THE LOOP AERIAL

THEORY OF OPERATION

CORRECT DESIGNING.

The loop aerial is a very interesting device. It is quite different in its method of operation from the outdoor aerial. The outdoor aerial is in effect nothing more nor less than a condenser. It is a very large condenser, to be sure, so far as its physical dimensions are concerned, but electrically it is a relatively small condenser. The loop, on the other hand, is an inductance. This fundamental difference between the two is the reason why it is necessary to use different methods of tuning in the two cases.

There is a very close parallel between the ordinary direct current generator or dynamo and the loop aerial exposed to passing radio waves. In the dynamo a number of coils corresponding to the loop aerial are rotated in a powerful magnetic field. The purpose of rotating them is in order that they may move with respect to the field and thus have a voltage generated in them.

LOOP ACTS AS COIL.

In the radio case the loop, acting as a coil, stands still, but the field moves swiftly past the coil, thus accomplishing the same result. The speed at which the field moves cannot, of course, be varied and is always the speed of light; that is, 186,000 miles per second

Let us see now what form of loop would have the greatest voltage generated in it by a passing radio wave. Let us think of this radio wave as very much like great smooth waves on the ocean, which move forward with a very definite velocity. The turns of wire on our loop aerial are necessarily in series with each other; that is to say, they form a continuous winding. If the maximum voltage is to be generated in any one turn of the loop then the voltage generated in the two sides of this turn should be in opposite directions, so that they may add and not oppose each other.

If the voltage generated in both sides of the loop were in the upward direction in any one instance then these two voltages would cancel each other, but if the voltage on one side of the turn was up and on the other side of turn it was down then they would add, and if the loop were connected to a receiver a current would flow around the turns of the loop.

A QUESTION OF SIZE.

Now, in order to have the voltage generated on one side of the loop in the opposite direction to that generated on the other side of the loop the loop would have to be one-half a wave length long; that is to say, it would have to be long enough in the horizontal direction so that one side was in the crest of the wave when the other side was in the trough of the wave. Since the distance between the crest of the wave is the wave length itself, then the distances from the crest to the trough is one-half the wave length.

The higher the sides of the loop are, that is, the longer the vertical wires are, the greater will be the voltage generated, and of course the voltage generated in each turn is added to the voltage generated in all the other turns.

HOW LOOP FUNCTIONS.

But a loop one-half a wave length long is quite out of the question. It would be as long as a steamship and almost as difficult to handle. The loops which we are using every day are of quite reasonable dimensions. They are only a few thousandths of a wave length long. How do they function? In order to answer this question let us ask ourselves how we would build a coil of wire in order that absolutely no voltage should be generated in it by the passing wave.

The only way in which this could be accomplished would be to so build the coil that the same voltage would be generated in both sides of it and that the voltage generated in the two sides would be opposed to each other This would give a complete cancellation and no voltage at all at the terminals of the loop or coil.

It is obvious that the only way in which this could be done would be by so arranging the loop that it had no length at all. That is to say, arranging it so that the two sides were exactly in the same position in space. This would mean that the horizontal wires across the top and bottom of the loop would cease to exist and the loop would become nothing but a wire laced up and down between pegs on the plain surface of a board.

TO OBTAIN VOLTAGE.

If there is any distance at all between the two sides of the loop then there will be some difference, not in the amount of voltage generated in the two sides, but in the time at which this voltage is generated, and there will consequently be some voltage at the terminals of the loop. since complete cancellation of voltages cannot occur.

If the loop is rotated so that its horizontal wires are at right angles to the direction in which the signal is coming then the loop has no length so far as these signals are concerned. The passing wave strikes both sides of each turn in the loop at exactly the same instant and the voltages generated are therefore equal and opposed, and there is no terminal voltage. This is of course the fact which gives the loop antenna its very useful directional property.

In applying the loop aerial to an actual radio receiver it is necessary that provision be made to tune it to resonance with the desired signal. This is accomplished by means of a variable air condenser, and since this condenser has a very definite maximum capacity the amount of inductance which the loop can have is also limited.

BEST TYPE OF LOOP.

The specification for the best loop aerial, therefore, is that it shall have just as many turns as possible, each turn being just as long as possible and just as high as possible and still have no more than the required maximum inductance. The higher the loop is the greater will be the voltage generated in each side of each turn, and the longer it is the greater will be the difference in time at which these voltages are generated in the two sides of the loop, and consequently the greater will be the voltage at the terminals, but it must not have an inductance value greater than that required for tuning.

In order to get the maximum number of turns for a given inductance which is what our loop requires, the turns should be wound just as far apart as possible It is found that this spacing is best accomplished by winding the loop on a frame which has the form of a vertical cylinder.

LISTENING-IN ON TRAINS

CANADA'S RADIO ENTERPRISE

ENTERTAINMENT FOR PASSENGERS.

Despite the fact that the train was speeding along at more than forty miles an hour on its way from Boston to Montreal, regardless of daylight and the hilly country through which the road lay, passengers in the parlour car were being entertained in a most novel fashion. From the loudspeaker at the end of the car issued forth music from New York and Schenectady with a volume which was easily heard by the passengers in the rearmost seat. And if at any time any passenger wished to listen more closely to the concert, he had but to put on the earphones which hung beside his seat.

As nightfall gathered and the music became even louder, reception improving with a resultant greater choice of stations, a feeling of admiration and awe pervaded the train. To pick up entertainment such as this, with as good a quality of tone and as small an amount of interference as one has in one's parlour at home, seemed incredible. The most sceptical on the subject of radio on moving trains would have been entirely convinced.

The Government-owned railway of Canada operates on its runs from coast to coast 76 trains equipped with receiving apparatus. Practically any of the longer trips in Canada may now be made more pleasant with the entertainment afforded by the radio.

BOX AERIAL USED.

A box aerial extending the length of the car and about seven inches above the metal roof, is used. The aerial is supported on glass insulators above the roof of the car, which is used as the earth for the receiver, thus allowing but a very short distance between aerial and earth. At the place nearest the position of the radio receiver the aerial is tapped and a lead-in brought to the set.

The receiver is housed in an upright cabinet, being a separate unit loosely placed in the container. Above and below the place for the receiver there is room for batteries and accessory apparatus, while on top of the cabinet is the cone loudspeaker.

As mentioned before, there is a pair of earphones plugged in at each seat, the fittings for these plugs being specially built into the car, and the wiring to the receiver is behind the panels. The number of phones used varies as to the number of seats, from 28 to 40 being used. These are connected to the receiver in sets of five, each five 'phones being hooked up in series, and each set in parallel. A special transformer on the output terminals of the set leads to these 'phones.

In most of the cars the receiver used is a four-valve reflex, doing the duty of a six-valve set, and fitted with a three-stage power amplifier for use with the loudspeaker. This receiver is specially made for the railway company, and is not found on the market, although at one time it was among the sets on sale to the public. The choice of this set and the five-valve neutrodyne of the same make on the newer cars, such as the Boston-Montreal, was only made after exhaustive tests had been conducted with a great variety of receivers.

SUPER-HETS. USELESS.

Loop aerials and super-heterodynes were found to be useless on moving trains, especially on the steel cars which make up the majority of those on the Canadian lines. There are still sets being tried out for new cars, and all the cars being built as parlour cars are now wired for radio while under construction.

To ensure the passengers' good reception, a radio operator is carried on each radio-equipped car These operators are, in the main, young men, specially trained to use the radio receivers on the trains, and know to a nicety what to expect on a run, and where to find stations quickly without picking up too much interference from telegraph and power lines.

TUNNELS CAUSE FADING.

It is interesting to listen critically to the concerts when going through cuttings, tunnels, and over steel bridges. Each of these structures has a tendency to blot the music out, sometimes noticeably, and at other times barely perceptible. Power lines also cause some trouble, and at some stations it is necessary to turn the set off on account of interference caused by the telegraph instruments.

Although a few railroads in the United States also carry radio-equipped cars, none of the companies have gone into the system, in the same manner as the Canadian National Railways Trains operating into the United States from Canada are now being equipped.

The Children's Corner

By "ARIEL"

Dear Radio Children.—I am keeping Our Zoo open for another week to allow belated "Surprizes" to come straggling in! So many animals arrive just as the door is shut. The "Squealer" we have in our Corner this week, drawn by Ronald Sutton, was a "late bird," but I thought you would all like to see him. He is really perched on the top of a very, very, long aerial pole, but we had to cut a lot of it off to get him in! I think he is rather a dear little chap in spite of the horrible din he is capable of producing? Have you all been having a shot at Big Brother Bill's Limerick Competition? It is great fun to hear them over the air, isn't it?

Our Poem Prize has been won by Eileen Hurrell of 134, Fisher Street, Beckenham, who has written about her little dog "Spot."

I have been so interested in the snaps some of my Radio Children have sent me. One day I must make a picture gallery of them for Our Corner.—Love to everyone,

ARIEL.

A Radio Ryme

HUSHEEN.

Oh! who is this that softly lies
At my heart's door with drowsy eyes,
While shadows o'er the sunset skies
Steal silently and soon, O!

**Husheen, Husho,*
Hush and lullalo,
Husheen, Husho,
†Hush go ciuin go lo!

It is my treasure noon and night,
It is my heart's love at first sight;
Oh, joy! to press that cheek so light,
And to my wee one croon, O!

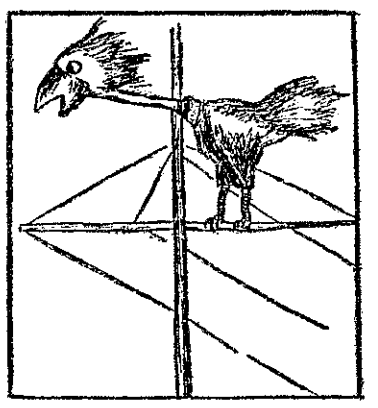
Husheen, Husho,
Hush and lullalo,
Husheen, Husho,
Hush go ciuin go lo!

Now the dusky night creeps down
O'er sleepy stream and heather brown,
High above the dreamy town
There floats the silver moon, O!

Husheen, Husho,
Hush and lullalo,
Husheen, Husho,
Hush go ciuin go lo!

—Francis A. Fahy.

†"Hush softly till dawn," pronounced "Hush guc kyune gul lo."
**Pronounced "Hush-een."*



THE SQUEALER

The "Squealer" sits on the aerial tops,
Squealing until he nearly drops,
When someone tunes his set in wrong,
Old "Squealer" is sure to come trotting along.

—Ronald Sutton, Invercargill.

THE PRIZE POEM

"SPOT."

He was just a little doggy, with a wriggling, stumpy tail,
But if you were to call him, to come, he wouldn't fail;
I loved this little doggy, stumpy tail or not,
And half of my affections were given to our Spot.
He never could agree with our fluffy Persian cat,
But, as he was a dog, it can't be wondered at!
He would chase her down the garden and then she'd climb a tree,
Looking very disgusted he would then return to me.
I'd take him to the river and let him have a swim,
I remember well how eagerly he'd take a big dive in;
Then I would take him in a punt for a jolly river ride,
For he always was so happy when nestling by my side.
His dear big doggy eyes would look so tenderly at mine,
And from their great brown depths pure faithfulness would shine.
Sometimes he'd catch a rabbit, and, looking up at me,
The expression on his face would say, "Here! Take this for your tea."
He lived to quite a ripe old age, and when he died at last
I though my heart was breaking, my tears fell thick and fast;
And now out in the garden is a little flower-grown plot,
With a stone on which is written, "Here lies our doggy—Spot."

—Eileen Hurrell (aged 14 years).

THE DISHONEST DAIRYMAN

Can you make sense of the following by inserting the letter "I", repeated as often as you like:—

F T H N M L K B R N G S L L C T T N, T H N K L L S K M T, M X T, T L L T'S T H N.

This is not nearly so hard as it looks. Start off with an "I" before the first "F," and make the word "H." Then just put in "I's" where you find they will make words.

A BEDTIME STORY

Elizabeth was a most industrious girl. She could sew frills on her aprons, plait her own hair neatly over her ears, and she always dressed her children beautifully and made all their clothes herself.

There were four of them: Golliwog, Peg, Meg, and the Midget. Golliwog always wore a tidy red coat and blue trousers; Peg had a beautiful tartan silk dress; Meg wore white, because Elizabeth thought it suited her round rosy face; and the Midget wore nothing at all because he was Elizabeth's new baby, and she had no time to make him any clothes till she had finished the scarf that she was knitting for her Grandpapa.

"Two plain, one purl. I really must get it done."

The garden looked very, very tempting through the open window, but Elizabeth kept on patiently knitting.

The children were sitting at her feet as good as gold, and Elizabeth was amazed to see Golliwog suddenly get up, pull at her skirt, and say: "Elizabeth, that's such a dull song you're singing—Two plain, one purl! Let's go into the garden and dance."

And then Peg rose up and said: "No, let's skip," and she tried to snatch Elizabeth's wool for a skipping-rope; and Meg, smiling sweetly, began to make a cat's cradle with the wool on the floor; and the Midget got up and played football with the ball. And the odd part of it was that Elizabeth couldn't answer, because her head felt top-heavy, and then began to nod in the silliest way, and she felt quite sure somebody was sitting on her eyes.

She knew nothing else until a fly tickled her nose and she saw the room again.

The children were all sitting at her feet as good as gold. Golliwog looked solemn, Peg prim, Meg amiable, and the Midget so small that it seemed impossible to believe he had ever shot a football into goal.

But something so annoying had happened that Elizabeth clasped her hands in dismay, and cried:

"Oh dear! I shall have to do it all over again!"

The knitting needles still lay in her lap, but every stitch of knitting had been undone as well as the ball of wool, and it was all twisted round the legs of the chairs and tables.

Then Janet came in with tea, and cried: "Well, I never! What a mess! Who did that, I'd like to know?"

"The dolls," declared Elizabeth.

Janet said Elizabeth was talking nonsense. The dolls said nothing at all, and the people next door said: "Oh, Micky, where have you been?" when their black kitten came home to tea, very tired.

BRUIN GOES SHOPPING.

A bear got loose from the Zoo, and, strolling along a street in the town, he wandered into a draper's shop, to the great alarm of the assistants, who were too frightened to guess what he'd come for. What Bruin really wanted was muslin (muzzling)!

THE LARK AND THE CAT.

"When is a lark like a cat?"
"When it purrs, of course."
"Does it ever purr?"
"Surely you have heard of the larkspur!"

HARRY'S RESCUE

This is a little story written by Peggy Farquhar, Mt. Hutt, about the little Fijian boy seen in the advertisement for Ryland's Wire.

Once upon a time, in Fiji, there lived a poor native boy called Harry.

His clothes were in rags and his feet were bare. He did not mind this, because it was so hot there.

He was an orphan, and he thought nobody cared for him.

One day, while he was walking along a street in one of the popular towns of Fiji, he saw a little girl rush out into the street. In a flash he was after her and just had enough time to carry her safely to the pavement at the other side of the street before a speeding motor passed by. Thus this ignorant little child would have been run over had not this clever native boy saved her.

Soon, beside him stood the thankful mother. She asked him where he lived His reply was: "I have no 'ome, no money, and I am only a miserable little orphan." Harry soon found himself being taken home with the child and her mother.

They arrived at the house, and the father, hearing of the rescue, offered Harry the job of helping him to sell wire.

If he did this, the father said, he would give him food, clothing, and a good and comfortable home.

Harry, thankful of food, without clothing and a good home, thanked the kind father so much that tears came into his eyes, and he now began to feel the loss of his own dear father and mother.

"THE CONVERT"

A story written by Bruce Jones, Musselburgh, Dunedin, about one of the series of advertisements of "Three Castles Cigarettes."

There was once a lady who wore an old fashioned dress—a crinoline. She was shocked and very indignant about the present habits and fashions, especially the short dresses and cigarette smoking by the young ladies of the present day. There was a vast difference between the crinoline and the present day dress, as anyone will see if they study the old photographs. This old lady, who, by the way, was called Fanny, was offered a cigarette by one of the young ladies. She felt so hurt by this insult that she cracked her on the head with her parasol. The cigarette was knocked out of the young girl's mouth, then she ran away. The old lady picked up the cigarette, and, for curiosity, had a puff. She found the smoke very nice, and continued to smoke the cigarette. She was so pleased with it, that she noted the name—"Three Castles Yellow." It is safe to say that this lady was a convert to cigarette smoking.

LETTERS

Dear Ariel,—It is a wet day and I did not know what to do with myself, so I decided to write to you for the third time. We have been having summer weather here; is it fine in Wellington? On Thursday night we had a friend who wanted to hear a lecture from 2YA, but, sad to say, there was static. Later, we turned on Auckland, but there was still static. I then went to the door and saw not a star in the sky. Our friend was disappointed, and so were we. Have you ever spoken on wireless yet? I am looking forward to the results of the story competition, and also to see the squealer. I am very sorry that cricket has come in, as I prefer football to any other game, but when the summer comes I shall go to camp with the Boy Scouts, as I left the Cubs and was promoted yesterday week. One of the Scouts told me we are going to the White Cliffs, a distance of 18 miles. We are holding an entertainment on Thursday night, about which I shall tell you in my next letter.—GEORGE BEST.

Dear Ariel,—I suppose the "wireless zoo" is getting nearly finished by now. I like all the animals, which have been drawn for our corner. I am sending you my painting and some Limericks. I do wish we could have a cross-word puzzle. I am sure everybody likes them. Love to "Our Corner" and best of wishes.—A loving reader.—NANCY McNIE.

P.S.—Many thanks for publishing my Limericks in the "Radio."

Dear Ariel,—I was so pleased to know I won the painting prize, and I hope that some of the others will have a chance of winning a prize another time. This is the first time I have won a prize, and I just love painting. I am sending you a picture of myself, and if you like you may put this picture in the Children's Corner of the "Record." I have a cat called Tinker, and she is a dear. Thank you so much for the book.—HAZEL HOWARD.

Dear Ariel,—Thank you very much for the prize awarded me for the "Fadout." I regret that I have been so long in acknowledging it. I am going to learn boxing for a quarter. I think it is grand exercise. I am in standard VI, and I go to the North Invercargill School. My teacher, whose name is Mr. Charles Blake, used to live in Wellington. His chief hobby is painting.—RONALD SUTTON.

LIMERICKS

There was once a young man out at Kew,
Whose aerial got somehow askew,
He climbed up the mast,
To make the end fast,
And that is the last that he knew!

There was once a young man at Broad Bay,
Who "listened in" day after day;
When he heard Brother Bill,
He took suddenly ill,
Since then he has shunned 4YA.