NATIONAL RADIO NEWS

FROM N.R.I. TRAINING HEADQUARTERS

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RADIO EARS of UNCLE SAM'S ARMY

See Page 14

TOMORROW—*WHAT?*

HOW many of us 20 years ago would have dared predict that in 1930 the human voice could encircle the earth without aid of wires? or dreamed of the wizardry of the photo-electric cell? or the controlling of time-pieces by Radio signals? or any of the thousand and one miracles of modern Radio?

And now, what of tomorrow in Radio? We can't close our eyes to its future. How silly we would be to sit supinely by and say that the climax has been reached—that all of Radio's wonders have been achieved. What Radio will do in the years ahead will so dwarf Radio as we know it today that there will really be no comparison. Today we are barely scratching the surface of this giant, mysterious force. We have unscrambled just a few of its secrets—just enough to peep ahead and see what a vast part it will play in the world in the next ten, twenty or thirty years and on—

Today a master clock in the Channin Building in New York is regulated by Radio signals from Arlington Naval Radio Station—tomorrow the time-piece you carry in your vest pocket may be regulated by Radio. Today a Radio wave carries 200 words per minute—10,000 tomorrow. Today Radio is used to detect approach of enemy aircraft—tomorrow Radio-directed rays may ward off enemy attacks—today Radio a billion dollar industry—tomorrow a giant interlocking world force dominating all commerce and industry!

But why go on? It is common knowledge that the man who is on the Radio "band wagon" today is pioneering in the most dramatic and awe-inspiring pursuit known to man!

J. E. SMITH.

QUIZDEX FOR THIS ISSUE—

Radio's governing body. A recent bill signed by President Hoover perpetuates life of Federal Radio Commission indefinitely. Sitting, left to right: Commissioners Saltzman, Sykes, Robinson, chairman; Lafount and Starbuck.

Growth Of Radio In Last Nine Years Is Amazing

By HAROLD A. LAFOUNT
Member Federal Radio Commission

NINE years ago, an amazed world awoke to read that on the night before instrumental and vocal music had been broadcast through a strange electrical apparatus and received many miles away from the sender by persons in various parts of the country. Radio broadcasting was hailed as the miracle of the century—a scientific discovery, infinitely more powerful to the popular imagination than the transmission of the crude wireless telegraphy of Marconi, accomplished in 1896. Since that time, the art has developed with astounding rapidity until today . . . its importance in the industrial world can only be appreciated when we realize that $650,000,000 worth of receiving sets and accessories were manufactured and sold last year. This does not include the enormous sum which went for transmitting sets, studio equipment and other facilities for production of program. And neither does it include the millions of dollars paid artists and musicians.

Today nearly every family in the United States owns a receiving set. I am told that the investment of the American people in receiving sets, alone, amounts to more than $3,000,000,000. This certainly indicates interest in radio programs. It is proof positive that radio is an indispensible necessity. Naturally this stupendous investment made must be safeguarded. And so it was with a view to your protection that a sympathetic President, his cabinet and Congress exercised the foresight to pass the Radio Act of 1927. And by so doing, they anticipated the universal use of this new and undeveloped discovery of science. The Federal Radio Commission was by the same act created to regulate and limit the use of radio in the best interest of the American public.

Five Radio Zones Created

Possibly you know the act provided that this country be divided into five radio zones and for the appointment of a commissioner from each—not to represent the zone, but to act with his four associate commissioners as a part of the national commission. The new commission was charged with the responsibility of issuing all licenses for radio transmission. Some months later, the law was amended—providing that the radio facilities of the United States be divided equally among the five zones and equitably among the several States in each zone according to the distribution of the population in the States. By this you can readily see that a sincere effort has been made by the Government to impartially divide the benefits of this great natural resource among all the citizens of the Nation because they share equally in its ownership.

To make and maintain such a division, or such equality, was found to be no easy task. In other words, upon 90 wave lengths available for the purpose we must place the 615 broadcasting stations in such a way as to maintain equality

and reduce interference. This proved to be somewhat of a Chinese puzzle, but after working day and night for several months the commission decided upon a plan of allocating a definite number of cleared, regional and local channels to each zone and to each State based upon its population.

An additional requisite of the law, and a very wise one, is that every station must be operated in the public interest, convenience and necessity. Although a just requirement . . . it is a difficult one for the Government to enforce. It means that the commission must determine which applicant or broadcaster can best serve you. Naturally, all them believe they can or that they actually are rendering the highest possible service, commensurate, of course, with the size of their respective cities.

For Commission to Decide

It is, however, a matter for the commission to decide, and in so doing your interests, your likes and dislikes and your local conditions are all important. Naturally, mistakes are made, it being rather difficult to always anticipate your desires. Likewise there may be violations of the Government's confidence expressed by its granting a radio license, but generally speaking broadcasters are making a sincere effort to comply with all rules and regulations of the commission and to operate in the public interest. Yes, indeed, they sometimes talk too much about the commodities they advertise, but that practice is being discontinued by many stations. Certainly their only available income is from the advertising, but this generally is in the form of a sponsored program, which is not so objectionable to the listeners; in fact, I believe this method of support or maintenance is preferable to the taxing of receiving sets. Under the present method broadcasting in the United States is leading every other nation on earth.

I do not believe we have reached perfection. Many changes will have to be made and some programs improved. I do want to remind you, however, that the programs now being broadcast in this country cost millions of dollars annually. It requires a substantial army of men and women, anticipating your desires and planning programs accordingly. A still larger throng, including many of the world's greatest artists, carry out the carefully planned details in order that you may be entertained and educated. Thousands appear before the microphone each year, all seeking your approbation. It is inconceivable that we all enjoy the same program, consequently broadcasters are continually striving to diversify them in an effort to please all their listeners some of the time, and perhaps that is all we can expect since our likes and dislikes vary so much.

Uses Are Increasing

The job of the Federal Radio Commission is not confined to broadcasting alone. The many other uses of radio are constantly increasing in importance. Radio has become an effective competitor of the cables. Today we can send radiograms to almost any civilized nation in the world. Soon, it is expected that the leading cities of the country will be served by a national wireless telegraph company. In the Southwest and the Far West the use of radio has been applied to geophysical work and by the sending of radio waves simultaneously with a dynamite blast geologists can determine the presence of oil, thousands of feet below the ground. In our larger cities, radio is used by police and fire departments to guard the public safety. The aviation industry has found radio indispensable to its proper growth and development.

Pilots get their bearings, advance weather forecasts and other valuable information by radio communication. The thousands of ships on the high seas are in constant communication with the mainland. Wireless telephone service is now available on some of the larger vessels making it possible for passengers to telephone from the ship at sea to any city in this and many other countries. Also, the 16,000 amateurs in this country and the thousands of other experimentors are constantly striving to improve the art and to find new uses for it. All these and other uses of radio are restricted to persons or companies operating under Government licenses, which must be issued by the Federal Radio Commission.

Radio Becoming Invaluable

From an economic standpoint, the value of radio for communication purposes cannot be overestimated. Do we really appreciate radio from that standpoint? Have we an adequate conception of its value to the rising generation? Throughout the length and breadth of the land radio is becoming invaluable in the education of boys and girls. In some cities it is even being used to inform grown-ups whose earlier circumstances were without educational opportunities. From the congested slums of our Eastern cities—those centers of mass population—all the way across the continent to the Rockies—radio has become an uplifting and cheering influence to all humanity.

Experiments in television are being conducted now with fair success. It is my belief that the day is imminent when we may witness not only moving pictures, scenes and spectacles, but even football games or a world series. I believe you will be able to follow the progress of a trans-Atlantic flight and I believe also that planes may be flown without a pilot, just as battleships may be controlled by radio signals.

At every hand we have indications that these and other wonderful developments are on the threshold. Such a growing and such a changing scientific art requires the eternal vigilance of your Government, that it may be qualified to allocate these precious wave lengths to the proper service consistent with their characters and public necessity. Unceasing study and research must underlie every decision of the commission. This rapidly growing industry must be maintained in paths of public interest. Your rights as citizens of this great country must be, and I am sure are being, safeguarded and under no circumstances should we permit a subversion of your interests to the profit-taking interests of private or commercial enterprises.

NRI Alumni Association Founded

By HAL JOHNS
News Staff

". . . To cultivate fraternal relations among the Alumni of the National Radio Institute, to foster the spirit of unity and loyalty to our Alma Mater, to encourage the Institute in its dissemination of Radio knowledge and to promote the welfare of the members by interchange of helpful information."

—From the Constitution of the N. R. I. Alumni Association.

A NUMBER of N. R. I. graduates met in Washington on November 23 and staged quite a surprise by organizing an Alumni Association. From what I have been able to learn it is the first alumni association of home-study school graduates ever organized!

The graduates present represented 32 States—each a successful Radio man. They talked the matter over among themselves, saw that there were many things that an alumni association could do to promote the well being of fellow graduates, etc., and then went about their business of perfecting an organization which should and will reflect credit on N. R. I. men more and more as the years roll by.

Mr. John Fetzer, pioneer Radio engineer and designer and builder of Station WEMC, Berrien Springs, Michigan, was named President, and the following were named vice presidents: Mr. Harry Barschdorf, 171 N. Summer St., Adams, Mass.; Mr. Alphy Blais, P. O. Box 221, Thetford Mines, P. Q., Canada; Mr. Hoyt Moore, 3301 S. Lyndhurst Drive, R. R. C. Box 415, Indianapolis, Ind.; and Mr. Donnell O'Connor, Radio Station WBT, Charlotte, N. C. Mr. Earl Merryman, 633 Raleigh Place, S. E., Washington, D. C., was named secretary.

Mr. Fetzer, in speaking of the association, said that details would be completed very shortly for extending the privileges of the Alumni Association to every N. R. I. graduate. The executive committee is now working upon the final draft of the constitution and the by-laws which will be published in succeeding issues of the National Radio News. More detailed plans for membership and for cooperation among N. R. I. men will be given in later issues.

Upon the termination of the meeting at which the Alumni Association was founded, the graduates pulled a big surprise on President Smith by giving him the beautiful loving cup which is shown on this page. All the graduates who were present at the meeting were made charter members of the association and their names have been engraved on the beautiful cup. Again N.R.I. men lead the way.

(Continued on page 14)

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Washington, D. C. February, 1930

There's Pleasure and Tall Money in Short Waves

GRADUATE Barschdorf of Adams, Mass., told me recently about his short-wave experiences. At 3 one morning he was working a little station out in the south Pacific—just where, he did not know. In signing off he flashed "Q. S. L., old timer," and the reply came back—"I can't, I'm a leper." "I'll never forget that," Barschdorf told me—"I was thrilled to know that I'd been talking to a leper who, on account of his affliction, can't even send a postal card from the little island where he is doomed to exile!"

A hurricane sweeps the Atlantic coast, trains are stalled in the northwest snows or a town may be cut off by floods in the Mississippi valley—in nearly every case the amateur or short-wave operator keeps in contact with the outside world and directs supply and rescue operations. One night he talks with Alaska—the next with a **caballero** in Spain or a sheep herder in Australia. Thrills! Of course. That's why once a short-wave enthusiast—always one!

If more people **realized** the pleasure of short-wave work—well, they would just get right into it.

And that brings us to this point—I know from several N. R. I. men that the Radio trained man who wants to build and sell short-wave transmitters and receivers needn't have any trouble in finding prospects for such apparatus. There's a good market for short-wave stuff and some good profits. Right now we are entering a short-wave era. I look for a big increase in this field. The international broadcasts will stimulate the interest of hundreds of people to reach out with their own short-wave sets and bring in the program as well as the thousand and one fascinating things going on in the short-wave belt.

N. R. I. men will find it to their advantage to encourage this short-wave interest. Don't overlook the tall money in the short waves.

E. R. HAAS,
Vice President and Director.

When you move please notify us at once of your new address. We want you to have each copy of the News. Back numbers are seldom available.

At ten, "I intend to be"; at twenty, "I expect to be"; at thirty, "I hope to be"; at forty, "I ought to be"; at fifty, "I should have been"; at sixty, "I might have been."

The reason that Edison invented as many things as he did was because he never invented an excuse.

Dear Mr. Smith:
I made $12 yesterday on repair jobs alone. I charge from $1 to $3 more than my competitors, and still Radio repairing has been extremely heavy. I have sold two sets today which will net me about $35.—L. D. Deshields, 1725 Greenup St., Covington, Ky.

Q S T U HAMS

The N. R. I., in cooperation with a big short-wave station in New York, wants to make a world-wide test on short waves. All N. R. I. men having short-wave stations or receivers are requested to send in their names at once for the details of this experiment. You will surely be interested in it—of course, if not, you'll not be obligated to enter into the experiment with us. So send your name in now—if you have either a short-wave transmitter or short-wave receiver or both!

J. E. SMITH.

NATIONAL RADIO INSTITUTE
Washington D. C.

Radio-Trician Service Manual

Compiled solely for Students & Graduates

SPARTON EQUASONNE RECEIVER

Models 301 and 931

The Equasonne receiver consists of three separate units, the selector, radio frequency amplifier and power converter.

The selector consisting of four variable condensers and coils, is of the band pass filter type, making four tuned circuits loosely coupled to each other. The coupling is adjusted so as to give a flat top selectivity curve about 10 kilocycles wide.

The radio frequency amplifier is a five-stage untuned radio frequency amplifier with a plate rectifier type detector, using six tubes in all. This amplifier amplifies approximately equally well all frequencies within the broadcast band.

The power converter consists of the conventional type rectifier and filter system as well as the one stage of audio frequency amplification. The power converters are of different construction in each respective model ranging from one power tube to two power tubes in push-pull.

Service Data Measurements for Sparton Equasonne Receiver, Model 931.

The Model 931 receiver uses six Cardon tubes No. 484. These tubes are practically the same as the standard five-prong 27 type tube but having filament voltage rating of 3 volts and a filament current reading of 1.1 amperes. The power tubes in this receiver are Cardon 182 type tubes, two of which are connected in push-pull. The Cardon 182 tube is similar to the 245 tube having a standard four-prong base and a filament rated voltage of five volts and a filament current of .8 amperes. These tubes can be tested in any regular testing instrument. The rectifying tube used in this receiver gives the standard 280-type tube.

Testing Voltages

Make all the following tests with volume control on full and voltage adjuster switch on the 110-volt A.C. line on the proper tap according to the A.C. line voltage. Test line voltage and set voltage adjuster to corresponding voltage or higher. Use a 0-160 A.C. voltmeter.

The terminals mentioned in the following tests refer to the terminals shown in Fig. 1 which are the same as the terminals shown in the schematic diagram numbering from 1 to 9.

Test With 0-300 D.C. Voltmeter

TEST NO. 1. Detector plate voltage. Measure detector plate voltage between terminals one and two. Normal voltage here should be approximately 140 volts without phonograph pick-up in jack. The limits of variation are 120 volts to 160 volts without pick-up. More or less than this indicates a defective plate circuit, possibly in resistance R 20,000.

TEST NO. 2. R.F. Amplifier plate voltage. Measured between terminals five and six the radio frequency amplifier plate voltage should be 145 volts. The limits for this voltage are: 130 to 170 volts, and more or less than these values indicates that there is trouble in the plate circuit which might be caused by defective resistance R 15,000 (R 7,000 in Model 301) or Speaker Field.

Test With 0-75 D.C. Voltmeter

TEST NO. 3. Detector bias voltage. Measure between terminals two and nine; normal bias is —12 volts. Allowable limits of variation are —10 and —17. Voltages above or below this may indicate a defective resistance R 20,000 A.

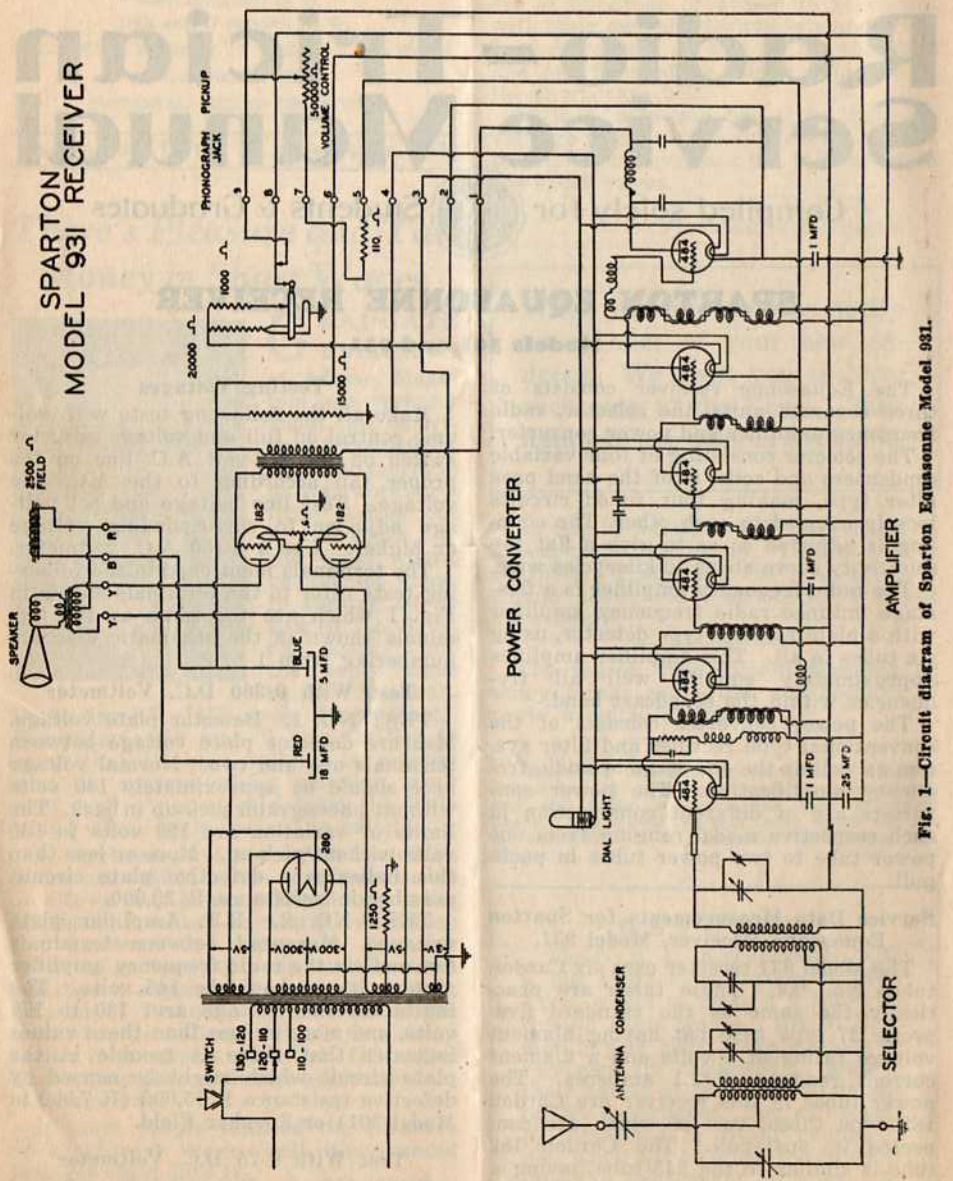

Fig. 1—Circuit diagram of Sparton Equasonne Model 931.

or connections. Detector bias voltage with pick-up plugged in should read between 3 and 5 volts. More or less than these voltages indicate defective circuit which may be in resistance R 1,000.

TEST NO. 4. Radio frequency bias. Measured between five and nine R.F. Bias normally —4.5 volts. The limits being —6 to —3. More or less than this

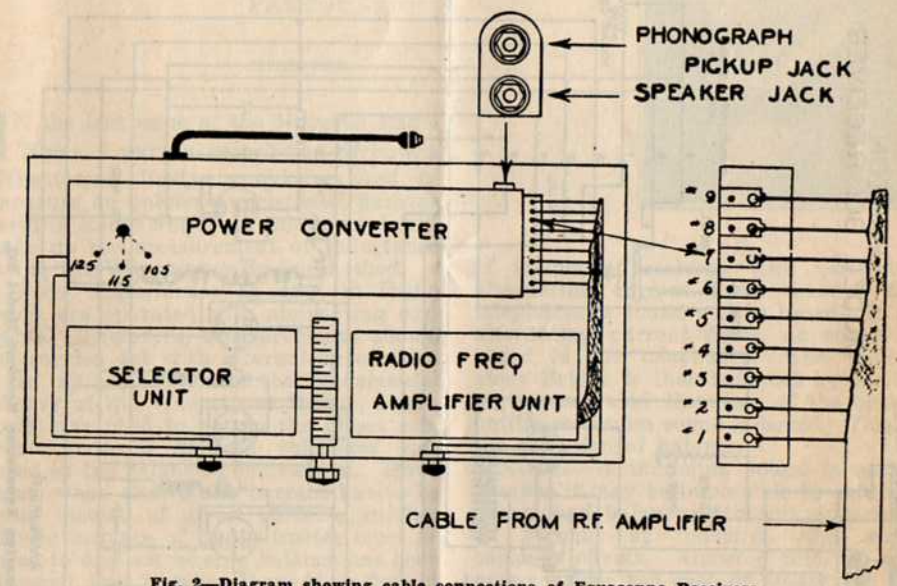

Fig. 2—Diagram showing cable connections of Equasonne Receivers.

results in loss in volume and indicates defective resistance R 110 or abnormal R.F. plate current. With volume off a wide variation of the above voltage is obtained but is not of consequence.

0 to 4 A.C. Voltmeter

TEST NO. 5. Heater voltages. (A) Detector and radio frequency heater voltage measured between terminal three and four. Normal 2.97 volts and more than this is dangerous to the tubes and greatly shortens their life; however, they may be run at as low a voltage as will give satisfactory volume. The maximum voltage allowable on these terminals is 3.1 volts, and this should never be exceeded. If the voltage is higher than normal, place voltage adjuster on next higher voltage tap.

TEST NO. 6. TEST KIT MEASUREMENTS. Remove A.F. tube and place in test kit socket. Place test kit plug in A.F. socket. (A) Measure filament voltage. Normal 4.75 volts. Limits 4.4 to 5.0. (B) Measure grid bias. Normal —40. Limits —30 to —52 volts. Readings greater or less than these show resistance R 1250 defective or abnormal plate current. (C) Plate voltage. Measure plate voltage. Normal 250 volts. Limits 300 to 220.

TEST NO. 7. ADJUSTMENT OF AERIAL COMPENSATING CONDENSER. Select a station, preferably a local, and at a time when it is the only station to be heard. Remove the aerial wire and put it on the connector between the selector and amplifier. If the station is heard at nearly the same volume, the selector is in adjustment. To adjust selector: Turn volume control to full and tune in some station of 1250 kilocycles or higher frequency. Adjust aerial compensating condenser until maximum response is obtained in speaker.

TEST NO. 8. TEST OF POWER CONVERTER. Turn off set and remove detector tube. Connect leads to a 4.5 volt "C" battery. Place one of these leads in terminal No. 1 and touch other to terminal No. 2. If click is heard in speaker, power converter is okey, providing the amplifier is good.

TEST NO. 9. Adjust hum control for minimum hum.

Testing Model 301 Receiver

The circuit diagram of Model 301 is shown in Figure 3. The same tests, with the exception of test No. 6 that have just

been given for Model 931 can be used for Model 301. In place of test No. 6 use the following test No. 10.

TEST NO. 10. TEST KIT MEASUREMENTS. Remove A.F. tube and place in test kit socket. Place test kit plug in A.F. socket. (A) Measure filament voltage. Normal 6.85 volts. Limits 6.0 to 7.5. (B) Measure grid bias. Normal —70. Limits —60 to —80 volts. Readings greater or less than these show resistance R 1700 defective or abnormal plate current. (C) Plate voltage. Measure plate voltage. Normal 350 volts. Limits 380 to 330.

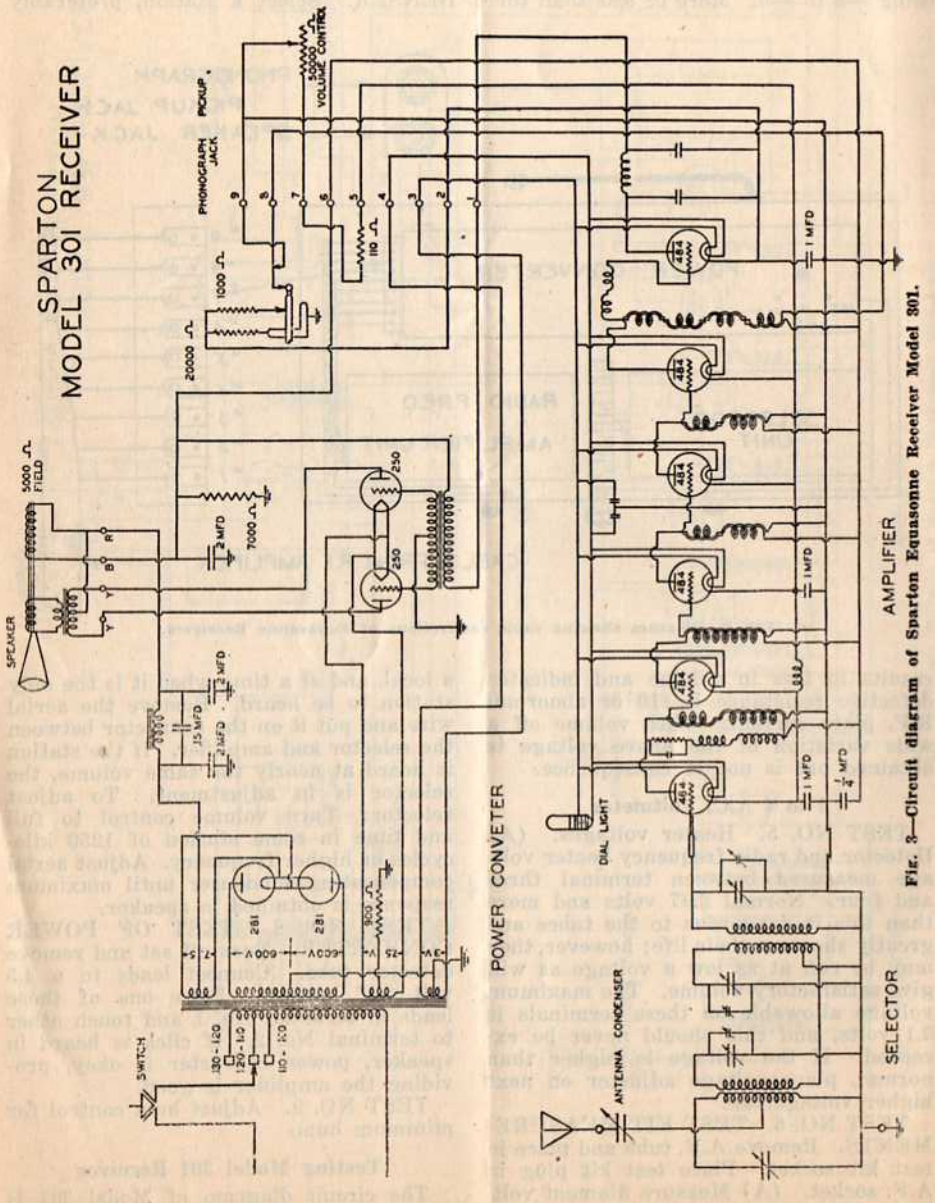

Fig. 3—Circuit diagram of Sparton Equasonne Receiver Model 301.

Inductance and Capacity Measurements With A Wheatstone Bridge

By JAMES A. DOWIE, Chief Instructor
Member I. R. E.

PART II

IN the last issue of the National Radio News, I gave a description of how a Wheatstone Bridge could be used to measure an unknown resistance, such as used in Radio work. In this issue, I will take up the measurement of Inductance using the Wheatstone Bridge method.

First, Inductances as used in Radio work are operated with alternating currents. Therefore, measurements should be carried out with alternating current.

In my explanation of the fundamental theory of the Wheatstone Bridge, a battery was used to obtain the direct current, hence a delicate voltmeter was used as the balancing instrument. However, when alternating current has to be used instead of direct current, another device in place of the voltmeter must be used to find out when a balance has been secured, that is, when there is no flow of current from point C to point D of the Wheatstone Bridge.

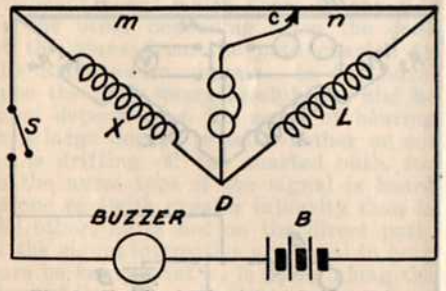

Fig. 3—Circuit of Wheatstone Bridge Using Buzzer and Phones as Indicator.

Figure 3 shows the circuit arrangement and apparatus used in this bridge. In place of the battery, "B," alone, a buzzer is added to the battery circuit and the combination utilized to give an alternating current through the various arms of the bridge. With this arrangement, the voltmeter is replaced by a pair of telephone receivers, then when the alternating current flows through the telephones, a sound will be heard. If no alternating current flows, no sound is heard in the telephones. The Wheatstone Bridge is then balanced by a sliding contact over the arms of the bridge until a minimum sound is heard. This is the condition of balance.

NOTE.—A minimum sound is stated because it may be impossible to obtain a zero sound balance with this apparatus on account of induction and stray capacity effects. Knowing this, we will now consider the case of measuring the inductance of a coil by means of such an arrangement.

Measurement of Inductance With Wheatstone Bridge

The circuit arrangement of this bridge for inductance measurements is shown in Fig. 4. m and n are the slide wire arms of the bridge, C, the sliding contact and L is the known inductance and X is an unknown coil whose inductance is to be measured.

The theory of this circuit is the same as the resistance measurement, that is, when the slider, C, is moved along m and n until a balance is obtained, a minimum sound will be heard in the telephones, then the following relation is true:

$$\frac{X}{L} = \frac{m}{n} \quad \text{therefore}$$

$$X = L \times \frac{m}{n} \qquad (4)$$

Thus, if a single standard inductance, a slide wire bridge, with phones and bat-

tery and buzzer, are available, inductances may be easily measured.

This relationship is only true provided the unknown inductance is of the same order of magnitude as the standard inductance. By this I mean inaccuracies will arise with these measurements if

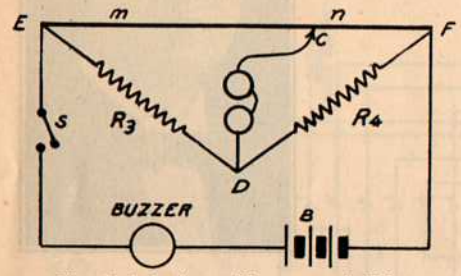

Fig. 4—Inductance Measurement Using Wheatstone Bridge.

the standard inductance is about 0.1 millihenry, while the unknown inductance is 10 millihenries. Because, then, the ratio of m to n would be too great to obtain a balance. If the ratio of m and n is about 1 or 2, then a sharp balance will be had.

The following notes should be of interest to Radio-Tricians interested in accurate measurements with a bridge.

The formula (4) for inductance is sufficiently accurate for all practical purposes. However, it does not take into consideration the resistance of the inductance coils. If there is a great discrepancy between the resistance of the two coils L and X, it is quite possible that a sharp balance will not be obtained. Balancing a Wheatstone Bridge circuit is something like tuning a radio receiving circuit, as resistance in a radio circuit makes for extremely broad tuning.

Balancing a Wheatstone Bridge is equivalent to reducing the resistance, and thus enables sharp balance or tuning. If the resistances of the coils are not balanced, a sharp balance will not be secured and hence the accuracy of the measurement will be destroyed, as the accuracy of the measurement in a Wheatstone Bridge depends upon the sharpness of the balance.

Since all inductance coils have some resistance, a better arrangement of a bridge is shown in Fig. 5, where each coil has its corresponding resistance in series with it.

For precision measurements, it is necessary to strike a balance for the resistances of the coils and for their inductances. The inductance balance is secured by means of the buzzer and telephones, while the resistance balance is secured by a voltmeter and battery for the source of supply. In this bridge, Fig. 5, we use two double pole double throw switches; one is used for switching on either the buzzer or battery for source of current, the other is for switching on either voltmeter or telephones for the balancing indicator.

The buzzer and telephones are used for the alternating current inductance balance, the battery and voltmeter for securing a direct current resistance balance. The variable resistances placed in series with each of the inductances enables balancing the inductance arms for resistance.

The following gives the method used for operating this type of bridge circuit. First, a balance is obtained for alternating current. The double-pole, double-throw switches are both thrown so as to use the buzzer and telephones. The sliding contact c on the wire m and n is varied until a balance is obtained. The switches are then thrown so as to place the battery and voltmeter in the circuit. With the sliding contact c fixed at the position previously obtained, vary the resistances R3 and R4 until the voltmeter indicates a balance by zero deflection. Now switch over to the buzzer and telephones and vary the position of the sliding contact until a balance is obtained as indicated by a minimum sound in the telephones. Then, switch to battery and

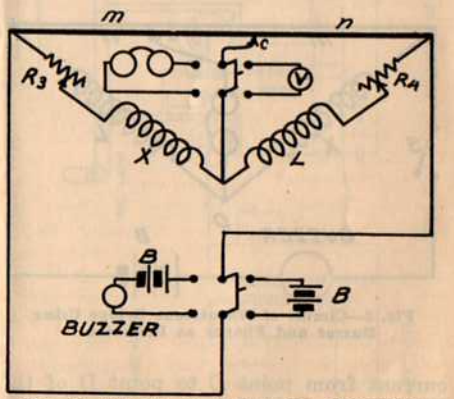

Fig. 5—Wheatstone Bridge for Measuring Inductance and Resistance.

voltmeter and keep the sliding contact fixed in new position previously found, then vary the resistances R3 and R4 until a balance is obtained. Alternate this way until a very sharp direct and alternating current is obtained, then note the

(Continued on page 14)

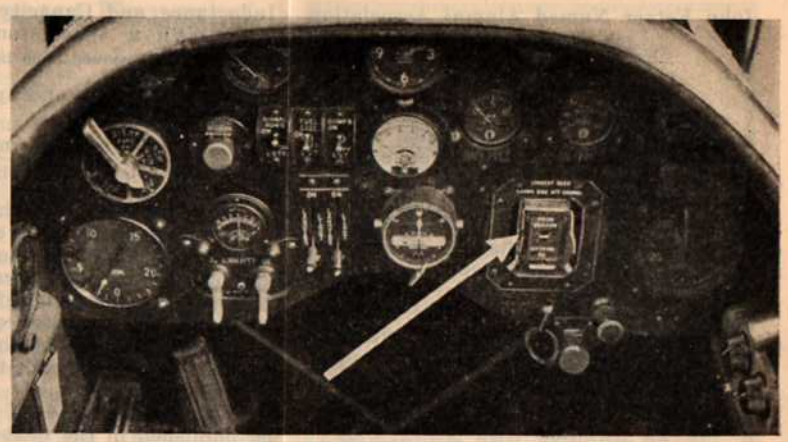

Photo shows the instrument board of an airplane equipped with the visual type Radiobeacon indicator. The arrow points to the indicator. A reed is actuated by Radio impulses and keeps the pilot informed at all times on which side of a charted path he is flying. The more pronounced the reed turns to one side, the farther the plane is drifting from the charted path.

Visual Type Radiobeacon Superior

A recent report made by the Depart- of Commerce shows that the visual type Radiobeacon has many advantages over the aural type. This report is based on a large number of experiments and tests performed by the Bureau of Standards.

The visual type of Radiobeacon operates on an entirely different principle from that of the aural type and thus gives a good opportunity for a comparison of the two types. In the visual Radiobeacon the pilot is kept informed at all times by a reed affixed to the instrument board which veers to one side or the other depending upon the drift of the plane from the path charted by the Radiobeacon signals. In the aural type the pilot wears headphones and he must depend upon his sense of hearing in a large degree to tell whether or not he is drifting off the charted path, for in the aural type if the signal is heard in one ear with greater intensity than in the other, he is not on the direct path. If the signal intensities are equal in both ears he knows that he is flying along the charted line.

The Department of Commerce report states that the visual type has these advantages over the aural system: 1. The visual system is simpler. 2. The operation of the visual indicators is less subject than the aural system to interference from other radio stations, such as the marine beacons. This is due to the audio-frequency selectivity of the reed indicators. 3. For the same reason "static" has less effect on the visual than on the aural system. The visual system will give direction in fairly severe static when the aural system would fail completely. The reed vibrations produced by exceptionally severe static can in no way be confused with the beacon signal indications. 4. Less skill is required on the part of the pilot to differentiate between the amplitudes of vibration of two reeds than to compare the relative strength of the two signals making up the aural beacon "interlock." 5. The visual system takes advantage of the psychological superiority of sight. The mind is stimulated to a greater degree by sight than by any of the other senses. Actual seeing rivets the attention immediately. A mere glance at the indicator gives the pilot his position with respect to the course. 6. The visual system has the inherent advantage that it can be so designed as to place an indication of direction at the pilot's disposal at all times, including the times when the pilot is receiving information by radiotelephone. In the aural system simultaneous furnishing of the two services is impossible; this violates a cardinal principle of safety devices. With the increasing use of high-frequency communication between airplane and ground the pilot will have to interrupt his beacon service more and more.

7. In order to reduce the radio direction service to its simplest terms, viz, no manipulation whatever by the pilot, there must be automatic control of the volume of the received signal, as the distance of the airplane from the beacon station changes. This is possible with the visual and not with the aural system.

John Fetzer Named Alumni Association President

(Continued from page 5)

JOHN FETZER

The many accomplishments of N. R. I. men as individuals will now be augmented by the world-wide influence of the first home-study school Alumni Association. Mr. Smith is overjoyed with the thought of the fraternal spirit that will be fostered by this association. He expresses the sentiment of the Institute when he says "Graduates of residence schools have alumni associations, and now I'm glad that N.R.I. graduates can enjoy the advantages and privileges to be derived from an alumni association of this kind. I'm proud of the spirit that graduates have shown in meeting here and forming this association. We at the Institute will do everything we can to foster its growth and encourage the good work it is destined to do for N. R. I. men the world over."

A man's real limitations are not the things he wants to do, but cannot; they are the things he ought to do, but does not.

Inductance and Capacity Measurements With a Wheatstone Bridge

(Continued from page 12)

values of m and n and apply the following formula.

$$X = L \times \frac{m}{n}$$

It will be noted that the important adjustment of the sliding contact was not changed in balancing the resistances R3 and R4. This is so arranged since the important adjustment of the slider determines the inductance measurement. The above formula is absolutely correct and is based upon both types of balance thus obtained.

(The third article of this series will be published in the next issue of the N. R. I. News.)

J. A. D.

NICE PROFITS!

Mr. Smith:

Please be advised that during the month of December my profits in RADIO were $345.95, this is mostly spare-time work. If it were not for the training that I received from the National Radio Institute, it would be impossible for me to do this work. I live in a town where you have got to have the stuff if you expect to make the money. Your school has put me in a position where I am in demand. I have 20 sets in my shop to repair and more coming.

MR. JOHN J. BRODERICK, JR.,
215 Hamblin Street,
Corbin, Ky.

The Army's Radio Ears

THE weird looking set of "mechanical ears" shown on the cover of this issue is what is known as the "sound locator" employed by the Ordnance Department of the U. S. Army. These mechanical ears can detect the buzzing of propellers or the faint whirr of an aircraft engine more than 15 miles distant. These sound locators are, in reality, Radio loud speakers in the sense of being the expotential type of horn—practically the same form of loud speaker that is used in talking motion pictures and public address systems. This type of horn is capable of reproducing the sound emanating from an airplane from 100 to 400 cycles. With the aid of these sound locators or Radio ears the operator can make the necessary calculations and deductions and within 30 seconds after a plane, say 15 miles distant in the darkness of night, is detected, its approximate location can be transmitted to a battery of aircraft guns. The success or failure of the air attack will then largely depend upon the accuracy of the anti-aircraft artillery. One type of aircraft detector developed by the sound laboratory of the Bureau of Standards has mechanical and electrical ears sensitive to a sound wave 20 miles distant. In this design a resistance coupled Radio amplifier is employed to enlarge the detected noise of an airplane or other far away sound. While the complete details of this new use of Radio principles and Radio apparatus by the U. S. Army are not available, this goes to show the numberless ways in which Radio is being used.

Dr. De Forest Honored

On January 8 Dr. Lee De Forest was elected President of the Institute of Radio Engineers. The public is well acquainted with his many Radio inventions. Often referred to as the father of Radio broadcasting, Dr. De Forest is the inventor of the 3-element vacuum tube and holds altogether over 120 Radio patents. Although KDKA is often referred to as the first station to go on the air to Dr. De Forest belongs the credit of making the first broadcast, he having transmitted the voice of Caruso from the Metropolitan Opera House sometime before the first station went on the air.

It is very fortunate for Radio and all connected with the profession that the Institute has at its head a man who understands Radio's problems and who is so well qualified to guide the American body of Radio Engineers to new fields of accomplishment.

Dr. De Forest is a member of the National Radio Institute Technical Advisory Board and gives the Institute and its staff the advantages of his many years of Radio experience which are passed on to N. R. I. students through the course.

OPERATORS BADLY NEEDED

Employment Manager Murray has more calls for Radio operators than he can fill. Graduates and students holding government operators' licenses should notify him at once if available for work. The shortage is so serious that we want to extend the privileges of our Employment Department to men who have not taken N. R. I. training. If you have any friends or acquaintances who hold operators' licenses and who want an operating job—send in their names and addresses at once! J. E. SMITH.

MISTAKE

Applicant — Well, here I am to see about that job you advertised.

Boss—I see. Do you think you can do the work?

Applicant — Work? Good gosh, I thought you wanted a foreman!

RIGHT! The more Radio knowledge the easier it is to grab the dollars.

--Drawn by Student Monebeck, Detroit, Mich.

Dear Mr. Smith:

When I enrolled I was working on a surveying gang making $4 per day for ten hours work. Now I am considered one of the leading Radio service men in town. I have my own shop, own all of the equipment and am my own boss and make all the profit.

Just recently I designed and built a test board that has no equal in the Bay District. It is entirely A.C. operated. It contains power pack modulated oscillator, vacuum tube voltmeter, capacity meter, continuity tester, A. C. filament transformer and all necessary meters for testing plate, grid, filaments, all at one time in a receiver. I would not take a thousand times the price of my course.—Leroy Bronson, 2004 Walnut Ave., Venice, Calif.

Left.—Miss Betty Compton being televised while Mayor Walker of New York looks on. A glass separates the transmitter from the receiver—one of the late Baird models. Television is advancing steadily. Stations increased from 10 to 20 in 1929. Public interest continues to grow. New refinements are constantly being made. It's a dead certainty that television will break on a commercial scale soon and when it does—watch out. It's going to take the country by storm and put a lot of big jobs and top profits in reach of men who are "up to the minute" in Radio.

AMERICAN SCHOOL OF THE AIR

On February 4 the American School of the Air will be launched. It is sponsored by Grigsby-Grunow, makers of the Majestic set. Already 35 stations of the Columbia Broadcasting System have agreed to carry the feature.

This is the first nation-wide attempt to give instruction to public school students by means of Radio. For 30 minutes on Tuesday and Thursday of each week, from February 4 to May 15, special high class educational lectures will be directed to school children throughout the country. A faculty of 16 prominent educators are preparing the special broadcasts on history, literature, civics, art, music, health, nature study and international good will. These programs mark a big step forward.

Radio is going to equalize educational opportunities. It will pay you to encourage the experiment. See that the schoolhouse in your locality is equipped to receive these programs. Radio will play a bigger part in education as time goes on. That means, also, a greater demand for Radio apparatus. It means that children will become Radio-conscious and will accept Radio more readily as a medium of education, entertainment and business information. If you want more information about these programs write to the American School of the Air, Box 100, Chicago, Ill.—J. E. S.

HOW ALDRICH GOES OUT AFTER RADIO BUSINESS

Student A. Lee Aldrich, 1137 Vincent Ave., N., Minneapolis, Minn., sends us this picture. It looks like a handy piece of machinery to get around with, conduct demonstrations and handle repair jobs quickly. Mr. Aldrich believes in advertising, too. It would be a safe bet to say that he had a firm grip on a large share of the St. Paul Radio business. With him, George Medved and several other N. R. I. graduates, the people of St. Paul ought to have their sets in top-notch working order!