NATIONAL RADIO NEWS

IN THIS ISSUE

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How Much Is Your Time Worth?

If you were handed $1.00 for every hour you devote to your N.R.I. lessons, wouldn't you arrange to study a good deal more than you now do?

The odd thing about this is that chances are you can make your study time pay you far more than $1.00 an hour. This fact was brought out in a conversation with an N.R.I. man who recently visited the Institute. He told me his company had raised his salary by $35.00 a month or $420 a year, when he had completed about 40 lessons on a schedule calling for 10 hours study a week (2 hours per night, five nights a week).

When he visited the Institute, it was almost a year since he had received that raise. Thus up to then, he had already been paid $1.00 an hour for the time he had studied and would continue to receive $1.00 an hour for that time, so that at the end of another year he would have received $2.00 an hour, at the end of the third year, $3.00 an hour, and so on.

As a matter of fact, the picture was even rosier for this particular student. The reason he happened to be in Washington was that he had been appointed manager for his company's branch in Richmond and was passing through Washington on his way to his new job.

His experience is not unusual. I mention it only because he is the only student with whom I have come in contact who had figured out, on an actual dollars-and-cents basis, just how much his study time was worth. On such a basis, I can recall some N.R.I. men whose study time has paid them as much as $8.00, $10.00 and even $15.00 an hour!

You—and every N.R.I. man—can make your hours of study pay you just as good a dividend; and you can probably find more time for which to collect. True, you won't be paid right away. But after all it is the future toward which you are working and it's in the future you'll be paid, if you *earn it now!*

J. E. SMITH,
President.

N. R. I. Student Installs P. A. System for Eucharistic Congress in Philippine Islands

"I am sending under separate cover a few photographs taken at the Eucharistic Congress here in Bacolod, P. I. We had complete charge of the P. A. Installation. Two amplifiers were used, one feeding the four horns in the plaza and the other two horns suspended in the bandstand. The four speakers in the plaza were used in conjunction with the microphone in the Temple—a carbon mike, by the way—and the two horns in the bandstand were used in conjunction with a Shure crystal microphone. The crystal mike was used in the bandstand for the choir singing and solos as it had better range and less background noise than the carbon. The whole thing was a great success and a few orders for amplifiers came in afterwards. People came from all over the Islands and were surprised at the good sound.

"The amplifier at the Temple was a Lafayette Model 100-A feeding four Wright DeCosters Model 4500; that in the bandstand was home-made. Class AB using 45's in parallel push-pull.

The Plaza. Arrows Indicate Location of Speakers

We made a name for ourselves in amplifier work, and there is quite a demand for our P. A. System."

IAN KINNES,
Philippine Islands.

The Temple at Night

Overseas Telephone Service

(Courtesy of Bell Telephone Laboratories)

Not many years ago a telephone call to London or Paris was an idea that belonged in one of those imaginative books that dip into the dim future. Today such a call is one of many in a daily stream of traffic that flows not only to London and Paris, but to the four corners of the earth—to Stockholm, Cario, Cape Town, Sydney, Buenos Aires, Honolulu and Tokyo.

Overseas telephone service began on January 7, 1927, with the opening of service between New York and London, over a long wave Radiotelephone circuit across the Atlantic. The scope of this service has been rapidly enlarged—a city or two, a group of islands, or an entire country at a time. The service now embraces practically all telephones in Western Europe; Egypt and part of South Africa; Australia; India, French Indo-China, Siam and the Netherlands Indies; practically all of Central and South America; Bermuda, Hawaii, the Philippines and Japan.

You can also be connected with the Bahamas, the Dominican Republic, and Puerto Rico; with Morocco, Algeria, Palestine, Syria, the Canary Islands, Iceland, and scores of distant lands all the way from the Arctic Circle to far below the Equator. Or you may talk to a passenger on any one of a score of ocean liners far out at sea. America's neighbors, Canada, Cuba and Mexico, have already been within reach by telephone for several years. Wire lines across the borders interlace the networks of Canada and Mexico with Bell System lines, while four submarine cables across the Straits of Florida interconnect the American and Cuban systems.

Without leaving the territorial limits of the United States, the Bell System subscriber is within reach of nearly 18 million telephones. With these foreign extensions he can reach a grand total of more than 32 million telephones, or about 93 per cent of all the instruments in the world.

The Radio Links

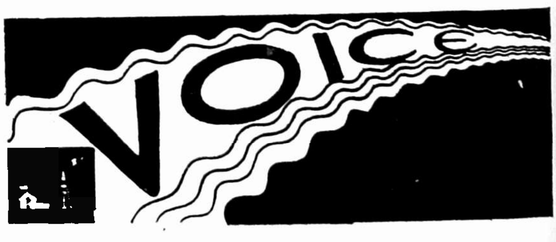
Radio and wire lines combine to form the voice channels to countries overseas. The calls to Europe, after passing through the Transatlantic terminal in the Long Distance Building at 32 Sixth Avenue, New York, travel over the original long wave, and three short wave Radio channels. These Radio circuits connect with land-wire lines in Europe. For example, a call to Vienna would go to London by Radio, by submarine cable under the Channel and thence by land wire across Europe to Vienna. Other connecting Radiotelephone circuits, at London and other European points, give service to the Levant, Africa, Australia, India and the Far East. All of these connecting circuits are in the short wave band.

New York is also the terminus for short wave channels to Buenos Aires, Rio De Janerio, Lima, Bermuda and ships at sea. Other short wave channels terminating at San Francisco provide service with Hawaii, the Philippines, Japan and the Netherlands Indies. From Miami we reach the West Indies, Central America, and the northern part of South America. The Miami channels are likewise short wave.

Repeaters

The history of telephony over great distances began in 1915 when service was opened over land lines between New York and San Francisco. This achievement of spanning the continent marked a notable advance in the telephone art. The coast-to-coast circuit employed the first vacuum tube speech amplifiers, commonly known as "telephone repeaters." These devices restore to the voice the power it loses in transmission. For you are aware, perhaps, that the tiny current flowing in the transmitter of your telephone has scarcely enough energy of itself to carry your voice beyond the state line. Installed at intervals along the circuit, these repeaters take the impulses created by your voice and restore them to their original strength. The action may be compared to a child being pushed in a swing. In this case each repeater along the line gives the weakened voice waves a vigorous push that sends them swinging on to the next repeater, just as the push keeps the child's swing in motion. As a result of this re-energizing, your voice is not only audible to your friend at the other end of the line, but easily recognized.

The introduction of repeaters made possible the extension of service across the continent. And



'hen Radio came along, they soon found useful mployment injecting new energy into aerial 'oice currents.

In One Jump

Vhile the rapid development of the vacuum tube nade it possible to transmit the voice with clarity ver wire lines thousands of miles long, transmission of the voice all the way across an ocean equired not only more technical skill but imagiation. In crossing the Atlantic, for example, here are no convenient islands on which interhediate repeater stations may be erected. The ntire amplification must be applied at two points -the transmitting and receiving stations. This as necessitated the design of equipment capable producing enormous amplification.

ne of the principal elements in amplification at he transmitting station is a water-cooled vacuum ube with a power capacity of 10 kilowatts. hirty of these are employed in the final stage of he long wave Transatlantic transmitter at Rocky Point, L. I. These tubes are also used at he short wave stations, though a lesser number required, on account of the higher concentraon of power in the directional transmission posible with short waves.

Shouts and Murmurs

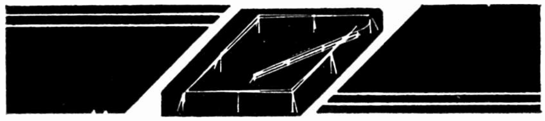
Whether you shout or whether you whisper, the ower behind the syllables you utter is a matter f a few milliwatts, which are the kind of units ne might use in measuring the power of insects. t can be readily seen, therefore, why it requires ich an enormous amplification of your voice to ridge an ocean. Actually these transmitters reroduce the voice in waves of energy which, if onverted back into sound waves, would rattle indows for miles around.

espite this enormous amplification which hurls he voice across thousands of miles with the force f a gigantic pile driver, the attenuation, or wear nd tear of such a trip reduces it to microscopic roportions. In a fraction of a second, those yllables have become a "far-heard whisper o'er he sea"—far more faint than those ghosts of ound across a lake on a breathless summer ight.

n actual figures, the amplification at the transitting station reaches a millionfold and more. et it is nothing to the operation which must be erformed at the receiving station. Picked up by ighly sensitive antennas, the Radio wraiths om across the ocean are carried to delicately ljusted receiving sets, in which the amplificaon reaches, at times, the prodigious figure of a llionfold.

Rhombics

arious types of antenna are used at the Radio ations. In long wave systems it is not practicable to give the transmitting antenna much more directive effect than you get when you shout across the street. With short waves, on the other hand, it is possible to concentrate the impulses along a fairly narrow path, effecting a substantial reduction in the power necessary to bridge a given distance.

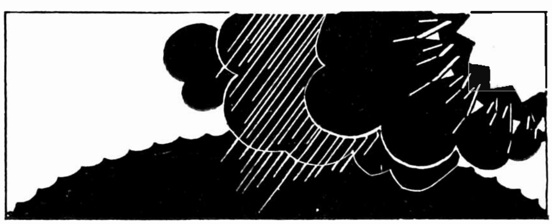


Receiving antennas, both long and short wave, can be made much more directional. At the long wave receiving station at Houlton, Me., a group of four antennas three miles long pick up the signals from the British transmitting station at Rugby, near London. At Netcong, N. J., rhombic antennas pick up short wave signals from Rugby. Both of these antennas are given a directive effect by reducing the strength of signals from any direction except that of the transmitting station. You have seen the auctioneer employ this principle when he cups his ear and says: "Did I hear two-fifty?"

The rhombic or diamond-shaped antenna is the prevailing type in use at both transmitting and receiving short waves stations. This antenna is remarkable for its simplicity, consisting merely of a single wire or pair of wires strung on poles in the shape of a diamond in a horizontal plane. In directiveness and quality of transmission or reception, it compares favorably with antenna arrays much larger and more complex.

Stormy Sunlight

In crossing the ocean, the voice impulses often encounter forces of elemental fury, no less powerful because they are invisible and inaudible. That blue vault above a sunlit Atlantic may be, as indeed it seems, delicately in tune with the faintest murmur from an antenna. It is quite as probable, however, that it is swept by torrents of elec-



trical energy from the sun, and reverberating with the crashes of hundreds of distant thunderstorms.

To make clear the nature of the problem of getting through such a medium it is well to review

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Overseas Telephone Service (Continued from page 5)

some of the special features of long-distance Radio transmission. To begin with, it must be remembered that we are dealing with point-to-point communication, in which we attempt to concentrate our signals along a certain path, unlike broadcasting, in which the station radiates in every direction, like the lamp on your living room table.

For the purposes of this discussion, we may regard the Radio waves that travel from transmitting to receiving antenna as the voice in flight through space.

Sky Waves

In tracing the path of this voice, let us take first the case of short waves. Like other waves, they leave the transmitting antenna at various angles, but it is the waves that take off at an upward angle of fifteen to thirty degrees which we depend upon mainly for long distance jumps. These are frequently referred to as "sky waves."

Continuing upward, they strike a large envelope around the earth known as the ionosphere. According to the present theory, this envelope is composed of an infinitely large number of electrified particles produced by the energy from the sun, and in lesser degree from meteors, cosmic rays and thunderstorms. This ionosphere reflects the Radio waves downward just as a mirror reflects light. As the earth is also a reflector, short waves usually bounce several times before reaching their destination.

Two-Cushion Shot

The fact that it may be a two, three or multi-cushion shot to the receiving station does not necessarily produce serious complications. The trouble is, however, that the waves sprayed from the transmitting antenna at various upward angles between 15 and 30 degrees, bounce along different paths. Upon arrival at the receiving antenna these waves may reinforce or may interfere with each other—just as waves from two large vessels may pile up one big one, large enough to swamp smaller craft, or may knock each other down. The effect in the case of Radio waves is to produce what is known as fading—that is, at one instant the voice is loud and at the next, faint.

While ordinary fading may be minimized by automatic volume-control devices which keep the volume fairly uniform, this difference in paths often causes another type known as *selective fading*, in which the wave interference is spotty —at one time it is in one part of the voice; again, it is in another. This changes the quality of the voice—for example, it may at one moment sound muffled, then shrill. This type of fading cannot be readily compensated for and may impair or destroy intelligibility.

Magnetic Storms

At times of great solar activity—of which sunspots are a common symptom—the radiations from that great orb of molten energy set the ionosphere seething. The effect terrestrially is known as a magnetic storm. A familiar phenomenon of such a storm is the aurora borealis (or auscralis) observed by those who live in the higher latitudes.

This seething changes our mirror from a well polished and reasonably level reflector to one which reflects the waves at various angles, scatters them over irregular paths and even absorbs a substantial portion of them. The more violent storms scatter or absorb so much of the waves that few of them ever reach the receiving station and there are times when the storm wipes them out entirely. These disturbances may last for a few hours or for several days.

Unlike short waves, long waves manifest a tendency to hug the earth, and are therefore less affected by the ebb and flow of electrified particles farther up. They are, however, particularly vulnerable to static. This is a disturbance caused by electrical discharges in the atmosphere, of which the thunderstorm is the most familiar and undoubtedly the most unpleasant form. It has been estimated that there are some 1800 of these going on all over the world at any given moment, producing about 100 lightning flashes a second. During the summer months there are, at times, enough of them in the vicinity of our receiving stations to cause serious interference.

Scrambling

To insure privacy in telephone conversations across the ocean, a device in the Control Room at the Long Distance Building performs upon the voice an operation popularly known as "scrambling," from its resemblance to a familiar method of preparing eggs. This is a deliberate mangling of the words in a way that produces complete gibberish.

One of the methods employed is to turn the voice upside down—that is, to make the high tones low and the low tones high. In the case of music, the "wry-neck'd fife" emite a rumbling note that resembles distant thunder while the tuba and the kettle-drum produce the squeaky notes of badly-greased wagon wheels. The result in the case of speech is worse than you might suppose, for this reason: Speech is actually a very complicated

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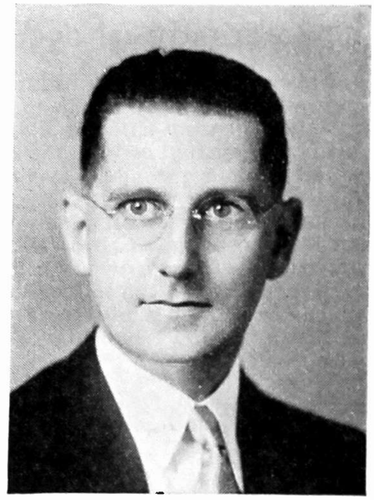
The Laboratory Page

By GEORGE J. ROHRICH

The purpose of this department is to furnish supplemental experiments to students who have completed their Home Laboratory Course, but who wish additional laboratory experience. You are not required to perform these experiments, but you will gain increased knowledge by doing so. Most of the material required will be that received as part of the Laboratory Course. Any other material necessary can be purchased very reasonably and will constitute an investment rather than an expense, as it will serve as replacements in service work or be useful in your shop later.



George J. Rohrich, Engineer in Charge N. R. I. Laboratory

EXPERIMENT NO. 56

Object: To show that a parallel combination of a coil and a condenser will conduct less alternating current than when the coil or condenser is used alone.

Apparatus Required: Power supplied to outlet which is known to be A.C. with voltage between 100 and 120 volts; power limiting panel described for Fig. 81 and Fig. 82 in preceding Laboratory Page; a 10-watt lamp; test wires or test prods attached to plug; audio frequency transformer (Item No. 24); .5 mfd. condenser (Item No. 38 where A.C. is 60 c.p.s.) or a 3 mfd. condenser (where A.C. is 25 c.p.s.); 5000 ohm resistor (or potentiometer, Item 13, set to 5000 ohms where A.C. is 60 c.p.s.); or a 2000 ohm resistor where A.C. is 25 c.p.s.

Apparatus Assembly: Connect the parts as shown previously for Fig. 83. Plug No. 1 may be inserted and used in socket No. 1 for A.C. in any convenient manner, but it is advisable to insert it in the special way explained for Fig. 81 so the lamp (or lamps) will be in the ungrounded side of the A.C. power line. Insert the plug with test wires in socket No. 2. Place one 10-watt lamp in one lamp socket in the lower limiting panel. Use the specified condenser and resistor to suit the frequency of your power line for clearest observations.

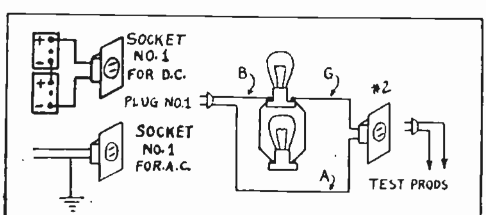


Fig. 83

Experimental Procedure:
1. Insert Plug No. 1 in socket No. 1 for A.C.
2. Touch the two test prods together and note that the lamp lights.
3. Hold the test prods on terminals P and B of the audio transformer (Item No. 24) and note that the lamp lights again although somewhat more dimly. See Fig. 84A.
4. Hold the test prods on the two terminals of the specified condenser. Note that the lamp lights again dimly. See Fig. 84B.
5. Hold the test prods on terminals 1 and 2 of the potentiometer (Item No. 13). Observe the precautions pointed out in Experiment No. 52 for Item 13. Note that the lamp lights again dimly. See Fig. 84C.
6. Connect terminals P and B of the transformer in parallel with terminals 1 and 2 of the potentiometer as shown in Fig. 84D. Hold the test prods on terminals P and B (or on terminals 1 and 2). Compare results obtained with those obtained in Procedures No. 3 and No. 5.
7. Connect the condenser terminals in parallel with terminals 1 and 2 of the potentiometer as shown in Fig. 84E. Hold the test prods on terminals 1 and 2. Compare results with those obtained in procedures No. 4 or No. 5.
8. Connect the condenser terminals in parallel with terminals P and B of the transformer as shown in Fig. 84F. Hold the test prods on terminals P and B. Compare results with those obtained in Procedures No. 3 or No. 4.

Observations: Procedure

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The Laboratory Page (Continued from page 7)

No. 2 above is a repetition of Experiment No. 51 where a resistor alone conducts A.C. Procedure No. 3 above is a repetition of Experiment No. 53; No. 4 is a repetition of Experiment No. 54, while No. 5 above is the same as Experiment No. 52.

Procedure No. 6 causes the lamp to light *brighter* than in Procedures No. 3 or No. 5. This would seem logical because current for lighting the lamp has to pass through the coil while additional current has to pass through the resistor due to the fact that a parallel connection is employed.

Procedure No. 7 also causes the lamp to light *brighter* than in Procedures No. 4 or No. 5. This again would seem logical because a parallel connection is again employed.

Procedure No. 8 causes the lamp to light *dimmer* than in Procedures No. 3 or No. 4. This procedure allows you to observe the object of this Experiment No. 56 that *less* alternating current is conducted while using a *parallel* combination consisting of a coil and a condenser.

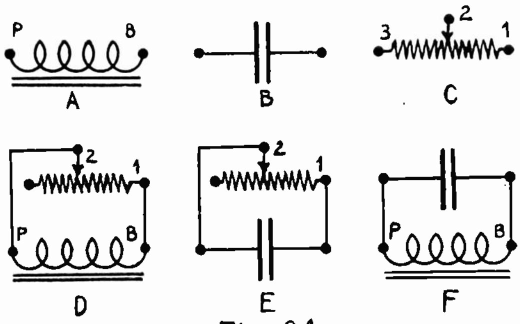

Fig. 84

At the beginning of this series of supplementary experiments I mentioned that a coil, condenser or resistor acts in a peculiar manner when used alone with a source of power; when combined in various ways, different actions occur. Here we note that each part possesses the "peculiarity" or "property" of having "resisting ability." We would naturally expect that two devices acting together as in Procedures 6 and 7 would provide less "resisting ability" or *impedance* to the electric current passing through the lamp. When we come to using a similar combination as in Procedure No. 8 we might also expect less impedance than in Procedures 3 or 4, yet the property of this particular parallel combination is that we have *less current* in the circuit, which means that we have *more impedance.*

When confronted with this peculiarity for the first time we cannot help but be astonished. Yet this peculiarity is used time and again to get minimum current from unwanted broadcast radio signals, so that we soon accept it as a commonplace fact and work with it, without being amazed. In other words we make use of this property while assembling a "wave trap" to eliminate signals which interfere with our favorite broadcast programs by selecting the proper value of our wave-trap tuning condenser, just as we have to select the proper size of condenser in this experiment to suit the frequency of the power line. Another application of this property is used in some filter circuits found in power-supply systems, to eliminate hum.

Theory of Action: In Experiment No. 53 it was pointed out that the "inductive reactance" of the coil between P and B on the transformer has a value of approximately 5460 ohms for a frequency of 60 cycles per second, while it has a value of approximately 2230 ohms for a frequency of 25 cycles per second.

In Experiment No. 54 it was pointed out that the "capacitive reactance" of the .5 mfd. condenser is approximately 5300 ohms for a frequency of 60 c.p.s., while the capacitive reactance of a 1 mfd. condenser is approximately 6360 ohms for 25 c.p.s. A 3 mfd. condenser has one-third of this reactance or 2120 ohms.

The least current will flow when the value of "inductive reactance" has the same value as the "capacitive reactance." This is the important property which we use to our advantage so frequently when combining condensers and coils in parallel for getting the least current from interfering of unwanted sources.

This peculiarity of getting the *least* current when the inductive reactance is equal to the capacitive reactance is given a special name. It is called *resonance.* However, when we review Experiment No. 55 in the preceding laboratory page, we find this same name of *resonance* is also used when combining the coil and condenser in *series* to get the *greatest* current. Therefore, we must now make a distinction between the two kinds of *resonance.* This is done simply by calling the one kind *parallel resonance,* while the other kind is called series resonance. It is obvious at this time that the results of these two kinds of resonance produce opposite effects; *parallel resonance* causes the *least* current to flow in the circuit, while *series resonance* causes the *greatest* current to flow in the circuit.

A *series* circuit also exists in Fig. 84F where the current is large. Prove this by removing the wire from terminal P and connecting another 10-watt lamp in *series* with this wire and terminal P.

Overseas Telephone Service

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›attern of sound, consisting of a succession of ·hord just like chords struck on a piano, though ıot always as melodious. Each of these chords :onsists of a basic tone and certain overtones. 'hese overtones form a chord that runs way up ıbove high C, its nature depending upon the qual-ty of the voice—sonorous, squeaky or raucous—ınd the particular vowels and consonants being ›ronounced.

'apsizing these chords has the effect of produc-ng syllables with vowels and consonants utterly trange to the human ear. It is in this unin-·lligible form that the voice crosses the ocean.

Vhile the similarity to scrambled eggs is marked, here is an important difference. No practicable ıeans has been devised for unscrambling eggs, vhereas this is quite easily accomplished in the ·ase of the voice by an "unscrambler" at the dis-ant terminal which reverses the process, pro-ucing your words in their original beauty.

Mother Tongue

Vhere a switchboard becomes the portal of peech to over sixty foreign countries, the ques-ion naturally arises as to what complications hese many languages create. The solution is uite simple. The official language of all the adio circuits operated by this company is En-lish. For example, on the circuits to London the perators in New York talk only with the Lon-on Trunk Exchange, the English operators deal-ng with the Continental operators in whatever oreign language the case may require. Bermuda ınd certain of the West Indies are English-peaking, while in Central and South America, he operators who work with New York or Iiami speak English as well as their native ongue. The circuits to Japan and other points ı the Pacific are likewise operated in English.

Knowledge of these foreign languages is, how-ver, a useful asset to our operators, and many of he overseas staff at New York speak at least ne other tongue. In all, some ten foreign lan-uages are represented there. And a knowledge f the language, geography and customs of a oreign country often enables an operator to han-le a call more intelligently.

Vhile your dealings with the operator are in nglish, calls often pass through several lan-uages before reaching their destination. A call › Bucharest, for example, is passed to London

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Handy Wave Trap Gives Weaker Signals a Chance

The Taco Wave Trap now comes to the rescue of set owners located in the vicinity of powerful broadcasting stations. This inexpensive device tunes out any overbearing signal so that weaker signals can be tuned in and their programs enjoyed. Such a trap is especially desirable with older type sets notorious for their broad tuning.

The Taco Wave Trap comes in three frequency ranges: 450-750, 750-1150, and 1150-1550 kc., or the complete coverage of the broadcast wave band. A unit of the particular frequency range in which the offending station falls, is selected. A set-screw adjustment then permits the tuning of the trap to the precise frequency to eliminate the heretofore overriding signal. The trap connects between antenna and set. Further details may be had by writing Technical Appliance Corp., 17 East 16th St., New York City.

n r i

Radio Star Blotters to Sell Service Work

A series of twelve blotters featuring brilliantly colored photographs of Radio, stage, and screen stars and containing service selling messages has been announced by National Union Radio Corporation. It is claimed that blotters form one of the most powerful sales promotion material available to servicemen today.

National Union suggests that the serviceman release blotters to set owners at regular intervals so that his message will be in the home whenever Radio trouble develops. This blotter series is being supplied through National Union distributors at a moderate charge and are imprinted with the dealer's name and address.

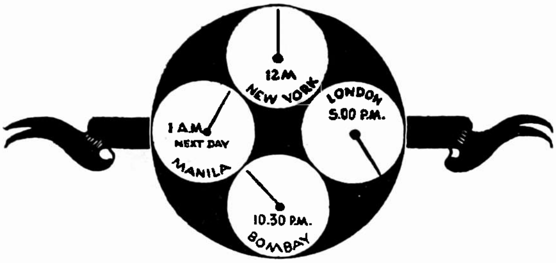
Overseas Telephone Service (Continued from page 9)

in English, and to Budapest and thence to Bucharest in German. The Bucharest operator deals with her subscriber in Roumanian. We have had calls that involved four or five languages.

Twisting Clocks and Calendars

An interesting adjunct to the New York transoceanic switchboard is a library of more than eighty directories, for all the principal points to which we give service. When a call is put in from this side, the operator looks up the number in one of these directories, and, if it can be found, passes it on to the operator across the ocean.

Telephoning to the other side of the world is often an almost startling reminder of the fact that sunrise or high noon or tea time—and, in fact, the phenomenon of daylight itself—varies



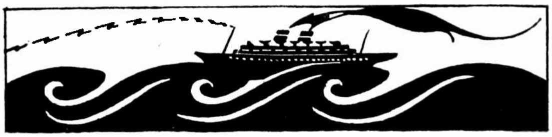
in different parts of the world. For the experience of many of us is confined to a change of an hour or so—as when we travelled from New York to St. Louis and found our watch an hour ahead of time, or crossed the Atlantic and made the pleasant discovery that lunch was coming earlier each day.

However, it remained for the telephone to provide us with a few surprises along this line. For example, we might call up an English friend some morning and find him at tea, or if he happened to be in India, he might be gone to bed—not at all a quaint English custom but due to the difference in time. Or we might call up our cousin in Tokyo some evening and have him tell us what happened tomorrow morning in Japan. For when it's noon today in New York, it's 5 p. m. in London, 10:30 p. m. in Bombay, 2 o'clock tomorrow morning in Tokyo and 6:30 this morning in Honolulu.

There are other surprises. On a fine September afternoon, when the leaves are just beginning to turn we would discover that the first signs of spring are just appearing in Buenos Aires, while a friend in Java is complaining—over the telephone—of the heat; and another, far up in Norway, becomes equally plantive about a thermometer below freezing.

Sea-going Telephones

In recent years the American has formed the habit of turning to the telephone on the slightest pretext. When he acquired the habit of making frequent trips across the Atlantic, it was natural for him to begin looking about the ship for a telephone. The result was the extension of Bell System telephone service to a score of ocean liners through stations in New Jersey, and also through the Transpacific stations at San Francisco.



The ships to which service is given are: Caledonia, Transylvania (Anchor Line); Empress of Britian (Canadian Pacific), Aquitania, Berengaria, Queen Mary (Cunard-White Star); Ile de France, Normandie (French Line); Monarch of Bermuda, Queen of Bermuda (Furness); Bremen, Columbus, Deutschland, Europa, Hamburg, Hansa, New York, Reliance (Hamburg-American—North German Lloyd); Conte di Savoia, Rex (Italian); and Chichibu Maru (Nippon Yusen Kaisha). The service is available to all Bell and Bell-connecting telephones in the United States, Canada, Cuba and Mexico.

Some Users

Overseas telephone channels have been employed for wide variety of personal and business matters. The financial world is probably the heaviest user, for every important financial development, every unexpected turn in price trends on the exchanges, whether up or down, is reflected in the volume of calls.

The Press is also a large user. You doubtless recall the dispatches telephoned from some distant country or the printing of an interview over the Radiotelephone with some eminent statesman or financier. Or some visitor of note is interviewed as his ship approaches New York.

In the business world the service has been used to buy and sell automobiles, flour, real estate, rare books, gasoline, diamonds. Department tores have obtained eye-witness accounts of hose breathlessly-awaited events, the fall fashion penings. Manufacturers and merchants have sed it to confer with their representatives broad, to give themselves an accurate picture f events in the foreign field, or to decide quickly ome urgent matter. The service has been employed in every phase of export and import trade ith America's overseas neighbors.

he Government has also employed the overseas elephone to keep in touch with the stirring vents that have marked the history of recent ears.

n addition to these uses, the voiceways to other ontinents have been employed for all manner f personal matters—birth, deaths, marriages, l the infinite variety of happenings that enross mankind's attention and that are no less iteresting because they may have happened on ne other side of the Atlantic or on the other ide of the world.

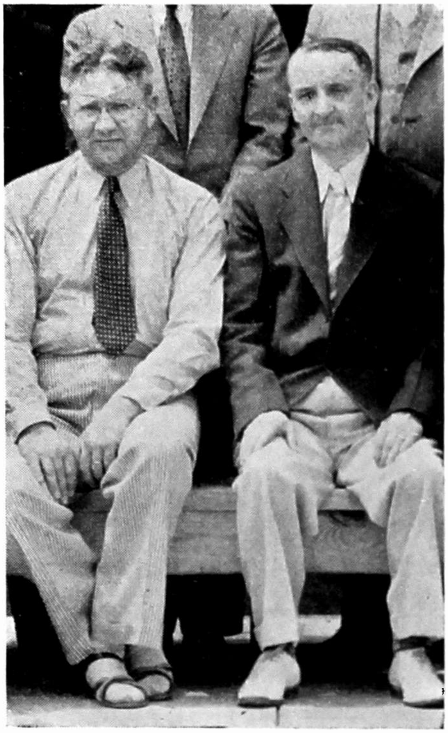
'hese channels have also been used by the great roadcasting companies to bring programs from broad to their American listeners. In this way mericans have heard famous orchestras of urope, statesmen addressing international gatherings and descriptions of important events taking place on the other side of the Atlantic. Or erhaps the program has come from some more istant continent, or from a ship in some remote uarter of the globe. The same telephone channels have taken American programs to foreign adio networks.

Circumlocution

lobe-Girdling telephony became a literal fact on pril 25, 1935, when President Walter S. Gifford f the American Telephone and Telegraph Company talked with T. G. Miller, Vice President of he Company, over a circuit that went around the orld. Mr. Gifford and Mr. Miller were in adjoining offices in the Long Distance Building at ew York.

raversing a path from New York through San rancisco, Java, Amsterdam, London, and back New York, the voices of the speakers covered distance of more than 23,000 miles. Radio hannels, land wires and submarine cables united form the voice path. The noteworthy feature f the conversation was the fact that all of the acilities employed are in regular use for commercial telephone service.

'he four major parts of the circuit comprised ne of the Transcontinental lines between New ork and San Francisco and three great Radio pans—New York to London, Amsterdam to Java nd Java to San Francisco, the last being a oiceway nearly 9,000 miles long.



"The man behind the name of Triplett" (right)—R. L. Triplett, snapped at his Bluffton, Ohio, factory, with Joseph Kaufman, National Radio Institute's Director of Education. "J. K." asks us to excuse his informal dress; he was just going fishing. Oh, yeah—in flannel pants?

—n r i—

Two New Auto Antennas Announced

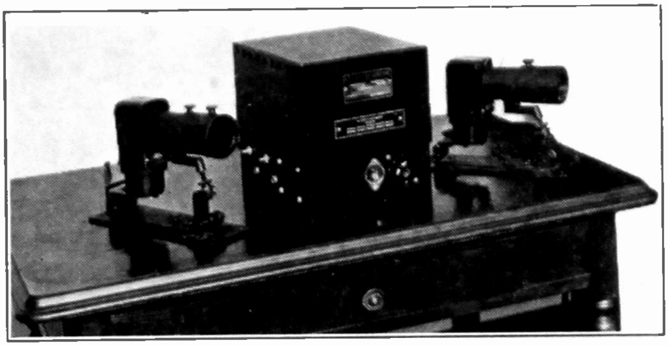
Two new car antennas designed to meet all automotive-Radio requirements are announced by Insuline Corporation of America, 25 Park Place, New York, N. Y. The first is the ICA "Poletenna," which is of the telescopic type, opening to a maximum height of 8 ft. It is intended to clamp to the rear bumper, and fits any make or model of car. It is also suitable for transmitting purposes and can be tuned for 5 and 10-meter amateur operation.

The second new antenna is the ICA "Airflow," especially designed for new cars of the streamline and all-steel body types. It consists of a length of rust-proof metal tubing supported on the top of the car by means of rubber suction cups, and is installed quickly and easily without requiring drilling of the top. It provides maximum signal pick-up with minimum ignition noise and wheel static, and is not affected by rain, snow, dirt or mud. Both products are available from dealers and jobbers everywhere.

An Invisible Electric Snare for Marauders

How an intricate net of invisible electric rays can be used effectively to snare burglars and kidnappers, and bring down the law upon them without their being aware of it, was recently demonstrated in New York City by engineers of the Signaphone Corporation. The device was installed in the General Electric Building, and various individuals were invited to test its powers of detection and alarm. Attempts to enter the 13,000 square foot area or to move from one zone to another were defeated at every turn.

Developed with the aid of G-E engineers, the protectional device relies principally on the phototube, or "electric eye," to foil marauders. The protective network was made up of the beam from a standard automobile headlight bulb, from which all visible rays of the light spectrum had been filtered. By the multiple system of mirrors, this single invisible beam was reflected back and forth across a room, around corners, and at different levels and angles until the guarded area was completely protected against movement of a body in any direction.



Photoelectric Equipment Used in Invisible Snare for Burglars

The system is extremely flexible in that the energy released by interfering with any beam can be used for various purposes, such as sounding an outside bell or siren. The type of installation made at the demonstration was unique and presaged more modern and effective methods. It automatically cleared a telephone line, dialed police headquarters, and tranmitted a spoken message summoning aid. After this message had been repeated for a minute and a half, the device "hung up" and then called the telephone company, repeating its message for the same period as a check upon the first call. Having done this, it once more cleared the line and automatically placed the telephone back in service.

It could just as easily have dialed the fire department, or summoned aid from other quarters. The invisible beams are sensitive to smoke as well as human intrusion. A small button is provided to check the apparatus so that operation can be assured before leaving the protected premises or retiring.

Previous proctectional systems relying on the phototube have had to depend on a visible white beam for reliable transmission of any considerable distances, or when reflected by more than a few mirrors. The 32-candlepower lamp employed in this demonstration was placed in a projector fitted with a special filter which transmitted only invisible rays of the infra-red band. The invisible beam was focused on the phototube through a special lens and holder connected to an amplifier using standard metal Radio tubes. Because of its design, the system is responsive to minute current values set up in the phototube, making it possible to employ the beam over long distances, and to reflect it from mirror to mirror and effectively honeycomb a space with unseen "fences" of electricity.

To demonstrate the distance of transmission possible with the device, an invisible ray was projected from a window on the 34th floor of the G-E Building to a window on the 63rd floor of the R.C.A. Building in Rockefeller Center, a distance of approximately 1800 feet. Every time a spectator passed his hand through the invisible beam he caused a light in the R.C.A. Building to be turned on. Even a whiff of cigar smoke was sufficient to light up the window four blocks distant.

The automatic equipment used in the demonstration was so small in size as to be almost unnoticeable. The mirrors employed were inconspicuous, and so adjusted and installed that the direction in which they reflected the beam would have been a mystery, even to an informed prowler. Disturbing these mirrors results in the alarm being sounded.

The system remains operative even though the power lines to the premises should be cut or fail. It is so arranged that a battery supply of electricity automatically trips in if the regular current is interrupted.

———— *n r i* ————

A Heavyweight

An electron weighs only 9,051 divided by 10,000,000,000,000,000,000,000,000th of one gram. Its electric charge is only 4.8 divided by 10,000,000,000th of a single electrostatic unit.

RADIO-TRICIAN
REG. U.S. PAT. OFF.

Service Sheet

Compiled Solely for Students and Graduates

NATIONAL RADIO INSTITUTE, WASHINGTON, D. C.

Readers who file Service Data in separate binders remove page carefully, trim on dotted line for same size as data published heretofore.

PHILCO MODEL 645
General Specifications

TYPE CIRCUIT: Superheterodyne, with preselector R.F amplifier, and push-pull pentode output (7 watts) built in connections for Philco All-wave aerial aerial selector built into and operated by wave-band switch

POWER SUPPLY: 115v, 60 cycle A.C

TUBES USED: 1 type 78, R F 1 type 6A7 Detector-Oscillator 1 type 78, I F 1 type 85, 2d Detector and 1st A.F.; 2 type 42 Push-Pull Output 1 type 80 Rectifier

WAVE BANDS: Three (1) Short-wave (2) Police, aircraft and amateur (3) Standard

COVERAGE OF EACH BAND: Band 1, 5.75–18 M C Band 2, 1.75–5.8 M.C. Band 3, 540–1750 K.C.

TUNING DRIVE: Dual planetary, ball bearing, 80 to 1 ratio for slow-speed tuning glowing arrow wave band indicator

PROGRAM CONTROL. 4-position, with bass compensation effective in first position (counter-clockwise)

INTERMEDIATE FREQUENCY: 460 K.C

POWER CONSUMPTION: 85 watts

SPEAKER: 645 Baby Grand Model—K31 Furniture Model—H21

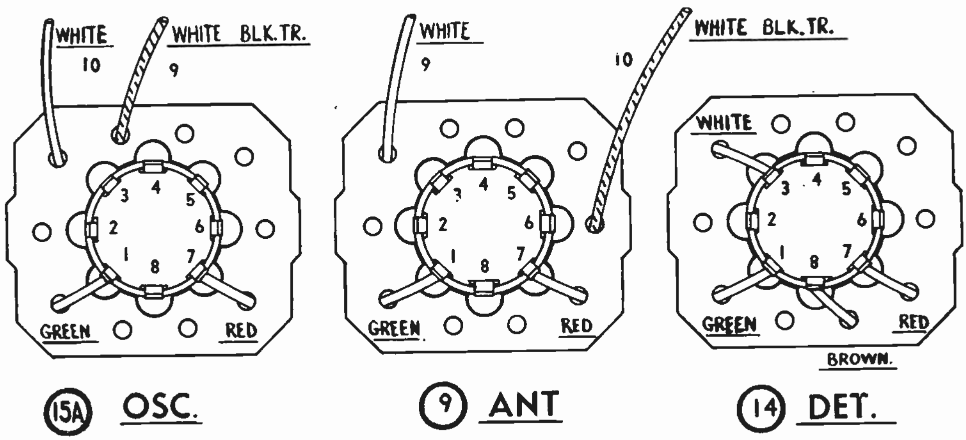


Fig. 1. R.F. Transformers

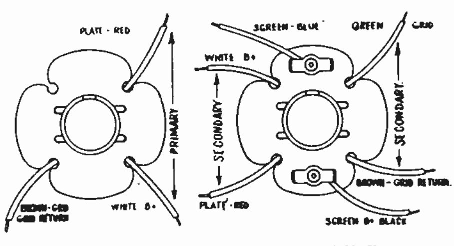
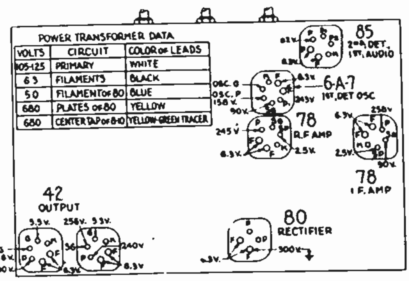


Fig. 2. I.F. Transformers

TUBE SOCKET VOLTAGES
(Measured from Tube Contact to Gnd.)

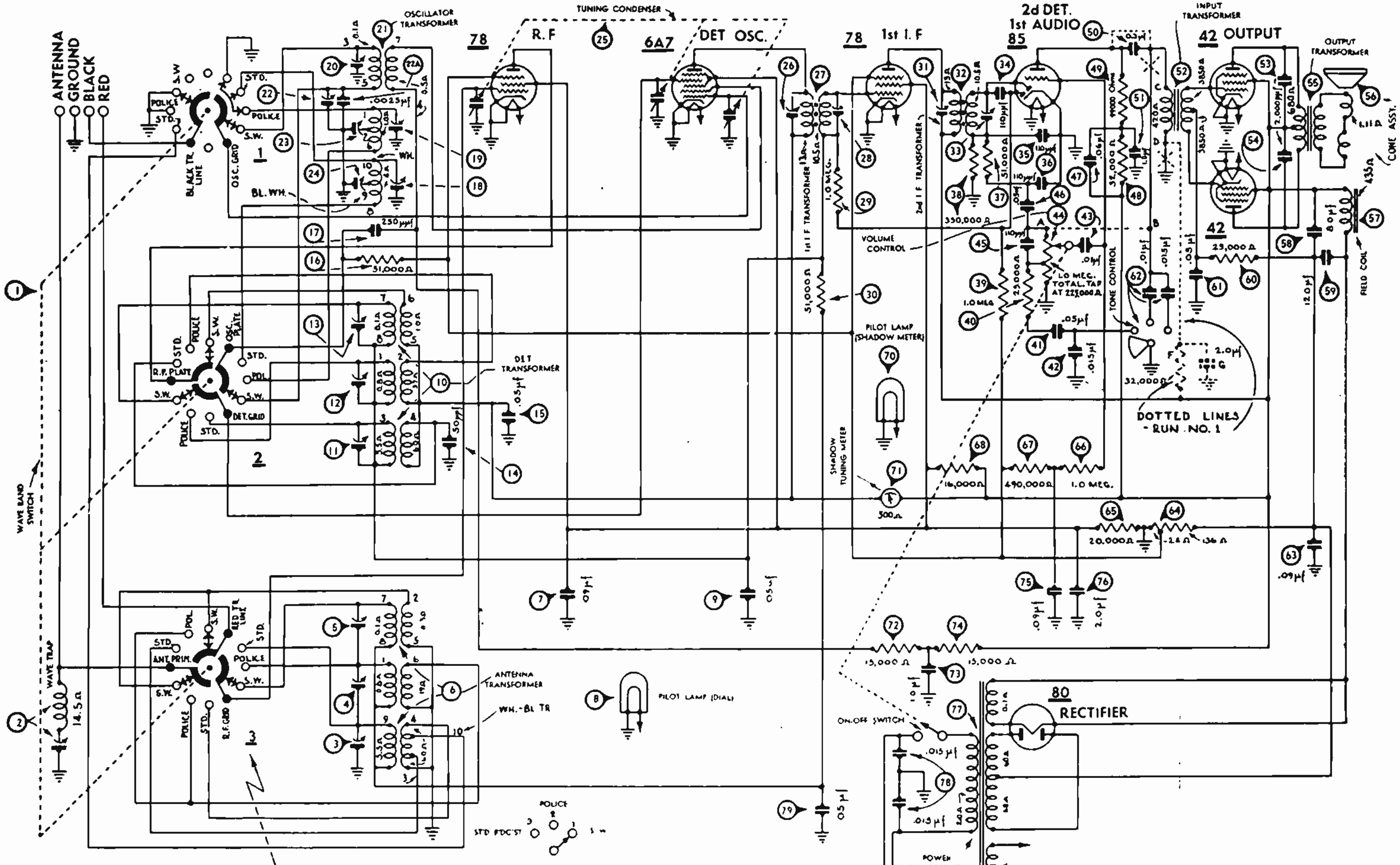


POWER TRANSFORMER DATA

VOLTS	CIRCUIT	COLOR of LEADS
105-125	PRIMARY	WHITE
6.3	FILAMENTS	BLACK
5.0	FILAMENT of 80	BLUE
680	PLATES of 80	YELLOW
680	CENTER TAP of 80	YELLOW-GREEN TRACER

Fig. 3. Tubes as Viewed from Bottom

The voltages at the points indicated by the arrows above were obtained with a Philco type 025 Circuit Tester which contains a high resistance (1000 ohms per volt) voltmeter Volume control at minimum, waveband switch at standard broadcast. K31 speaker



NUMBERS INDICATE RELATIVE POSITIONS OF SWITCH-SECTIONS FROM FRONT OF CHASSIS

ALL SWITCH-SECTIONS SHOWN IN POSITION NO. 1

SCHEMATIC DIAGRAM OF PHILCO MODEL 645

Phase Inversion for Amplifying Circuits

Phase inversion consists of obtaining the input for a push-pull stage from a single-ended stage by resistance-coupled circuits and without the use of a push-pull input transformer. The chief reason for existence of the phase inverter is the fact that a relatively simple and inexpensive arrangement may yield results which could not be equalled unless a transformer of excellent quality and consequently high price were used. When properly designed, a phase inverter can be made to deliver two signal voltages exactly 180 degrees out of phase and of equal amplitude. Moreover, there need not be any frequency distortion, and phase shifts can be reduced to a negligible amount.

The phase inversion technique as practiced in Europe and America alike, is dealt with in detail in the June 1936 issue of the Aerovox Research Worker. Because of the widespread interest in phase inversion, additional copies have been run off and made available to anyone writing to Aerovox Corporation, 70 Washington St., Brooklyn, N. Y., without charge or obligation.

—*n r i*—

New Amperite Velocity Microphone With Cable Connector

Amperite Mike with cable connector

A new and improved cable connector is now supplied as standard equipment with Amperite Velocity Microphones, models RBMn and RBHn, at no extra cost. The cable connector is of the positive three pin type. A locking ring eliminates any possibility of pulling the connectors apart, or loose contacts. The body of the connector holding the cable is made extra long to prevent the leads from shorting. Because of the possibility of trouble with connectors, the final models were put through a great number of field tests before adapting them. By putting the cable connector on the shock absorber and not on the microphone itself, mechanical noises due to moving the cable do not reach the microphone.

—*n r i*—

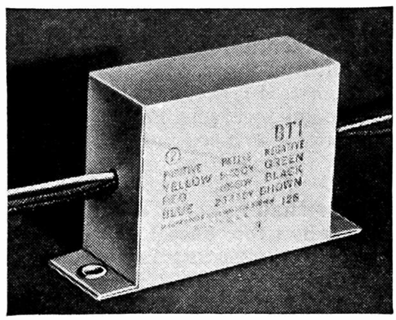
Aligning Philco Receivers

All servicemen know the need for receiver alignment information in a handy, compact, time-saving form—especially in view of the growing complexity of modern multi-tube, multi-wave receivers. To meet this need (at least for one very large group of receivers), John F. Rider has put between the pages of a single 176 page book complete alignment instructions on every Philco Radio ever made, from the first set up to the latest 1937 chassis. "Aligning Philco Receivers" as announced by John F. Rider presents comprehensive alignment service data, step-by-step, and table by table, covering every one of the 8,000,000 Philco receivers produced to date. The book sells for $1.00 and is available through Radio jobbers.

New Universal Condenser Replacements Announced by Sprague

Three Universal Replacement Condensers, announced by the Sprague Products Company, North Adams, Massachusetts, pave the way for quick, efficient service replacements on hundreds of Radios. With only a few of these new Sprague Condensers in his kit, the serviceman can obtain needed capacity combinations or single sections almost at will and without the loss of time commonly involved in getting exact duplicate replacements. Also, the new units are small enough to fit in anywhere and are adaptable to any type of mounting.

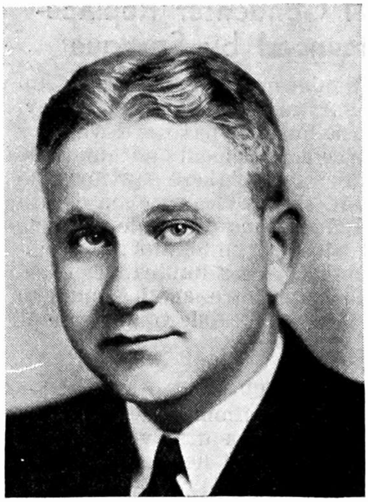
Sprague Condenser Type BT-100 is a rectangular unit having three 8 mfd. sections (8-8-8 mfd. 200 volts) and two 5 mfd. sections at 25 volts. From the individual sections and leads, numerous combinations such as 8-16 mfd.; 12-16; 10-16; 5-20, etc., may quickly be obtained. Also, the 5 mfd. sections may be combined as a single 10 mfd. unit. This same condenser in a round cardboard casing with mounting lugs is known as Sprague Type ST-10.



Sprague Condenser Type BT-100

The third new Universal Replacement Condenser is known as Sprague Type BT-1. This has three 150 volt sections, 5-10-25 mfds. Six leads give any needed combination of these capacities.

These new condensers may be obtained at leading Radio jobbers. A new Sprague Catalog will be sent upon request to the Sprague Products Company, North Adams, Massachusetts.



JOSEPH KAUFMAN

Television--Fa

Joseph Kaufman

N. R. I. Director of Education

Patriotic American citizens, reading about Television developments in England, France, Germany, Russia, and Italy, and about actual Television broadcasts in England and in Germany, where Television receivers are now available to the general public, are beginning to wonder what has happened to American progressiveness.

Yes, it is true that England and Germany have introduced Television ahead of us, but let us point out a few interesting facts about the systems being used.

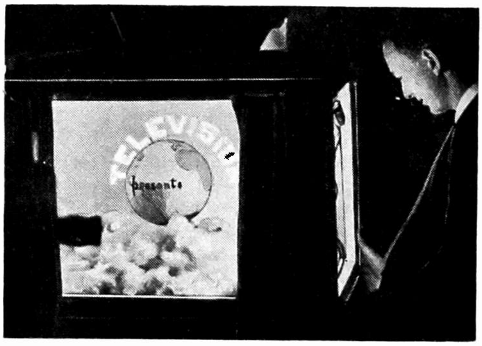
The Goerz-Bosch-Fernseh interests in Germany are using the American Farnsworth system with certain modifications, while Marconi-E.M.I. of England and another German company are using the same principle on which the American R.C.A. system is based.

The Baird interests in England, allied with the British Government, just last year signed up with Farnsworth. Thus it is *American Television technique* that is being tested out in these advanced showings across the Atlantic. Soviet Russia may soon become another testing ground for American apparatus. It was recently reported that RCA received an order from U. S. S. R. for complete Television equipment—transmitters and receivers.

In spite of the fact that American Television experimenters and manufacturers are very active abroad, there are many reasons why they hesitate to offer Television to the American public. Foremost of these is the fact that modern Television is an ultra high frequency proposition, with each transmitter having a maximum range of about fifty miles. Small countries like England and Germany require only a relatively few stations to give complete coverage, whereas a very large number of stations, costing millions of dollars, will be required in the United States.

The coaxial cable, developed by A.T. and T., will very possibly overcome part of this handicap, and an experimental section of this cable has now been laid between New York and Philadelphia.

The question of sponsorship of Television programs is another problem of this country. In England and Germany, where Radio broadcasting is under direct Government control, the people



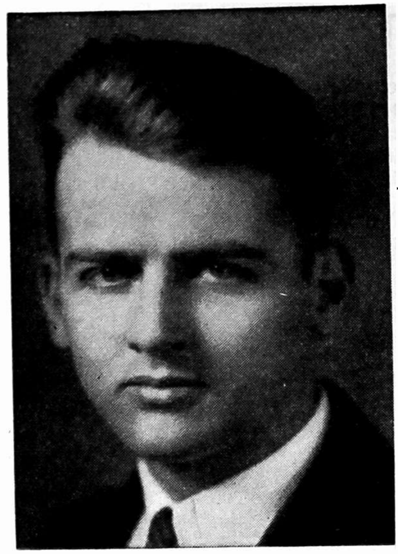
A scene in the Farnsworth Television Studio, where a small stage has been devised to present the "theme" of a Television program.

themselves are taxed to pay the expenses of Television broadcasting and Television programs. In this country, on the other hand, Television programs will have to be sponsored by advertisers just as in the case of Radio here.

Until a completely satisfactory Television system has been developed and made available to a large number of people, sponsors will not be willing to foot the very high bills. And so American research organizations continue with improvements and experiments, seeking to produce a perfected Television service which will allow receivers to be sold to the public at a reasonable price and with a reasonable guarantee that they will not be made obsolete by new developments. In the meantime, naturally, America profits by the experience and mistakes of her friends across the sea.

t and Fancies

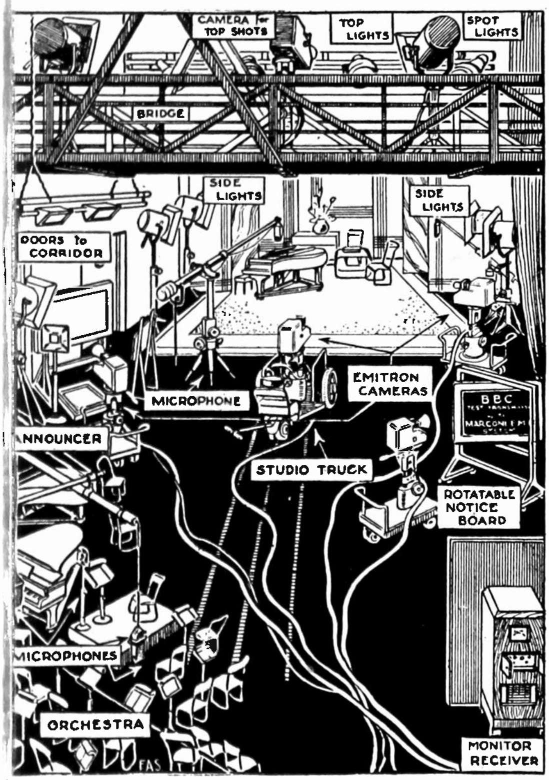
Paul H. Thomsen
N. R. I. Television Consultant



PAUL H. THOMSEN

merican Television research is today being concentrated upon a standard of 441 lines, interlaced scanning being used with a frame frequency f 30 per second. Daily transmissions of programs using this high definition Television are eing made in New York City today. Over eventy-five receivers are located at strategic oints in the city to monitor the transmissions.

Contrast this with the system used in Germany, where only 180 line pictures are being scanned t the rate of 25 frames per second, and in England where 405 line scanning is being used.



(Courtesy Television and Short-Wave World)

Arrangement of equipment in the Marconi-E. M. I. elevision studio, located at Alexandra Palace in London. Daily transmissions are now being made with 05-line pictures, using a system which is much like he R. C. A. television system in this country.

As you know, the more lines there are per picture, the greater is the detail, and the more frames there are per second, the less flicker there will be in the reproduced picture.

Let us consider a few of the problems which must be solved before the United States can have nation-wide Television service. The 441 line standard for this country means the highest picture frequency which must be transmitted will be about 3 megacycles per second.

If double side-band transmission is used, this means the band width will be 6 megacycles. Such a wide band can be obtained only at ultra-high frequencies, and Television transmitters must therefore operate on frequencies somewhere between 40 and 100 megacycles.

Engineers quickly recognized that amplification of a band of frequencies as wide as 3 megacycles is a very costly procedure. This problem cannot be avoided in transmitters and the initial cost of these transmitters will therefore be quite high. In receivers, however, costs can be kept down by omitting the picture frequency amplifier and making the gain of the R.F. system sufficiently high so that the cathode ray picture reconstructor can be connected directly to the second detector of the superheterodyne receiver. Of course, a 6 megacycle band width is still required in the preselector and I.F. amplifier sections of the receivers, but engineers are now working on a system which uses single side-band transmission and reception, reducing the band width to 3 megacycles. If this system proves successful, engineers can get the required gain in the re-

(Page 18, please)

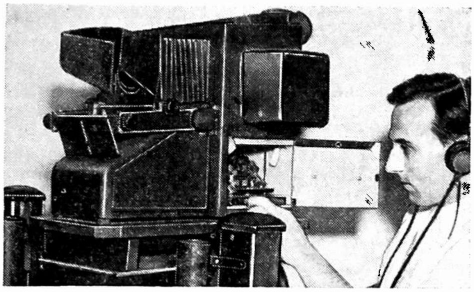
Television—Facts and Fancies (Continued from page 17)

ceiver with fewer stages, and thereby reduce the cost of the receiver considerably. Thus you can see American Television research engineers are making considerable progress towards lowering the cost of a Television receiver.

Mass production will undoubtedly have a great deal to do with receiver prices. In England, a sound-picture receiver which last year cost $500 is today costing only about $300. American mass production methods should reduce the cost of a similar receiver to $250 or even $200.

American business-men recognize that Television programs will be even more costly than Radio programs. In order to keep this cost down to a minimum, any one performance or event must be transmitted simultaneously over the entire country.

This can be accomplished only by forming chains of Television stations just as there are now chains of Radio stations. Land wire telephone lines are out of the question for Television purposes, since they will not handle such a wide band of frequencies as is required. As already mentioned, there is available between New York City and Philadelphia, a special coaxial cable which can be used to send Television programs from one city to the other by direct wire. Some engineers believe, however, that it will be more economical and more satisfactory to link Television transmitters together by Radio relay stations. Already mobile ultra-high frequency Television transmitters have been developed to send programs by air from out-door pick-up points to the main transmitter.



The Philco Television Camera In Operation

Those responsible for the development of Television insist that it must be more than a passing fad in order to be successful. The type of Television entertainment which will be acceptable to the American public is therefore just as important as the quality of the reproduced picture. Program directors and continuity writers are busy in many American cities studying this problem and trying out their ideas on America's experimental Television stations. The high initial cost of Television requires that no chances be taken with poor programs. Television performers must be capable of giving their performances without script, just as in movies. Stage scenery must be prepared, just as for any theatrical production. Complete daily Television programs are being planned and tried, for naturally different types of programs must be used at different times of the day in order to interest the maximum possible number of viewers.

According to RCA, June 29, 1936, marked the beginning in this country of organized Television experiments between a regular transmitting station on top the Empire State Building in New York City, and a number of experimental receivers in homes. These field tests, conducted by NBC, brought Television out of the RCA laboratory into the sphere of practical use.

The Don Lee Broadcasting System is doing important experimental work on the Pacific Coast, and many outstanding programs have been produced.

Farnsworth Television, Inc., has established a new experimental Television transmitter near Philadelphia to speed up research work.

And now "Business Week" reports that "The Columbia Broadcasting System has applied to the Federal Communications Commission for permission to construct atop the Chrysler building in New York a television transmitter that would rank with the 30-kilowatt unit to be installed on the Eiffel Tower in Paris, as the world's most powerful television station.

"The antenna for the CBS transmitter will be constructed just below the Chrysler tower's steel spike, 971 feet above the ground.

"Dr. Peter C. Goldmark, who heads up Columbia's experimental work with television, explains that the height of the antenna is not the only thing to be considered, and he points out significantly that the biggest market for television receivers lies to the north of Manhattan's midtown and that the Chrysler tower has an absolutely clear field in that direction. Hence the broadcast waves 'will not be broken up or refracted by the steel skeletons of other skyscrapers, and therefore a common fault of television—the production of double images—will be avoided.'

"CBS is buying its $330,000 transmitter from the Radio Corporation of America, for since the time of the famous trust decision which partitioned up the electrical equipment field, RCA has had a virtual monopoly on the manufacture of such

(Page 21, please)

RADIO-TRICIAN
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Service Sheet

Compiled Solely for Students and Graduates

NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

PHILCO MODEL 37-600

Specifications

TYPE CIRCUIT: Superheterodyne with pentode output.

POWER SUPPLY: 115 V., 60 cycle A.C.

TUBES USED: 1 type 6A8G, Det. Osc., 1 type 6J7G, 2nd Det., 1 type 6K6G, Output, 1 type 5Y4G Rectifier.

FREQUENCY RANGE: 530-1800 K.C.

INTERMEDIATE FREQUENCY: 470 K.C.

CURRENT CONSUMPTION: 45 watts.

SPEAKER: B-6.

POWER OUTPUT: ½ watt.

Adjusting Compensating Condensers

To accurately adjust the compensating condensers in the **Model 37-600** receiver, it is necessary to use a signal generator of high stability on all frequencies, such as the **PHILCO Model 088 Signal Generator.** This instrument has a continuous frequency range from 110 to 20,000 K.C., and is designed to meet every requirement of the serviceman.

An output meter is also needed,—**PHILCO MODEL 025 Circuit Tester** includes a very sensitive output meter

Convenient tools to use in adjusting the compensators are the **Philco No. 3164 Fibre Wrench** and **No. 27-7059 Fibre Handled Screw-driver.**

The locations of the various compensating condensers are shown in Fig 1 Connect the output meter to the plate and cathode contacts of the 6K6G power tube, and adjust it to use the 0-30 volt range

When adjusting each circuit, care should be taken to have the signal generator attenuator set for approximately ¼ scale reading on output meter

Intermediate Frequency Circuit

1. Connect the 088 signal generator output lead through a .1 mfd. condenser to the grid of the 6A8G tube and the ground lead to the chassis.

2. Turn the sensitivity compensator (23) to maximum capacity position (clockwise), and then release it: 1½ turns (counter-clockwise)

3. Turn gang condenser to approximately 600 K.C. Set the signal generator at 470 K.C.

4. Adjust the compensator (18) and (20) for maximum reading on the output meter Then turn the sensitivity compensator (23) clockwise until a hiss, (oscillation) is heard. Now turn the compensator (23) counter-clockwise until hiss ceases, then continue for ¼ turn more.

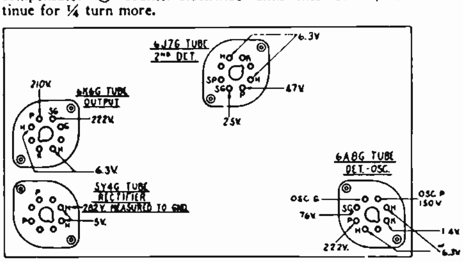

Fig. 2. Tube Sockets as Viewed from Underside of Chassis. (Measured from Socket Terminal to Ground Volume Control in Maximum Position)

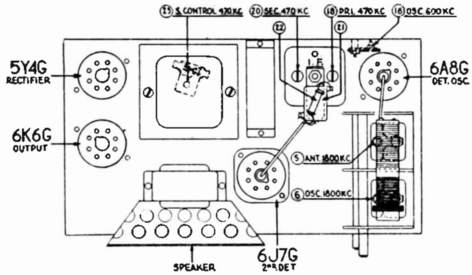

Fig. 1. Location of Compensators

Radio Frequency Circuit

1. Remove the signal generator output lead from the 6A8G tube, and connect it to the aerial lead of the receiver through a 100 mmfd. condenser.

2. Turn the gang condenser to minimum capacity position, (counter-clockwise) and place a .006" (six-thousands inch) gauge between the stator and rotor plates. Now turn the gang clockwise until stator and rotor plates touch gauge.

3. Remove gauge from gang condenser. Now set signal generator at 900 K.C., (using second harmonic 1800 K.C.), adjust compensators (6) and (5) for maximum reading on output meter.

4. Turn the signal generator and receiver gang condenser to 600 K.C., and adjust compensator (16). In doing so, the gang condenser must be rolled slightly above and below the 600 K.C. signal until the maximum reading is indicated on the output.

5. Turn the gang condenser to 1800 K.C. and signal generator to 900 K.C., (using second harmonic of signal generator 1800 K.C.), readjust compensator (6) for maximum reading on output meter. Set gang as per paragraph 2. for this adjustment.

6. Turn the gang condenser and signal generator to 1400 K.C., readjust compensator (5) for maximum reading on output meter. After the above adjustments are completed and receiver is placed in the cabinet, the dial pointer is properly placed by turning the signal generator to 1000 K.C. Then tune receiver for maximum signal. The dial pointer is then placed on gang shaft, so that it indicates 1000 K.C on dial.

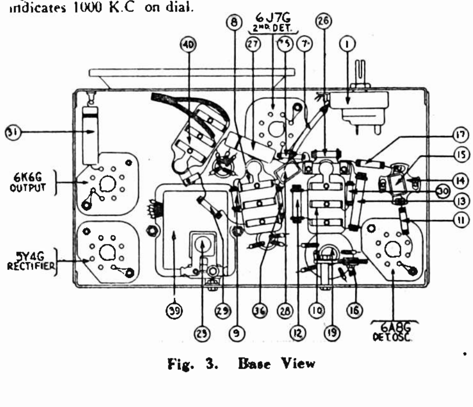

Fig. 3. Base View

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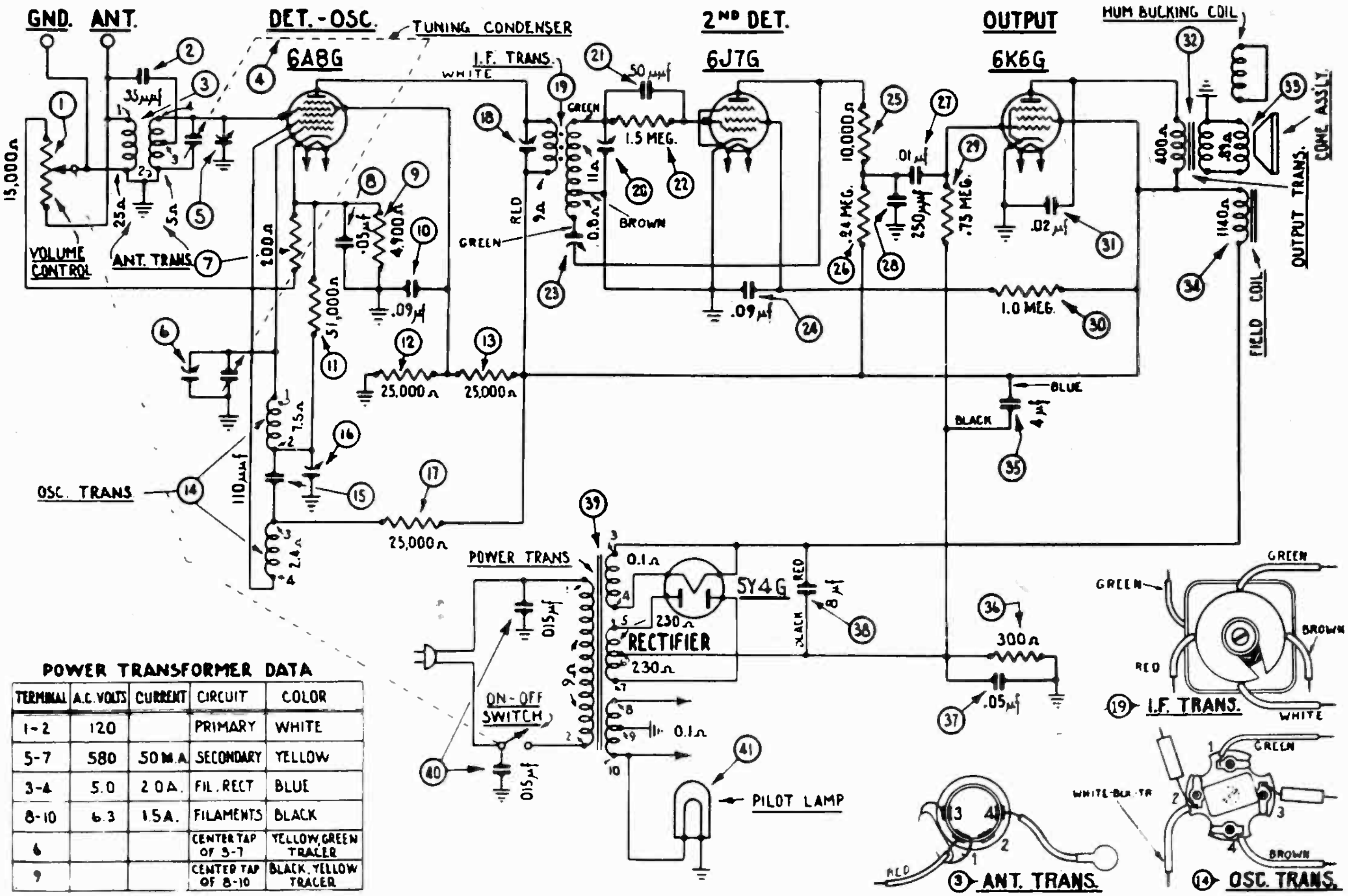


POWER TRANSFORMER DATA

TERMINAL	A.C. VOLTS	CURRENT	CIRCUIT	COLOR
1-2	120		PRIMARY	WHITE
5-7	580	50 M.A.	SECONDARY	YELLOW
3-4	5.0	2.0 A.	FIL. RECT	BLUE
8-10	6.3	1.5 A.	FILAMENTS	BLACK
6			CENTER TAP OF 5-7	YELLOW, GREEN TRACER
9			CENTER TAP OF 8-10	BLACK, YELLOW TRACER

SCHEMATIC DIAGRAM OF PHILCO MODEL 37-600

Television—Facts and Fancies (Continued from page 18)

units both for visual and audio broadcasting. In its application to the Federal Communications Commission, Columbia has indicated it would invest another $130,000 in television equipment.

"RCA makes both sending and receiving apparatus, and this is the equipment which has been used exclusively in the tests conducted by NBC, an RCA subsidiary. Presumably Columbia will be under no such obligation, and that's why the trade is particularly excited about the advent of this first free agent into the field of experimental operation. CBS might, for example, be able to put RCA's iconoscope camera and Philo T. Farnsworth's dissector tube equipment to identical tests that would yield the first comparative data on the operating efficiency of these two principal rival systems.

Photograph of the image of Jean Muir, movie star, transmitted by Television and received at a distance of seven miles.

"Thus far, Mr. Farnsworth has kept his entire television system pretty well under wraps, contenting himself with assertions that no one else could go into commercial production on television cameras or receivers without being licensed to use some of his basic patents, such as the scanning device. But similarly, anyone who wants to build television equipment will have to pay some royalties to RCA which holds basic patents on all vacuum tubes.

"If Farnsworth, for example, were interested in playing ball with Columbia, and Columbia were interested in playing ball with him, it would be possible to tell just who had the edge on whom, and once those lines were drawn it might be possible to unsnarl the patent tangle without court action and expedite commercial television.

"A similar situation exists with receivers. Not only Farnsworth and RCA, but half a dozen others — notably including the Philco Radio & Television Corp.—have been experimenting with receivers. In Television as in Radio it is generally assumed that RCA will control basic patents; but, restive under RCA's Radio patent control, Philco has also conducted exhaustive experimentation. (Incidentally, it is also the only American licensee of Farnsworth to date.) Others may be entertaining similar ambitions, but all of them, including Philco, are primarily interested in gearing themselves up so they can tap rapidly the big market for sets, regardless of whom they pay royalties to."

Thus America prepares for Television. Today, in scores of laboratories, it is bridging the years of research and experimentation ordinarily required before a new industry becomes a success. Television in the United States will appear as a nation-wide public service and will grow in a healthy American way.

You who are on the threshold of an extending Radio industry must prepare for an opportunity which will come only once in your lifetime. You must know the fundamental principles of Radio and Television, for with these mastered you will be ready for whatever equipment Television finally presents to the public. The National Radio Institute has long recognized the importance of Television and has included this complete basic instruction in the regular Radio Course. Those who complete the Course and who keep in touch with the current developments in Television, through their technical magazines, will be ready for their ride to success when Television sweeps this country.

———*n r i*———

A Question of Viewpoint

Examiner: "Ever been sick?"
Applicant: "Nope."
Examiner: "Ever had any accidents?"
Applicant: "No, sir."
Examiner: "Then how'd you get that scar on the back of your hand?"
Applicant: "A rattlesnake bit me."
Examiner: "And you don't call that an accident?"
Applicant: "Nope, the son-of-a-gun did it on purpose."

Bouquet

NATIONAL RADIO NEWS is certainly "tops" among Radio magazines. I am much impressed with the excellent manner in which the National Radio Institute, through its magazine, keeps in touch with the Alumni and Students, bringing them first hand information of new developments and problems that take place so quickly in the field of Radio today.

JOHN CAFREY,
Sugar Notch, Pa.

Novel Radio Items

—BY L. J. MARKUS—

London Television Hops Across Ocean!

Although modern television transmitters ordinarily have a range of less than 50 miles, the sound portions of the ultra high frequency television broadcasts sent out from Alexandra Palace, London have been heard quite regularly in New York. This freak reception is believed due to unusual activity of sun spots. Radio engineers wonder what will happen in 1939 when these solar storms are scheduled to reach their peak.

———— *n r i* ————

Did You Know That—

Radio receivers now outnumber all other electrical appliances in homes except flatirons? . . . Dials of automatic tuning receivers can be printed in Braille for the blind? . . . Headphones in each of the 4,000 cells in Michigan State Prison give prisoners a choice of programs picked up by three powerful radio receivers?

———— *n r i* ————

Radios Serviced in Trailer!

An enterprising California serviceman has built his entire shop into a trailer, which he can bring right to the door of his customers, who are invited into the trailer to watch their Radios being repaired.

Radio Prevents Collisions at Sea!

An ultra-short wave transmitter so small that it can be mounted, antenna and all, in a glass bulb no longer than an ordinary radio tube, is the heart of the collision-preventer now being used on the French liner "Normandie." The transmitter, operating on a wavelength of 16 centimeters, is mounted in a parabolic mirror; this concentrates the radio waves into a beam which is reflected back to an ultra-short wave receiver by any object in the path of the ship, causing an alarm to sound.

———— *n r i* ————

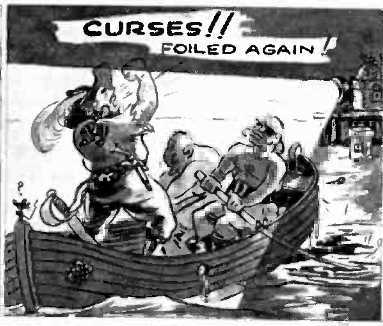
Test Your Sharpness of Vision!

Study the following sentence carefully and state how many F's, both large and small, it contains.

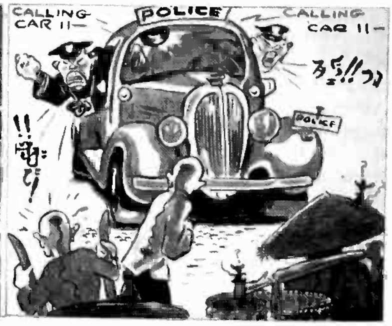
"The Famous N.R.I. fundamental Radio Course is the result of scientific study combined with the practical experience of years."

Out of twenty people of average intelligence, not more than two will get it right the first time; a large proportion will not find more than three F's even after being told there are more.

CRYSTAL MIKE "OUT-FOXES" FOXES! Even with all his "foxy" ways, the sly old fox is no match for modern Radio equipment. To prevent destruction of young animals in nest houses, one fox farm owner has installed crystal microphones at strategic points to detect disturbances. A watchman listens in at a central point, ready to rush to the rescue when baby foxes are in danger of destruction by their parents.



ELECTRIC EYE TRAPS PIRATES! Pirates or even swimmers crossing a beam of light which just skims the waves in New York Harbor will set off a siren, turn on powerful searchlights, and bring police speed boats into action. Powerful light sources and photoelectric cells are used in this novel light beam burglar alarm, which will protect the ocean side of the recently established foreign trade zone.



POLICE RADIO INVADES CHINA! Even far-off China is adopting police Radio in its war against crime. Several shipments of Western Electric ultra high frequency police Radio equipment have recently been made to Chinese ports. Two-way communication between cruising squad cars and police headquarters will be possible, for each car will carry an ultra high frequency transmitter.

N.R.I. ALUMNI NEWS

P. J. Dunn	President
Earl Bennett, Clarence Stokes	Vice-Presidents
R. H. Rood, F. E. Oliver	Vice-Presidents
Earle Merryman	Secretary
Louis L. Menne	Executive Secretary

An Open Letter from President Dunn

Fellow Officers and Members of the Alumni Association—Greetings!

This is the first chance I have had since my re-election in January of greeting you through the medium of our national paper, the National Radio News. First of all, I want to thank every member of the N.R.I.A.A. for the confidence you have in me by re-electing me a third time as your President. I can assure you that I feel greatly honored to be selected to lead such a fine body of men.

It is indeed a great honor to be President of such a fine organization as the Alumni Association, and I am proud to be associated with such fine gentlemen as Mr. J. E. Smith, the President of our school, and the rest of the faculty who are so much interested in the Alumni and who have done so much to make it one of the greatest Radio organizations in the world.

P. J. DUNN, President, N. R. I. Alumni Association

We have gone far during the past three years since my first election, because we have all worked together trying to help one another advance in the art of Radio, our profession. Our Local Chapters have grown in number and have worked hand in hand with the National Officers and National Headquarters also has been on the job at all times, whenever they could assist in any way. So you see we are bound to forge ahead, because we are doing something that is worthwhile.

The idea of the Alumni Association was conceived by our good friend J. E. Smith. It was he who planted the seed and like the seed of a beautiful flower it has blossomed into this fine organization that we have today. Don't let us stop—let's keep the flower in bloom. There will be many more young men coming into our organization looking for advice and help with their many problems, the same as we did a few years back—we are not going to let them down. We are going to work hand in hand as in the past to keep our Alumni alive, so that in years to come it will be an inspiration and a guiding hand to the young men who come after us.

Let's carry on and make this a banner year for our Alumni. We can do this by adding to our membership, by enlarging our Local Chapters, by attending our Local Chapter meetings regularly and helping our National Officers in every way possible.

And let me say a few words for the backbone of our organization. I have reference to the several thousand members who are not connected with Local Chapters. These men live in large cities and small communities, in all parts of the world. Although we do not see these men as we do those who are members of Local Chapters they are by far in the majority and their opinions are a healthy influence in the success of the Alumni Association.

I wish I could shake the hand of each and every one of you. But won't you accept this message as a humble effort to convey to you my genuine appreciation of your loyalty to the Alumni Association, and my invitation to you to take an active part in the affairs of the Association by your suggestions and criticisms which we shall be glad to have you send to headquarters? With my best wishes for good health and happiness to you and yours, I am

Sincerely your friend,
P. J. DUNN, National President.

The N.R.I. Alumni Association has indeed been fortunate in having as its president such a loyal and progressive member as P. J. Dunn. Much of the success of both the Alumni Association and the Baltimore Chapter is due to his untiring efforts.—L. L. Menne, Exec. Sec'y.

Joseph Kaufman, N. R. I. Director of Education Scores Big Hit at New York Chapter Meeting

On March 18, 1937, Mr. J. Kaufman, Director of Education, N.R.I., and Mr. L. L. Menne, Executive Secretary of N.R.I. Alumni Association, attended a meeting of the New York Chapter, at which Mr. Kaufman delivered a very interesting and informative talk on Radio Receiver Theory and Servicing Methods.

More than one hundred were present and although the meeting did not adjourn until 11:00 o'clock not a man left the hall. In fact until almost midnight Mr. Kaufman was besieged by a group of members who informally asked questions and stayed to become better acquainted.

Twenty-one new members joined the New York Chapter that night. The meeting was ably conducted by the Chairman, Mr. Allen Arndt, who was well supported by other officers of the Chapter.

An old subject was presented in a new way by Mr. Kaufman in a two and a half hour talk covering superheterodyne receiver principles and their relation to everyday servicing.

Considering first the preselector circuit, he pointed out what would happen if there were no preselector, a condition which is approached in some receivers (especially midgets) because of inadequate preselector design, because too long an antenna is used. All signals picked up by the receiving antenna reached the input of the first detector along with the oscillator signal under this assumption with interference of many types as a result.

Mr. Kaufman then pointed out that even the best preselector was of no use in eliminating repeat point interference unless it was ganged to the oscillator. Image interference came next; it was shown that the preselector had to be more selective for a low than for a high I.F. value in order to avoid this type of trouble. When an interfering station which is above the dial frequency by twice the I.F. value of the receiver gets through the preselector image interference results.

With a choke input to the first detector (no preselector) any two signals whose frequency difference equals the I.F. value will be reproduced by the receiver without the aid of the local oscillator. A selective preselector limits this type of interference to a narrow band, and good preselector design can eliminate this trouble entirely, except perhaps in ultra high frequency bands. Code interference occurs when code signals whose fundamental frequency (or a harmonic of it) is equal to the I. F. passes through the preselector; the interference will be encountered over the entire tuning band.

A powerful local short wave station can cause interference if it can get through the preselector and the local oscillator produces a strong harmonic which will mix with the interfering signal to produce an I. F. beat.

Most superheterodyne interference troubles are eliminated by using a highly selective preselector which is ganged to the oscillator. In servicing a receiver having interference troubles, try shortening the antenna; if this fails and only a single station is producing the interference, a wave trap inserted in the antenna circuit and tuned to the interfering station will generally effect a cure.

Conventional oscillator designs were next considered; it was pointed out that for either a linear or square law first detector the oscillator signal should be about 10 times as strong as that of the incoming signal. The evolution of the combination oscillator mixer-first detector circuit was presented, starting with screen grid and pentode tubes, then the pentagrid converter and finally the pentagrid mixer using a separate oscillator. The use of the pentagrid mixer, Mr. Kaufman explained, reduces frequency drift and degeneration, especially in the ultra-high frequency range.

The I.F. amplifier, which controls the all-important adjacent channel selectivity, was then considered, typical single tuned high gain circuits and double resonance peak or band passed circuits being discussed. Several methods of servicing band pass and variable selectivity were shown. In showing the interrelationship of the various circuits, he pointed out that a good preselector, good frequency converter, good I.F. gain and good selectivity all were necessary in order to secure a desired overall response.

Mr. Kaufman next turned to I.F. alignment and preselector-oscillator tracking, showing how easily this could be done if the function of each section was understood. He pointed out that it was not necessary to "wobbulate" the preselector at low frequencies if the rotor plates of the preselector tuning condensers were bent to secure exact alignment.

Upon completing his talk, Mr. Kaufman answered a number of questions dealing with superheterodynes. Most of those present remained to take part in the informal discussion which continued for almost an hour.

Article On Illinois State Police System Proves Popular

I must tell you how I enjoyed the February-March issue of National Radio News. It certainly was interesting, especially about the Illinois State Police. I think every State should have its Police more on that order, then maybe crimes would not happen so often.

CLOYSE L. LUCAS,
McCune, Kansas.

—— *n r i* ——

May I say I think the Novel Radio Items page is all to the good. And the article on Illinois' new Radio police equipment was certainly interesting. Let's have more of them.

C. V. BROWN,
Edwardsville, Ill.

—— *n r i* ——

Let me take this opportunity to compliment you on the splendid way you print your Radio news. Every bit of print in the News is very interesting, educational, and entertaining. In the February-March issue the Illinois State Police Radio System was especially interesting.

JULIUS J. TENCH,
Bedford, Ohio.

—— *n r i* ——

I would like to take this opportunity of telling you how much I enjoyed the article on the Illinois State Police Radio System. It was very interesting to me as I have heard some of these stations quite often on my short-wave receiver.

RAYMOND L. HILL,
Cedar Rapids, Iowa.

—— *n r i* ——

I sure think a lot of National Radio News. It has helped me on many a job that wasn't as easy as it first looked. The service sheets are actually worth real money to any serviceman, working on any receiver that happens to come along.

Graduate JOHN G. SALONEN,
Chisholm, Minn.

Additions to N. R. I. Ham List

The following call letters have been reported since the last issue of the News. In spite of the large number of call letters so far reported, it is still felt that there are a great many N.R.I. amateur operators whose call letters have never appeared in the News. If you are one of them, make it a point to report your call letters the next time you write N.R.I. or submit a lesson for grading.

Charles Casselman—W8ORH—Sherman, N. Y.
Geo. H. Emond—VE2NE—Riviere du Loup, P.Q., Canada.
Ralph B. Toye—W1GPL—E. Braintree, Mass.
George S. Maxey—W6BIL—Tulare, Calif.
F. A. Thompson—W9HLX—Indianapolis, Ind.
Oscar Dutton—W9ZFX—Tonganoxie, Kansas.
Howard McDonald—W9MVK—Indianapolis, Ind.
Geoffrey G. Field—VE2BO—Montreal, Que., Canada.
Benjamin Lamboy—K4ERA—Cayey, Porto Rico.

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Suggests More Space For Amateurs

What do you think of N.R.I. Hams having a larger corner in the magazine, and giving more details of their stations, such as the transmitter used, band of operation, and other details that may be interesting?

GEO. H. EMOND
Riviere du Loup,
P. Q., Canada.

—— *n r i* ——

Approves Laboratory Page

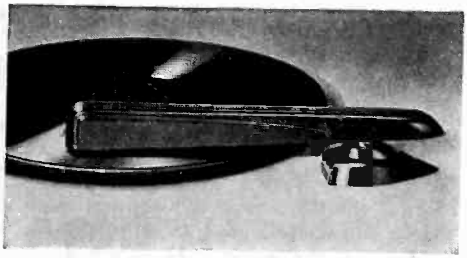
The News is getting better all of the time. Each issue is fuller—a little thicker—and contains the sort of information I am looking for. Mr. Dowie's article on A.F.C. was particularly interesting. Also the supplementary laboratory experiments will do a great deal toward giving even the graduates a clearer and perhaps more comprehensive view of the actual processes taking place in the various parts of a Radio.

Graduate ALLEN MCCLUSKEY,
Birmingham, Alabama.

New Shure "Zephyr" Crystal Pickup

The first of a series of improved crystal phono-record reproducers, The Shure "Zephyr," has been announced by Shure Brothers, manufacturers of microphones and acoustic devices, Chicago, Ill.

The "Zephyr" is a notable example of modern design in both form and performance. Tone-arm and base are attractively streamlined in black bakelite moulded. Ultra wide-range frequency response to 10,000 cycles, sufficient output to operate through the audio system of a modern



The Shure "Zephyr" Crystal Pickup

Radio receiver, and the new built-in "needle-tilt" method of reducing "tracking error" are among the important technical features.

The new "needle-tilt" principle improves reproduction and increases record life by maintaining the projection of the needle very closely tangent to the record groove at all times. In contrast to the long established European practice of "bending" the tone-arm or "off-setting" the pickup head, the angular correction against tracking error is accomplished by "tilting" the needle chuck relative to the axis of the mechanism. This improves appearance and requires minimum space since a straight tone-arm can be employed.

The model illustrated is the 99A. The pickup is 10½" long overall and is equipped with a special hinge mechanism which allows the head to be lifted high above the turntable for convenient needle changing. A record pressure of only 2 ounces, low needle-point impedance and "needle-tilt" correction for tracking angle, combine to insure long record life.

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Characteristic Wall Chart Issued

The Arcturus Radio Tube Company, Newark, N. J., offers a new wall chart of tube characteristics. 137 types with all their rated values are listed, special tube application data given, and basing connections for all tubes illustrated. Dealers and servicemen may obtain the chart, free of charge, from Arcturus distributors.

NATIONAL RADIO NEWS

FROM N.R.I. TRAINING HEADQUARTERS

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T. E. ROSE, EDITOR
S. M. ARMSTRONG, MANAGING EDITOR

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