Construction of Simplified Radio Sets

RADIO
FLASH

CONTENTS

How To Make A Cigar Box Crystal Detector Radiophone Receiver
Aerial Diagrams
Wiring Diagram for Two-Slide Tuning Coil
Wiring Diagram for Loose Coupler
How to make a Supersensitive Regenerative Receiving Tuner
Hook Up for a Vacuum Tube Detector
Vacuum Tube Detector Control
Hook Up for a Detector and One-Step Amplifier
Detector and One-Step Amplifier
Hook Up for a Detector and Two-Step Amplifier
Detector and Two-Step Amplifier
Navy Set and Hook Up
Symbols Used in Radio Hook Ups
Easy Way to Learn Radio Telegraph Code

Copyrighted 1922 by Hubbs Publishing Co., Inc.

No. 1
10 Cents

Published by Wm. E. Hubbs 600 Fisher Ave. North Bergen, New Jersey
DIAGRAM FOR ANTENNA

MATERIALS REQUIRED

1. 100 FT. 1/4 HARD DRAWN COPPER WIRE
   OR
   100 FT. 22 B.S. 7-STRAND COPPER WIRE
2. INSULATORS
   1 - 4 PORCELAIN TUBE
   2 SCREW HOOKS

TWO WIRE AERIAL

MATERIALS REQUIRED

1. 100 FT. 22 B.S. 7-STRAND COPPER WIRE
   OR
   100 FT. 1/4 HARD DRAWN COPPER WIRE
2. INSULATORS
   1 - 4 PORCELAIN TUBE
   1 SCREW HOOK
3. 80 FT CLOTHES LINE
4. 1 PULLEY
5. 1 CLEAT

INSULATOR

PULLEY

SPREADER

CLOTHES LINE

WATER PIPE

GROUND CLAMP
HOW TO MAKE A CIGAR BOX CRYSTAL DETECTOR RADIOPHONE RECEIVER

REAR VIEW DETAIL OF PANEL B

DETAIL OF PANEL A

DETAIL OF DETECTOR PARTS

SIDE VIEW OF CLIP

DETAIL OF SLIDER

VIEW OF COMPLETE RADIOPHONE RECEIVER

LIST OF MATERIALS

DIAGRAMMATIC HOOK-UP OF SET

DIRECTIONS:

No. Description Size Material
1 Cigar Box 8 x 5 x 3/4 Wood
2 Panel A 8 x 2 x 7/8 Wood
3 Panel B 7 x 2 1/4 x 7/8 Wood
4 Panel C 2 1/2 x 1 5/8 x 7/8 Composition
5 Ground Rod No. 6 Copper
6 Ground Clamp 1/2 x 1 1/2 x 1/2 Wood
7 Crystal Cup 1 x 1 x 1 Wood
8 Mica Plate for C 1/2 x 1/2 x 1 Wood
9 Nut for C 1/2 x 1/2 x 1 Wood
10 Set Screw 1/8 x 1/4 x 1/2 Wood
11 Crystal Rod 3/8 x 3/4 x 1/2 Wood
12 Crystal and Mounting Rod 3/8 x 3/4 x 1/2 Wood
13 Phone Condenser 0.01 M.F.
14 Grounding Post 1 x 1 x 1 Wood
15 Grounding Post 1 x 1 x 1 Wood
16 Grounding Post 1 x 1 x 1 Wood
17 Grounding Post 1 x 1 x 1 Wood
18 Grounding Post 1 x 1 x 1 Wood
19 Grounding Post 1 x 1 x 1 Wood
20 Grounding Post 1 x 1 x 1 Wood
21 Grounding Post 1 x 1 x 1 Wood
22 Grounding Post 1 x 1 x 1 Wood
23 Grounding Post 1 x 1 x 1 Wood
24 Grounding Post 1 x 1 x 1 Wood
25 Grounding Post 1 x 1 x 1 Wood
26 Grounding Post 1 x 1 x 1 Wood
27 Grounding Post 1 x 1 x 1 Wood
28 Grounding Post 1 x 1 x 1 Wood
29 Grounding Post 1 x 1 x 1 Wood
30 Grounding Post 1 x 1 x 1 Wood
31 Grounding Post 1 x 1 x 1 Wood
32 Grounding Post 1 x 1 x 1 Wood
33 Grounding Post 1 x 1 x 1 Wood
34 Grounding Post 1 x 1 x 1 Wood
35 Grounding Post 1 x 1 x 1 Wood
36 Grounding Post 1 x 1 x 1 Wood
37 Grounding Post 1 x 1 x 1 Wood
38 Grounding Post 1 x 1 x 1 Wood
39 Grounding Post 1 x 1 x 1 Wood
40 Grounding Post 1 x 1 x 1 Wood
41 Grounding Post 1 x 1 x 1 Wood
42 Grounding Post 1 x 1 x 1 Wood
43 Grounding Post 1 x 1 x 1 Wood
44 Grounding Post 1 x 1 x 1 Wood
45 Grounding Post 1 x 1 x 1 Wood
46 Grounding Post 1 x 1 x 1 Wood
47 Grounding Post 1 x 1 x 1 Wood
48 Grounding Post 1 x 1 x 1 Wood
49 Grounding Post 1 x 1 x 1 Wood
50 Grounding Post 1 x 1 x 1 Wood
51 Grounding Post 1 x 1 x 1 Wood
52 Grounding Post 1 x 1 x 1 Wood
53 Grounding Post 1 x 1 x 1 Wood
54 Grounding Post 1 x 1 x 1 Wood
55 Grounding Post 1 x 1 x 1 Wood
56 Grounding Post 1 x 1 x 1 Wood
57 Grounding Post 1 x 1 x 1 Wood
58 Grounding Post 1 x 1 x 1 Wood
59 Grounding Post 1 x 1 x 1 Wood
60 Grounding Post 1 x 1 x 1 Wood
61 Grounding Post 1 x 1 x 1 Wood
62 Grounding Post 1 x 1 x 1 Wood
63 Grounding Post 1 x 1 x 1 Wood
64 Grounding Post 1 x 1 x 1 Wood
65 Grounding Post 1 x 1 x 1 Wood
66 Grounding Post 1 x 1 x 1 Wood
67 Grounding Post 1 x 1 x 1 Wood
68 Grounding Post 1 x 1 x 1 Wood
69 Grounding Post 1 x 1 x 1 Wood
70 Grounding Post 1 x 1 x 1 Wood
71 Grounding Post 1 x 1 x 1 Wood
72 Grounding Post 1 x 1 x 1 Wood
73 Grounding Post 1 x 1 x 1 Wood
74 Grounding Post 1 x 1 x 1 Wood
75 Grounding Post 1 x 1 x 1 Wood
76 Grounding Post 1 x 1 x 1 Wood
77 Grounding Post 1 x 1 x 1 Wood
78 Grounding Post 1 x 1 x 1 Wood
79 Grounding Post 1 x 1 x 1 Wood
80 Grounding Post 1 x 1 x 1 Wood
81 Grounding Post 1 x 1 x 1 Wood
82 Grounding Post 1 x 1 x 1 Wood
83 Grounding Post 1 x 1 x 1 Wood
84 Grounding Post 1 x 1 x 1 Wood
85 Grounding Post 1 x 1 x 1 Wood
86 Grounding Post 1 x 1 x 1 Wood
87 Grounding Post 1 x 1 x 1 Wood
88 Grounding Post 1 x 1 x 1 Wood
89 Grounding Post 1 x 1 x 1 Wood
90 Grounding Post 1 x 1 x 1 Wood
91 Grounding Post 1 x 1 x 1 Wood
92 Grounding Post 1 x 1 x 1 Wood
93 Grounding Post 1 x 1 x 1 Wood
94 Grounding Post 1 x 1 x 1 Wood
95 Grounding Post 1 x 1 x 1 Wood
96 Grounding Post 1 x 1 x 1 Wood
97 Grounding Post 1 x 1 x 1 Wood
98 Grounding Post 1 x 1 x 1 Wood
99 Grounding Post 1 x 1 x 1 Wood
100 Grounding Post 1 x 1 x 1 Wood

In installing the aerial great care should be taken to have all parts well insulated. All permanent connections within the cigar box should be soldered. In connecting the ground wire to the earth pipe or other grounded pipe it is best to use a copper ground clamp. Scrape the pipe clean before applying the clamp and solder the wire to the clamp. If no clamp is available, parts wire can be wound tightly around the pipe after both have been filed clean and the wire attached. To obtain best results with a crystal detector radiophone set, two things are absolutely essential. First, a sensitive crystal and second a sensitive head set. Be sure both these articles have been thoroughly tested before purchasing them. A good crystal can be spoiled by careless handling. Keep the fingers off the surface of the crystal. The crystal can be cleaned by brushing with benzine or naphtha. The galena crystal works best when the cat whisker makes light contact.
TWO SLIDE TUNING COIL WIRING DIAGRAM

Board Assembled

Cross Section of Coil

REQUIRED MATERIALS.

1 BOTTOM BOARD
2 END BLOCKS
1 PAPER TUBE 5½’x 7
3 SPOOLS NO. 22 ENAM. WIRE
2 SLIDE RODS
2 SLIDERS
4 SCREWS FOR SLIDER RODS
4 SCREWS FOR 2 END BLOCKS

1 SMALL SINGLE BINDING POSTS
2 MEDIUM DOUBLE BINDING POSTS
1 FIXED PHONE CONDENSER
1 CRYSTAL DETECTOR
1 CRYSTAL GALENA-MOUNTED
4 PHONE POINTS
6 RUBBER BUMPERS.

HOOK UP FOR A DETECTOR AND ONE STEP AMPLIFIER
LOOSE COUPLER WIRING DIAGRAM

Cross-Section of Coupler

Secondary
Shows method of tapping

Primary

Connect to A. and B. as in fig. 2.

Condenser and detector connected to coupler.

Phone condenser

Detector

Phones

REQUİRED MATERIALS.

SECONDARY COIL

3 SPOOLS 22 ENAM WIRE.
9 SWITCH POINTS
1 SWITCH COMPLETE
2 SMALL SINGLE BINDING POSTS.
1 3 ROUND INSIDE BLOCK
1 3½ DRILLED OUTSIDE BLOCK
1 3 PAPER TUBE

1 CRYSTAL GALENA- MOUNTED
4 PHONE POINTS
12½ OF PHONE WIRE- TWISTED
6 RUBBER BUMPERS
4 LARGE SINGLE BINDING POSTS
2 LARGE DOUBLE BINDING POSTS
1 FIXED PHONE CONDENSER
1 CRYSTAL DETECTOR

PRIMARY COIL

1 SLIDE ROD
1 SLIDER
2 SCREWS FOR SLIDER ROD
4 SCREWS FOR END BLOCKS
1 BOTTOM BOARD WITH FIXED END
1 CLOSED END BLOCK
1 OPEN END BLOCK
1 PAPER TUBE 3½ x 7½
3 SPOOLS 22 ENAM WIRE
HOW TO MAKE A SUPERSENSITIVE REGENERATIVE RECEIVING TUNER

HOOUP OF SUPER-SENSITIVE REGENERATIVE RECEIVING TUNER WITH VACUUM TUBE DETECTOR

FRONT VIEW OF PANEL

REAR VIEW OF PANEL

LIST OF MATERIALS

<table>
<thead>
<tr>
<th>No. Req'd</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Variometers</td>
</tr>
<tr>
<td>2</td>
<td>Variometer Knobs</td>
</tr>
<tr>
<td>2</td>
<td>Variometer Dials</td>
</tr>
<tr>
<td>1</td>
<td>Vario coupler</td>
</tr>
<tr>
<td>1</td>
<td>Vario coupler Knob</td>
</tr>
<tr>
<td>1</td>
<td>Vario coupler Dial</td>
</tr>
<tr>
<td>1</td>
<td>Switch Lever</td>
</tr>
<tr>
<td>10</td>
<td>Switch Points</td>
</tr>
<tr>
<td>2</td>
<td>Switch Stops</td>
</tr>
<tr>
<td>1</td>
<td>Composition (Bakelite, etc.)</td>
</tr>
<tr>
<td>1</td>
<td>Hard Rubber Panel 18 7/16 x 3/4&quot;</td>
</tr>
<tr>
<td>1</td>
<td>Wood Base 18 7/16 x 3/4&quot;</td>
</tr>
<tr>
<td>2</td>
<td>Binding Post</td>
</tr>
<tr>
<td>6</td>
<td>Wood Screws</td>
</tr>
</tbody>
</table>

DIRECTIONS

This short wave regenerative tuner is especially designed for connection to a vacuum tube detector. - The variometers are used for tuning and the circuits are inductively coupled. Broadcasting received with this circuit will come in very loud and extremely sharp tuning is also obtainable. - In constructing this tuner, a pattern the exact size of the panel should be laid out on a sheet of paper. - The position of the various switch points, binding posts, center shafts of variometers and vario coupler, attachment screws, etc. should then be marked on the paper and this can be used as a template in locating the positions of the holes to be drilled in the panel. - The variometers and vario couplers should be screwed to the wooden base. - The variometers should be rotatable through 180 degrees.

The wiring should be of the bus bar type, using No.16 bare copper wire in order to get necessary rigidity.

All connections should be carefully soldered using resin as a flux in preference to other kinds of flux.
BACK VIEW OF PANEL & TOP VIEW OF BASE OF A VACUUM TUBE DETECTOR CONTROL

HOOK UP FOR A VACUUM TUBE DETECTOR

LIST OF PARTS

<table>
<thead>
<tr>
<th>REO</th>
<th>DESCRIPTION</th>
<th>REQ</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Panel about 4&quot;x6&quot;</td>
<td>1</td>
<td>Grid Condenser</td>
</tr>
<tr>
<td>F2</td>
<td>Base &quot; 4&quot;x6&quot;</td>
<td>1</td>
<td>Grid Condenser</td>
</tr>
<tr>
<td>F3</td>
<td>Rheostat</td>
<td>1</td>
<td>Vacuum Tube Detector</td>
</tr>
<tr>
<td>10</td>
<td>Binding Posts</td>
<td>1</td>
<td>6 Volt A Battery</td>
</tr>
<tr>
<td>1</td>
<td>Socket</td>
<td>1</td>
<td>Storage Battery</td>
</tr>
<tr>
<td>1</td>
<td>Grid Leak</td>
<td>1</td>
<td>22 1/2 Volt B Batteries</td>
</tr>
</tbody>
</table>
BACK VIEW OF PANEL & TOP VIEW OF BASE
OF A DETECTOR AND ONE STEP AMPLIFIER

LIST OF PARTS
DETECTOR AND ONE STEP AMPLIFIER

<table>
<thead>
<tr>
<th>REQ</th>
<th>DESCRIPTION</th>
<th>REQ</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Panel about 6&quot;x8&quot;</td>
<td>1</td>
<td>Vacuum Tube Detector</td>
</tr>
<tr>
<td>1</td>
<td>Base &quot; 6&quot;x8&quot;</td>
<td>2</td>
<td>&quot;  &quot; Amplifier</td>
</tr>
<tr>
<td>10</td>
<td>Rheostats</td>
<td>1</td>
<td>Double Circuit Jack</td>
</tr>
<tr>
<td>2</td>
<td>Binding Posts</td>
<td>1</td>
<td>Single &quot;  &quot;</td>
</tr>
<tr>
<td>2</td>
<td>Sockets</td>
<td>1</td>
<td>Amplifying Transformer</td>
</tr>
<tr>
<td>1</td>
<td>Grid Leak</td>
<td>1</td>
<td>6 Volt &quot;A&quot; Storage Battery</td>
</tr>
<tr>
<td>1</td>
<td>Grid Condenser</td>
<td>2</td>
<td>or more &quot;B&quot; Batteries</td>
</tr>
</tbody>
</table>
DIRECTIONS FOR OPERATING AND TUNING THE RECEIVER

Wire the set up and put a 1500 coil in the secondary and 1000 coil in the tickler, then before you connect the aerial up turn on the "A" battery, adjust the "B" battery, and slowly close the coupling between the tickler and secondary until you get a howl or bubbling sound in the phones. If not, REVERSE the tickler connections until you do.

Then, without connecting the aerial to the set, connect the ground and put a coil in the primary with the primary condenser in parallel. Vary the primary condenser until you get a decided click in the phones. If not, try another coil until you do. Until this thud or click is heard at some point on condenser scale you cannot hope for STRONG SIGNALS.

The secondary condenser should be set near zero and the coupling between primary and secondary coils should be about 45 degrees during this test. When you get the set balanced in this manner, a slight movement of either primary or secondary condenser should give the click.

Then connect the aerial to the set and use coil 1000 in the secondary for waves from 3600 to 6000 and coil 1500 for waves of 6000 and over.

In tuning, move the secondary condenser VERY SLOW, as it determines the wavelengths, and all other adjustments must be made to correspond. When you hear a station vary the secondary condenser until it is loudest and move tickler coil until louder, then vary primary condenser. Just a slight movement of each coil will result in HIGH AMPLIFICATIONS.

The louder the click in the primary circuit the more sharply the set is tuned. Loose coupling is very important, for without it, it is impossible to tune the set as it should be. An average of about 45 degrees is right for loudest signals.

It is impossible to tell what coils to use in the primary for a given wave except by experiment.

Success can only be obtained by tuning properly, and the bubble and click method is the only way to determine if all the circuits are really in tune or not.

Decreasing the capacity of the secondary condenser decreases the wavelength and calls for decrease in the primary condenser.

Increasing the secondary condenser increases the wavelength and calls for an increase in the primary condenser; or, if the condenser is as high as it will go, a larger primary coil is necessary.

The important thing to remember is to move the condensers SLOWLY and keep the set balanced at all times by the clicks.

Radio Broadcasting Guide of North America

The only complete station guide published. Sent to any address upon receipt of 12 cts. in stamps. Address direct to Wm. E. HUBBS - 600 Fisher Ave. - N. Bergen, New Jersey
FEED BACK RECEIVING SET FOR DAMPED AND UNDAMPED WAVES

CONSTANTS FOR THE RECEIVER.

The secondary coil is shunted by a variable condenser of .001 mfd. maximum capacity, and one with a vernier will be a great help in telephone work.

The grid condenser may be fixed or variable. A variable one of .0005 mfd. will be the most satisfactory, if using different tubes from time to time.

The bridging condenser may be fixed or variable and should have a capacity of .002 mfd.

The "A" battery should be a 6 volt storage battery.

operation.

The "B" battery should be at least 22½ volts for the most successful operation.

No primary load coil is required with honeycomb coils.
INSTRUCTIONS FOR WIRING THE RECEIVER

In our receiver we use DeForest Duo Lateral Honeycomb Coils for all wavelengths and they give us remarkable results. They are superior to anything we have ever tried in our experience of over eight years in the Radio game.

We hear amateurs as far West as Kansas and New Mexico; also Honolulu, California, British Guiana, South America, German, French and British stations, and Chicago, Detroit, Cincinnati, New York, Newark and other telephone stations.

The following combination of coils are what we use, and while it is not so easy to choose the primary coils—as the size depends on the capacity of the aerial and primary condenser—once the secondary and plate coils are known it is easy to find the right primary coil.

Our aerial is 4 wires, 60 feet high, 165 feet long, and has a capacity of .0006 Microfarads. Our primary condenser is a .003 mf. A one or two wire aerial, 100 feet long and 30 or 40 feet high, will be found very satisfactory for phone work, with a .0015 primary condenser.

<table>
<thead>
<tr>
<th>Type of Station</th>
<th>Wave Lengths in Meters</th>
<th>Primary Coil Number</th>
<th>Secondary Coil No.</th>
<th>Tickler Coil Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>KDKA, WJZ, KYW.</td>
<td>150 to 400</td>
<td>25</td>
<td>50</td>
<td>35 or 50</td>
</tr>
<tr>
<td>Amateur</td>
<td>330 to 375</td>
<td>25, 35 or 50</td>
<td>50</td>
<td>35, 50 or 75</td>
</tr>
<tr>
<td>Commercial</td>
<td>550 to 700</td>
<td>25</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Arlington</td>
<td>2500</td>
<td>100</td>
<td>600</td>
<td>300</td>
</tr>
<tr>
<td>Foreign</td>
<td>3600 to 6000</td>
<td>300, 400 and 600</td>
<td>1000</td>
<td>750</td>
</tr>
<tr>
<td>Foreign</td>
<td>6000 to 20000</td>
<td>400, 600 and 750</td>
<td>1500</td>
<td>1000</td>
</tr>
</tbody>
</table>

In the diagram the grid leak is connected to the negative (—) terminal of the "A" battery, but we recommend connecting it to the positive (+) for trial and to leave it where it gives the best results. It may easily be made with a few lead pencil marks on cardboard between two binding posts; or, if a tubular Audistron, UV200 Radiotron or Electron Relay Tube be used, a Remler grid leak and fixed condenser may be purchased for 90 cents and will be satisfactory.

It is important that the leads to the tickler coil be reversed and left where the valve circuit oscillates steadily. The correct connection is readily determined when an undamped station is sending.

The diagram shows the proper connections, and it is important that they should be duplicated in detail. We recommend that the "B" battery be varied with a Clapp-Eastham 5000 OHM Graphite Potentiometer, but should you prefer to use a 22½ volt variable "B" battery with Radiotron UV200 Tube, connect wire from plus "B" battery post to right hand phone post and do not buy potentiometer.

All connections must be SOLDERED and the set wired with No. 18, or larger, annunciator wire.

The diagram shows a series condenser in the primary circuit, but we get the best results with it shunted around the primary coils. It is desirable to have a series parallel switch so it can be used either way. If possible, get a .003 for the primary circuit. It is of more real value to the set than an amplifier, when used with a large aerial and long wave lengths.

To use loose coupler with this set, plug primary and ground in No. 4, secondary in No. 5, and short No. 6 with a piece of wire.

Dealers

Drawings of Amplifier copied from Radio plans published by

S. NEWMAN & CO.
RADIO DESIGNING & ILLUSTRATING
74 Dey Street, Dept' H New York City

The following plans ready for delivery, ask for our interesting proposition.

1-Crystal Receiving Set
2-Super Selective Regenerative Tuner
3-V.T. Detector with 1 or 2 Step Amplifiers
4-Loop Aerial
5-Short Wave Regenerative Set
6-Medium Wave Tuner 180 to 3500 Meters
7-Amplifier
8-Radio Frequency Amplifier
9-Armstrong's Super Regenerative Tuner
EASY WAY TO LEARN RADIO TELEGRAPH CODE

While enjoying the radio telephone concerts each day, the new radio enthusiast will probably hear a great deal of dots and dashes on certain times other than the radio telephone one (360 meters). After a while he or she may wish to learn to read these dot and dash messages. Indeed, there is great fascination and romance in being able to do this.

Hence, there is a combination of dots and dashes representing each letter of the alphabet and numerals. The best thing to do is to memorize five characters at a time. Having mastered these, pass on to the next five. When these are mastered go back again to the first five and memorize the entire ten letters so that you will not forget any of them as you go along. Take the end of a pencil or coin and tap off each letter as if the object were a regular telegraph key. Keep on doing this for several days and at frequent moments until you can tap off the entire alphabet and numerals rapidly and without having to think but just as an instant for each letter.

After you are certain you can “send off” all characters, you are ready to purchase a learner set and turn to send properly and with a regular telegraph key.

When you can send clearly at a rate of 10 or 15 words per minute you should begin to learn to receive or copy the code. This can be best done by having an operator friend send slowly and repeatedly until you recognize each character instantly and without having to think too long. If you cannot get an operator’s assistance, you may purchase an automatic sender.

After this preliminary stage, it is only a matter of constant and regular sending and receiving practice. It usually requires from two to four months of daily practice to become an amateur radio telegrapher.

MEMORIZE ONE GROUP AT A TIME

<table>
<thead>
<tr>
<th>1st Lesson</th>
<th>2nd Lesson</th>
<th>3rd Lesson</th>
<th>4th Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>F</td>
<td>K</td>
<td>P</td>
</tr>
<tr>
<td>B</td>
<td>G</td>
<td>L</td>
<td>Q</td>
</tr>
<tr>
<td>C</td>
<td>H</td>
<td>M</td>
<td>R</td>
</tr>
<tr>
<td>D</td>
<td>I</td>
<td>N</td>
<td>S</td>
</tr>
<tr>
<td>E</td>
<td>J</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5th Lesson</th>
<th>6th Lesson</th>
<th>7th Lesson</th>
<th>8th Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>W</td>
<td>4</td>
<td>5</td>
<td>Z</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9th Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
</tr>
<tr>
<td>Semicolon</td>
</tr>
<tr>
<td>Comma</td>
</tr>
</tbody>
</table>

| Colon      |
| Interrogation |
| Distress Call |

SYMBOLS USED IN RADIO HOOK-UPS

The following shows some of the symbols used in diagrams illustrating the methods of connection for radio circuits.

- ALTERNATOR
- AMMETER
- AMPLIFIER
- ANTENNA
- ARC
- BATTERY
- BUZZER
- CATHODE
- CONDENSER
- CONNECTION OF WIRES
- NO CONNECTION
- COUPLED COILS
- VARIABLE COUPLING
- CRYSTAL DETECTOR
- GALVANOMETER
- SPARK GAP (PLAIN)
- SPARK GAP (QUENCHED)
- GROUND
- INDUCTANCE
- ALTERNATOR
- AMMETER
- AMPLIFIER
- ANTENNA
- ARC
- BATTERY
- BUZZER
- CATHODE
- CONDENSER
- CONNECTION OF WIRES
- NO CONNECTION
- COUPLED COILS
- VARIABLE COUPLING
- CRYSTAL DETECTOR
- GALVANOMETER
- SPARK GAP (PLAIN)
- SPARK GAP (QUENCHED)
- GROUND
- INDUCTANCE