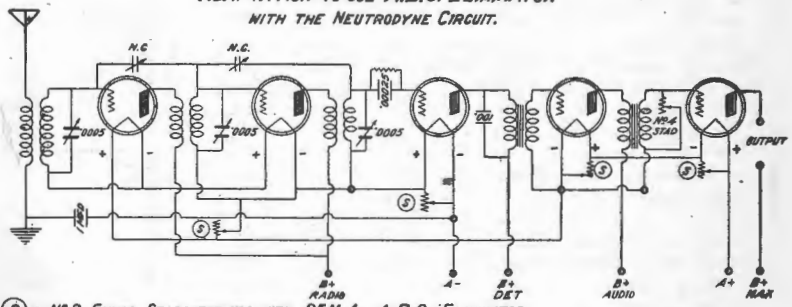


FIG. 9

ADAPTATION TO USE A.B.C. ELIMINATOR WITH THE NEUTRODYNE CIRCUIT.



(S) = N°2 EMMCO STADS FOR USE WITH 85 M.A. A.B.C. ELIMINATOR. IF 350 M.A. A.B.C. ELIMINATOR IS USED THESE STADS MUST BE N°1A.

on the radio set and adjust the knobs on the eliminator in the following order:—

Output Control	Out
Detector	Three Quarters In
Radio	Three Quarters In
Audio	Three Quarters In

Note.—Never switch an eliminator on unless the valves are in their sockets and eliminator connected, or you will probably damage the ABC. It is now safe to switch the eliminator on. The next step is—adjust the filament voltage and plate voltage as follows:—

Detector and Radio, 4 to 4½ volts
First Audio, 5 volts

Now tune in a local station and adjust the detector and audio plate voltages by the knobs on the elinminator. For best result use a high-resistance, high-voltage meter reading from 0 to 200 volts, with a resistance of 800 ohms per volt, otherwise the adjustment will be far too high.

Note: If A609 or 201A valves are used the following plate voltage will be satisfactory:—

Radio	100 volts
Detector	45 to 90 volts
First Audio	100 to 120 volts
Last Audio	100 to 180 volts

To test a radio set for HUM, do not tune in a station, as some broadcasting stations are notorious for their bad filtering; the best method is to tune your set to a silent position between stations, and then listen attentively. There are a lot of causes for hum in a modern set, which are not due to the eliminator, and this also applies to B. eliminators.

Measuring Instruments.

The volt meters necessary for accurate adjustment of sets using ABC eliminators must be of very high resistance. As most set builders cannot afford to buy these more or less expensive instruments, it would be of great advantage if they were able to hire them from some local wireless dealers. Arrangements have been made with dealers in the capital cities to have available volt meters of the required type for hire at a nominal fee, and this will help those people who do not wish to buy their own instrument to accurately adjust their sets. The volt meters recommended are the 800 or 1000-ohms-per-volt type Ferranti or Jewell.

Anyone wishing to have their set converted over for use with this eliminator, and who is not fully capable of doing the job himself, can consign his set direct to the Emmco factory, or, better still, send it through their local dealer.

FERRANTI TRANSFORMERS

INTERESTING NOTES.

In connection with the "Ferranti" A.F.5 transformers used in the 1928 Screen Grid Solodyne, featured in the October issue of "The Queensland Radio News," some extremely informative remarks on these by the makers no doubt will be of interest.

The A.F.5 gives results as good as, or superior to, the best resistance coupling, as it not only amplifies the bass frequencies almost fully, but reproduces the higher audio frequencies, which with resistance coupling, are seldom present to an appreciable extent, especially when high amplification valves are used. This feature is partly due to the fact that the transformer, as is the case with all Ferranti audio-frequency types, gives its characteristic with a .0003 condenser built in, this condenser being necessary for proper rectification, a point which should always be borne in mind. The transformer in addition has, when used with a low impedance valve, a rising characteristic at the higher audio frequencies, and this compensates to some extent for the unavoidable cut-off in the r.f. stages, and also for loss in the a.f. side of the receiver.

The published characteristics of almost all transformers on the market are taken without any load on the secondary and without any condenser across the primary, and are therefore not a true guide to their performances. The curves of Ferranti transformers are taken, as already indicated, with the condenser permanently in position, and with a valve load corresponding to the working conditions connected to the secondary. The fact that many present-day speakers will not produce the lower frequencies is no excuse for using amplifying apparatus which does not amplify those frequencies, as obviously the way to progress is to make one's receiver give an output approaching as nearly as possible to the straight line condition and then to develop the speaker to the same pitch.

It is sometimes assumed that speakers cut off dead at, say, 200 cycles, which assumption would mean that their response curves were of a rectangular shape, which is, of course, absurd; if this were so, a speaker operated by means of a transformer or other device which did not amplify notes below 200 cycles would give the same performance, whereas this is not so as may readily be demostrated. The difference between using an average cheap transformer and an A.F.3 or A.F.5 can readily be demonstrated on the ordinary horn type speaker. As regards valves, it is preferable to use a large power valve in the last stage with as much grid bias as it will take, because of the great amplification provided. This is more necessary when using a transformer of the A.F.5 class, seeing that the bass notes are fully present and overloading tends to occur at first at the bass frequencies owing to the much greater amplitude of these.

By using an ordinary a.f. valve, if these frequencies are not amplified so much the tendency to overloading will not, of course, be so great, but that is obviously the wrong way to overcome the difficulty. In all cases, therefore (assuming that the H.T. supply is sufficient), a power valve should be used in the output stage. The great feature of this Ferranti transformer is that its amplification of the bass notes is as good from a uniformity point of view as the best resistance coupling, whilst its amplification of the higher frequencies is better and the overall amplification is greater than that to be had by resistance coupling.

Whilst we do not recommend it, the A.F.5 may, if absolutely essential, be used following a high-impedance valve, provided that valve has plenty of h.t. and suitable positive bias, under which condition is impedance may be reduced to 30,000 to 40,000 ohms. and the cut-off with the A.F.5 at 50 cycles will be only of the order of 20-30 per cent., whilst the over-all amplification will be about 130, so that only one a.f. stage need then be employed. As the cut-off occurs in only one stage it may not be considered serious, and in fact it will on most speakers not be audible, seeing that even with perfect reproduction the ear cannot detect differences in sound intensity of the order of 20 per cent.

Impedance.

The expression "impedance" is often used rather loosely. It conveys nothing with regard to a transformer or choke unless the actual corresponding frequency is specified. It is always necessary to make the transformer primary impedance as much greater than that of the valve in the plate circuit, of which it is connected as is possible at the lowest frequency it is desired to amplify fully, the approximate formula governing the matter being :—

$$\text{Amplification} = M \times \text{ratio} \times \frac{Z}{\sqrt{R^2 + Z^2}}$$

Where M = Valve amplification factor.
Ratio = 3.5 in the case of a Ferranti transformer.
R = the valve impedance.
Z = the impedance of the transformer primary at some specified frequency.

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NEWER, BETTER

NEW RADIO RECEIVERS at BEDROCK PRICES with a further inducement of 25 per cent. Discount off Receivers for Cash with Order.

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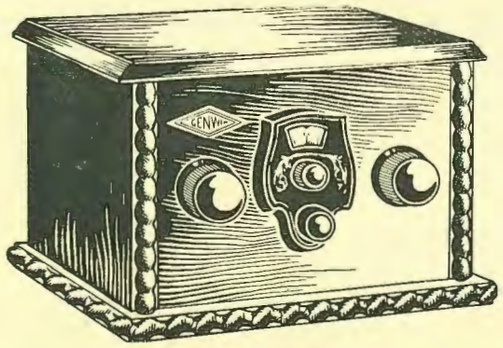

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All that can be desired in a Radio Set is embodied in the "SUPER RADIO" THREES—perfect selectivity—mellow tone—good volume—and the cabinets are of delightful Jacobean design.

THE COMPACT MODEL.

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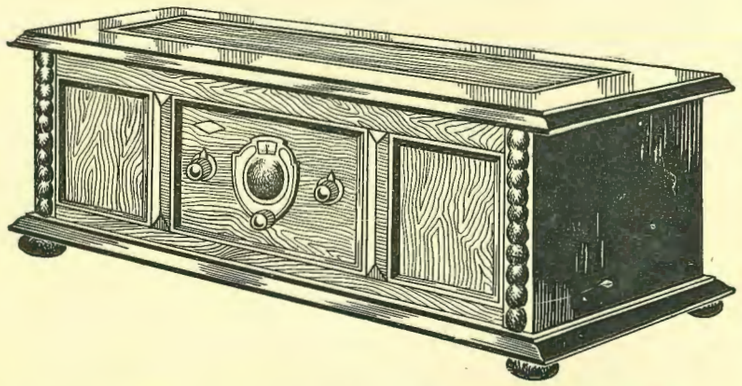
Super Radio "DE LUXE" 5 Valve Receiver

Embodies the same circuit as the "Compact" Model, but has a larger cabinet with compartments for the "A," "B," and "C" batteries. This cabinet is a handsome piece of furniture, and is well worth the extra money.



Super Radio "De Luxe" 3 Valve Receiver, complete with "Sterling Dinkie" Speaker **£16/5/-**

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Super Radio "DE LUXE" 5 Valve Model

This model is similar to the "Compact," the only difference being the larger cabinet (24 x 10 x 10 inches), and the folding panel doors. Outwardly and inwardly "Super Radio" Radio Sets are masterpieces of radio receiver design. Selective, powerful, simple, and amazingly sweet. Note the startling prices.

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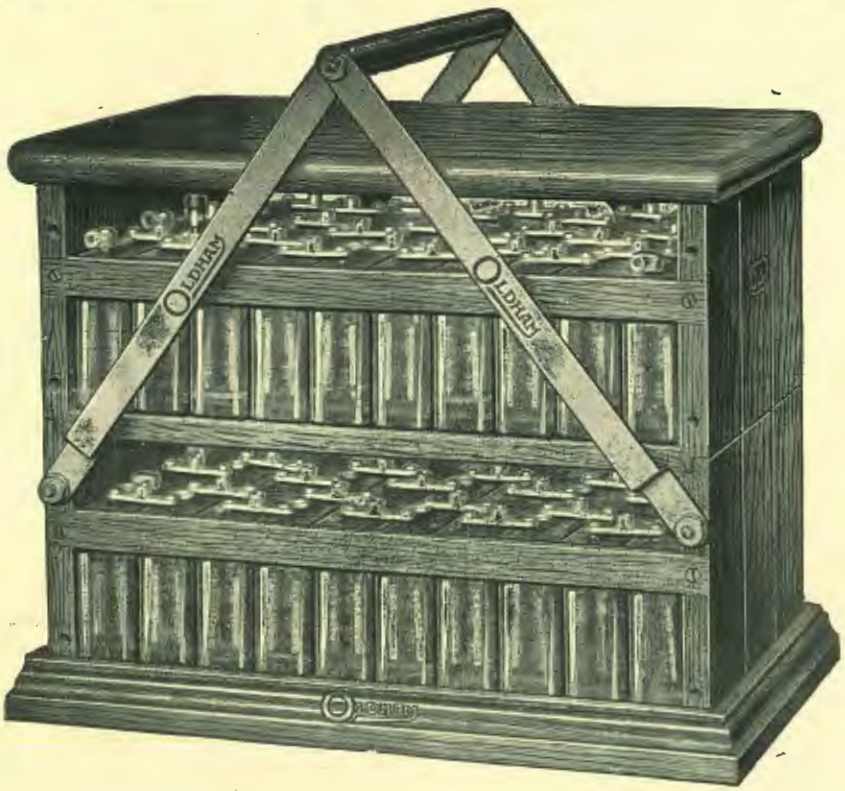

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BAIRD'S TELEVISION Apparatus

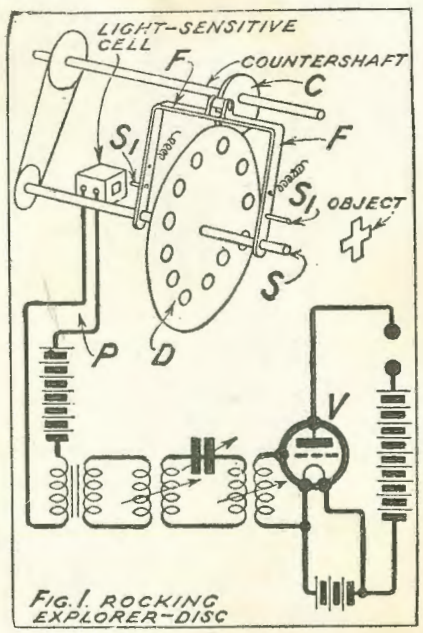
Some Recent Developments

A TELEVISION system capable of transmitting moving scenes through the ether on all fours with the present broadcast service, is a "consummation devoutly to be wished for" by all good radio enthusiasts. Judging by recent reports in the daily Press, the prospects of such a service are daily increasing.

Meanwhile, very little technical information has been given regarding the ways and means by which the latest moving-picture results have been secured, according to "The Wireless Constructor." The general theory underlying the original apparatus as used by Mr. Baird (the Scottish inventor) has certainly been published, but details of more recent advances are not generally available.

It must be borne in mind that the principle underlying all television systems consists in throwing an image of the scene to be transmitted upon a selenium or photo-electric cell, capable of responding quantitatively to light of varying intensity. In this way, the gradations of light and shade produce electric currents of corresponding value. In photography, for instance, the sensitised surface of the plate or film is responsive to variations of light and shade in such a way that after certain chemical treatment, the complete picture is reproduced in permanent form.

The photo-electric cell used for television is sensitive to light in something of the same manner, except that it reacts by altering its electric resistance continuously with changes in the intensity (i.e. light and shade) of the ray thrown upon it. If, therefore, such a cell is placed in series with a suitable battery, the value of the current flowing through the circuit as a whole fluctuates accordingly, just as the current through a microphone fluctuates in accordance with the varying pressure of sound waves.

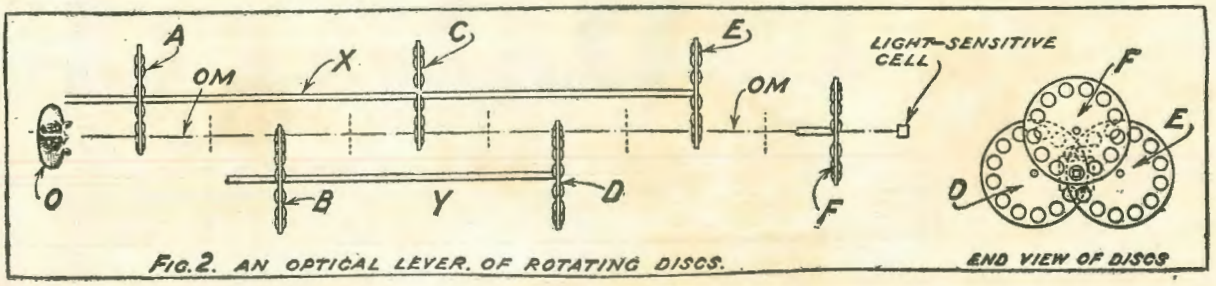


A method of exploring patented by Mr. Baird.

The continually-changing current from the photo-electric cell is first amplified, and is then transmitted either directly over a connecting wire, or as a modulation upon a radiated carrier-wave, to the receiving station. Here it is detected, if necessary, amplified, and then fed to a sensitive glow-lamp, so that the illumination of the latter changes instantaneously with the variations of the incoming signal current.

Complicated Problem.

So far the whole process is very similar to that used in ordinary telephony, if one imagines the microphone to be replaced by a photo electric cell, and the incident sound waves by a ray of light of fluctuating intensity. The outstanding difference, however, between telephony and television lies in this fact. In telephony there is no need to arrange the received signals in any definite spatial relation. One note simply follows the next in a sequence of time. In harmony several notes may be superposed, but the trained ear is able to detect and appreciate them simultaneously in time.



An ingenious method of speeding up the passage of the light ray across the silenium cell.

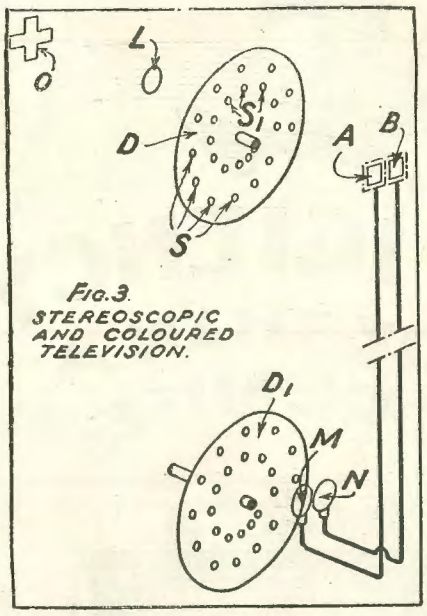


FIG. 3.
STEREOSCOPIC AND COLOURED TELEVISION.

The subject of Patent No. 266,564.

In television, on the other hand, it is necessary to send the scene in separate small sections or areas one after the other, so that the forehead, eyes, nose, and mouth, for instance, are transmitted as separate groups of signal elements, one following the other at an enormously rapid rate. At the receiving station each signal impulse is separately received and must be separately projected from the glow-lamp so as to reach the viewing screen (a) in its proper postion in space (so that the forehead, nose, and mouth are not blurred into one unrecognisable mass) and (b) so rapidly that the whole picture is repeated not less than twelve to sixteen times per second, as otherwise the cinematographic effect of animation is lost.

The First System.

In the original system used by Mr. Baird, the picture at the transmitting station is cut up or "explored" into suitable signal elements by a rapidly rotating disc, provided with a series of spirally-arranged lenses or holes, whilst at the receiving end the received signals are reassembled in their proper order by a similar disc driven at the same speed as the one used for transmission.

Bearing in mind these fundamental points, it may now be of interest to give a short description of some of the television patents granted to Mr. J. L. Baird and to Television Ltd. Copies of the printed patent specifications can be obtained by those interested from the Patent Office 25, Southampton Buildings, London, W.C., England, at a cost of one shilling each.

Patent No. 253,957, granted to Mr. J. L. Baird:

The disc D shown in Fig. 1 is provided with a number of spirally arranged lenses, and is rapidly rotated in front of the object to be televised (shown as a cut-out cross), so that each lens sweeps out a parallel track across the object and projects a corresponding beam of light on to a light-sensitive cell.

Shadow Effects.

If the source of light illuminating the object comes from behind, each lens will receive a ray of light that is diminished periodically by the outline of the object. In other words, the shadow of the object will be thrown upon the optical cell in consecutive bands or segments.

If, on the other hand, the source of light illuminating the cell lies on the same side of the "cross" as the exploring disc, then the latter will only pick up reflected light and not the direct ray. By using reflected light it becomes possible to transmit details on the surface of the "cross" instead of a mere silhouette, though, of course, the intensity of each ray of light is considerably diminished.

As the rays of light reach the sensitive cell, fluctuating current are set up in the circuit P, and these are subsequently amplified by a valve V, ready for transmission to the distant station.

In order to obtain a finer subdivision of the objects to be televised the shaft S supporting the rotating lens disc may be moved to and fro at right angles to its length by means of a frame F, which is rocked about a second shaft S1 against spring action by an eccentric cam or disc C mounted on an upper countershaft as shown.

The Next Development.
Patent No. 265,640, granted to Mr. J. L. Baird.

One obvious criticism to be urged against the use of any purely mechanical exploring device, such as a rotating disc with spiral lenses, is that the necessary speed to ensure a close-grained and clear-cut reproduction of the transmitted scene cannot be obtained, owing to purely mechanical considerations.

Mr. Baird therefore proposes to overcome this objection by utilizing what may be described as an optical lever for increasing the speed at which the ray of light can be made to move across the optically-sensitive cell. To do this he mounts a series of rotating discs A—E, as shown in Fig. 2, in such a way that the image of the object O (shown as a grotesque doll's head) projected by the first disc A is "explored" by the second disc B.

As the lenses of the second disc cross the image in the opposite direction to the movement of the disc A, the effective speed of exploration is determined by the relative motion, so that if the two shafts X, Y are rotating at the same rate the speed will be doubled.

The image passing through the disc B is in turn scanned by the disc C, with a corresponding gain in relative motion, and so the speed is doubled at each

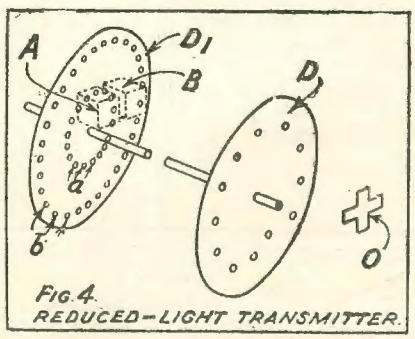


FIG. 4.
REDUCED-LIGHT TRANSMITTER.

An attempt to reduce the light needed to illuminate the object to be televised.

stage, as the image is projected in turn one disc to another, moving from left to right.

Loss of Light.

As in this arrangement the lenses are mounted on each disc in a perfect circle, and not spirally, it is necessary to introduce a traversing movement across the sensitive cell at the last stage. This can be done either by introducing an oscillating or rotating mirror between the last disc E and the sensitive cell, or by displacing the supporting shaft of an extra disc F so that its lenses move across the optical axis OM in a direction at right angles to those of the discs D or E.

In spite of the highly ingenious character of this arrangement, it would appear that a considerable loss of light intensity must occur at each point where the image projected by one disc is traversed by the lens of the next following disc. In other words, although the speed at which the ray of light emerging from the optical lever system and impacting upon the sensitive cell is increased, the intensity of that ray, and therefore its power to stimulate or energise the cell, would appear to be proportionally weakened.

"Stereoscopic" Pictures.

Patent No. 266,564, granted to Television Ltd., and Mr. J. L. Baird:

In the case of cinematographic reproduction from a series of film photographs, many attempts have been made to secure what is called the stereoscopic effect. That is to say, instead of the moving picture being thrown upon the screen as a flat or "two-dimensional reproduction," it appears to have depth as well.

In one known system this result has been attained with a considerable degree of success by throwing two pictures on the screen simultaneously, and providing the audience with spectacles of differently-coloured lenses, so that each picture is seen separately by each eye. The action of the human eye then automatically merges the two separate images into one harmonious whole, in which the various objects stand out from one another in their natural perspective.

Mr. Baird has invented an arrangement whereby the same stereoscopic effect is said to be imparted to pictures or scenes transmitted by television. His method is illustrated in Fig. 3, and consists in using two sensitive light cells A and B placed slightly apart, each cell receiving separate light-impulses from the object A to be televised.

The Receiver.

At the receiving end two light sources M and N are similarly displaced, and are respectively energised by the currents derived from the two cells A, B. The resulting variations in light intensity are separately synthesized or reassembled, and are then viewed through an ordinary stereoscope.

In order to keep each image separate from the other a special rotating disc D is used in exploring the object O through a lens L. This disc has two series of spiral holes or lenses marked S and S1. The spiral lenses S are arranged so as to throw one series of light rays on, sav. the cell A, whilst the other lenses S1 feed the cell B.

The two image beams may be prevented from creating mutual interference by providing a partition between the two series of lenses, which partition may either be made rigid with the exploring disc, or else it may be made to rotate relatively to the disc.

The reassembling disc D1 at the receiving end is also provided with two separate series of spiral lenses in order to project each completed picture separtely.

By interposing a stationary orange-red screen between the exploring disc and the light-sensitive cell A, and a stationary green-blue disc between the same disc and the cell B, Mr. Baird states that the object to be televised may be transmitted in natural colours, similar coloured screens being provided for the light sources M, N at the receiving end.

Patent No. 266,591, granted to Mr. J. L. Baird:

In the original experiments carried out by Mr. Baird, the light directed upon the sitter's face was so powerful as to be almost intolerable after a very short time.

In order to avoid this inconvenience, Mr. Baird proposes to reduce the brilliance of illumination by using two light-sensitive cells instead of one, and energising both cells simultaneously with light-beams from the same object. The two series of light signals so produced are sent separately to the receiving station and are there re-combined into one picture.

In order to keep each picture separate from the other in the process of transmission, a different interruption frequency is used in each case. As shown in Fig. 4, an exploring disc D is used to traverse the object O, and the resulting light rays are then cut up into two different frequencies by means of a second disc, D1, provided with an inner and outer series of interrupting holes a, b.

There are twice as many holes in the circle "a" as in the circle "b," so that light falling on the sensitive cell A is interrupted at a frequency double that at which the rays falling on the cell B are interrupted. In this way each image-signal can be transmitted separately from the others to the distant station. There the two signals are separately rectified and the resultant currents fed in combination to the illuminating glow-lamp.

The Transmitting License

By "Q.R.N."

Article No. III.—Dealing with the Construction and handling of Radiotelegrams.

WE are now ready to consider the actual radiotelegram and its form. A radiotelegram (or radiogram) consists, so far as a transmitting station is concerned, of four parts—the preamble, the address, the text, and the ending. We shall consider all four in this order.

The Preamble.

(a) As already stated, the preamble of a radiotelegram contains all the instructions as to transmission. In point of fact the preamble contains eight definite parts transmitted in a fixed order. Students should learn the order of transmission with care.

First of all, and immediately after the preliminary call (—.—.—) comes the service prefix. The prefix denotes the class of radiotelegram and acts as an instruction to both the transmitting and the receiving station. The prefixes are only five in number:—"A" for a service message (i.e., one dealing with the conduct or maintenance of the radiotelegraphic service; "ST" for a paid service message; "S" for a Government radiotelegram; "D" for an urgent radiotelegram; and "PRESSE" for a press message. Ordinary messages have, of course, no prefix.

(b) Immediately after the prefix comes the word "RADIO," transmitted, of course, at full length.

(c) Next comes the name in full of the station of origin (either a ship or a coast station). Note that the full name is spelt and not merely the call sign given (e.g. CANBERRA—not VHO).

(d) Fourthly comes the number of the message, and we shall have a word about numbering. Australian coast stations use a daily system of numbers—the "day" being 24 hours starting at mid-night. During each "day" all messages for any one particular ship are numbered consecutively from 1 onwards, due attention being given to questions of priority of messages as considered earlier. Special groups are not made for the various classes of message, but all classes are numbered in the one sequence. After the ensuing mid-night a fresh start is made. Each station to which transmission is made is, of course, given its own series of numbers, renewed daily, and in every case commencing at No. 1. Similarly, British and Australian ships number their messages according to this plan. On the other hand, however, many foreign ships number their traffic, not by day, but voyage. Thus the first message transmitted after the commencement of a voyage would be No. 1, and at the end of the voyage (round trip) the numbers might be up in the thousands.

(e) After the number of the radiotelegram comes a figure denoting the number of words in the message, and next comes

(f) The date of handing in, and

(g) The time of handing in.

A note may be made here about the method used in transmitting the time mentioned in (g). Time is transmitted in two groups of figures, to indicate hour and minute, followed by the suffix "M" for a.m. or "S" for p.m. The indicators stand respectively for "matin" and "soir"—"morning" and "evening." Thus 9.15 a.m. would be rendered by "9.15M" and so on.

(h) The last item comprised in the preamble is the route instructions (if any), indicating the special route the message is to take, or the service instructions put in by the receiving station (e.g., such indicators as "Reception Doubtful" etc.).

The Address.

Immediately after the preamble, and prior to the address proper comes the break sign (—...—). Next in order come any special instructions given by the sender. Such instructions may, for example, be "Reply Prepaid" (for which the indicator "RP" is inserted with a figure representing the amount paid for the reply, or "POSTE" for a radiotelegram intended for postal delivery from a ship's subsequent port of call. However, it is sufficient that the student for the Amateur Operator's Proficiency Certificate should know that such (and other) instructions are inserted in a radiotelegram without concerning himself with learning the full list.

The address proper presents no difficulties. It should, of course, give all the information necessary for the safe delivery of the radiotelegram. Such an address as

WILLIAM LONSDALE,
Passenger Canberra,
BRISBANE RADIO.

is sufficient for all ordinary purposes. It should be noted that names of towns, countries, etc., consisting of more than one word are charged as one word in the address, but in the text of a radiotelegram count as separately chargeable words.

The Text.

Between the address and the text of a message the break sign (—...—) is again inserted. Nothing very much need be said under this heading. Brevity consistent with clarity is, of course, the end desired. In plain language all words up to a maximum of 15 letters count as one word. Words of greater length counts as one word for every 15 letters.

Code words (as distinct from plain language or from cypher) are ordinary words used in such a manner as to conceal the meaning; or pronounceable groups of letters not forming natural words. Cypher may be unpronounceable agglomerations of letters; or groups of figures. In code, 10, and in cypher, 5, letters are allowed as the maximum per word or group.

The Ending.

After the break sign (—.—.—) which separates the text from the signature comes the actual ending of the radiotelegram. The signature of the originator of the message is sent as written. Next comes the sign (.—.—.—.) indicating the end of the message, followed by the call sign of the transmitting station.

As an example of the foregoing a complete radiotelegram in transmitting form is given below. Readers will be able to decipher the various symbols and signs for themselves.

—.—.— RADIO CANBERRA 17 13 26 11.17S —...—
Smithson 229 Windsor Terrace Brisbane —...—
Have you renewed subscription Queensland Radio News —...—
BROOKES .—.—. VHO

Signals Dealing with Money.

This is a point not usually covered in books of instruction on telegraphy. How, for instance, would one transmit the figures representing 17/6 or £10/5/6? Many amateurs, not having seen the point discussed in the textbooks, would avoid trouble by spelling the amount in words. Yet the transmission in figures is simple. The amount of pounds is signalled in the usual figure code, preceded by the signal LX. Between the pounds and the shillings is sent the signal (—..—. NR), representing "bar indicating fraction," as described in Article I., and the same signal is repeated between the shillings and pence. LX is only sent in the case of pounds.

Fractions.

Simple fractions, such as ½ ¾ 5/16ths and the like present no difficulty. The numerator is transmitted, then the sign (—..—.) followed by the denominator. But it is obvious that something more is needed to transmit, say 1 5/16ths in such a manner as would preclude its being read as 15/16ths. This is done by inserting between the whole number and the fraction a signal MM (—— ——). Therefore, the signal for 1 5/16ths would read

.———— —— —— ..... —.—. .———— —....

Receipt of a Radiotelegram.

The signal (.—. R) followed by the number of the radiotelegram being acknowledged is used to indicate correct reception. The acknowledging station gives the call sign of the station which has transmitted the radiotelegram, followed by "R17" or "R65" or whatever the number may be, in turn followed by the call sign of the acknowledging station.

Error in Check.

If a transmitting station notices on a radiotelegram that a greater or lesser number of words has been charged to the originator of the message than should have been, the mistake is signalled as a fraction. The numerator shows the number of words for which payment has been made, while the denominator represents the actual number of words chargeable. For example, if a radiotelegram of 50 actual words has been paid for as 51 words, the signal indicating the mistake would read: 51 —..—. 50.

Length of Transmission.

The length of time occupied in continuous commercial transmission must not exceed 15 minutes. At the end of every 15 minutes a break must be made for three minutes, to be occupied in listening in for any other station that may have traffic for either of the two stations concerned. This regulation applies, of course, with equal force to amateur as well as to commercial signalling, with the important difference that amateurs must stop for three minutes after every ten minutes continuous' signalling.

Long Radiotelegrams.

During the transmission of long radiotelegrams such as press messages exceeding 40 words in length, a break is made by the transmitting station after each 20 words by means of the inquiry call (..———..). The receiving station, if reception has been correct, repeats to the sending station the last word received, followed by the "Go ahead" signal (—.—). The remarks given above relative to the 15 minutes' work, 3 minutes' silence, also apply.

If the transmission consists of a series of messages the receiving station gives an acknowledgment of each message as received.

Closing Down.

The end of traffic between two stations is denoted by each station signalling ...—.—, followed by its own call sign.

The instruction given in this and the two earlier articles covers fully the requirements of the relative paper in the Amateur Operators' Profficiency Certificate examination. Students who have given due attention to the points discussed need have no qualms about sitting for this paper with every chance of success.

The remaining articles of the series will deal with the technical aspect of amateur transmission.

Short Wave Activities

Some Interesting Observations by an Active Brisbane Experimenter

By F. NOLAN.

The way the short waves are progressing is really remarkable. One thing that appeals to the writer (as much as the DX part does) is the fact that the quality of modulation always seems better on short waves than that given out by our stations on the 250-550 band.

3LO, on 14th November, at 11.40 p.m., made a special test transmission to the King of Siam, and the modulation, in my opinion, was at least 20 per cent. better than anything they have ever done on 371 metres. The Siamese delegates now in Australia spoke to His Royal Highness, the speeches being interspersed with musical items.

2ME, Sydney, the experimental station of Amalgamated Wireless (A'sia.) Ltd., made another special duplex telephony test with ANE, Government Radio Service, Bandoeng, Java. This was very interesting and instructive.

People in Sydney were speaking to Java in the same manner as one would use the ordinary telephone and at the same time 2ME re-broadcast Java, thus enabling one to hear Java's replies to Sydney at the one dial reading, omitting the necessity of changing from one wave to the other.

2XAF, the Developmental Research Laboratory of the General Electric Company, Schenectady, New York, was to have made further tests with Sydney on the 12th of November, but nothing has been done yet, although 2ME has been making morning tests with River Head, New York.

On the 14th, when 2ME relayed PCLL Holland (when they were finished with ANE Java), PCLL was coming in on the speaker here apart from 2ME's relay. On the 15th November at approximately 11.30 p.m., our time, London was coming in well, but now that summer is here 5SW isn't coming through at more than anything from R3 to R6; two months ago he was R5 to R8. This station is always worth listening to, however.

2XAD, New York, isn't coming in as well either. In winter he can be picked up at 8 a.m. till 12 p.m.; now he can be picked up at 8.45 a.m. to 11.30 a.m. PCJJ is still coming in well, and sometimes late at night calls up Western Electric Coy., U.S.A. Last time I heard him he played "Dream Kisses," "There's a Silver Lining," and other items, the names of which I don't know.

FL Paris is not in a good position to listen to, being right on 32 metres, where the Aussie hams thump their keys, calling "DX," "W"—"W" by the way being the new intermediate for the U.S.A.—formerly "NU." 6AG Perth comes in splendidly. "The Moon Has Cast Her Lamps Upon the Mountain" was heard from there recently. He works late at night.

The Japanese short wave stations come in fine, but have us tricked—English isn't used at all! Russian stations are doing well also, but again the language is a difficulty. There are plenty of weaker stations that one can get on headphones, but the ones mentioned are received on the speaker.

In passing, it might be mentioned that all the old Commercial calls from U.S.A. have vanished; that old landmark, KEL on 28.0 metres has been replaced by KES on 28.0, KZET on 30.1 is now KZIM, KEWE on 40 is KLL on 21.85, while 6XI is never heard on 31.0 now.

Of the Australian amateurs on short waves, 7DX Hobart is undoubtedly the best. He uses crystal control on 32.48 metres, and re-broadcasts 3LO a lot in his tests. 7CW uses some good phone, but has been silent at night for a week or so. 7CH comes in well here—D.C., R6 to 8. 7BQ is a little raw A.C. at times, R8. 7LJ has also been silent at night for a week or so, but comes in at the same strength as 7DX and 7CW. 7LV uses crystal also.

2HM always makes one laugh when using phone. He worked 7DX and 2ZN on 11th about 11 p.m., three way phone. He worked 3GR last night, and had four YL's at his shack, who spoke to 3GR. One could almost see 3GR blushing! 2HM's Acousticon mike comes in better this side with 1½ volts, not 3 volts. Signal strength is maximum. 2ZN's phone and morse are good here, R6 to 9. 2NO is "A1." He's doing something on 220 also; R8 to max. here on the short wave.

4PN is undoubtedly the most consistent 4; he clicks with the Japs more than anyone else during the past twelve months—good D.C. sigs. 4CM is still as keen as ever, and an ardent lover of experimenting Has an automatic going on 10 metres. 4WS has at last got his "Mopa" out of its mopy way, and it is at last reaching out to America. 4WA, 4CG, 4CN and 4GO seem to be having a spell, while 4BB likes ten metres best at present. 4RG is trying phone lately. We never get this station more than R3, but outsiders hear him R8 and max. 4NW's phone and morse is R5 to 6 here. 4RA is D.C. and R.A.C. max. here; he clicks Japs and Yanks, and is a new 4. 4AB always goes for the Yanks—Bill was over there one time, I think. However, it's no trouble for him to click. 4LJ always strong D.C. sigs. here.

Here is a list of the more powerful short-wave broadcasters and their wavelengths:—

Station.	Wavelength	Country
ANE	15.93	Java
ANH	17.0	Java
PCLL	18.0	Holland
2XAD	21.96	New York
5SW	24.0	London
GBS	24.70	London
2FC	28.50	Sydney
PCJJ	31.40	Holland
2XAF	31.40	New York
ANE	31.86	Java

Station.	Wavelength.	Country
FL	32.0	Paris
JB	32.0	South Africa
3LO	32.0	Melbourne
2BL	33.0	Sydney
6AG	33.0	Perth
KDKA	43	Pittsburg, United States
AGJ	56.70	Germany
3XL	49.96	Bound Brook, U.S.A.
6WF	100.0	Perth
JHBB	37.0 & 50	Japan, Ibrakikan
RFN	40.0	Russia
WLW	52.02	Cincinatti, U.S.A.
AGC	17.50	Germany

Coils for "Holiday Portable"

In case any reader wishes to construct his own coils for the "Holiday Portable" described elsewhere in this issue, the following information is offered:—

The primary (aerial) coil and the secondary (grid) coil may be wound side-by-side on a 2-inch diameter bakelite tube, 3½ inches long. The primary (L1) consists of 15 turns of 28 gauge D.S.C. wire, and the secondary (L2) has 90 turns of the same wire. Both coils are wound in the same direction, with a ¼-inch space between them. The outside end of the secondary goes to the grid, and the inside of the primary to the aerial.

The tuned-plate coil (L3) and the reaction coil (L4) are wound in exactly the same way on a tube of the same size, L3 having 90 turns and L4 40 turns. The outside of L3 goes to the grid condenser, and the outside of L4 to the detector plate. Both coils should be fitted with small feet, which will allow them to be mounted about half-an-inch above the base.

While we believe that the machine-made coil in nearly every case gives the most satisfactory results, and invariably recommend them for that reason, there are some readers who, for various reasons, will wish to make home-constructed coils do. The above directions will enable them to do this with every assurance of success, and we may mention that these details apply also to the coils used in the "Screen Grid Three" recently described in "The Broadcast Bulletin."

"Magnavox" Dynamic Speaker

REDUCTION IN PRICE ANNOUNCED.

As we go to press, advice is received from Messrs Mick Simmons Ltd., to the effect that the price list for the famous "Magnavox" Electro-Dynamic Loudspeakers and Loudspeaker Units have been substantially reduced. Country dealers and those interested should secure all information concerning this change from the Queensland distributors: Messrs. Mick Simmons Ltd., Queen Street, Brisbane.

THE LIFE CIRCUIT—(Continued from Page 27).

the main fact is that he had been dead some hours when discovered this morning, and Monsieur Le Prefet immediately advised me that he could grant my request to supply a dead criminal for research purposes.

This was what I had been eagerly waiting for, and I immediately made arrangements for the final experiment this evening.

During the time I had been studying the propogation of aetheric waves in relation to broadcasting human effort, both instrumental and vocal, I have discovered that the performer does more than create sound waves and impress them upon the microphone.

He creates vibration of energy—his own physical and mental energy—and the waves from these are picked up by the microphone and are radiated by the transmitting station."

Trembot paused to let the significance of his discovery penetrate our still uncomprehending minds.

"Perhaps I shall carry you a step nearer comprehension if I tell you that I have named these emanations 'Vitrons,' otherwise electrons of life."

Doubtless, our faces bespoke our lack of understanding, for Trembot laughed as he would to a pack of dull, stupid schoolboys.

"My friends, every time a man or woman performs before the microphone, he or she radiates a varying amount of his or her vitality or life-force," he continued didactically. "Hitherto no man, other than myself, has realised that fact, and it was therefore my appointed mission to build an instrument which would receive and make manifest these 'vitrons.' I shall not try to tell you what the cost of achieving this was —I shall merely attempt to demonstrate the fact that those radiations exist and that I can, let us say, 'detect' them."

CHAPTER IV.

The body of the dead Apache lay on the workshop table with a metallic band round his head and another round each ankle. Across his chest lay the terror-stricken rabbit, spreadeagled on a curious frame-work of brass rods and silvery wires.

It was a terrible sight, and each of us was on the tip-toe of excited wonder—and crowded as near to the Professor as we could get.

Trembot suddenly leaned forward and closed a series of switches—and immediately one loudspeaker after another burst into life. Each had been especially tuned and he named each one as it commenced:

"Berlin, Vienna, Madrid, Rome."

The jumble of speech, song and instrumental music was indescribable, and, to our unaccustomed ears, the selection of one from the other was practically an impossibility.

"London!"

The addition of the clear, penetrating notes from the British capital completely filled in the few minute spaces of silence which had previously been noticeable.

"Gentlemen," cried Trembot, "we have now a practically unbroken stream of 'vitrons' flowing through the circuits. These I shall superimpose until they are all flowing in one channel which may truly be termed 'The Life Circuit.'

"But," he paused, "in order to obtain every available 'vitron,' I shall bring in our own beloved Eiffel Tower."

As he finished speaking he closed the switch nearest to him and the room itself almost vibrated with the tremendous roar which came from the six loudspeakers.

It was absolutely impossible for any man to speak —or shout—and be understood, and we waited for Trembot's next move.

The song which was being broadcasted from Eiffel Tower ceased, and in the comparative silence which reigned, my friend spoke rapidly.

"The next item from our own city is a band piece. Immediately it commences I shall 'change over' to the life-circuit. When I do you must watch the dead body of Henri Formesnes."

As he concluded the announcer commenced: "'La Fils de Vie'—jazz number—played by Marriane's 'Hot Spot' Negro Band"—and, a moment later, the crashing, deafening roar of the ten lusty negroes, singing, shouting, laughing and playing with every ounce of their unrestrained physical energy, almost drove us crazy. The thought flashed through my mind that Trembot had deliberately arranged this display of barbaric life-force to coincide with the momentous experiment he had planned to undertake, but further speculation was interrupted by the intense interest which my friend's feverish actions had awakened. Like a juggler—or, rather, a magician—he closed switch after switch and made connection after connection, and the instant each rapid action was completed, a lamp glowed or shone brilliantly, or a valve uttered an insistent whine or howl, or coupled circuits hummed with the intensity of their swiftly moving magnetic fields.

It could not have been more than a minute before everything was adjusted, and Trembot cast a final, anxious eye at the complicated apparatus he had put into action.

Suddenly, he closed what might be termed the "master switch"—a double-pole knife-blade pattern with about a dozen contact leaves—and the room was flooded with a ghastly, green radionce which emanated from a huge transmitting valve standing just above the master switch.

The deafening tumult from the battery of loudspeakers immediately ceased, and in its place came shrieking, unearthly howls like those of a "soul in torment."

The blood was trickling around my skull and face with maddening irritation, my tongue stuck to the roof of my mouth, and saliva poured along my jaws —and I, too, felt my backbone bend—and was afraid.

The rabbit, securely attached to what I knew now to be a sacrificial frame, was quivering in every muscle; its eyes were distended, it fought and battled for breath with agonising futility—and—the dead apache sighed and shivered. Pure, undiluted fear was upon us all—even Trembot was, I think, afraid at that moment. Fascinated horror held us spellbound, while we watched the facial muscles of the dead criminal twitch and the thick eyelids quiver.

Surely, Trembot had not actually restored life to the dead man. Merciful heavens! such a thing is forbidden by divine law. As the thought came into my brain—the trembling rabbit gave one convulsive quiver, squealed as only an animal on which death has laid its hand is able, and lay quiet.

At the same moment Henri Formesne, who had been dead over twelve hours, again sighed and groaned.

Whether it was merely auto-hypnotism or the result of some reflex action of the words which hammered in my own brain, I shall never know, but, on the instant in which the "dead" man gave forth that unequivocal sign of life, a piercing voice flooded the laboratory:

"It is forbidden !"

Shaking with fright I looked at my friend. Trembot's face was suffused with an indescribable joy and happiness; he was a man who had accomplished his life's work.

Suddenly, he uttered a strangled gasp and pitched headlong amongst his beloved valves, batteries and circuits—dead.

* * * *

I am an old man now, and do not scoff at the "supernatural." In fact, I have been working ever since to repair and rebuild my friend's "Life Circuit."

So far I have not solved the mystery, but if I do, I am prepared to follow Trembot.

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The Radio Trade at Play

"All work and no play makes Jack a dull boy," is an old saying which evidently finds favour with the electrical and radio traders in Brisbane.

On the 8th of November last several leading traders assembled at the Wynnum Golf Club in an endeavour to determine who was the best "player." After lunch had been partaken of in the club-house, the contestants shouldered their "goff" bags and commenced an eighteen-hole stroke handicap match for a handsome trophy donated by Mr. J. J. Pearse. Although a holiday spirit was evident during the afternoon, the match was very keenly contested throughout.

The trophy was won by Mr. R. S. Goadby with a nett score of 76. A surprise was given to the players by Mr. A. A. Ewing, who presented a special "cup" to the highest gross scorer, and which caused much merriment. This "cup" was won by Mr. R. Galloway whose card showed a gross score of 148.

The following are the individual detailed scores:—

	Gross Score.	Handicap.	Nett Score.
Goadby, B. S. (E.S.C.A. Ltd).	106	30	76
Broad, F. (F. Broad & Sons)	104	25	79
Maddick, H. Edison Swan Coy)	94	15	79
Hoe, Fred (Edgar V. Hudson)	107	25	82
Broad, R. (F. Broad & Son)	109	25	84
Pearse, J. J. (Exide Bat. Service) ..	103	18	85
Ewing, A. A. (Trackson Bros. Ltd.)	111	25	86
Faine, C. G. (Electric Construction Coy., of Aust.)	97	10	87
Warburton, A. (Warburton, Franki Ltd.)	117	25	92
Phillips, P. H. (Aust. G.E. Coy.) ...	127	30	97
Peterman, W. E. (W. E. Peterman)	122	25	97
Chandler, J. B. (J. B. Chandler and Coy.)	131	25	106
Hills, A. (Philips Lamps)	142	30	112
Galloway, R. (W. T. Henly Ltd.) ..	148	25	123

All present enjoyed themselves thoroughly, and appreciated the efforts of Mr. H. Maddick, the convener of the tournament, to whom much of the success of the match was due. It was later decided to hold similar tournaments periodically.

There is also a persistent rumour "in the air" that the traders intend issuing a challenge to 4QG at a later date, and we hope that the match can be arranged. It is understood that a stipulation will be made that 4QG shall not employ any input current from "batteries" to stimulate their players. The match, of course, could not be broadcast !

During the afternoon, Mr. Warburton announced his intention of donating a trophy to be competed for at the next tournament among the traders.

Little Marjorie Streeter-Pain

AUSTRALIAN CHILD ACTRESS FROM HOLLYWOOD NOW TOURING THE COMMONWEALTH.

During November this talented little lady made several appearances at 4QG upon Uncle Ben's session, and sang her way into the good opinions of all who heard her.

She is Marjorie Streeter-Pain, child actress from Hollywood, now touring Australia on the Tivoli circuit. Marjie is only ten years of age, and has achieved great success for a child so young.

Of Australian birth, she journeyed to the United States some few years ago with her mother to seek fame on the films. Her beauty and her ability quickly won her recognition—even in the Land of Talent—with the result that she was selected for many big film productions by William Fox, Warner Brothers, and other well known producers.

In addition to her movie work, Marjie has had much stage experience, appearing at over forty theatres in New York City in a feature child act. She is shortly returning to the United States to fulfil a contract of eight feature films by William Fox, so those of us who heard Marjie "over the air" will, in the course of a year or so, have the pleasure of seeing this talented little girl acting upon the silver sheet, in fulfilment of the great predictions that have been made for her by many movie directors.

RADIO CLUBS OF QUEENSLAND.

AUCHENFLOWER AND DISTRICT—Secretary, L. Gibb, "Frampton," Ridley Street, Auchenflower.

CAIRNS AND DISTRICT.—Secretary, Mr. Tarbit, c/o. Mr. Les. Fritzsimmons, Cairns.

EASTERN SUBURBS.—Secretary, J. Burns, Longland Street, East Brisbane.

GRACEVILLE.—Secretary, H. Carter, Cr. Molonga Terrace and Wylie Streets, Graceville.

IPSWICH.—Secretary, S. J. Aspinall, Brisbane Street, Ipswich.

SOUTH BRISBANE.—Secretary, W. R. Gilbert, Gordan Street, Coorparoo.

TOOMBUL.—Secretary, T. Starkie, Sandgate Road, Nundah.

TOWNSVILLE.—Secretary, E. J. Jefferies, Fletcher Street, West End, Townsville.

WIRELESS INSTITUTE (Queensland Division).—Postal address Box 689K, G.P.O. Brisbane.

WOOLOOWIN.—Secretary, H. A. Jiear, Lisson Grove, Wooloowin.

WYNNUM AND MANLY.—Secretary, P. J. Golden, c/o Tracksons Bros., Ltd., Elizabeth Street, Brisbane.

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Wooloowin Radio Club — 4WN

4WN MONTHLY REPORT.

Everything is moving along very nicely with the gang at 4WN. The new Xmitter is still under construction, but is looking more and more like 4QG every week. Unfortunately, we have lost the services of our Chief Op., 4FK, who has been transferred North by the P.M.G. Department for about 10 months. Vern has taken a portable Xmitter along, and hopes to be one of the first to QSO the gang with our new gear. Anyone with reports for portable 4FK can forward via oa-4WN if desired.

At a recent meeting, the business of the evening being impromptu speeches, the gang settled down to a good night's entertainment. The ballot delivered some interesting items, including YL's Linotypes, Radio uses in Aviation, Nash Cars, etc., etc. Of course there is only one member who knows all about YL's and he did his best to enlighten the gang on the moods and modes of the present day flapper. Never mind, Clyde, OM, we're all young yet; we still have time to learn.

Other speeches were delivered in fine style, the best being that of our worthy president. Anyone desiring the title of his lecture must ask him on the quiet, as I don't think the Editor would allow space enough in these columns.

Our friend, Bill Blaikie, has arrived back from the land of the blacks. Welcome home, OM, we do hope to see your dial at headquarters more often now. If you should be wondering what all those panels are for, Bill, they are the foundations of our new 1929 Xmitter (ARTL gang, please note). ..

Mr. Kenna recently gave an interesting lecture on have a miniature General Electric factory for a clubwhy's and wherefores of balanced and unbalanced circuits, etc. Any of the gang who missed this treat sure need spanking, as F.K. went to great trouble to make every point clear.

Our congratulations are offered to oa-4RL, the Central Technical College Radio Society. Apparently they have a miniature general electric factory for a clubroom. Everyone is looking forward to big things from 4RL before long. (Sh ! ! ! Wooloowin gang don't like inter-club debates—Oh, no !)

Rumour has it that another of our gang has had an interview with the Radio Inspector, but we'll just wait and see.

Club meetings are held every Thursday night at the club-rooms, Willmington Street, Wooloowin. Anyone interested in the club's activities or in radio generally is cordially invited to attend.

The "Utility" Micro Dial

It cannot be said of many things that they leave nothing to be desired, and nowhere is the truth of this more apparent than in the radio apparatus field, where excellent operation in one direction is often secured with a decided sacrifice in some other essential quality.

With regard to the "Utility" Micro-Dial, which has just made its appearance in Australia, we can honestly say that we can think of no other improvement that could be added to the instrument, so perfect is its mechanical precision, and so excellent the results obtained. The "Utility" Micro-Dial is manufactured in England, and is particularly suited to short-wave receivers. It permits a reduction-ratio of 70 to 1 over the whole dial range, with an absolute absence of backlash or slipping of any kind. A means is also provided for making a rough adjustment by applying the rotating action directly to the condenser spindle, dispensing with the vernier movement altogether. The indicating dial mechanism is particularly fine, a nickel-plated cursor with black hair-line indicator being fitted, working in conjunction with a stationary metal dial finely calibrated in degrees and finished in satin silver.

Due attention has been paid by the manufacturers to the fact that many present-day variable condensers are fitted with a "single-hole-mounting" bushing and nut, which project an appreciable distance in front of the panel, but the dial is also applicable to instruments with the three-screw mounting feature. Large bakelite knobs of finely moulded black bakelite and polished nickel centre screw give the Micro-dial a particularly attractive appearance, and one has only to test the beautifully smooth movement to realise that here, at least, is the ideal dial for the short-wave set. On the broadcast wavelengths, too, this dial will be a decided acquisition to any receiver, for its inclusion can only result in greatly simplifying the tuning of selective circuits. The "Utility" Micro-Dial is supplied complete with all fittings and full mounting instructions, and is obtainable from Messrs J. B. Chandler & Co., 45 Adelaide Street, Brisbane, from whom our sample was received.

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.

"J.S.," Ipswich.—"Having a short-wave adaptor, and wishing to use the Screen Grid Booster, what would be the size of the condenser and coil to enable me to tune from 15 to 60 metres?"

Answer.—With the .0005-mfd. condenser specified, a coil of three turns, three inches in diameter, will tune approximately from 15 to 50 metres. A condenser of very small capacity must, however, be connected between aerial and the aerial terminal for the short waves; a Grodan or any midget neutralising condenser is suitable. With the .0005-mfd. condenser you will probably find the tuning very critical on the short waves, and it would be a better plan to use a .00015-mfd. tuning condenser in conjunction with two plug-in coils to cover the desired wavelength range. One of three turns and one of seven turns, both three inches in diameter, will be about right. The Screen Grid Booster works very well on the short waves if these changes are made.

"H.L.," Charters Towers.—"What type of spark-coil could be used for plate supply for a low-power transmitter; using a 201-A tube as an oscillator? (2) Could this form of power be successfully applied to the 'DX Special Transmitter' as published in the 'Radio News' of 1/10/28? If so, what type of blocking condenser would be required? (3) Using a single wire aerial, what is the correct length of wire that has been found best to work on the 32-metre band with this 'DX' Transmitter?"

Answer.—An ordinary Ford ignition coil, with its vibrator adjusted to give an even tone, is often used. It is essential that a fixed condenser be shunted across the secondary terminals, and this must, of course, be able to withstand the peak voltage developed by the coil. A suitable condenser may be constructed of two dozen full-plate photographic glass negatives with the emulsion washed off, between which are interleaved tin- or copper-foil plates about an inch smaller each way than the negatives. Every other tin-foil plate is connected to one terminal, and the remaining plates to another terminal, and the whole condenser clamped fairly tightly between two flat pieces of wood. When assembling the condenser, smear each glass plate with a thin coating of Vaseline. (2) Yes; the blocking condenser may consist of a glass-plate condenser similar to the one just described, but having one dozen quarter-plate negatives with an appropriate number of tin-foil plates. (3) The best type of aerial for use with the "DX Special" for 32-metre operation is a "Zeppelin" wire type designed especially for that wavelength. We are mailing you a rough sketch showing the construction and dimensions of such an aerial. The transmitter described will, however, work quite well on an ordinary aerial and earth system of average dimensions, provided a .0005-mfd. variable condenser is connected in series with the aerial lead, and this adjusted so that a harmonic of the natural wavelength of the aerial falls on, or close to, 32 metres. For example, suppose the natural wavelength of your aerial-earth system is 110 metres (an average figure). By means of the series condenser, this is reduced to 96 metres, so that the third harmonic will be just on the required wavelength—32 metres.

DROP the Technical Editor a line if your set is not "perking" as it should. Be brief and to the point—ten-page epistles strictly prohibited!

"C.L.S.," West End.—"With regard to the 'Screen Grid Three,' described in the 'Broadcast Bulletin' of November 19th, could you tell me if home-made coils will do, and if so, how to make them? (2) Would an Ormond condenser with 18 plates on the moving vanes do instead of the .00035-mfd. condenser on the same set?"

Answer.—In the article describing the "Holiday Portable" which appears in this issue, you will find particulars of the coils, the same kit being used in this receiver. (2) Yes; your Ormond condenser will do nicely for the reaction control, and no alterations to the coils will be called for.

"Radio Crank," Bulimba.—"Could you kindly let me know, through 'Q.R.N.,' where I could place a microphone in the 'DX Special Transmitter,' published in your October issue?"

Answer.—There are two simple methods of modulation. The simplest is the "loop absorption" system; just connect the microphone across a coil of one or two turns of heavy insulated wire, which may either be slipped over the transmitter coils or placed close to the end of one of them. The number of turns is increased or the coupling tightened until the requisite depth of modulation is obtained. The other, and more satisfactory method, is the "grid control" system. In this, the secondary of a "Ford" ignition coil is connected in series with the variable grid leak, and the primary connected to the microphone and a 4-volt battery—three dry cells will do. The vibrator is screwed down hard. Adjustment of the grid leak and of the microphone battery voltage will enable very good quality of speech to be obtained.

"F.W.H.," Eton.—"Re the Screen Grid Booster, please advise me if the way to connect it to my receiver is as shown in the enclosed sketch. I anticipate removing the aerial from the aerial terminal of my set to that of the Booster, doing likewise with the earth wire, joining the two earth terminals together, and connecting the 'Output' terminal to the aerial terminal of my set. (2) Is the .5-mfd. condenser an absolute necessity, and also is the Booster shielding necessary?"

Answer.—I have made one or two corrections in your sketch, and am returning it to you. You will note that the earth terminals of your set and the Booster should not be joined together, as a connection already is provided by way of the batteries. (2) Yes, the .5-mfd. by-pass condenser connected between the screen-grid terminal and filament negative is necessary. Shielding is desirable, but may be omitted, provided the Booster is placed about 12 inches away from the receiver, and with its coil at right angles to the nearest coil in the set.

"M.K.," Gympie.—"With reference to the 'DX Special Transmitter,' described in the October issue of 'Q.R.N.,' would you kindly tell me if No. 28 D.C.C. could be used instead of the silk-covered wire mentioned? (2) How many turns will be required for each choke? (3) Could a microphone be used on the set? If so, where would it be connected? (4) What would be the approximate cost of a wavemeter?"

Answer.—Yes; the cotton-covered wire will be O.K. (2) About 100 turns on each. (3) See reply to "Radio Crank," Bulimba. (4) A serviceable wavemeter could be built for approximately £1, but the calibration would cost somewhere in the vicinity of £1/1/. It is money well spent if you are thinking of starting in the transmitting game.

"W.A.P.," Duaringa.—"Could you supply me with a diagram of a good 'B' eliminator, giving a list of the parts required for three tappings at 22½, 90 and 135 volts, with variable resistances on each tapping?"

Answer.—The information you request is being prepared, and will be forwarded on in a few days' time.

"Subscriber," Finch Hatton.—"On my five-valve Neutrodyne last night, I got very clear reception from 2FC and 4QG, but lost every word of Mr. Bruce's speech the night before. I could hear the voice loudly enough, but not the words. Do you think a transformer between the set and loudspeaker would help when statics are bad, or a Screen-Grid Booster as described in the October 'Radio News'?"

Answer.—If you were unable to follow the words on account of static interference, no amount of alteration or adjustment to the set will cure this. You do not say if the voices are clear under good atmospheric conditions; if they are, then it is safe to say that the trouble is not in the set itself. If, on the other hand, the speech is still muffled when there is no static, then there is distortion in the set. In that case, it is caused either by incorrect battery voltages or faulty valves. The corrected diagram of battery connections has been sent on to you, and this probably will be of assistance in rectifying the trouble. A 1-1 ratio output transformer connected between set and speaker is desirable, and may possibly give you slightly better reproduction, but it will have no effect as far as static is concerned. The addition of the Screen-Grid Booster will have the effect of increasing your range and making previously weak stations much louder, but it cannot suppress static in any way, unless the set is used with an indoor aerial of some kind.

"Tuner," Paddington.—"Will you please give me full particulars for making a 'B' battery, using vaseline or some such jars and the thick zinc obtainable at all ironmongeries—not the zinc used in dry batteries, as this is much too thin and does not last long enough. I wish it to be 90 volts, with tapping at 45 volts for detector. (2) Would it be possible to take a tapping at 4 volts for L.T. supply. Please give me a list of the parts required and the grade of zinc, also, if possible, the approximate price of all material."

Answer.—We are mailing you a copy of the August 27th issue of "The Broadcast Bulletin," which contains instructions for building such a battery. The sacks from old dry "B" batteries are used, and it is essential that the batteries from which these are taken are not too old. Best results are secured when the batteries have just been discarded, and it should be mentioned that this should be done always when the batteries reach 37 or, at the lowest, 35 volts. Get pure zinc from an ironmonger or plumber, as thick as you can. (2) No; it is not feasible to draw filament current from the same battery. Such a battery has a very small capacity and low discharge rate, and would be quite incapable of supplying the comparatively heavy current required by the valve filaments. If you already have the necessary jars, the cost of material will be confined to the price you pay for the zinc.

"H.K.," Thinoomba.—"I have built the five-valve Peridyne receiver described in the August 'Radio News,' and have had a little trouble with the set. It is built according to your description, the only alteration being that Philips valves are used. The trouble is in the r.f. side of the set, the valves I am using here being A-609's. Working the set as described, the volume control is practically useless, as it makes hardly any difference to the volume. I have to screw the knob adjustment of the second coil down as far as it will go to get any volume. By disconnecting the volume control, and adjusting the knob of the coil to about ¾-inch from the bottom, I gain a considerable amount of volume. As far as the tone is concerned, I must that it is the best set I have ever worked, but can you suggest any improvement I can make to get increased efficiency from the set?"

Answer.—From your description, I should say that you have been unfortunate enough to secure a kit of coils that is not matched properly. I cannot account for the symptoms you mention in any other way, unless the three sections of your three-gang condenser are considerably out of step with one another. The only course I can suggest is to transpose the second and third coils. This may not have the desired effect, but it will enable you to judge for yourself whether or not the trouble lies in this direction. If it does, you will find that the adjustments of the coil knobs for maximum results will have to be changed considerably. You might send the coil kit to the manufacturers with return postage prepaid, and they will test it for you and rectify matters if any fault is found. The remainder of the set is so simple that it would be impossible for any trouble to creep in anywhere else.

"Radiant," Paddington.—"I have constructed a Radiokes Reinartz three-valve receiver. From the diagram enclosed, you will see the parts that I have used. Are these satisfactory? If so, how far is it possible to receive with such a receiver, and at what speaker strength? My aerial is 30 feet high and 50 feet long, and I have a good earth. Is the crystal amplifier which is on sale in Brisbane satisfactory, and what volume on the speaker can be expected with such an instrument fitted to the crystal diagram enclosed? There is enough volume now to fill a small room. What is a good fixed detector for such a set?"

Answer.—The parts you have used are quite OK, but you will not get very good results on the Southern stations using that circuit. While the single-control Reinartz is an excellent receiver for nearby reception, no receiver of this type having a fixed reaction can be satisfactory on distant stations. If you replace the .0001 fixed reaction condenser with a variable condenser of .00025 or higher capacity, you will have an excellent set with variable reaction, and capable of bringing in the Southern stations at good speaker strength when conditions are normal. I cannot speak from practical experience regarding the amplifier you mention, and would therefore hesitate to condemn it. However, I do not think it is worth your attention, and I would advise you to use a valve amplifier if you require loudspeaker volume. I like the Lion-Micro or the Liontron, obtainable at most dealers, or from Messrs. J. B. Chandlers. It is of the "semi-fixed" type, and is more sensitive than most fixed crystals, while being quite rugged.

"J.J.W.," Bell.—"In the July issue of the 'Radio News,' you described a three-valve set which appealed to me—principally the cost. ('A Good Three for £5'). I had practically decided to build one, but the advent of the new screen-grid valves has made me wonder if the set could be decidedly improved by the expenditure of a few shillings extra. Am I right?"

Answer.—The "£5 Three" is perhaps one of the best three-valve sets that can be built, **using ordinary three-electrode valves.** As you surmise, however, the use of screen-grid valves makes a wonderful improvement in results, but the set is then different altogether, and is completely removed from the "£5 Class." In this issue you will see a description of a modern screen-grid three. It is shown as a portable, but the receiver unit is quite suitable for home use. For your information, the cost of the parts works out at, roughly, £20—including the valves, batteries, carrying case, etc. The receiver alone runs to about £9/15/-. This latter figures is useful when comparing the two receivers. As far as performance is concerned, there is no comparison between the two sets—the screen-grid set has it every time. Still, if you do not wish to spend that amount of money, you will be well pleased with the performance of the "£5 Three."

RADIO ABROAD

AEROPLANE RADIO.

If aeroplane service tests undertaken by the American Telephone and Telegraph Co., between the ground and a cabin aeroplane, develop as rapidly as some of the recent experiments in radio communication, it will soon be possible for anyone within reach of a telephone to communicate with any one who may be travelling by aeroplane.

"It may be a matter of five years," one of the engineers of the above company stated, "and it may quite possibly be a much shorter time, before we achieve our object of an actual connection-service between an object moving through the air and a station on the ground."

In the present experiments, apparatus is being used by means of which the wavelength may be changed instantly, so that the most efficient and least-congested channels may be found from moment to moment.

* * * *

ON THE TRAINS.

The Radio Committee of the American Railway Association has recently requested that the Radio Commission reserve a wavelength band for train communication. This method of linking the engine and the guard's van has been mentioned before. A section approximately 140 k.c. wide is desired in the 2250-2750 k.c. region.

Since the range of the telephone equipment used on trains is limited, the interference will be very slight, and there is probably no reason why such a wavelength should not be assigned for the purposes mentioned.

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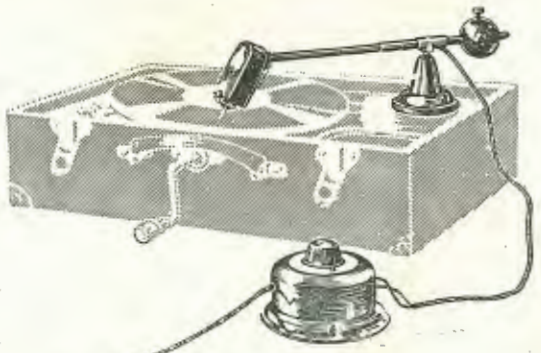

Full volume without the slightest distortion.

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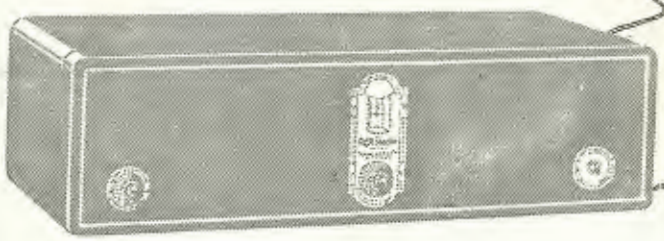

THIS superb combination will reproduce with amazing realism the tonal shadings of a great orchestra, the deep bass of the Wurlitzer organ, the soaring treble of the singer, and the clear singing tone of the solo instrument. Volume, by a simple control, can be increased to the intensity desired or reduced to the veriest whisper.

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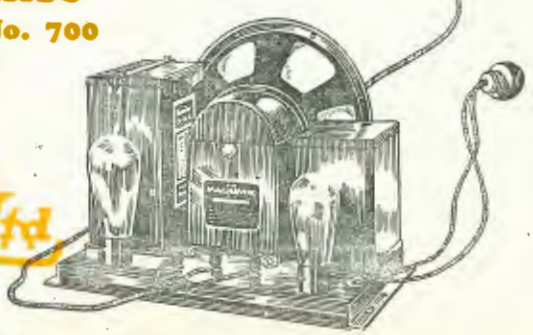

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