THE WIRELESS WEEKLY

A Journal Devoted to the Interests of Wireless Enthusiasts both Amateur and Professional

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# A Talk with Wireless Weekly.

AMATEUR transmission of Telephony has advanced another step. Miss Josie Melville last Sunday evening transmitted her voice to many hundreds of "listeners-in."

Why were there not thousands listening to this wonderful music, and why cannot the general public listen to such tip-top music and singing every evening. The answer can be summed up in three words, "NO OFFICIAL BROADCASTING."

Is the Wireless Department, now attached to the Postmaster General's Department, revenue producing? Would official broadcasting produce revenue. "Wireless Weekly" contends that properly handled it would. £20,000 would be amply sufficient to start broadcasting throughout Australia, and from a scheme which we have prepared, would immediately be revenue producing, not taking into consideration "Wireless Advertising," which, were it allowed, and properly regulated, would double the amount invested within six months.

There seems to be a dog-in-the-manger attitude about this matter; those who could broadcast are not doing so, and the general public is suffering accordingly.

Just now the local man with a valve set can listen to some splendid amateur telephony every evening, but our country brother and the crystal man can only get occasional snatches.

Easter is not far off, when the country man will be down to the city. Look to it, wireless enthusiasts, that your country brother goes back home with a head full of circuits and radio lore, and a set under his arm. Remember every new devotee to the science means another unit of strength for the test which will no doubt have to come, if the authorities do not quickly awaken to the fact that broadcasting is a public necessity.

## UTILITY OF RADIO IN MINES.

The use of radio telephone instruments has now become so general that inquiries have been made as to the feasibility of the use of radio instruments underground, with the idea advanced that they would be especially valuable when accident interfered with the ordinary means of communication, says a writer in "Engineering and Mining Journal Press." The U.S. Bureau of Mines has investigated the matter at the Bureau experimental mine at Bruceton, Pa., in co-operation with radio engineers from the Westinghouse Electric and Manufacturing Co. The experiments are described in Reports of Investigations, No. 2407.

# MUSIC IN THE AIR

## "SALLY" BY WIRELESS.
## CONCERT A GREAT SUCCESS.

A RARE TREAT was given to those who have a wireless set in their homes, on Sunday night. Miss Josie Melville, of "Sally" fame, transmitted her voice to many hundreds of "listeners-in." Owing to the very heavy storm that was hanging about on Sunday afternoon and evening, it was thought that static would prevent a successful concert, this proved incorrect, and Miss Melville's voice came through as clear as a bell, every note being perfect.

Miss Melville is now a record holder, being the first great Australian theatrical star to entertain hundreds of the public by wireless in Australia.

Reports received from many country centres state that "Sally's" voice came through splendidly at full strength.

A well known amateur at Tamworth reports the concert full strength, modulation perfect, voice clear, slight static.

The two selections rendered by Miss Melville were "Look for the Silver Lining" and "Joan of Arc." Those listening in who had already heard her voice, pronounced that heard through wireless receivers her voice to be equally as good.

Mr. B. Cooke reports that Sunday night's concert came in splendidly at the Observatory. Miss Melville's voice was excellent, intonation perfect. Mr. Cooke had a number of guests to "listen in," including Miss Pearl Osbourne (Sally's understudy) and Mr. Claude Watts.

### EXTREMELY NERVOUS.

Miss Melville was extremely nervous when she approached the Microphone to render her first selection.

She was awestricken when she realised that her voice was travelling from that small piece of mechanism into hundreds of homes, where many hundreds of people sat listening to her. Many that she has never seen, nor never will see.

*Miss Josie Melville ("Sally") singing at Mr. Maclurcan's last Sunday evening.*

**MISS JOSIE MELVILLE**

When interviewed by "Wireless Weekly" after singing at Mr. Maclurean's Wireless Concert on Sunday night last, Miss Melville said that before she started singing into the microphone she felt more nervous than she had ever done on the stage. "It is beyond me," she said. "The mysteriousness is too great. I do not know why I was so nervous, but the thought that so many people who I could not see were listening to me quite overawed me. I very much enjoyed listening to the other items on Mr. Maclurean's programme, and am delighted to hear that so many people have notified you that they enjoyed my singing."

"SALLY"

## SHIPS YOU SHOULD HEAR THIS WEEK.

We publish each week under the above heading ships that should be nearing or departing from our coast:—

| | | | |
|---|---|---|---|
| ANCHISES | MFW | PORT STEPHENS | ZSU |
| BARADINE | GFBN | TASMAN | PMZ |
| CANADIAN T'PTR | VGBY | TREVESSA | BGR |
| EASTERN | YUH | VINITA | KOTL |
| HARORATA | MRF | WAINIANA | GNE |
| MADRAS MARU | JIR | CUFIC | GDR |
| NORTHUMBERLAND | ZBL | MAKUKA | GDZV |
| ORARI | MRM | JERVIS BAY | VZDK |
| ORESTES | YTN | MARSINA | VKZ |
| POONA | MSO | NARKUNDA | GCVB |
| PORT ALMA | EQB | PACIFIQUE | FNW |
| PORT NICHOLSON | XHO | SONOMA | WHM |

## LAND STATIONS YOU MAY HEAR.

| Station. | Call. | | |
|---|---|---|---|
| ADELAIDE. Radio | VIA | KING ISLAND | VZE |
| AUCKLAND | VLD | KAEWEING | VZR |
| AWANUI | VLA | KIETA | VIU |
| AWARUA | VLB | MELBOURNE | VIM |
| APIA | VMG | MACQUARIE ISLAND | VIQ |
| BRISBANE | VIB | MISIMA | VIX |
| BROOME | VIO | MADANG | VIV |
| COOKTOWN | VIC | MOROBE | VZK |
| CHATHAM | VLC | NAURU | VKT |
| DARWIN | VID | NOUMEAU | FQN |
| ESPERANCE | VIE | NUKUALOGA | VSB |
| EITAPE | VZX | OCEAN ISLAND | VQK |
| FLINDERS IS | VIL | PORT MORESBY | VIG |
| GARDEN ISLAND | VKQ | PERTH | VIP |
| GERALDTON | VIN | ROCKHAMPTON | VIR |
| HOBART | VIH | RABAUL | VJZ |
| | | RARATONGA | VMR |
| | | SAMARAI | VIJ |
| | | SYDNEY | VIS |
| | | THURSDAY ISLAND | VII |
| | | TOWNSVILLE | VIT |
| | | TULAGI | VQJ |
| | | WYNDHAM | VIW |
| | | WILLIS ISLAND | CGI |
| | | WOODLARK | VIF |
| | | WELLINGTON | VLW |

## WIRELESS EQUIPPED AUSTRALIAN TUGS.

It is not generally known by our readers that Messrs. J. and A. Brown's powerful tug boats, "Rollicker" and "St. Olaves," have standard Marconi ½ k.w. sets installed, and can immediately put into operation should the emergency arise.

The sets were fitted by the Admirality, and the receiving apparatus is operated in a sound proof cabinet.

## HAVE YOU A LICENSE FOR THAT SET!

Wireless amateurs are warned that they must hold a license before they can use a wireless set. With the increasing number of experimenters, a very strict watch is being kept for breaches of the Wireless Act.

The experiments consisted first in receiving signals from without the mine by means of a receiver, located inside the





mine, and, second, both sending and receiving messages underground through the strata. It was found that with a receiving instrument set at a point 100 feet underground, signals from KDKA station of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., could be heard distinctly. Station KDKA is at a distance of about 18 miles from the experimental mine. About 50 feet from the receiving station used in this test was a 6 inch bore hole from the surface, lined with iron pipe and containing electric-light wires, which extended therefrom throughout the mine. The presence of these wires evidently assisted greatly in the reception, for when the receiving set was carried to another point in the mine removed from wires and tracks, the signals were barely audible through 50 feet of cover. The fact that signals were detected, however, even though faintly, is sufficient evidence of transmission through the ground to encourage experimenting.

The preliminary experiments, although unsuccessful in indicating any practical method of using wireless waves for underground communication, nevertheless indicate clearly that electromagnetic waves may be made to travel through solid strata. The "absorption," or loss of intensity, with distance is very great, for the short wave lengths (200 to 360 metres) used in these experiments. Longer wave lengths are known to undergo less absorption, and may possibly be found practically effective under certain conditions.

# MAKE YOUR OWN

## A Simple Honeycomb Coil Winder.

It is thought that the following description of a winder which will produce coils having a law self capacity will prove useful to those who construct their own apparatus, says G. S. Hall in Modern Wireless:—

There are various types of coils on the market to-day which are fairly expensive to buy, each having their own merits, and which are similar to those about to be described, the difference being in their relative cost. Once the winder is made, coils can be made by the dozen, if required, and, moreover, it can be used for a variety of other purposes.

Now it is desired to make a coil in a compact form, the turns of which shall be separated one from another.

Suppose we have a cylindrical drum, which may be coupled by means of a shaft (passing through the centres of its circular ends), gear wheels, and a crank, and connecting rod movement to a pencil resting on the drum (see Fig. 1). We may trace approximately

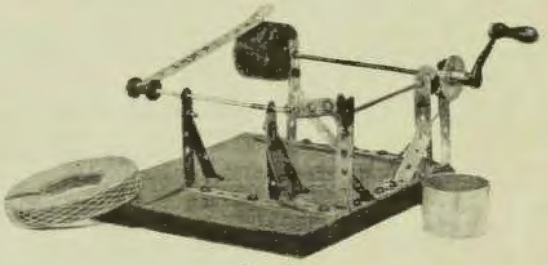
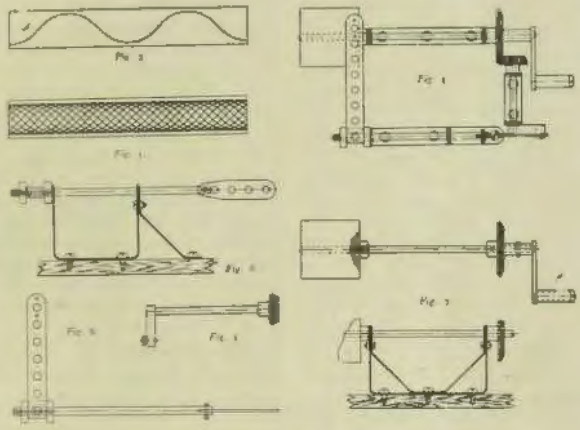


Fig. 1.

a sine curve, the amplitude of which will defend on the thraw of the crank. Suppose the drum makes one complete turn. If each of the gear wheels have the same number of teeth, or if the number of teeth on one is some multiple of the number on the other, then the pencil point will finish up where it started from, and a curve will be obtained which, when developed, will appear as in Fig. 2.

Again, if the gear wheels have no common multiple, then the pencil will not finish where it started, but will either be in advance of or behind the starting point, and it will only be after several turns of the drum

that the pencil reaches its starting point once more. In the meantime, a "band" of curves will have been traced on the drum, the appearance, when developed, being as in Fig. 3. If we now continue winding, the same band will be traced out again, and it will be seen that, considering the pencil



replaced by a wire threaded through the guide layers will be built up, and each turn will be separated from its neighbour by a definite amount depending on the number of teeth on each of the gear wheels. In this particular case we will take wheels having 25 and 48 teeth, the smaller being a bevel wheel from a "Meccano" set, and the larger one bought from a dealer in gear wheels. The drum is a piece of curtain pole, 1¾in. in diameter, and 1¾in. long. This is screwed on to a 3/16in. shaft, the other end of which carries the larger bevel wheel and the handle, by which the drum is rotated (see Fig. 4).

A piece of "Meccano" shafting is threaded for a 1-4in., to take a piece of 1-4in. square brass rod, which is to form the crank. The other end carries the bevel wheel. Another piece of "Meccano" shafting is prepared to take the guide for the twine, having at one end a saw cut along its axis for about 3-8in., at right angles to which is drilled a small hole to take a split pin.

A short length of "Meccano" stip forms the connecting rod. The other end of the guide rod carries the guide itself, the guide being bent round the rod and held in position by a nut on each side (see Fig. 6).

All the bearings are made up from "Meccano" strip, and they must be very rigid. A glance at the sketches should make the construction clear. It has been found best to wrap a thin sheet of metal round the drum, the ends being about 1/16in. apart, so that the coil may be slipped off the drum more easily.

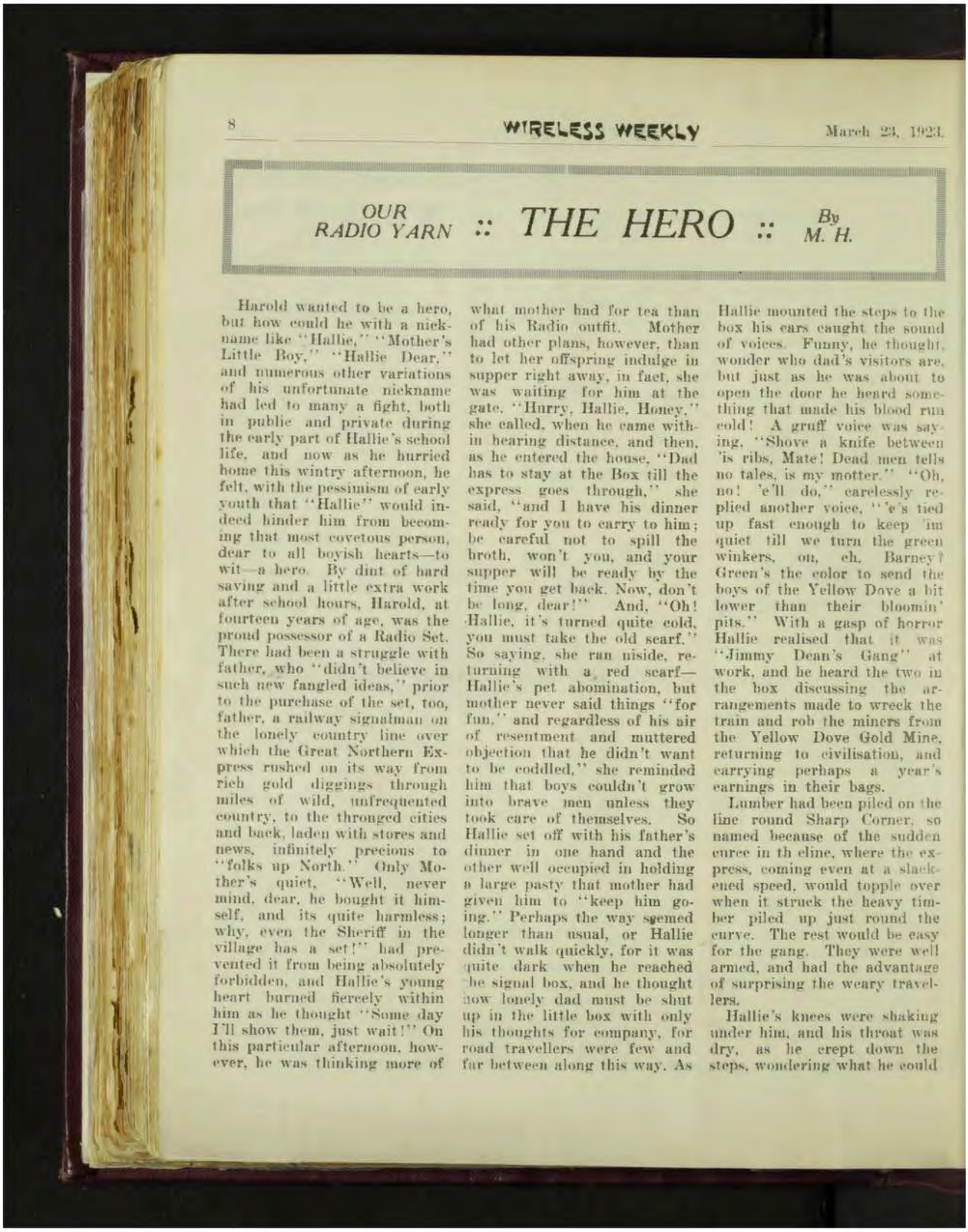


Usually the coil is dipped in molten wax, all superfluous wax being shaken out as far as possible afterward, as this makes it stronger, which is of great advantage.

With a crank radius of 3-8 in., a coil, nearly ¾in. wide, is formed, and on the drum described it is found that 18 turns give a coil suitable for 180 metres, with a .0005 variable condenser in shunt, 30 turns for 300 metres, and so on up to about 600 metres. The wire used is to 28 S.W.G. D.C.C. The winder may be used to make up H.F. Intervalve Transformers by winding on two wires at once, as the coupling between primary and secondary is a maximum, and the self-capacity of each is law.

It should be remembered that reliable service when wire lines are not available demands a very high standard of construction in the radio field. About 200 watts are required for 100-mile radio telephony, and with this amount of energy radio telegraphy can be carried 400 to 500 miles.

Mr. T. Armstrong, of the P.M.G's. Dept., Electrical Engineers' Branch, Melbourne, has been appointed Assistant Radio Inspecor, Sydney.



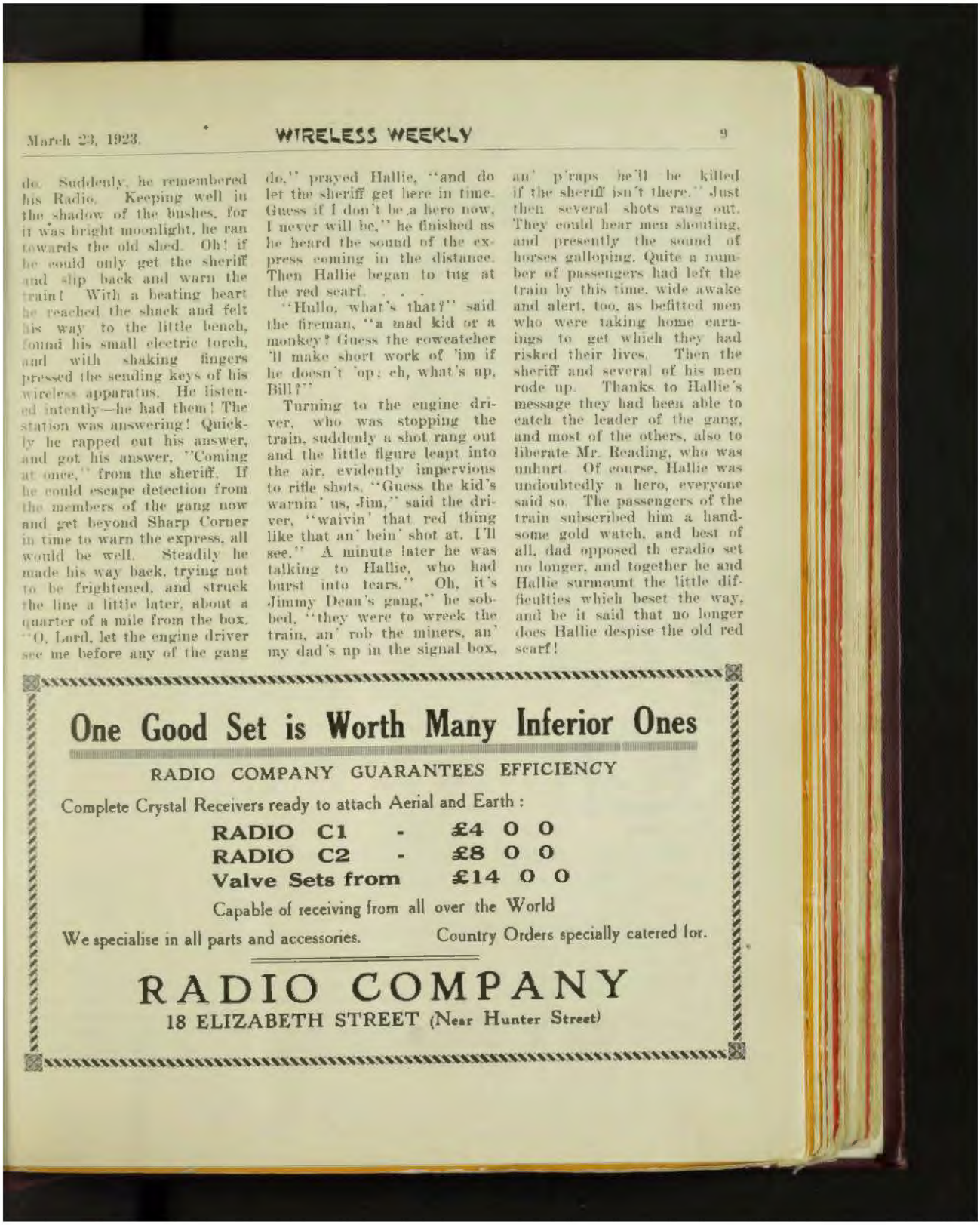


## OUR RADIO YARN :: THE HERO :: By M. H.

Harold wanted to be a hero, but how could he with a nickname like "Hallie," "Mother's Little Boy," "Hallie Dear," and numerous other variations of his unfortunate nickname had led to many a fight, both in public and private during the early part of Hallie's school life, and now as he hurried home this wintry afternoon, he felt, with the pessimism of early youth that "Hallie" would indeed hinder him from becoming that most covetous person, dear to all boyish hearts—to wit—a hero. By dint of hard saving and a little extra work after school hours, Harold, at fourteen years of age, was the proud possessor of a Radio Set. There had been a struggle with father, who "didn't believe in such new fangled ideas," prior to the purchase of the set, too, father, a railway signalman on the lonely country line over which the Great Northern Express rushed on its way from rich gold diggings through miles of wild, unfrequented country, to the thronged cities and back, laden with stores and news, infinitely precious to "folks up North." Only Mother's quiet, "Well, never mind, dear, he bought it himself, and its quite harmless; why, even the Sheriff in the village has a set!" had prevented it from being absolutely forbidden, and Hallie's young heart burned fiercely within him as he thought "Some day I'll show them, just wait!" On this particular afternoon, however, he was thinking more of what mother had for tea than of his Radio outfit. Mother had other plans, however, than to let her offspring indulge in supper right away, in fact, she was waiting for him at the gate. "Hurry, Hallie, Honey," she called, when he came within hearing distance, and then, as he entered the house, "Dad has to stay at the Box till the express goes through," she said, "and I have his dinner ready for you to carry to him; be careful not to spill the broth, won't you, and your supper will be ready by the time you get back. Now, don't be long, dear!" And, "Oh! Hallie, it's turned quite cold, you must take the old scarf." So saying, she ran inside, returning with a red scarf—Hallie's pet abomination, but mother never said things "for fun," and regardless of his air of resentment and muttered objection that he didn't want to be coddled," she reminded him that boys couldn't grow into brave men unless they took care of themselves. So Hallie set off with his father's dinner in one hand and the other well occupied in holding a large pasty that mother had given him to "keep him going." Perhaps the way seemed longer than usual, or Hallie didn't walk quickly, for it was quite dark when he reached the signal box, and he thought how lonely dad must be shut up in the little box with only his thoughts for company, for road travellers were few and far between along this way. As Hallie mounted the steps to the box his ears caught the sound of voices. Funny, he thought, wonder who dad's visitors are, but just as he was about to open the door he heard something that made his blood run cold! A gruff voice was saying, "Shove a knife between 'is ribs, Mate! Dead men tells no tales, is my motter." "Oh, no! 'e'll do," carelessly replied another voice, "'e's tied up fast enough to keep 'im quiet till we turn the green winkers, on, eh, Barney? Green's the color to send the boys of the Yellow Dove a bit lower than their bloomin' pits." With a gasp of horror Hallie realised that it was "Jimmy Dean's Gang" at work, and he heard the two in the box discussing the arrangements made to wreck the train and rob the miners from the Yellow Dove Gold Mine, returning to civilisation, and carrying perhaps a year's earnings in their bags.

Lumber had been piled on the line round Sharp Corner, so named because of the sudden curee in th eline, where the express, coming even at a slackened speed, would topple over when it struck the heavy timber piled up just round the curve. The rest would be easy for the gang. They were well armed, and had the advantage of surprising the weary travellers.

Hallie's knees were shaking under him, and his throat was dry, as he crept down the steps, wondering what he could





do. Suddenly, he remembered his Radio. Keeping well in the shadow of the bushes, for it was bright moonlight, he ran towards the old shed. Oh! if he could only get the sheriff and slip back and warn the train! With a beating heart he reached the shack and felt his way to the little bench, found his small electric torch, and with shaking fingers pressed the sending keys of his wireless apparatus. He listened intently—he had them! The station was answering! Quickly he rapped out his answer, and got his answer, "Coming at once," from the sheriff. If he could escape detection from the members of the gang now and get beyond Sharp Corner in time to warn the express, all would be well. Steadily he made his way back, trying not to be frightened, and struck the line a little later, about a quarter of a mile from the box. "O, Lord, let the engine driver see me before any of the gang do," prayed Hallie, "and do let the sheriff get here in time. Guess if I don't be a hero now, I never will be," he finished as he heard the sound of the express coming in the distance. Then Hallie began to tug at the red scarf. . . .

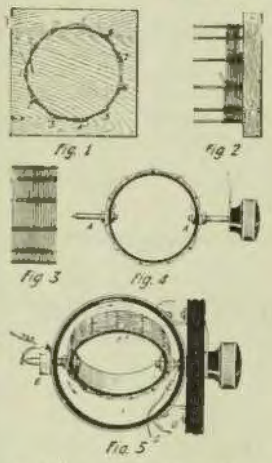
"Hullo, what's that?" said the fireman, "a mad kid or a monkey? Guess the cowcatcher 'll make short work of 'im if he doesn't 'op; eh, what's up, Bill?"

Turning to the engine driver, who was stopping the train, suddenly a shot rang out and the little figure leapt into the air, evidently impervious to rifle shots. "Guess the kid's warnin' us, Jim," said the driver, "waivin' that red thing like that an' bein' shot at. I'll see." A minute later he was talking to Hallie, who had burst into tears." Oh, it's Jimmy Dean's gang," he sobbed, "they were to wreck the train, an' rob the miners, an' my dad's up in the signal box, an' p'raps he'll be killed if the sheriff isn't there." Just then several shots rang out. They could hear men shouting, and presently the sound of horses galloping. Quite a number of passengers had left the train by this time, wide awake and alert, too, as befitted men who were taking home earnings to get which they had risked their lives. Then the sheriff and several of his men rode up. Thanks to Hallie's message they had been able to catch the leader of the gang, and most of the others, also to liberate Mr. Reading, who was unhurt. Of course, Hallie was undoubtedly a hero, everyone said so. The passengers of the train subscribed him a handsome gold watch, and best of all, dad opposed th eradio set no longer, and together he and Hallie surmount the little difficulties which beset the way, and be it said that no longer does Hallie despise the old red scarf!

## NOVEL "BASKET WEAVE" WINDINGS.

As almost every one in radio is acquainted with the so-called basket-weave inductances for tuning transformers, and know of their merits in regenerative circuits, an idea is herewith presented in brief and the builder may choose his own materials an methods in construction.

We need not go into detail of the winding, as the principle is universal and has been published heretofore, the secret, of course, being to have an odd number of pegs, 7, 11, 13, etc., Fig. 1. The wire is started




alternating around each peg and in so doing, each turn cuts its adjacent, the effect being mall capacity and large inductance. The builder may suit himself in using pegs, matches being commonly employed and left in the finished coils. The size and number of wire turns, etc., will depend on the builder's specifications. A wooden base is used and the coils are woven in cylindrical form, Fig. 1.

Fig. 2 shows the partially finished coil. When the desired size is woven, the pags are loosened from the base, the weave removed, and bathed in hot parraffin or shellac. Cardboard tubing may be inserted on the inside for reinforcement. Fig 3 shows the finished coil. Fig 4 shows the secondary coil completed, with pivots, knob and connections to each pivot (A).

The primary coil is wound similarly, being ¼ to ½ inch or so larger in diameter. Fig. 5 shows the principle of the instrument with its revolving secondary (E) and the stationary primary. A bearing of wood or rubber is mounted on the side of the primary (B) and brush contacts (C) are made for the secondary. The primary coil may be mounted on a panel by means of a strap (D).

This style of coupler or variometer may be used in either crystal or vacuum tube work, the number of coils and turns being fixed by the amateur's resources and type of circuit. For longer wave ranges the coils should be tapped. By a change in connection the coils become either vario-couplers or vario-meters.

## PESTS, VALVULAR AND OTHERWISE.

Dear Sir,

Your correspondent, Mr. J. W. Robertson, has excellent ideals, but his standards are wrong, and his attitude towards hat earnest and usually painstaking person, the Wireless Amateur, is both intolerant and ungenerous. Like the Pharisee of old, he is thankful that he is not like others, "pests and amateurs," whose valves ho w nad,l hwowrosihp valves howl, and who worship not at the shrine of the great god, "Dot-dash."

Like J.W.R., I believe some restriction is necessary, but not on the ines he lays down. Writing as an electrical man of over 20 years' experience, and one who has burned the midnight oil not without profit, I object to, and canno see the logic of, having my ability to use a valve measured in terms dot-dash.

I have neither the time nor the inclination to study Morse, which, after all, does not advance the student the length of one ion in his study of wireless. Morse is at best but a very primitive means of communication, which must inevitably be superseded by some form of transmitting, either the spoken or written word.

The ability to send and receive at a given speed does not necessarily imply that its possessor has either technical knowledge or wireless experience; that if it did numbers of postal and railway telegraphists possessing a very elementary knowledge of electricity, and none of radio, would be fit and proper persons to use valves.

As the regulation stands, a boy scout fairly proficient in scout craft, but knowing nought of either the farad or the heury, may be admitted to the charmed and selfish circle of valve users, but the man with technical knowledge, who can, in J.W.R's. words, define capacity and inductance, yea, even impedance and periodicity, &c., must learn Morse, or stay without.

The writer is prepared to take a shade of odds that a Morse test would worry, if not disqualify such men as Dr. Fleming, and Steinmetz, and takes a little comfort from the fact that he fails in rather good company.

In conclusion, do you not think a technical test would be more to the point? Think it over, J.W.R.

(Signed) H. C. WALKER.

## USES FOR BRASS CHAINS.

Here are a few uses for brass chain, such as is commonly used as dog or key-ring chain:

Fig. 1.: A single link held under a binding post to hold large wire W, or several small wires.

Fig. 2: A single link to join several wires without soldering, or to act as a tap of a large wire W.

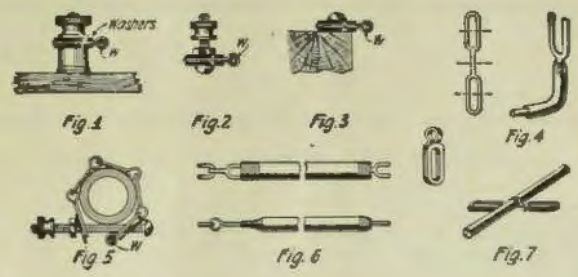
Fig. 3: A single link to support insulated wire W.

Fig. 4: A small spade tip for wires made by cutting a flattened link on the dotted line, binding the wire to the straight part with finer wire, and soldering.

Fig. 5: An efficient ground clamp, which will hold large wire W, or small wire under the nut.

Fig. 6: A flexible cable for heavy currents consisting of chain covered with rubber tube.

Fig. 7: A handy fastener for small tubing or wire made of a single link bent as shown, and fastened with tacks or screws.



# THE RADIO BOTTLE

(BY P.G.A.H.V.)

## HOW I PUT THE ELECTRONS TO WORK.

**The Evolution of the famous "Fleming Valve"—as Told by Its Inventor, Prof. James Ambrose Fleming, M.A., D.Sc., F.R.S., in Popular Radio.**

AN aeroplane is speeding along at a hundred miles an hour, two miles up in the sky above the English Channel. A slender wire trails out behind the machine. From time to time the pilot glances at the compass on the instrument board.

Suddenly a voice speaks to him, the voice of a man sitting many miles away in his office in the city of London, a voice that has overtaken him.

The pilot listens, turns a switch, and answers. He is detached from earth, hurtling through space, but it is as though he were standing in that city office talking to his director.

This is one of the miracles of today brought to pass by a lamp. Another aeroplane speeds like a blind thing in a fog. The pilot can see nothing. He is quite lost, everything is blotted out, yet he has no fear. A tiny lamp has the aeroplane on an invisible leash, and leads it safely to the aerodrome.

Somewhere on the illimitable ocean is a battleship. An admiral in Whitehall, faced with a sudden emergency, desires to find that ship, speak with the captain, and send the grim ironclad steaming full speed to a secret destination. A few years ago it would have been an impossible task; now, a lamp accomplishes the miracle.

A ship is going down with hundreds of helpless passengers. An agonized signal for help is flung into the heavens—by a lamp. And another lamp, hundreds of miles away, instantly responds and sends a ship to the rescue.

A world famous prima-donna pours out her soul in song in a little room, and the magic lamp takes her song and carries it from her lips to thousands of homes where people sit and listen to the thrilling cadence of her voice.

It seems almost incredible that these wonders are made possible by a lamp, yet it is true.

The story of how I came to invent the Fleming thermionic valve, which played so important a part in bringing these things to pass, began long ago when Edison was devoting his genius to lighting the homes of the people with electricity. After countless experiments the labours of Edison in the United States and of the late Sir Joseph Swain, aided by Mr. C. H. Stearn, in England, turned a scientific theory into an accomplished fact, and produced the electric incandescent lamp, which was destined to work such wonders in the world.

Forty years ago, in 1882, after the Edison Electric Light Company of London was formed, I was appointed electrical adviser to the company. I was therefore brought into close touch with the many problems of incandescent phenomena with all the scientific means at my disposal. Like everyone else, I noticed that the filaments broke easily at the slightest shock, and when the lamps burned out the glass bulbs became discolored.

This discoloration of the glass was generally accepted as a matter of course. It seemed too trifling to notice. But in science it is the trifles that count. The little things of to-day may develop into the great things of to-morrow.

I wondered why the glass bulb grew dark, and I started to investigate the matter. I discovered that in many burned-out lamps there was a line of glass that was not discoloured in any way. It was as though someone took a smoked glass, drew a finer quickly down it, and left a perfectly clean line behind.

I found that the lamps with these strange, sharply-defined clean spaces were covered elsewhere with a deposit of carbon or metal, and that the clean line was immediately in the plane of the carbon horseshoe filament and on the side of the loop opposite to the burned-out point of the filament.

It was obvious to me that the unbroken part of the filament acted as a screen to that particular line of clear glass, and that the discharge from the overheated point on the filament bombarded the remainder of the bulb with molecules of carbon or vaporized metal shot out in straight lines.

My experiments at the end of 1882 and early in 1883 proved that I was right.

Edison was at work in his laboratory in 1883 when he noticed that if he fitted a tiny metal plate inside the bulb of an electric lamp and connected it outside the bulb with the positive end of the filament, he obtained a slight current. The phenomenon was called "the Edison effect"; but Edison could not explain it, nor did he use it in any way.

In October, 1884, Sir William Preece obtained from Edison some of these electric lamps with metal plates sealed inside them, and he turned his attention to the investigation of th ephenomena of the Edison effect. He decided the Edison effect was connected with the projection of carbon molecules from the filament in straight lines, thus confirming my original discovery. There Sir William Preece let the matter rest, just as Edison had done. He did not satisfactorily explain the phenomenon in any way. The Edison effect remained just a peculiar property, a mystery of the incandescent lamp.

With these lamps I conducted

many tests of a highly technical nature, which I fully described in various scientific papers to the Royal Society and Physical Society. I was keenly interested, although the average man would have found little in my laboratory to appeal to him. I fully confirmed Sir William Preece's observations that the molecules discharged from the incandescent filament could not pass round a right-angle bend, and doubly confirmed my original discovery that the molecules travelled in straight lines.

Then I enclosed the negative leg of the carbon filament in a glass tube, and found that the bombardment of electrified particles was completely stopped. By altering the position of the metal plates, I learned that I could vary the intensity of the bombardment. At last I tried placing a metal cylinder completely around the negative leg of the filament without touching it, and the mirror galvanometer that I was using to detect the currents indicated the strongest current of all. It was plain that the metal cylinder enclosing the negative filament caught all the electrified particles that were shot out from the filament.

What I discovered led me to experiment with electric arcs in the open air, and I found that the same phenomenon existed. I published the result of these experiments in a paper in 1889, "On Electrical Discharge Between Electrodes at Different temperatures in Air and High Vacua."

Thereafter, whenever the opportunity occurred, I continued my experiments with a view to further discoveries. I need not enter into technical details here, but all my researches indicated that the molecules of my original discovery were composed of particles charged with negative electricity. Since the brilliant discoveries of Sir J. J. Thomson, in 1897 we have called them "electrons." By surrounding the negative filament with a metal cylinder and bringing the filament to a high state of incandescence, a current of negative electricity was induced to flow from the filament to the plate, but it could not be induced to flow in the opposite direction from the plate to the filament.

I have often been asked to explain why the current could flow one way and not the other, and I think a rough analogy is to liken the glowing filament to a battery of guns always firing shells at a certain target. The shells must travel away from the guns. The impulse is behind them, so they must go forward. It is physically impossible for them to travel toward the guns from which they have been fired. In hitting the target the shells burst and expend their energy; just as the electrons give up their energy, or negative electricity, when they hit the cylinder surrounding the filament.

It is thus easy to understand why the current can flow only one way, that is, from the filament to the cylinder. The electrons are like porters, all hurrying in one direction with a tiny load of negative electricity. As there are no porters travelling in the opposite direction, it is impossible to get any current carried back again.

In 1899 I was asked to act as electrical advisor to Marconi's Wireless Telegraph Company, and to assist in solving the technical problem of equipping the first trans-Atlantic wireless station at Poldhu with electrical apparatus that would send a wireless impulse across the Atlantic. At that time a wireless signal had not been sent much over 100 miles, so it was a big jump to send a signal 2,000 miles.

We realised that high power would be necessary, and that the old methods of supplying power would be useless. Accordingly, we ordered certain machinery, which was installed in due course, and in November, 1901, Senatore Marconi, with two assistants, went to St. John's, Newfoundland, to see if it was possible to obtain messages from Poldhu.

The weather was bad. High winds enveloped them as they stood on Signal Hill trying to induce their kites and balloons to rise in the air. They had barely coaxed one kite to rise when it broke from its moorings and fell into the sea. They tried again until at last the long-looked-for signal was detected. On December 12 they heard three distinct taps signalling the letter "S" and wireless telegraphy across the Atlantic was an accomplished fact, needing only more perfect instruments to make it commercially possible.

In those early days the coherer was used to detect signals. All wireless students know how it works. The metal fillings in the coherer leap together at the touch of an electrical impulse and form a bridge for the current to pass over, and they have to be tapped apart before they can detect another electrical impulse. Senatore Marconi improved on the coherer as a receiver by inventing the magnetic detector. Yet there was room for still further improvement.

Wireless waves from spark sets arrive as a series of impulses, or gushes, and they set up an alternating current in the aerial wire, that is, a current that swings backward and forward. I realised that if this alternating current could be rectified or converted into direct current, it would be possible to use the mirror galvanometer of Kelvin to register oscillations that were possibly too weak for the known receivers to detect. I aimed, like many other men, to stop the current swinging back and to make it always flow forward.

It was a difficult problem. I experimented with many of the rectifiers then in use in my efforts to solve it. One rectifier can be made of plates of aluminium and graphite immersed in a solution of certain salts. The current was able to pass freely from the graphite to the aluminium, but when the current was reversed and attempts made to make it flow from the aluminium to the graphite, a deposit formed on the aluminium, which effectually stopped the current from flowing.

While this acted well enough for certain purposes when the frequency of the currents was low, it was quite useless for wireless purposes. With a low frequency current the electric impulses, coming slowly, gave time for the deposits to form on the aluminium plates. But wireless oscillations, coming at the rate of hundreds of thousands or millions a second, were so rapid that they gave no time to create the deposits.

Finding that these chemical rectifiers were not suitable for use with high frequency currents, I sought something that would operate more rapidly as a rectifier. I was pondering on the difficulties of the problem when my thoughts recurred to my experiments in connection with the Edison effect.

"Why not try lamps?" I thought.

Then and there I determined to see if they would serve the purpose. I went to a cabinet and brought out the same lamps that I used in by previous investigations. My assistant helped me to construct an oscillatory circuit with two Leyden jars, a weird wooden frame, and an induction coil. We then made another circuit, in which was inserted one of the lamps and a galvanometer, afterward tuning it to the same frequency as the first circuit.

It was about five o'clock in the evening when the apparatus was completed. I was, of course, most anxious to try the experiment without further loss of time. We set the two circuits some distance apart in the laboratory, and I started the oscillations in the primary circuit.

To my delight I saw the needle of the galvanometer indicated a steady direct current passing through, and found that we had in this peculiar kind of electric lamp a solution of the problem of rectifying high frequency wireless currents. The missing link in wireless was found —and it was an electric lamp.

I saw at once that the metal plate should be replaced by a metal cylinder enclosing the whole filament, so as to collect all the electrons projected from it. I accordingly had many carbon filament lamps made with metal cylinders and used them for rectifying the high frequency currents of wireless telegraphy.

This instrument I named an oscillation valve. It was at once found to be of value in wireless telegraphy, the mirror galvanometer that I used being replaced by an ordinary telephone, a replacement that could be made with advantage in those days when the spark system of wireless telegraphy was employed. In this form my valve was somewhat extensively used by Marconi's Telegraph Company as a detector of wireless waves. I applied for a patent in Great Britain on November 16, 1904.

In 1907 De Forest added the grid, consisting of a zigzag wire placed between the filament and the plate. Thus was born into the world the valuable thermionic valve, consisting of an incandescent filament enclosed in a highly exhausted glass bulb, the filament being surrounded by a metal cylinder, with a wire grid or cylinder of metal gauze placed between the cylinder and the filament.

It may be truly said that a little thing like a burned-out lamp led up in the course of years, and after countless experiments by many scientists, to the modern miracle of wireless telephony.

Since the date of my experiments in 1904, a countless multitude of eminent scientists have turned their attention to the study of the thermionic valve. In its three-electrode form, that is, with the spiral wire grid in addition to my metal cylinder, it has given us the solution of a long-considered problem—that of making a perfect telephone relay. It has enabled us to transmit speech by ordinary wires thousands of miles overland, as well as making possible the achievement of wireless telephony. It has become the master weapon of the telephonic engineer.

We are even now not nearly at the end of the services it may render to electrical science and to mankind.

## APPRECIATION.

Mr. Maclurean, our pioneer amateur, has the heartfelt appreciation of Australia's wireless experimentor. For the last 12 months he has given up his Sunday evenings to entertain them, and real fine entertainment it has been.

"Wireless Weekly" has during this week received many intimations of appreciation of Mr. Maclurean's concerts. "Long may they continue." Even when "Broadcasting" does come, we hope Mr. Chas. Maclurean will still continue his Sunday evenings entertainment.


### THE LEICHHARDT AND DISTRICT RADIO SOCIETY.

The 21st General Meeting of the above Society was held at the Victory Hall, Annandale, on Tuesday, 13th inst. A technical committee of six was formed, the following being nominated: F. Thompson, L. Collett, F. Lett, F. Roscoe, J. Dawson and W. J. Zech. The first two gentlemen are qualified naval operators, and Mr. Zech is an ex-service operator.

Arrangements were then made to hold a musical evening at the Club's Hall, on Tuesday, 20th inst., to entertain members of other clubs and persons interested in the Club's welfare. Mr. Raymond McIntosh has consented to give a demonstration of valve work on that night.

The rest of the night was taken up with an interesting demonstration by Mr. Fred. Lett, assisted by Mr. F. Roscoe, using a 3-valve set on an indoor aerial, 15 feet long. Some excellent results were obtained, at the conclusion of which a hearty vote of thanks was tendered the demonstrators.

Enquiries re the Society will be gladly received by Hon. Sec. (pro. tem.), Mr. Fred. Thompson, 12 Pearson Street, Balmain East.

### BALMAIN DISTRICT RADIO SOCIETY.

This Society is making steady progress. Three new members were admitted at our last meeting.

The night of meeting has been altered to Tuesday night, as this night is more convenient for the majority of our members. We are meeting at No. 71 Louisa Road, Long Nose Point, where the Society has an aerial erected, and a very fine set. Our structural masts for this aerial have been favourably commented upon. Buzzer practice is rigidly carried out regularly.

Our Honorary Draughtsman, Mr. W. Hammer, has drawn up plans for our new station and Club room, to be erected at No. 9 Nicholson Street, Balmain. This site has the highest altitude in Balmain, and the plan provides for eighty-four structural mast aerials, with a spread of 110 feet.

The Club room will be of concrete, 30 x 15, with 11 feet cavity walls.

As soon as the material can be assembled we will commence building.

This Society will be pleased to welcome any lady or gentleman who is interested in the science of radio. Any enquiries or information will be gladly supplied by the Acting Secretary, F. W. Ricord, 77 Gnone Street, Balmain.

### RADIO LEAGUE OF VICTORIA.

The fortnightly general meeting of the Club was held at the new and well appointed Club Rooms of the Presbyterian Church, Box Hill.

Elections for the following term was held at this meeting. The following gentlemen were elected unopposed:—President, Mr. Howden; Hon. Life Vice-President: Mrs. H. S. Benttie; Vice-Presidents, Rev. P. L. Forster, Mr. H. S. Benttie; Secretary, Mr. H. Hurst; Treasurer, Mr. G. Hitchcox; Assistant Secretary, Mr. Robinson. Elections for the Council resulted in: Mr. Lusty, Mr. Perks, Mr. Mathews, and Mr. Cummins.

After the usual business was dealt with, several items were dealt with on the Club's transmitting, and it has been decided that permission be got from the Church to erect an inverted "L" aerial to the height of 50 feet, and to take the best step to obtain the funds to complete the set.

The Club has indeed been very fortunate in obtaining the present Club Room, and it should be deemed a great honour by our members.

### QUEENSLAND INSURANCE RADIO CLUB.

The application for license by the above new Club indicates the trend of wireless, the importance of which is emphasised by the Managing Director of the Queensland Insurance Co., Ltd., giving his patronage to the Staff's Club.

No doubt other commercial concerns and the banks will follow by lending their support to movements by their staffs in this direction, which must tend to promote that spirit in their services so necessary for the progress of business.

A fine antenna has been erected on the roof of the Company's six storey building in Bridge Street, and a well equipped station is being furnished in it.

The principals of the Club are:—Patron, A. McVernon, Esq.; President, S. A. Grace; Secretary, A. S. Llewellyn; Assistant Secretary, A. G. Dodd; Treasurer, J. H. Taylor.

### ILLAWARRA RADIO CLUB.

The 18th General Meeting of the Illawarra Radio Club was held at the Club-room, 75 Montgomery Street, Kogarah, on Thursday, 15th March. Two new members were elected.

The Secretary reported the position with regard to the Club's receiving set, which he anticipated would be ready for operation by next meeting. All materials for the aerial being now in hand, it was proposed to erect same forthwith, and arrangements were made accordingly.

Mr. S. Atkinson delivered an interesting lecture on "Phase Relation between Current and E.M.F. in Tuned Circuits." An understanding of these underlying principles enabled one to see better why in operating a set best results or loudest signals were possible only when these factors were in proper relation to each other. On the question of phase difference, it was stated that while the frequency of an alternating current flowing as a result of an applied electra-motive force would be the same as the frequency of the e.m.f., it did not necessarily follow that the two would rise and fall in unison, or, otherwise, would be in phase with each other. Due to conditions existing in the circuit, the current may reach its maximum value either before or after the e.m.f., may be leading or lagging behind the e.m.f, in either of which cases

they were said to be out of phase. The causes of 'these variations or phase differences in electrical circuits were analogous to corresponding conditions existing in mechanical systems. The 'properties of an electrical circuit to be considered were resistance, inductance and capacity, which in a moving system 'were equivalent to friction, mass and flexibility respectively; there were also to be considered the factors of quantity, current and e.m.f. in the electrical 'circuit, analogous to the mechanical factors of movement, speed and twisting force or torque. By means of 'these mechanical analogies, the lecturer was able to make clear what took place, and the resulting 'variations in flow of e.m.f. and current in an electrical circuit on (a) resistance, (b) inductance, and (c) capacity 'being introduced into the circuit; and the consequent effects on phase relation were fully illustrated by means of sine curve diagrams.

A great deal of information was to be gained from 'the lecture, resulting as it did in many points being raised which lead to some keenly 'interesting discussion; the vexed question of harmonics, their causes and effects, also came in for some lively argument in which all joined.

At the 'conclusion, a vote of thanks was unanimously accorded the lecturer, who responded.

The next meeting of the Club will be held 'at the Club Room (as above), on Thursday, 29th March, at 8 p.m., when Mr. Hewett will lecture on "Valve Reception 'and Circuits." All interested are invited to attend.

## CONCORD RADIO CLUB.

Dear Sir,

The following is our report of Club meetnig, held on the 14th:—

At the Concord Radio Club meeting, on Thursday, March 14th, Mr. Chas. W. Slade, Principal of Croydon Radio School, gave a very instructive lecture on "Radio Waves, Damped and Undamped."

He commenced by comparing them with sound and light waves, explaining step by step how the different frequencies and wave lengths affected each.

Intense interest was displayed throughout by all members present, and it was decided to ask Mr. Slade to lecture again in the near future.

Mr. Slade's School at Croydon comes as a boon to the local amateurs, his fe being small and his interest in radio vast. He has recently returned fro mthe Royal Navy, where he had 13 years' radio experience.

Mr. Slade stressed the need for careful operation of valves, much useful information along this line.

## RADIO INSTALLATION RULES

of 'the

FIRE UNDERWRITERS' ASSOCIATION OF NEW SOUTH WALES,

'issued by

QUEENSLAND INSURANCE RADIO CLUB.

The following is a summary of the Rules' adopted by Insurance Companies on the 6th instant, which, if not complied with will occasion the charge of additional rates for present insurances on dwellings and other risks to which aerials are connected.

Where insurances already exist and radio installations have 'been made in buildings insured or in which the contents are covered, the insurance company should be 'notified, so that same may be inspected, and the policy placed in order by having the necessary endorsement thereon.

RECEIVING STATIONS ONLY.

ANTENNA:

Outside of buildings should be of rugged and 'durable construction, and shall not be in such a position that they can come in contact with electric light or 'power wires by sagging failure or otherwise. The splices and joints in the span should be soldered.

LEAD-IN 'WIRES:

Must be of not less than No. 16 S.W.G. Copper, or No. 18 S.W.G. copper clad steel, must not 'be nearer than 12 inches to electric light and power wires, unless separated therefrom by 'a continuous and firmly fixed non-conductor (additional to any insulation on wire) that will maintain perfect separation.

PROTECTIVE DEVICE:

The lead-in wires shall be provided with lightning arrester of approved pattern, operating 'at potential of 500 volts or less, fixed as near as practicable to point (inside or outside) 'where wires enter the building and not in vicinity of easily ignitable material or gases. An antenna grounding switch is desirable, and in its closed position should form a shunt around the device, but 'must not replace the lightning arrester.

PROTECTIVE GROUND WIRE:

May be bare or insulated of not less than 16 S.W.G. copper, and run in as straight line as possible to good permanent ground, preferably water piping. Gas piping is absolutely debarred.' The grounding of the aerial is of primary importance to minimise lightning hazard.

GROUND WIRE:

Must be 'of not less than No. 16 S.W.G. copper, or 18 approved copper clad steel, bare or insulated, running inside or outside of building, 'and may be used as the "protective ground wire" if conforming to rule in connection therewith.

(The Underwriters' Rules for Transmitting Stations will appear in next 'week's issue.)

## QUESTIONS.

J. Gawland (Hunter's Hill):

(1) This arrangement would be quite suitable.

(2) Contacts should be furnished with nuts, especially to take the lead wires, and therefoe need no soldering.



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