Indiana Historical Radio Society

BULLETIN

VOL. 13 Sept. 1984 NO. 3

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FOR SOCIETY INFORMATION WRITE TO:

Vice President-For legal matters of the IHRS.
Secretary-For general correspondance and membership applications.
Treasurer-For membership payments and address changes. (1984 dues are $6.00).
Historian-For History of the IHRS and for donations of material for the scrapbook.

Please use a stamped, self-addressed envelope when requesting information.

Valparaiso Meet

The IHRS fall meet was held on September 15 at the Valparaiso Technical Institute in Valparaiso, Indiana.

The morning was spent buying, selling, and trading old radio equipment. After lunch, hosted by the Alumni Association, a business meeting was held.

The secretaries report on the last meeting was read and accepted. The Treasurer reported a balance of $1791.91. It was moved and seconded that the report be accepted and it was.

A Constitutional amendment was proposed by Glen Rogers and accepted by a vote of the members. It reads as follows:

A. Amend the IHRS constitution to permit waiver of the requirement of Indiana residency for office; 1. by a majority vote of the board, and 2. by a 3/4 majority of the members present, at a regular meeting.

B. Amend the IHRS constitution to provide only one class of membership and all members shall have full voting priveleges.

An election of officers was held. The officers for 1985 are;

President-Robert Shuck
Vice-president-Paul Gregg
Secretary-Marilyn Johnston
Treasurer-Diana Heathcote
Editor-James Fred
Historian- Dr. E. E. Taylor

The Hershmen family was given a round of applause for being Hosts for the fall meet. The IHRS made a contribution to the Alumni Assoc. and a gift to the Wilbur Cummings Museum.

Continued on page 14

POWEI CROSLEY,Jr. and HENRY FILLMORE

One day when Henry Fillmore was eating lunch at a downtown restaurant in Cincinnati, his friend Powel Crosley, Jr. came up to his table and sat down beside him. He asked Henry if he had ever thought about conducting a professional band for radio broadcasts. He replied that it would be a grand experience but that he had never explored the possibility. Crosley then asked him to go over to the WLW studio and talk to Ford Billings, his station manager, who had a proposition for him. Sensing an opportunity, Henry went directly to the WLW studios. Billings explained that band music had proved to be quite popular on the radio and that sponsors often asked for band music to be played between commercial messages. He said that Cincinnati boasted of some of the finest musicians in the nation and that in his opinion a professional band would be the most effective way to bring them to the attention of the radio audience. Billings said that in searching for the right conductor Fillmore's name had come up repeatedly and that his showmanship and personal magnetism were the deciding factors.
You're the man we want, and we want you to form the best darn studio band in the country. What do you say?"
No further selling was necessary. Billings wanted a professional band on a "sustaining" basis. It would be an official studio band and perform as sponsors were acquired. He said he would try to attract regular aponsors but explained that most of them came and went according to immediate sales increases of their products and usually did not have the patience to wait and see if their advertising had any long term benefits. However, a studio band would mean steady employment for the musicians, and the broadcasting schedule would be very flexible.

They discussed the number of musicians required. Billings asked if eighteen would be sufficient, but after Fillmore worked up a list of essential instruments, they agreed that twenty-two would be the absolute minimum.
Henry would have liked more, but he was sure that with a stellar musician in each chair they could do the job. Billings explained that they would be broadcasting over both WLW and WSAI, since Crosley owned WLW and had a controlling interest in WSAI.
Crosley had come a long way since the first radio broadcasts in the livingroom of his home in 1921. At the beginning of 1923 he was broadcasting with only 100 watts, but this was increased to 500 watts the same year. In 1924 it was 1000; 5,000 in 1925 and 50,000 in 1928. Crosley did not sell his first radio commercial until 1926 or 27. Before that, his first commercials were mostly "plugs" for the Crosley Radio Corporation.
This type of advertising worked wonders - his company's profit in 1928, for example, was 3.7 million dollars. But this was profit largely from the sale of radios. His station did not become self sustaining until 1930. Crosley's stations were not unique in this regard; other radio stations were owned and operated by banks, railroads, newspapers and even churches. But WLW was unique in one respect, it started a policy of using almost all LIVE talent as opposed to recordings.
Henry quickly got together a group of fine musicians, about half were members of the Cincinnati Symphony Orchestra's wind section. The broadcasts began over WSAI, with regularly scheduled programs every Thursday and additional programs as needed.
There is no reliable public record of the exact number of broadcasts by Henry Fillmore's Band during this period, but the band had frequent broadcasts, as did an orchestra which was also sponsored by Crosley. On Christmas Day in 1927 their broadcast went out over the NBC Red network. For this occasion Henry composed "THE CROSLEY MARCH", and it was played for the first time on this broadcast.

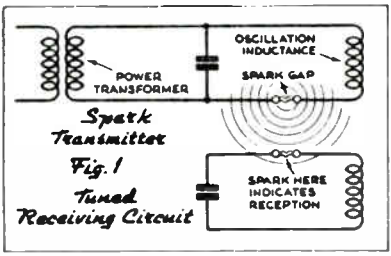
 Continued on page 14

RADIO DETECTORS

By John W. Campbell, Jr.

IN RADIO parlance, the circuit in a receiver that strips incoming high-frequency waves of the audio impulses of speech and music they carry is usually referred to as the "detector" circuit. Actually the word "demodulator" would be more accurate, for a detector is any device that will reveal the presence of electro-magnetic radiation, whereas a demodulator separates the modulated signal from the carrier wave.

When Hertz sought by means of the first radio-frequency experiments to prove the existence of the electromagnetic waves indicated by the equations of Clerk Maxwell, he first had to devise a way of generating the radiations. The spark-gap oscillator answered that problem—he hoped. Hertz also needed a detector that would tell him if this theoretical electromagnetic energy was in fact present. The first detector was



Spark Transmitter Fig. 1 Tuned Receiving Circuit

simply a tuned circuit, matched to the transmitter. In their earliest form, Hertz's circuits were similar to those shown in Fig. 1; when powerful oscillations were set up in the transmitter, somewhat weaker oscillations were built up in the nearby detector circuit and a smaller arc leaped its spark gap.

Stimulated by Hertz's proof of the existence of electromagnetic waves, other scientists discovered new ways to detect them. Iron filings, it was found, tended to clump together in the presence of radio waves, and would then conduct a local current more readily. The result was the coherer (Fig. 2), which was in effect a crude amplifier, since it would turn on a local current when controlled by a distant signal. But it wasn't particularly sensitive, and the filings had to be "decohered" or loosened up, usually by a clapper device, before it could react to a new signal. It was thus suited only for code communication.

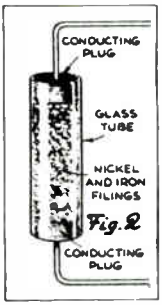


Fig. 2

Next in order of simplicity after the coherer was the crystal detector, a circuit of which is shown in Fig. 3. The property of certain crystals, notably galena (sulphide of lead), of converting R. F. oscillations into uni-directional current was discovered early in this century. Though devised later than other, more effective detectors, crystals had the advantage of simplicity, low cost, and fidelity.

The operation of a crystal set is simple. The incoming R.F. (*A* in Fig. 4) is sent through a crystal which offers substantially more resistance to current flowing in one direction than in the other. The result, as indicated in *B*, Fig. 4, is a direct current, still pulsating at high frequency, with wave amplitudes that correspond to the audio modulation impressed on the R.F. When this current is applied to a pair of earphones, the diaphragms cannot follow the rapid R.F. pulses, but they can respond to the much lower frequency of the change in amplitude of the R.F.—that is, to audio modulations, shown at *C*.

Precisely why a galena crystal can offer differential resistances to A.C. has not yet been satisfactorily explained. Scientists believe that its action is related to barrier-layer rectification, another imperfectly un-

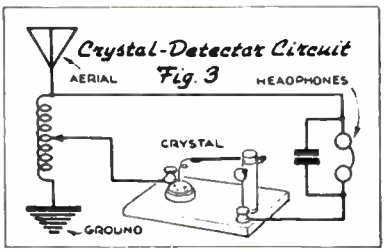
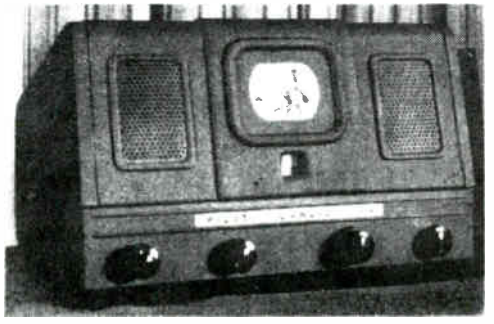


Fig. 3

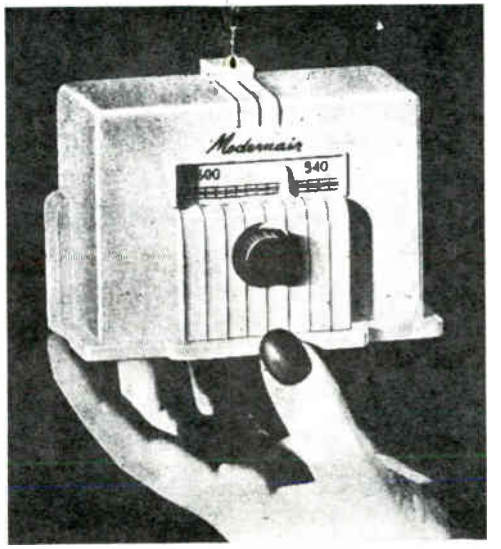
DO YOU REMEMBER 1948?

Popular Science, Mar. 1948

Television Set Weighs 15 lb. A lightweight, small-screen TV receiver selling for about $100 is being manufactured by Pilot Radio Corp., Long Island City, N. Y. The set can easily be moved about the house, and comes with a doublet wire for an inside antenna. It has a 3" picture tube.



Popular Science, Jan. 1949



Midget Radio Has Power

OPERATING on hearing-aid batteries and using a tiny war-developed tube, this miniature radio claims 100-mile reception. A wire clipped to any handy metal object provides the aerial. The listener uses earphones and has complete dial tuning and full band selection. The set is about 4½ inches wide and three inches high and is molded from Tenite plastic. It is made by the Modernair Corporation, of Los Angeles.

Popular Science, Jan. 1948

FREE LITERATURE Write Today

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The Television Buy of the Times

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Popular Science, Jan. 1948

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ESPEY MANUFACTURING COMPANY, INC.

Popular Mechanics, Feb. 1948

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Master Unit and one Remote Unit	$24.95
Remote Units	5.25

RAYTONE ELECTRONIC COMPANY
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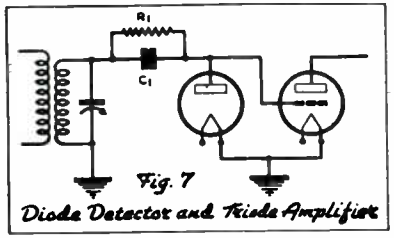
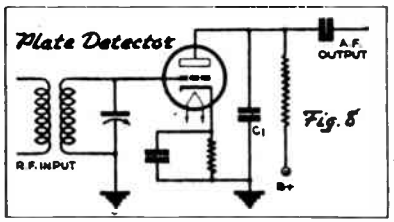
Popular Mechanics, 1948



The diode detector is commonly used today. It can handle very strong signals without overloading, has excellent fidelity, and is simple and reliable. However, it isn't extremely sensitive, since the filter system imposes a load that draws power from the tuned circuit. This in turn reduces selectivity.

Fig. 7 shows a modified diode detector directly coupled with a triode amplifier. Here the filter circuit operates somewhat differently; when a positive R.F. signal comes along, the 250-mmf. condenser C_1 transmits it freely, applying a positive potential to the diode plate and drawing electrons from the filament until the charge on the condenser is neutralized. This may take less than a ten-thousandth of a microsecond. When the positive peak declines to zero, the electrons are trapped on one plate of the condenser, on the plate of the diode, and on the triode grid. Their only escape is through the high-



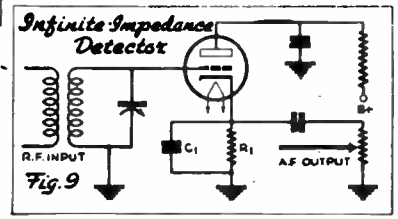
resistance shunt, and it takes more nearly ten thousand microseconds than a ten thousandth of a microsecond for the charge to leak away. Thus the charge on the condenser can increase at radio frequencies but can decrease only at audio frequencies. Since it is applied directly to the triode grid, the triode plate current will follow A.F. modulation.

The grid of a triode is quite capable of collecting electrons from the filament, and consequently can serve as a diode plate in itself. In the grid-leak detector of years past, a single triode was used to perform this double function. The grid-leak detector was selective, though the fidelity was not high and it tended to overload on strong signals. It is seldom used today.

The circuit of a plate detector is shown in Fig. 8. The high value of the cathode resistance makes the grounded grid strongly negative with respect to the cathode, so much so as to cut off the plate current when there is no signal. When a negative signal reaches the grid, practically no change of plate current occurs, for it's already nearly zero. But when a positive signal arrives, the strong bias is decreased and plate current flows. This gives the nonlinear reaction necessary for demodulation. Condenser C_1 shunts the R.F. pulses to the ground. Able to handle fairly heavy signals, the plate detector shown gives good fidelity. It imposes no load on the tuned circuit and hence has good selectivity.

The infinite-impedance detector, so called because it has almost infinite resistance to R.F. between grid and ground, and hence places no load on the tuned circuit, is illustrated in Fig. 9. A positive signal applied to the grid permits the plate current to flow, and this causes a voltage drop through R_1 that drives the cathode positive. Since there is always some current flowing through the tube, the cathode is always somewhat positive with respect to the grid, and no grid current flows. Whatever the positive potential of the grid, the cathode will rise to match it, though it won't follow the negative swings as rapidly because of C_1. The result is that the potential across R_1 exactly follows the peaks of the R.F. signal. There is no amplification, but the detector has excellent fidelity, will handle strong signals, and is much used today.

Fig. 10 is the regenerative detector, of evil memory. It has excellent sensitivity and selectivity, but against these are poor fidelity, extreme unreliability, complexity of operation, and a bad tendency to turn into



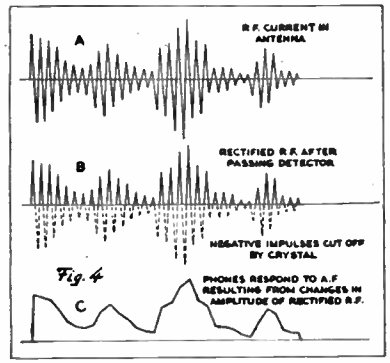
a transmitter able to send out squeals and howls into neighboring counties. Outlawed on broadcast frequencies now, it is still used by some amateurs on short-wave receivers. Basically it is a grid-leak detector so ar-

AND HOW THEY WORK

derstood phenomenon in which certain metallic oxides exhibit the ability of rectifying A.C. The plate-and-needle detector, essentially a metal needle resting lightly on a metal plate, embodies this principle, as does the razor-blade radio shown on page 209.

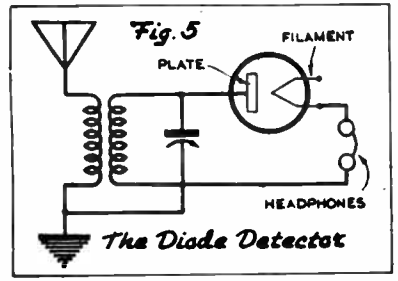
One of the most sensitive instruments known in the early days of wireless was the galvanometer. Unfortunately, it requires direct current; if it is fed A.C. of even moderate frequencies, the needle tries to swing one way on positive impulses and the other way on negative ones, with the result that it stands quite still. Before it could detect R.F., it had to be coupled with a rectifier that would intercept half the R.F. wave.

To improve the detector, the British Marconi Company called in Dr. J. A. Fleming, a leading English research physicist. Flem-



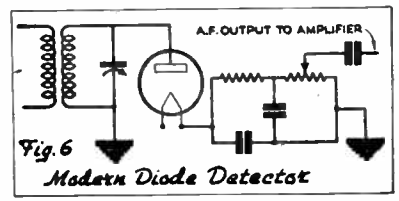
ing had already done some notable research for a lamp-bulb manufacturer. The carbon-filament lamps of the time had a tendency to burn out at the positive end of the filament, due to the "Edison Effect." Edison had reported that a hot filament in an evacuated tube would retain positive but not negative charges—in modern terms, that it would give off electrons. Therefore electrons jumped from the negative end to the positive, carrying part of the current and heating the positive end by bombardment.

Dr. Fleming's studies of the Edison effect, plus his realization that the galvanometer would make a sensitive detector if it could be used with R.F. currents, gave him the answer—the Fleming Valve. It was a simple diode rectifier, a heated filament and a plate in an evacuated envelope, in series with a galvanometer and the antenna circuit. The diode permitted one half of the waves to kick the moving coil, but blocked the opposite set of half-waves. Before long headphones, taken over from the telephone, were used in place of the galvanometer and found unexpectedly efficient (Fig. 5).



Essentially, a demodulating detector is a nonlinear element—one that will pass more current in one direction than in the other—followed by a filter circuit. (A diode can be made to pass 95 percent of one half-wave and none of the other; a crystal may pass 80 percent of one and 40 percent of the other. So long as conductivity is dissimilar, demodulation will take place.)

In the simple diode detector shown in Fig. 5, the headphones themselves constitute the filter; the phone coils have sufficient inductance and capacitance to make an excellent R.F. trap. In Fig. 6, which shows a more modern version of the diode detector, a resistance-capacitance filter is used instead. The condensers and resistors are of such



values that the condensers discharge through the resistors only at comparatively low frequencies—15,000 cycles a second or less—with the result that the ultrarapid R.F. pulses are completely smoothed out and only modulation remains. (Turn the page)

Continued on page 10

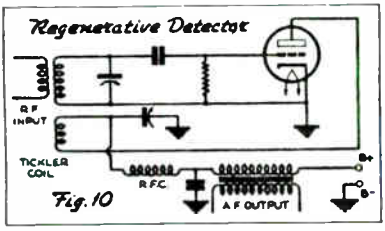


Fig. 10

ranged that part of the amplified signal is fed back to the grid to be reamplified. The feedback is supposed to be just a little too weak to sustain self-excited oscillation, the trick being to adjust the feedback just right.

A modification of this, the super-regenerative circuit, has several interesting and useful features. Though tricky, it's exceedingly sensitive and sharp-tuning. Essentially it is a regenerative detector, but a "quench circuit" consisting of a triode and an inductance-resistance network acts to interrupt its functioning at a supersonic frequency. The theory of its operation is ingenious. An ordinary regenerative detector with a little too much feedback will hesitate for a fraction of a second, then gradually sweep into oscillation. The super-regenerative detector has so much feedback as to cause oscillation, but the quench circuit keeps interrupting it before the oscillation can establish itself. This permits a tremendous amount of reamplification. The circuit is particularly useful on frequencies of 100 megacycles and above, where tube losses tend to be severe, for the principle permits B power to replace such losses.

The problem of demodulating F.M. signals is quite different from that with A.M. In Fig. 11 the R.F. input is fed to a special intermediate-frequency transformer that has two secondary circuits, S_1 and S_2, each of which drives a conventional diode detector and filter circuit. (Usually one 6H6 dual-diode detector tube is used.) If the intermediate frequency of this receiver is 5.00 megacycles, the primary of the "discriminator transformer" would be tuned to the same value, S_1 tuned to 5.10, and S_2 to 4.90 megacycles. If the signal comes through at 5.00 megacycles, both secondaries and their associated detectors receive an equal voltage; and since the filter circuits are so arranged as to oppose the voltages, they cancel each other and no A.F. is produced. But when the signal frequency varies either up or down, it will approach the resonance of one secondary and move farther away from that of the other. One will get a decreased and the other an increased voltage, and a net voltage will appear across the audio output. Since the voltage across the audio-output terminals will increase as the R.F. signal departs from 5.00 megacycles, audio volume will be determined by the extent of frequency deviation. Audio pitch will likewise be determined by the number of times a second that frequency deviation occurs. The circuit therefore meets the required conditions of F.M. demodulation.

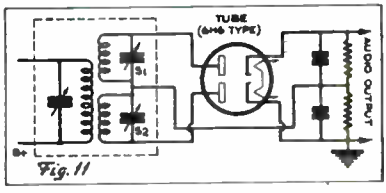
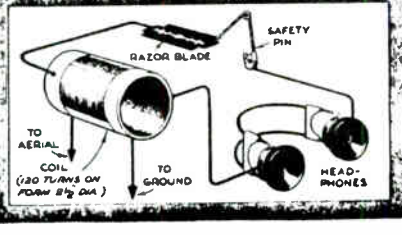
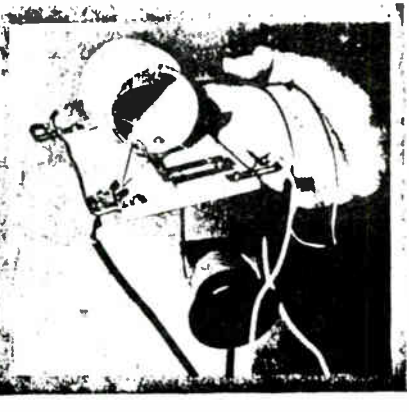


Fig. 11

Lt. M. L. Rupert's "foxhole radio," used on the Italian front, gets reception on a razor blade. O. B. Hanson, chief engineer of N.B.C., improved it by tying pencil lead to the pin point. Wire gauge is not critical, but, good headphones, a long aerial, and patience in locating a sensitive spot on the razor blade are all requisite





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ICA Announces A New Line

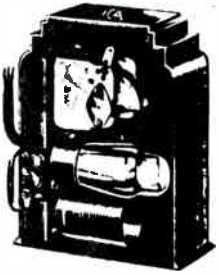
The Universal Mascot

ONE-TUBE RECEIVER — BATTERY OPERATED
AN EASILY CONSTRUCTED SET FOR THE SHORT WAVE NOVICE

Unquestionably the one tube battery short wave kit is the easiest to assemble. Even a young school boy can follow the picture diagram. The simple construction for step by step asembly will enable anyone to construct this set in a very short time. Our point to point construction description together with illustrated diagram—easy for the layman to follow—enables the most inexperienced to build.

This set has been so highly regarded, that it has been acclaimed editorially by editors of radio publications.

Surely, unless the IA Mascot-1 were not different in design and quality, it would not be so widely praised.



COMBINES BEAUTY WITH EFFICIENCY

Attractively designed in a beautiful black bakelite cabinet. It incorporates a new non-inductive regenerative control. The tuning is easy and the high efficiency gives amazing results. Brings in short wave stations including police calls, airplane calls, ships at sea, etc.

It uses a standard No. 6 Dry Cell battery 1½ volts and one small 45 volt B battery. A type 30 tube is used in this circuit.

Licensed under R. C. A. and Hazeltine Patents.

Complete kit of parts includes bakelite cabinet, four 6-prong bakelite coils with three windings covering wave lengths from 16 to 200 meters and all necessary parts, hardware and wire.

Packed in an attractive display box.

Size of set 6¼" high x 5⅛" wide x 2¾" deep.

No. 16 List Price $9.95

Less Tubes, Batteries or Phones.

OPTIONAL ACCESSORIES

2 coils No. 1424 wave length range 190 to 310 and 300 to 550 meters..... List—$1.85

PIED PIPER CRYSTAL RECEIVER

Looks Like a Midget Receiver

ALL one has to do is to hook up the aerial and the ground and tune in. The earphone connectors are also conveniently located on the front panel.

The PIED PIPER is the last word in crystal sets. Quality of reception, of course far exceeds that of any other crystal receiver.

Boys and Girls, Scouts, men in offices, patients in hospitals, campers, especially become enthusiastic boosters of the PIED PIPER. It practically sells on sight.

The PIED PIPER is as different from old type crystal sets as can be. It's a beauty. Housed in beautiful black bakelite case, it looks just like a regular radio receiver.

The PIED PIPER is 6½" high x 4¾" wide x 2¼" deep. The set has an adjustable crystal control operated from the front panel. A tuning dial is operated by a bakelite knob on the front panel also.

No. 5.....List $3.40

BAKELITE UTILITY CASE

This case is ideal for mounting desk microphones, meters, small radio sets, short wave converters, oscillators, and for other valuable purposes. Overall dimensions 5⅛" x 2⅜" x 6½" tall. Diameter of cut-out 3¼". Made of Bakelite, it can be easily drilled and machined.

No. 97.....List $1.00

INSULINE CORPORATION OF AMERICA -:- NEW YORK, N. Y., U. S. A.

FROM THE PAST

As I look over the old radio parts catalogs I remember how I started in radio. I first became interested in radio in 1931 which was only 2 years into the Great Depression. Since money was hard to earn I spent mine for a soldering iron, a power transformer, and a pair of headphones.

Old memories returned when I recently found a 1934 ICA catalog. I've decided to share some of the illustrations with you.

I picked some items that are housed in a Bakelite case. This case looks just like an electric clock case. You can see how economical it was to use the same case, with an insert in the round hole, for a short wave converter, a crystal receiver, and a one tube receiver.

If any collector out there in "Radio Land" has a case or one of the items shown I would like to hear from him or her. Just write to the Editor in care of the Bulletin.

Short-Wave Converters

I. C. A. SCOUT
SHORT WAVE CONVERTER
20 to 200 Meters

Operates on Either A. C. or D. C. Current

I. C. A. MARVEL
SHORT WAVE CONVERTER
20 to 200 Meters

An Efficient Low Cost S. W. Converter

Valparaiso 1984 (continued)

Dr. E. E. Taylor will serve as chairman for the February 1985 meet to be held in Indianapolis, Indiana.

The Spring Meet has been set for May 10-11, 1985 in Auburn, IN, at the Auburn-Cord-Dusenberg Museum. The Committee will consist of Del Barrett, Jerry Uueber, Ross Smith, Bob Maxwell, and Tammy and Nelson Preble. Contest catagories will be TRF sets, Regenerative sets, Crystal sets, Superhetrodynes, and A.C. sets.

It was moved, seconded, and passed that the Treasurers briefcase be replaced. The meeting was adjourned

Powel Crosley Jr. (continued)

There were many sponsors for Fillmore's Band. One of the first was the R. F. Johnson Paint Co. and another was the Standard Oil Co. of Ohio.

Excerps forthis article were taken from "HALLELUJAH TROMBONE" by Paul E. Bierley, published by Integrity Press, and used by permission.

Marshall Howenstein

RADIOADS

WANTED: a Hitachi Vidicon camera tube type 8758. Ted Drogoski, 507 Coal Valley Road, Clairton, PA 15025.

FOR SALE: 1927 Zenith model 11, beautiful tiger-oak cabinet, slant front, excellent condition. Also Freed-Eisemann cabinet speaker W/6 ft cord & 5 prong plug, good condition, Radiola 62 (Console) double chassis set, very good shape. Send SASE for others. James M. Seal, 3309 Boatman's WH. Rd., Morristown, TN 37814.

FOR SALE: Entire collection of radios, parts, and tubes to be sold as a unit. Send $2.00 and a large SASE with two stamps for a 8 page list. Donald J. Juleen, 6250 Ledge Rd., Sturgeon Bay, WI 54235.

WANTED: Good chassis and speaker for Majestic model 51 or 52. James M. Seal. Address above.

FROM THE MAIL BAG

FOR SALE: "RCA Radiola 66", model AR-598. Set is in excellent condition and in working order. It has all the original tubes. If interested write: Mr. Eugene Ruggles, 117 Breckinridge St., Michigan City, IN 46360. Phone: 219-874-8884.

STORIES
GAMES

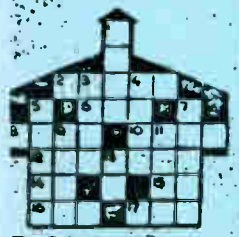
The GIRLS and

PUZZLE CORNER

—1—

This week our crossword puzzle is found in a blockhouse, like those built by the early settlers in America as a protection from the Indians. It's a good place for a hard battle, and we hope you win.

THE BLOCKHOUSE



The Definitions:

Horizontal

2. What Indians did to their victims
5. A number
8. Fright
10. Midday
13. American natives
14. Negative
15. Left side (Abbr.)
16. Finish
17. An affirmative vote

Vertical

1. A scheme
2. Light rope
4. Girl's name
5. River in France
7. A body of sheriff's assistants
8. Soon
11. Lone aloe
13. Within

—2—

A word meaning an Indian is [illegible] the center of our diamond. The second one means adults, the third is a badge of honor, the fifth is unwelcome, and the sixth is cover. Can you complete the diamond?

F
E
D

Radio Crystal Set Costs Only a Dollar And Can Be Built in an Hour or Two

By STANLEY JOHNSTON
Radio WLBY

For the beginner in radio, a tube-less, battery-less crystal set is ideal. You can build one in an hour or two with less than a dollar's worth of parts; yet from its simple circuit you can learn much which will be of use when you build more complicated sets. The usual range of a crystal set is 25 miles or so. In these days of super-power broadcasting stations, however, occasional 300 or 400-mile reception is not at all unusual.

This modern variable condenser tuned crystal radio uses but three parts: a variable condenser, a crystal detector, plus four Fahnestock clips for making connections with the headphones, antenna, and ground, are all that you need to buy—the coil is home made.

Winding the Coil.

Winding the coil is the first step in building the set. Thread one end of the wire through two small holes punched in the side of the coil form. No. 26 double cotton covered (DCC) wire is best, although any size of copper wire between No. 22 and No. 28, enameled or covered, will do. The coilform is a 2½-inch cardboard tube.

Then rotate the form with one hand and guide the wire with the other, stopping occasionally to push the turns together with the thumbnail. When 60 turns have been wound on the form, again thread the wire through the side to fasten it, leaving a short length as before in order to make connections with the variable condenser.

Rest Is Easy.

Once the coil is wound, the rest of the job is easy. The parts are mounted on a small wooden baseboard, with the variable condenser and the crystal detector to the front to allow easy adjustment. Behind the condenser is the coil, and at the rear of the baseboard are the Fahnestock clips for the antenna and ground. Similar clips for a phone are at one side of the baseboard. Connections are made with short lengths of copper wire, following the circuit diagram.

Be sure that one end of the coil connects with the "rotor," or movable plates, of the variable condenser and the other end to the "stator," or stationary plates. In the circuit the rotor is marked "r". To make connections with the Fahnestock clips, loop one end of the hook-up wire around the wood screws, mounting the clips before the screws are forced into the baseboard.

Tuning Is Simple.

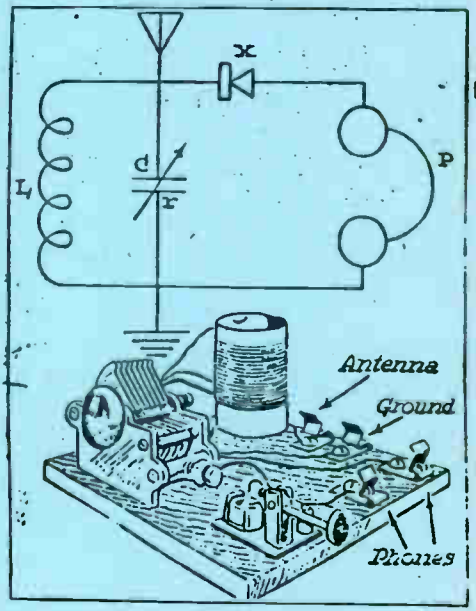
To complete the set you will need a sensitive pair of headphones—preferably new ones—and a good antenna and ground. The ground may be the cold water pipe. The antenna should be as high and as long as possible.

Tuning is simple but will require a little practice. Adjust the crystal detector to a sensitive point by moving the "cat-whisker" over the surface of the crystal. Then tune in the station by rotating the variable condenser.

In the next article I will tell you how to build a simple one-tube set.

Parts List for Crystal Set

L—coil, see text.
C—variable condenser. Capacity .0003365 mfd (365 mmf) or .0005 mfd. (500 mmf.) Mfd.—microfarad. Mmf.—micro-micro-farad.
X—adjustable crystal detector. Also wire, Fahnestock clips, and baseboard. Headphones, any good pair with a resistance of between 1000 and 5000 ohms.



This article was written in 1938 by one of our own members, Stanley Johnson, who passed away about two years ago.