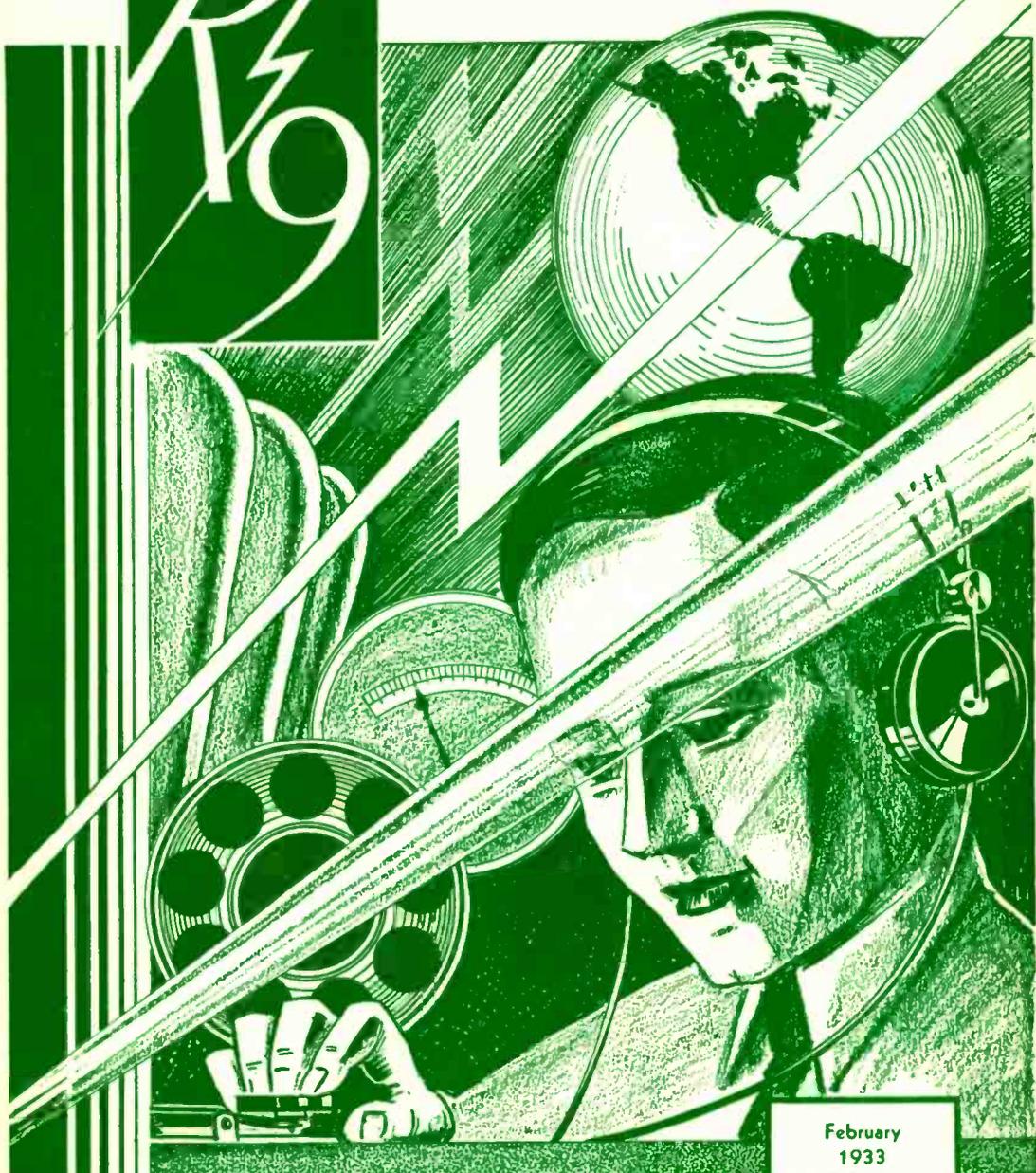


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THE INTERESTS OF
THE RADIO AMATEUR

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February
1933
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WITH THE EDITOR

Five Years Hence

Rg is the only U.S.A. magazine of national circulation including as a prominent feature discussions of the policies and politics of amateur radio. Why do we include such material?

Does it interest you? If not, it should—or you will have no kick coming when further encroachments are made on your rights. Five years ago, ham radio lost a large share of its frequency bands for just two reasons: (1) lack of active interest in the whole situation by the transmitting amateurs—“let George do it”; (2) lack of appreciation on the part of Amateur Radio’s representatives at Washington that the conference there would be a dog-eat-dog affair, not a conference to which gentlemen (who state they are above “lobbying”) could go and, with hats in hands, successfully request favors of the powers-that-be.

The next conference will be a repetition of the Washington affair unless ham radio wakes up in the course of the five years to come. Our frequency bands were safe at the 1932 Madrid conference, not due to any virtue in ham radio itself, but because conditions were too poor to warrant serious effort on the part of commercial interests to encroach on our bands.

Join in *Rg*’s campaign to stimulate interest in these subjects. Help to elect aggressive Directors who can think and plan. “Yes-men,” such as form a majority of the present Board, are of no benefit to anyone, even those at HQ whom they “yes.” When the time comes that it appears profitable to the commercial interests to fight against continuance of our present frequency territories and traffic-handling rights they will use any weapons on which they can lay their hands—let us be adequately prepared to do the same.

Five years will pass before we know it—let’s start now. And in the mean-

time let’s not forget that more can be done, and will need doing, in *Washington* than in a dozen international conferences. Did you know that ham radio will soon have an unofficial representative in Washington, one whose hands will be tied only by the limits of common sense, not by HQ’s over-weening respect for powers-that-be, commercial or governmental. Col. Foster, W6HM, is the man; though a gentleman by nature, he knows how to forget that fact when his opponent does, an ability which, unfortunately, we are very likely to need.

Too Technical?

Fortunately from most standpoints, (but unfortunately for an editor), ‘ham’ radio comprises men of all sorts and walks of life. In technical ability, they range from the merest tyro to the engineer, technical man, and scientist whose ability and knowledge of radio, its practice and theory are second to none.

There then arises the question of “how technical” should articles be in a given magazine for amateur consumption. In asking this question at local radio clubs, the editor has heard *QST* condemned almost in the same minute as “too technical” and “too much for the kids or beginners”; it has also been said that the articles on more advanced apparatus are only of the “how to build it” variety, with little mention of reasons why some point should be solved as the author solves it.

Rg is in much the same boat—we can merely say that it will be our policy to present so nearly as they may be available technical articles of all gradations.

Of course, in other matters *QST* is a paper only for kid consumption, and will remain so as long as it refuses to include articles and correspondence on the matter most vital to amateur radio today: preservation of our rights.



GANGSTERS, INCORPORATED

By CLAIR FOSTER*

Men of Big Business gang up to prey upon the public just as do the Little Fellows of no business at all. One difference between the two classes of gangsters is that the little fellows have the courage to risk their necks and their liberty while the big fellows hide behind corporate contrivances and thus see to it that their victims take all of the chances. Another difference is that laws are made to restrain the small gangsters while other laws are made solely for the protection of Gangsters, Inc., and to enlarge their fields of operation. Still another difference is that laws, as made, are applied to small gangsters while other laws, perfectly clear in wording and intent, have been declared by constituted authorities not to apply to the illegal acts of Gangsters, Inc.

The Radio Laws of the United States declare that all use of the people's air shall be in the public interest. The keystone of the Radio Act is that every transmitting station, to justify its use of the air, must be operated for "public interest, convenience, or necessity." At present, there are licensed in the United States about 4,000 commercial stations. There are licensed over 30,000 privately owned and operated stations that are termed *amateur stations*, though their owners are "amateur" only in the sense that they accept no remuneration for services rendered to the public. These privately owned stations transmit, receive, and deliver messages for the general public free of all charges—even for postage. Therefore, if there are any stations being operated strictly in compliance with the law they are these private, or amateur stations. That this free service is greatly valued by the public is shown by, literally, thousands of letters of gratitude received by every

amateur who is handling message traffic.

The amateur service that is the greatest boon to the public is that which spans the Pacific Ocean. There are thousands of our own people—Army, Navy, Marine Corps, teachers, missionaries, physicians, and other civilians—in Hawaii, Guam, the Philippines, and China. These people must all keep in contact with their families and friends in the United States. Few of them have the money to pay the high tolls exacted by the commercial radio and cable corporations. Amateur stations for several years have kept up all this communication. The service has grown until now from 3,000 to 4,000 messages a month cross the Pacific by amateur radio. It is a growing and immensely valuable public service.

The right of a private station to collect a fee for its service has never been adjudicated in the courts. The question has never arisen—simply because no amateur wishes to serve for hire. I believe, though, that there is no fundamentally sound reason why the labor of a private operator isn't just as worthy of its hire as that of a corporation which is in the radio business purely for what can be made out of the public. That the public likewise believes this is proved by the frequency with which we amateurs have to return money that is sent us by grateful people.

The messages that travel by amateur radio by the thousands here and there over the United States do not especially interest the commercial companies. In most cases an airmail stamp would deliver one of these local messages promptly enough. But trans-Pacific amateur message traffic is of a different character and value. It takes highly developed stations to span the Pacific consistently day after day. And it requires operators of no mean ability to read the

*W6HM, Carmel, California.

dots and dashes of code transmissions through the welter of interference in the narrow bands to which private stations are restricted. *But*, trans-Pacific radiograms save three weeks' time, or more.

This trans-Pacific amateur traffic *does* concern the commercial radio and cable corporations, for it undoubtedly cuts into their private pocketbooks. But it concerns far more the thousands of our own people who are urgently in need of a service that they have no money to pay for. Now, is there any logical, any consitutional reason why a privately controlled corporation should be given a monopoly of the air over the Pacific for handling for their private profit messages that competent amateur stations will handle for nothing!

After the Act of 1927 came into force, the Federal Radio Commission asked its General Counsel for an opinion on the question of an amateur's handling a message of a "business" character. His opinion summed up in effect that an amateur could legally handle any type of message whatsoever so long as not done for hire. Copies of this opinion were distributed to Radio Supervisors throughout the country for their guidance. The opinion was common sense and common law. A private operator may transmit a message from California to Arizona without hindrance by Federal authorities, just as surely as I may, without restriction, carry a passenger between those states in my automobile or plane, as long as I accept no pay for the service. So long as there is no remuneration there is no "commerce,"—in spite of what the Supreme Court may have said in its famous Mann Act case. When the new amateur regulations came out after the law of 1927 was enacted, that hoary old quip about "commercial correspondence" had been dropped. But the commercial people felt that they simply had to have a toe-hold from which to thrust at amateur message-handling; so this appeared as

new regulation No. 365:

"The term amateur radiocommunication means radiocommunication between amateur radio stations solely with a personal aim and without pecuniary interest."

You may be sure that if there had been any ground on which the commercial people could have hung a prohibition against amateur message-handling the regulations promulgated under the Act of 1927 would have said so in plain English. As a matter of interest, a lawyer friend of mine in Washington told me that Col. Manton Davis, Vice-President and General Counsel of the Radio Trust, said that he himself believed an amateur had the legal right to handle any type of message. Not that Col. Davis' opinion adds anything to the knowledge generally extant, but it is merely by way of indicating why no plain-English prohibition was put into the amateur regulations.

Regulation No. 365 sounds innocent enough to allay the fears of most amateurs; but it was worded to provide a background for the commercial people to do some high and lofty "interpreting." Stating an unsound premise and then "interpreting" it is an old dodge for befogging a real issue. And now we have an instance in point. On January 31, 1932, the Secretary of the Federal Radio Commission notified the headquarters of the American Radio Relay League that amateur stations set up at conventions, athletic meets, flower shows, and such gatherings would no longer be permitted to accept messages from the general public, quoting Regulation No. 365. In conclusion, he said,

" . . . Amateurs may do all things that are reasonably necessary or incident to the service permitted. The solicitation of messages from the general public in the manner suggested, even though no charge is made and delivery is not guaranteed, is not a reasonable or necessary incident to the service and is therefore not permissible."

Since then the F.R.C. has issued permits to several amateurs to set up their stations at such gatherings, but in each case the permit has been restricted by, "On condition that no messages are

[Continued on page 22]



"SWINGING" CHOKES

For Filter and Smoothing Circuits

By FREDERICK S. DELLENBAUGH, JR.*

[The average amateur, and many others, frequently specifies a far larger choke than necessary; this is not only expensive, but may actually introduce difficulties. Advantage can be taken of the "swinging characteristic" of chokes to reduce their size materially. Commercial "ratings" of chokes mean next to nothing.

To the reader unable to follow the course of reasoning herein, we recommend that he read at least the last three paragraphs of the body of the article.—EDITOR.]

The Energy Storage of Chokes

Many misleading ideas are prevalent in regard to the use of inductance for smoothing the ripple in rectified AC power supplies. Inductance is electrical inertia and is directly analogous to the fly wheel on an automobile engine. Such a fly wheel is used for the same purpose, namely, to smooth out pulsations in driving torque produced by successive cylinder impulses. A large, slow-speed engine requires a heavy fly wheel while modern high speed automobile engines employ very light fly wheels. This is because the energy in a fly wheel is proportional to the mass and the square of the angular velocity. Therefore, as the speed increases, the mass reduces rapidly to produce the same smoothing effect. The same thing is true of golf clubs. If the weight of the club is reduced 10%, and if, as a result, the player can swing the club with a 10% increase in velocity, the energy of impact when it hits the ball will be increased 20%, resulting in greater distance. Electrical inertia in the form of inductance must be considered from the energy standpoint. The inductance itself is analogous to mass and the current is analogous to velocity. The energy stored is proportional to the inductance and the *square* of the current. (Note 1.)

The rating of inductance should be in terms of energy stored and its size depends upon its energy storage in the

same way that the size of a transformer depends upon its volt-ampere or watt capacity. In actual use, devices for providing inductance are variously referred to as *chokes*, *reactors*, or *retard coils*, which all mean the same thing.

While only a given amount of energy can be obtained from any given choke, the rate at which the energy is used may vary greatly. In single-phase full-wave 60 cycle rectification the ripple has a frequency of 120 cycles. The time from one current peak to the next is therefore $1/120$ of a second. If a choke stores energy of one watt-second, and its total energy is absorbed between one current peak and the next, it will give out 120 watts. If this energy were delivered uniformly it would light two 60 watt lamps for this short period. As the time becomes shorter, more watts may be obtained for the briefer periods, the total energy available remaining constant. As an extreme case, consider an automobile ignition coil, which has a definite energy storage due to the magnetic field set up by the primary winding. When the breaker contacts open, the magnetic field collapses and the voltage rises rapidly until it breaks down the spark-plug gap. The remaining energy available then flows through the ionized gas and ignites the mixture. The same thing happens in rectified AC power supplies under some conditions. High voltage tubes of the mercury vapor type occasionally become defective and suddenly shut off the current being conducted. This "shut off" phenomena is of extremely short duration, but the energy present in the associated smoothing chokes must be released somewhere. This release of energy will be extremely rapid and the resulting rise of voltage will often break down

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†Those to whom the following article may appear "too technical" are asked to see the section *With the Editor* in this issue.—EDITOR.

insulation and put the power supply out of commission. For this reason, protective spark gaps are frequently used across choke terminals in large power supplies.

Definition of Inductance

The ordinary term *inductance* really means the *coefficient of self-induction*. It is primarily defined as the flux linkages per ampere. (Note 2.) This means

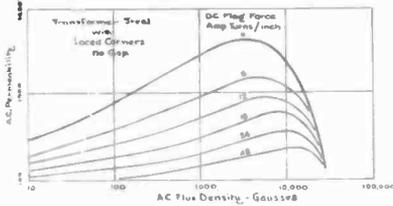


Figure 1
Effect of DC saturation on the permeability of steel.

turns times total magnetic flux divided by current.

The object in choke design is to obtain the most magnetic flux with the least material. The amount of flux produced will depend upon the ampere-turns in the winding divided by the reluctance of the magnetic circuit. (Note 3.)

Constant inductance assumes that the configuration of the choke and its magnetic constants remain fixed for every value of current. All electrical theory is based upon this fact, which is repeated for emphasis—namely,—*the inductance is assumed to be constant and independent of current.* With iron-cored chokes of commercial design, this is no longer true.

The Relation of Inductance to Core Size

Electrical steel has a property known as *permeability* which expresses its ability to carry magnetic flux with respect to air. This permeability will vary between 200 and 6000 in transformer grade steel, depending upon the flux

density. Permeabilities as high as 100,000 have been obtained with special alloys such as *Permalloy*, *Hypernik*, and the like.

It is obviously desirable to introduce a core of magnetic material in order to increase the inductance obtained for a given combination of turns and current. But the moment this is done, the inductance is no longer constant, but varies with the total amount of flux produced. The situation is still more complicated by the fact that in smoothing chokes we are dealing with alternating current superimposed upon direct current. The design problem thus becomes chiefly—

How shall the iron core and copper winding be related that the most inductance may be obtained for a given amount of material?

Figure 1 shows how permeability varies with AC and DC flux. For any combination of AC and DC a definite permeability is obtained. Generally, a completely closed magnetic path, such as is used in transformers, will result in very high DC flux, which will saturate the core and lower its AC permeability. This AC permeability is often

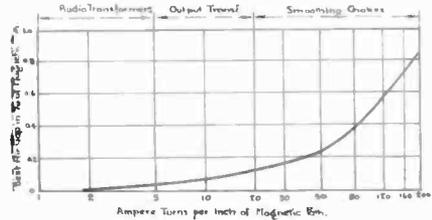


Figure 2
Range of air gap for different types of chokes.

referred to as *incremental permeability*. In order to prevent DC saturation from lowering the AC permeability too far, an air gap is introduced. Figure 2 shows the approximate range of air gaps customarily employed for different types of chokes. The inductance will be controlled by the total reluctance of the magnetic circuit with respect to the

AC ripple. Thus, as the air gap is increased, the AC permeability of the iron path is increased, due to reduced saturation by DC flux. At the same time, the AC flux must also go through the air gap which increases the total reluctance. Thus for very small air gaps, the inductance falls off due to low permeability of the steel, while very large gaps lower the inductance due to the trouble in pushing flux through the air gap itself. The problem is to obtain the ideal intermediate air gap which will give the maximum AC inductance. Several methods of design are available for accomplishing this, probably the most practical being that developed by C. R. Hanna of the Westinghouse Electric & Manufacturing Company. (Note 4.) This method reduces the design to an empirical curve plotted between the energy-storage per cubic inch of iron and the magnetizing force per inch of magnetic length.

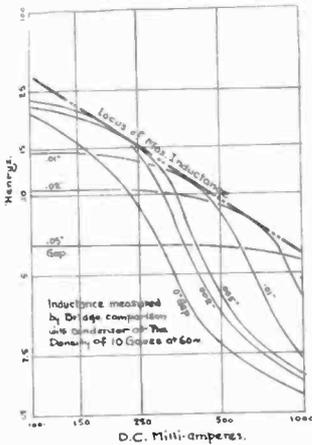


Figure 3
Variation of inductance with DC current in typical smoothing choke.

This is illustrated by Figure 3, showing a succession of curves taken upon one choke with various air gaps. It will be seen that for any given value of DC current there is one best air gap. If the

gap is smaller, some inductance is lost by saturation. If the gap is larger, the inductance is again lower because reduced DC flux does not produce as much gain in AC permeability as is lost by the increased gap. These results

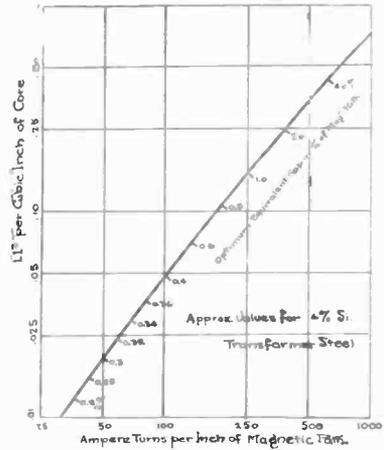


Figure 4
Design curve for determining best use of material in choke.

are plotted to logarithmic scale. The Locus of Maximum Inductance calculated by Hanna's method is shown in Figure 4. The scales are marked off in ratios good for any sized core of the same material. The best air gap is marked along the curve. This air gap is given in percentage of the total length of magnetic path.

The air gaps of Figure 4 are the effective values. Due to fringing of flux around the gap, the actual spacer will usually be different from the effective value. The relation between theoretical gap and actual spacer for a common type of core is shown in Figure 5. These details must be determined by the designer for the particular metal and core shapes he is using. The details are mentioned to show that there is one and only one combination that will make the best use of material for any given choke. Furthermore, if the AC flux in the choke varies, a different gap will

(Continued on page 24)



Antipodean QSO Record?

One thousand six hundred (1600) transoceanic QSO's with just three American stations is the record of VK5HG of Glenelg, South Australia. He has QSO'd 572 times with W9GV, 524 times with W9CKQ, and by the time this appears in print will have passed his 500th QSO with W2CC* to whom the schedule has now shifted. Though communication has been carried on at various times of the day including those when the signals probably go the "long way around," the regular time is just after sunrise at W2CC which is located in Mount Vernon, New York. The 7 mc. band has been used exclusively. Some time ago when the schedule was daily instead of three times a week, forty-four consecutive QSO's were held before a day of unusually poor conditions spoiled the record.

The transmitters at VK5HG and W2CC each consist of a 210 tube in the Hartley circuit with an average input of about 35 watts. VK5HG's frequency is 7270 kc.; W2CC uses 7055 or 7280 kc. Both stations still use two-tube

(Continued on page 29)

*Albert E. Scarlett, Jr., 64 Adams St., Mt. Vernon, New York.

FLASHI

3 Year Station Licenses

On January 7, the Federal Radio Commission ordered effective January 6 that all amateur station licenses be extended for a period of two years from the date of expiration of existing license.

The following was adopted as paragraph e of Rule 27: "The licenses for amateur stations will be issued for a normal license period of three years from the date of expiration of old license or the date of granting a new license or modification of a license."

We assume that the extension mentioned in the first paragraph is automatic, but will present further information next month. Probably each license holder will receive notice direct from the Commission.

A. R. R. L. Directors' Elections

The Executive Committee of the League has announced the results of the elections for Directors which closed December 20th at West Hartford. Elections are held each year in half the A.R.R.L. divisions. Those affected this year were the Central, Hudson, Northwestern, Roanoke, Rocky Mountain, and West Gulf Divisions. Results announced are as follows:

Central Division:

Elected:	
L. G. Windom, W8GZ	852
Rejected:	
E. A. Roberts, W8HC	538
R. M. Crandall, W9FKE	271

Hudson Division:

Elected:	
B. J. Fuld, W2BEG	335
Rejected:	
H. G. A. Mustermann, W2TP	325
Dr. A. L. Walsh, W2BW	256

New England Division:

Elected:	
George W. Bailey, W1KH	569
Rejected:	
C. B. Weed, W1BHM	164

Northwestern Division:

Elected:	
Ralph J. Gibbons, W7KV	239
Rejected:	
John B. Waskey, W7TX	228

Roanoke Division:

Elected:	
H. L. Caveness, W4DW	121
Rejected:	
R. N. Eubank, W3AAJ	89
C. S. Hoffman, Jr., W8HD	47
J. F. Key, W3ZA	43

Rocky Mountain Division:

Elected:	
R. J. Andrews, W9AAB	107
Rejected:	
L. D. Stearns, W6BTX	76

West Gulf Division:

Elected:	
Frank M. Corlett, W5ZC	250
Rejected:	
Harold Hartman, W5QL	148



SUPERHETERODYNES IN AMATEUR PRACTICE

By FREDERICK T. SWIFT, JR.*

[In this series of articles, Mr. Swift will discuss in some detail the general principles of superheterodynes as used in amateur practice, specific considerations and variations possible in each unit, the interconnection of the units, miscellaneous considerations, and finally conclude with the selection of those variations which seem to him best, and the building around them of a practical superheterodyne. —EDITOR.]

In order to appreciate the advantages of a superheterodyne receiver it is necessary to discuss other types of amateur receivers and point out in what respects they fail to meet the requirements imposed on them by amateur operators. The simplest of our receivers, and one which was most popular with amateur operators in the days when a single receiving tube cost as much as our modern low-powered transmitter, was the simple detector. This receiver was thoroughly satisfactory when our bands had more than twice their present width, and one-half their present number of stations, and in a time when a thousand miles was considered DX. As the bands became more crowded, the woeful lack of selectivity began to hamper satisfactory communication. The everlasting itch for more DX prompted a more sensitive receiver. The first addition to this receiver was an audio-amplifier of one or more stages, and while this increased the signal strength, it also increased the background noise level in the same ratio, so that the sensitivity showed little, if any, improvement. The audio-amplifier in no way affected the selectivity. The selectivity problem was tackled rather ineffectively by tuning the audio-amplifier, (to a fixed audio-frequency) which then discriminated against signals heterodyning (i.e., beating) with the detector at other than the frequency to which the amplifier was resonant. This was rather un-

satisfactory since the instability of our transmitters made sharp audio-tuning impossible. Even today but a small percentage of our transmitters are sufficiently steady to warrant the use of a sharply tuned audio system.

Tackling the selectivity problem from the radio frequency end for a time proved ineffective because of the low gain obtainable with three element tubes to say nothing of their instability and resulting tendency to oscillate. Screen grid tubes were the answer to this problem. Little headway was made, however, until after the introduction of the indirectly heated cathode, because of the high cost, short life, and microphonic qualities of the DC tetrode (four element tube). These problems were largely overcome when the demand for a satisfactory screen grid tube for AC operated broadcast receivers brought forth such valves as the type '24, '35, '58, and others. The large broadcast demand made these tubes comparatively reasonable in cost. Their use solved practically all of the difficulties present in the similar DC tube. They were non-microphonic, had a high amplification constant, and the screen provided sufficient shielding between the plate and grid to prevent the amplifier from oscillating. The difficulties of increased tuning controls were overcome by "ganging" the detector and radio frequency tuning condensers on a single dial. Actual practice soon solved the difficulties of satisfactory inter-stage shielding. The result was a receiver which presented a new and outstanding difficulty, namely that a strong local station completely paralyzed the receiver. In addition to this, the background hiss was so much higher than in the simple detector-type of receiver that it partially overcame the advantages occurring from radio frequency amplification.

*B. S. W6CMQ, 2510 Mar Vista Ave., Altadena, Calif. Head of Advanced Dept., National Automotive and Electrical School, Los Angeles.

Advanced amateurs soon found that a local oscillator coupled to the detector partly overcame the difficulties of paralyzing due to local signals. This type has what is known as a *heterodyne* rather than *autodyne* detector. While the heterodyne receiver partially overcame the interference problem, it was not the complete answer.

In the reception of continuous wave signals on a simple type receiver, we do not actually hear the incoming signal in the headphones; neither do we hear the oscillations produced by the local oscillator whether of the heterodyne or autodyne type. What we do hear are "beats" produced by them; the local oscillator is adjusted so that its frequency of oscillation is just sufficiently different from that of the incoming signal to produce a beat of audible frequency, which we can then hear in the headphones.

But it is possible so to adjust the frequency of the local oscillator that the beat is super-audible, that is, above the limit of hearing of the human ear. Since this is nearly always produced by the heterodyne method and the beat note is super-audible, we call this a *superheterodyne* receiver (though it would be perfectly possible to build a superautodyne receiver). Later on, our beat-producing process must be repeated all over again by the use of a second oscillator, whose output is adjusted to the proper frequency to beat with the super-audible beats, this time to produce audible beats.

A *superheterodyne* may be defined as a receiver which differs from other receivers in that it "converts" (by beating) the incoming radio frequency signal to a second, fixed, radio frequency, which is then passed through a fixed-tuned radio frequency amplifier usually called the *intermediate frequency amplifier* or *i.f. amplifier* — whereas the ordinary radio-frequency amplifier amplifies the signal at its own frequency.

Doing the job in two stages when we can easily do it in one may sound both

complicated and foolish. It is complicated, but not foolish. There are two reasons why such a process is desirable: (1) it permits the radio frequency amplifying to be done at just one frequency, no matter how great the range of frequencies which the receiver may be made to handle; no radio frequency amplifier can be made to work with equal efficiency over a wide range; hence the i.f. amplifier can be adjusted to the point of maximum amplification, and left there; (2) it is a fact apparently inherent in amplifying circuits that *much greater amplification can be obtained at low radio frequencies*, and this is the most important reason for the construction of superheterodynes—so that we can amplify at the frequency we chose for best results rather than that determined by the distant station.

To sum up: a superheterodyne is a receiver whose radio frequency amplifier is "fixed-tuned." The frequency of all incoming signals is "converted" to the frequency of the intermediate frequency amplifier by beating a local oscillator with the incoming signal so that the beat frequency corresponds to that to which the intermediate amplifier is permanently tuned.

The superheterodyne receiver has numerous advantages which recommend it to the use of advanced amateurs. It has a minimum of background noise; it is highly selective; it is super-sensitive; and it almost completely conquers the problem of local interference. The theory of its operation is thoroughly familiar to some, but should be briefly reviewed here so that we may more fully understand the technical problems involved in its design.

As has been said, the local oscillations may be produced by either the autodyne or heterodyne method.

If the detector is caused to oscillate to produce the necessary beat frequency (autodyne), two disadvantages result. The first is a rather unstable oscillator and therefore, a comparatively unstable

intermediate frequency. A second, and more serious, disadvantage is that the detector must be detuned from the incoming signal and tuned, rather, to a frequency which differs from the incoming signal by an amount equal to the frequency of the intermediate amplifier. For example, if the signal has a frequency of 7000 kc., and the i.f. amplifier a frequency of 500 kc., the detector would have to be tuned to either 7500 or 6500 kc. The result is poor sensitivity and a lack of selectivity, since the detector circuit must be sufficiently broad to pass the desired incoming signal in spite of this detuning. This is known as the *autodyne* method. The most satisfactory method of accomplishing the same result is to use a local oscillator coupled to the detector circuit to provide the necessary beat, so that the detector circuit may be tuned exactly to resonance with the incoming signals. This, as we have said, is known as the *heterodyne* method of reception. If a further increase in selectivity and sensitivity is desirable, a *pre-selector* or tuned radio frequency amplifier may be added ahead of the first detector; this stage operates at the frequency of the incoming signal. It should be remembered, however, that the primary purpose of this stage is selectivity or the rejection of unwanted signals, rather than amplification.

The problem presented by the intermediate frequency amplifier is a comparatively simple one as all its tuned circuits, once adjusted, may be left strictly alone. There is only one limit placed on the frequency at which this amplifier will operate. If the frequency of the i.f. amplifier is low, the difference in frequency between the signal and first oscillator will be small. This means that it is possible for both the sum and the difference of the signal and intermediate frequencies, to fall within the range of the tuning dial of the first oscillator, which will result in each station being tuned in at two different points. Besides being unsatisfactory because of the un-

certainty in logging signals, it is most undesirable since the interference difficulties will double. It is exactly equivalent to having twice the actual number of stations in operation.

An example may better illustrate this point. The oscillator and receiver will, of course, have the same tuning range. For the 40-meter amateur band, this range will be about 400 kc.—300 kc. within the band, with a 50 kc. margin on either side. Let N equal the difference between the oscillator and first detector, in kc. This will also be the frequency of the intermediate frequency amplifier. This means that to prevent the receiver from tuning in any signal at two points on the oscillator dial, (with the oscillator either tuned N kc. above or N kc. below the frequency of the receiver) the value of $2N$ will have to be greater than the tuning range of the receiver. Since $2N$ must be greater than 400 k.c., N will have to be greater than 200 k.c. This practically excludes the use of the conventional (i.e., conventional for broadcast purposes) 175 kc. intermediate amplifier, even on the 40-meter amateur band which is the narrowest one assigned to our use. A similar calculation for the 80-meter band will show that the frequency of the intermediate amplifier must be greater than 300 k.c. This consideration makes desirable the use of an i.f. amplifier with a frequency of from 500 to 600 k.c.

The signal delivered by the intermediate frequency amplifier is still super-audible in frequency and in all respects similar to any other radio frequency signal and, therefore, it must be demodulated or detected, which means that a second detector is essential. If the receiver is to be used for continuous wave signals (CW), some method must be provided to make these signals audible in the head telephones just as was the case with the simple, single-tube receiver—that is, a second local oscillator must be provided whose frequency differs

from that of the detected signal by an audio frequency. For example, if the i. f. amplifier is tuned to 500 kc., the oscillator will have to be tuned to about 500.5 or 499.5 kc., which will produce a 500 cycle beat signal in the headphones. As was the case before, this may be accomplished in two ways, using either the autodyne or heterodyne method. In the first method, we cause the second detector to oscillate, and by detuning it slightly from the frequency of the intermediate amplifier, produce the necessary beat note. However, if we are to attain a maximum of selectivity, even detuning $\frac{1}{2}$ kc. will mean a loss of signal strength and sensitivity—again a heterodyne oscillator becomes desirable. Since the frequency of the intermediate amplifier is fixed, the frequency of this heterodyne oscillator may also be fixed; it therefore in no way complicates the tuning of the receiver. Its use makes it possible to tune the second detector to exact resonance with the signal. If additional signal strength is required, the second detector may be followed by an audio frequency amplifier. A refinement that may be added is a tuning control on the second oscillator, to tune it to a greater or lesser difference of frequency with the second detector, thus producing an audio frequency signal higher or lower than 500 cycles ($\frac{1}{2}$ k.c.); this might be termed an "audio-frequency tuner." While in no way necessary, it is sometimes desirable to control the tone to suit the auditor's fancy, or to suit the particular frequency to which the audio-frequency amplifier may be tuned or peaked.

It will be the purpose of this series of articles to go into the technical design involved in such a receiver for amateur purposes, showing the various possibilities in each of the several units of such a receiver, and ending with a practical selection of ideas and the building around them of a practical super-

heterodyne receiver. Unfortunately, it is impossible to build a receiver with as many outstanding advantages as the superheterodyne without complicating the construction. This receiver is not recommended to anyone not already familiar with the simpler types of receivers, since its assembly is only half the job; the hardest part of the job is "shooting the bugs."

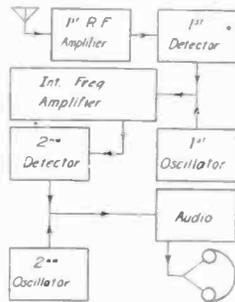


Figure 1

Figure 1 is a block diagram of a superheterodyne receiver showing how the various units which we have briefly discussed are combined into the complete receiver. In order to proceed with the discussion in a logical order, we will discuss in order the various problems beginning with the pre-selector and working through the receiver, ending with the audio-frequency amplifier. It should be remembered that the design or construction of any of the units differs but little from the conventional ideas embodied in modern amateur receivers. The chief problem encountered in building a superheterodyne receiver is the satisfactory interconnection of the units, not their individual construction.

[This article will be continued in the next issue]

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"RADIO TRUST" DISSOLVED*

By OSWALD F. SCHUETTE†

The dissolution of the \$7,000,000,000 Radio Trust is the greatest victory ever won in the Court of Public Opinion, just as it is the largest combination that has ever been dissolved by the Government of the United States.

It must not be forgotten that ten years ago, Harry M. Daugherty, then the Attorney General of the United States, gave this combination a "letter of immunity" against governmental attack and that it was not until Senator James Couzens of Michigan had secured an investigation of the radio trust by the Senate Interstate Commerce Commission that the Department of Justice filed the suit to dissolve the combination.

Although the radio combination had been perfected in 1922, it was not until the spring of 1927 that it undertook to exact a patent royalty from the entire radio industry. At that time it announced its terms which required the payment by every radio manufacturer of 7½% of his gross receipts, as a patent royalty, but required him also to buy all his tubes from the combination. In addition, it fixed a minimum annual royalty of \$100,000. As a result, the "forgotten man" of the industry—any manufacturer doing business of less than \$1,350,000 a year—was automatically debarred from the radio field.

Efforts to fight the combination in the courts were almost impossible so far as these smaller manufacturers were concerned, as the high priced legal talent which had been lined up by the combination made such a fight seem hopeless. Therefore, we decided to take this battle into the Court of Public Opinion, where the enormous assets of the combination would be a liability. On Aug-

ust 1, 1927, in the Chicago law office of the late Ernest R. Reichmann—who became the General Counsel of the organization—we organized the Radio Protective Association. This included a small group of manufacturers, only two of whom had done a business in the preceding year of \$1,000,000.

The first step of our new organization was to file suit, through a group of its members, in the United States District Court at Wilmington, Delaware, to declare the "tube clause" a violation of the Clayton Act. This litigation lasted three and one-half years. Three times the matter was laid before the United States Supreme Court, but in each case the finding of the Lower Court that the "tube clause" was illegal was upheld. During the course of this litigation, the independent companies filed suits aggregating \$40,000,000 for triple damages against the combination. But, while it took the courts of law three and one-half years to declare the "tube clause" illegal, so successful was the fight of the independents in the Court of Public Opinion, that the radio combination abandoned its attempt to enforce this clause early in 1928, thus relieving the industry from that burden. The radio combination also abandoned its effort to collect the \$100,000 minimum.

In the spring of 1929, the combination also reduced its royalty demand from 7½% of the gross receipts to 7½% of the net selling price of the electrical apparatus actually used in the radio set, by eliminating the royalty on expensive and unpatented cabinets, to which the manufacturers had objected as an illegal extortion.

Since that time, the Radio Corporation has again reduced its patent de-

*R9 presents this material, not because an occasional amateur is also commercially interested in radio, but because the activities of the "radio trust" vitally affect the prices of much amateur apparatus.—Ed.

†Executive Secretary, Radio Protective Association, National Press Building, Washington, D. C.

mands and the present royalty is 5% on the net selling price of the electrical apparatus used in the set.

But all this relief would have been in vain if the combination had been allowed to remain intact. To force the dissolution of the combination, therefore, we carried our battle to every tribunal in the Court of Public Opinion. Our first opportunity was given to us by the Senate Patents Committee, under Senator Dill's bill to confiscate patents owned by combinations found guilty of violating the anti-trust laws. During these hearings we told, for the first time, the complete story of the formation and the operations of this huge combination. The Senate Patents Committee reported the bill favorably, but it did not reach final enactment. We made the same charges before the House Committee on Merchant Marine and Fisheries, which was in charge of radio legislation and to the Senate Committee on Interstate Commerce which handled the radio legislation in the Senate.

All of this called called public attention to the charges and had its immediate result in tempering the demands of the combination. We also carried the charges to the Federal Radio Commission where we tried to prevent the radio combination from receiving licenses for radio operation.

But the most important victory won by the independent interests came in the summer of 1929, when at the special session of Congress, Senator Couzens introduced his resolution to investigate the Radio Trust and the Senate unanimously ordered his committee on Interstate Commerce to carry out a complete investigation of that group. This gave us an opportunity to make the charges under oath and to require the representatives of the combination to present their side of the matter, similarly under oath. At the conclusion of those hearings, I made a formal demand upon the committee that it call Attorney General

Mitchell to the stand to explain why the Department of Justice had not proceeded against this combination, even after the civil courts had found the corporation guilty of violating the anti-trust laws in the "tube clause" proceedings. In response to this demand, John Lord O'Brian, the assistant Attorney General of the United States, wrote a letter to the committee explaining that the department was investigating the matter and would presently determine its attitude.

Before the Department could make a final report, however, the radio combination announced that the General Electric and Westinghouse Companies had been given 55% of the stock control of the Radio Corporation of America. This seemed so defiant a challenge to the committee that Attorney General Mitchell was asked to explain. The necessity for his appearance before the Senate Committee, however, was obviated by the filing of the government dissolution suit five days later. This suit accused the Radio Corporation of America, the General Electric Company, Westinghouse Electric and Manufacturing Company, the American Telephone and Telegraph Company, and the General Motors Corporation of violating the anti-trust laws. At the time of the filing of the suit, the latest balance sheets of these companies showed combined assets of \$7,224,681,597. Shortly thereafter, the Grigsby-Grunow Company of Chicago, one of the leading independents, filed a triple damage suit for \$30,000,000 against the same combination.

Shortly after the filing of the suit, the Department of Justice retained the Hon. Warren Olney, Jr., former Associate Justice of the Supreme Court of California, to take charge of the prosecution, and negotiations with the trust have been carried on under his supervision. Throughout these negotiations, I have taken the position that a settle-

(Continued on page 25)



TRAFFIC TAPERS

Owners of amateur stations are absolutely forbidden to transmit internationally messages emanating from third parties.

Although we have not received at this writing the official text adopted by the final sessions of the Madrid Conference, we are reliably informed that the sentence in italics was added to Paragraph 2 of Article 6, which, as in the Washington treaty, forbade the international transmission of messages except those relating to the experiments and "remarks of a personal character" which were too unimportant to warrant the use of public commercial or governmental facilities.

Thus is another nail driven into the coffin of international amateur traffic to the direct detriment of the public interest not only in the United States but throughout the world. And once again is illustrated how little does consideration for the public interest enter into the actions of those who are supposed to be its representatives. It should be remembered that international amateur traffic diverts funds from private pockets, but pockets which wield a tremendous influence; comparatively few of the great international cable and radio facilities are publicly owned, and special arguments which might apply to public ownership do not apply in this case. ●

28 mc. Information Wanted

R9 would appreciate reports from those working in the 28 mc. band. Though transmitters and receivers have been made to work in this band, and some QSO's have been held, there seems to be too great a dearth of knowledge regarding the communication possibilities of the band. ●

R9 is *not* a Pacific Coast local publication. New York stands second on our subscription list; little Connecticut is third.

MADRID

"The outstanding result of the conference," says Judge Sykes [Vice-Chairman of the Federal Radio Commission, and Chairman of the American delegation to the International Radio Conference held at Madrid, Spain], "was the adoption of a single convention, the first ever adopted by the nations of the world, which covers communication in general—not only radio, but telegraphy and telephony."

He explained that the United States, because of its peculiar position, differed from the other nations, since its telegraph and telephone services are handled by private companies, and was not a signatory to the telegraph and telephone regulations, but only to the part relating to radio.

In addition to this joint convention, which may be compared to the original Constitution of the United States, adopted in 1789, Judge Sykes added, a number of rough spots in the radio regulations were ironed out. Generally speaking, he said, these regulations, as now drafted, are more harmonious and satisfactory from a technical standpoint.

After many years of hard fighting, the United States won a signal victory at the conference by obtaining the use of English on a par with French, for discussions and debates at the conference, while retaining the French language alone for official documents.

[Why not a few years of hard fighting to obtain a victory of justice for those who make best use of the air, instead of one of convenience to delegates? —EDITOR]

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[Continued from page 61]

transmitted for the general public." This is clearly an infringement of the Constitutional rights of a large class of citizens of the United States and of the public which wishes to avail itself of the service of the amateur stations. Moreover, it is a violation of the Radio Act by the very officers appointed to administer that Act, in that they aim to prevent 30,000 amateur stations from compliance with the fundamental requirement of the law itself, viz., that every station must be operated for "public interest, convenience, or necessity." Now, in just what manner could a station set up at a convention or a flower show be of interest to the public, or serve the public convenience, or meet a necessity of the public, if it is forbidden to act as a means of communication for the public! Regulation No. 365 is disingenuous in the first place; and, in the second place, the conclusion drawn from it by the Secretary of the Radio Commission is weird, to say the least.

While I was in Washington in the spring of last year, 1932, the Radio Corporation of America had a plan afoot to get the Radio Commission to issue an order prohibiting all private vessels, yachts and expeditions from communicating with amateur stations. This would mean that ships, such as Admiral Byrd's, or MacMillan's, or any of the many private expeditions that sail forth to the little-known places of the earth, must buy or rent radio equipment from a commercial company, have it manned by commercially paid operators, and pay to the commercial companies—nearly all to R.C.A., of course—tolls on every word received or transmitted by such means. It is well known that for years such expeditions have enjoyed their right to be served by amateur stations. They have gone forth equipped by amateurs and manned by operators from the amateur

ranks; and amateur stations in the United States and various other parts of the world have carried on their communications. These exploring, or scientific, or just plain adventurous people depend upon amateur service for reasons other than those of economy. They have learned that amateurs can be depended upon to keep up their interest in the movements and welfare of the expeditions, that the amateurs become familiar with the families and affairs of the expedition's personnel, that the amateurs can be relied upon to keep communication schedules at all sorts of hours and carry out no end of important commissions. They have learned that for every commercial station that will heed their calls, one thousand amateurs will be standing by for them. To prevent all these people from communicating with amateur stations would be absolutely *against* the public interest.

As a matter of information, the Radio Corporation of America tried to drive a wedge into this kind of message traffic when Byrd's ships, the *New York* and the *Eleanor Bolling*, were making trips from New Zealand, conveying his equipment and supplies to the Antarctic. R.C.A., thru Lindh, its San Francisco superintendent, protested to the government against Ralph Heintz' station, 6XBB, working these ships. Lindh charged that 6XBB was an amateur call and that, as such, it had no right to communicate with ships. Byrd was then at his base, "Little America," while his overladen ships were plowing their dangerous way thru stormy seas and floating ice. This protest of the R.C.A. was transmitted to him by 6XBB. Byrd immediately sent a message of expostulation to Washington. So that there could be no doubt of the authenticity of it, he relayed it by Navy channels—thru NPU at Samoa and NKF at the Naval Bureau of

Radio Research in Washington. He said that 6XBB was handling thousands of words for him, and he insisted that this contact be not disturbed. And that was that. The sum total of achievement on the part of R.C.A. was that Lindh's stations were stuck with a hookful of paid messages that they couldn't deliver because the amateur operators on Byrd's ships were so angry they wouldn't answer an R.C.A. call!

Just fancy! The consummate cheek and inhumanity of trying to stop those poor fellows, fighting storms and ice, from communicating with their families in the United States except by paying—and paying high—at so much a word to the Radio Trust!

The latest move of the commercial corporations to stop amateur message-handling—and, at that, the amateur service that is of greatest value to the public—that has come to my attention is this: In October, 1932, I received a radiogram from one of the Army Signal Corps officers in the Philippines saying that a letter had been sent from the Philippines Bureau of Posts to Washington requesting to be advised whether or not it is possible to apply international regulations to Philippine amateur stations. The significance is this: under the terms of the International Radiotelegraph Treaty each country is permitted to treat its amateurs as it sees fit. It may refuse to issue any amateur licenses, it may restrict amateurs in any way it chooses, it may prohibit them from transmitting or receiving messages. As a matter of fact, most foreign countries do prohibit the handling of messages by amateurs. There may be a certain measure of justice in this for the whole citizenry of these foreign countries; in most cases, the communication systems are operated by the governments themselves and they derive revenue for the support of government by their message tolls. But in the United States and possessions, tolls exacted from the public go into private pockets,

and are not used for the benefit of our citizens as a whole. So, in the United States and possessions, the public has never yet been forced to pay tribute to the private communications corporations by a ban on amateur message-handling.

We learn from commercial operators that the R.C.A. and Mackay, (as the International Telephone & Telegraph Co. is known among radio men), have been copying the amateur trans-Pacific traffic to build up a record of amateur messages that they arbitrarily claim should have been sent thru commercial channels. How absurd! It would be just as rational for the amateurs to copy the commercial traffic to find out just how many paid messages could as well have been transmitted free by amateur stations to the great advantage of the public.

When our Congress gets the real significance of these schemes of the commercial interests, I have no doubt that the Congress will put a stop to them. No further legislation is needed to protect the right of the private stations to handle messages free of charge. All that is necessary is to see that present laws are not perverted to the interest of the commercial corporations—more especially to R.C.A., a corporation that has already been adjudged by Federal courts to be operating in defiance of the Sherman and Clayton Acts, and, therefore, to be operating in defiance of the clear provisions of the Radio Act as well.

(Continued on page 26)

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See page 27

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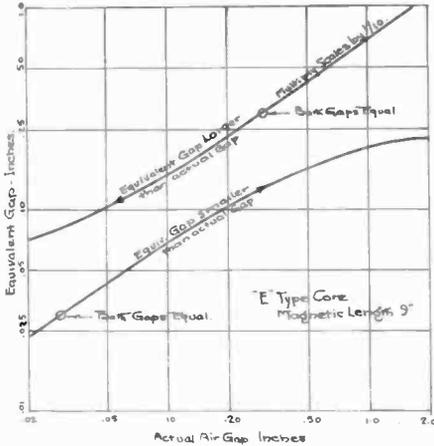


Figure 5

Relation between actual air gap and equivalent magnetic gap.

Effects of Iron Saturation Upon Choke Behavior

When the DC is increased through a choke, the resulting constant magnetic flux is also increased and the permeability with respect to a superimposed AC is reduced. This means that the apparent inductance varies with the amount of direct current. This can be seen by reference to Figure 3 where the curvature of the inductance is very evident as the current varies. The value of inductance which results from meter readings is some average of the instantaneous values, just as an AC meter reading is some sort of average (r.m.s.) value of the instantaneous values. Choke inductance can be measured by bridge methods in terms of a standard inductance or standard capacity. It can also be measured by the AC voltage drop across the choke and the AC current through it in the actual operating circuit. The ratio of the voltage to the current will give the reactance and this

value divided by $2\pi f$ will give the inductance. The values of inductance obtained by these two methods may not be, and usually are not, the same. This is not the fault of the methods, but is because any definition of inductance, when it varies with conditions, must also include complete definition of the conditions under which it is tested.

The instantaneous value of inductance can be found by taking oscillograms of the current through the choke and the voltage across its terminals. Tracings of such oscillograms are shown in Figure 6. It may be shown mathematically (Note 5) that the instantaneous inductance may be defined as the voltage divided by the slope of the current wave. Figure 6C shows the slope of the current wave and curve D

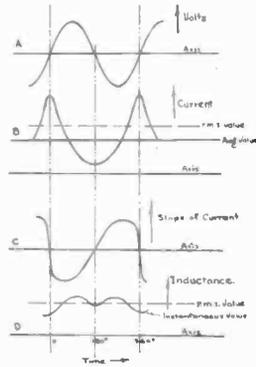


Figure 6

The cyclic value of an iron cored choke inductance.

in the same figure shows the resulting cyclic inductance. It will also be seen from this that under the conditions for which these curves were taken, the maximum inductance is nearly double the minimum value. Several effects result from this variation and such a choke may actually do more harm than good by introducing distortion if the smoothing is already excellent. It is

also a source of trouble when trying to avoid resonant effects. Suppose the first choke in a normal choke input type of filter has an apparent inductance of 6 Henrys and operates into a condenser of 2 μ fd. Resonance for 60 cycles will occur with approximately 3 Henrys and 2 μ fd. in series. If the 6 Henry choke has characteristics similar to Figure 6, it may easily approach 3 Henrys during the minimum cyclic value. If this happens, the combination is very apt to *drop into resonance with disastrous results to the power supply system*. The *hum* in the output of the filter will materially increase, the current peaks in the rectifier tubes will be large and the current distribution thru the tubes will become unbalanced. In the Delta Laboratories we have been able to produce conditions similar to this where one tube dropped the load almost entirely and the other tube carried an extreme overload. The action seems to be due to the first filter section swinging with the 60 cycles and opposing conduction by one tube and aiding that by the other, representing a sort of synchronous short circuit for one tube.

[This article will be concluded in the next issue]

Footnotes

(1). The actual value of this energy is one-half the above product in watt seconds or Joules, which are the same thing. This is expressed mathematically as follows:

Watt Seconds equals Joules equals

$$L (I^2) / 2$$

Where: L equals Inductance in Henrys

I equals Current in Amperes

(2). This may be expressed by the simple formula given below:

$$L \text{ equals } [(\phi)N \times 10^{-8}] / I$$

Where: L equals Inductance in Henrys

I equals Current in Amperes

N equals Number of Turns

(phi) equals Total flux
 10^{-8} equals Factor converting to practical units

(3). This relation can be substituted in formula II and gives:

$$L \text{ equals } 3.2 AN^2 \mu \times 10^{-8} / J$$

Where: J equals Length of magnetic circuit

μ equals Permeability

A equals Area of flux path

And the other terms as before.

(4). C. R. Hanna, **Design of Reactances and Transformers**, A. I. E. E., 1927.

(5). From the fundamental relation:

$$e \text{ equals } -L (di/dt)$$

$$\text{we get } L \text{ equals } e / (di/dt)$$

or Instantaneous Inductance is given by the ratio of the voltage to the slope of the current, at the same instantaneous time.

"Radio Trust" Dissolved

[Continued from page 20]

ment of the suit which left the radio combination powerless further to injure its competitors would be for the best interests of the radio industry by removing the major cause of difficulties and litigation. I have realized that to litigate the suit against the Radio Trust for something like three years longer, before the Supreme Court could say the last word, would only work harm to this industry. Such litigation could only enrich the lawyers who have already received millions of dollars in fees.

The main effect of the present decree will be to make it possible for independent manufacturers to obtain radio patent licenses either as a group from the Radio Corporation or separately from the former constituents of the combination. In this way, it is to be hoped that any attempt by the Radio Corporation to levy an exorbitant patent royalty can be counteracted by the competition of the American Telephone, the General Electric, and Westinghouse Companies.



Correspondence

Brooklyn, N. Y.

Sirs:

Regarding the article in your November issue, *Who Should be A. R. R. L. Members?* why "within one year"? [Paragraph 2 provides that applicants for full membership or renewal should hold operator's license or have held one within one year.—Ed.] Once we have held a license, that attests to some degree of technical and operating qualifications—lack of time, lack of cash, or both may drive some of us off the air and cancel our tickets—but rarely our interest! Why should we be disqualified?

E. I. HALLOCK, ex-W2UB

[The League needs a voting membership that is *interested, competent, and active*; inactive men cannot appreciate many problems at issue. It takes practically no time or cash to keep up an operator's license; few who do not keep them up can claim great interest. Many suggested eliminating one year provision, making an up-to-date license necessary. Chief reason for confining vote to those interested, competent, and active; we hope to see many important questions referred to the membership for decision by direct vote.—EDITOR]

Gangsters, Incorporated

[Continued from page 23]

What the amateur stations *must* have is more space on the air. When the people of the United States learn that it is *their* public domain that is being handed out without cost to privileged interests, I have no doubt that private stations that serve the public without charge will *get* more space. But the immediate and crying need of the amateurs is for Congressional scrutiny of the administrative machinery of governmental agencies having to do with radio, to the end that these persistent and unwarranted threats against amateur service to our people be stopped dead in their tracks.

I own and operate alone a highly developed station of the amateur class, doing nothing but trans-Pacific message work. I have specialized in this particular work for several years. I am

a colonel in the Quartermaster Corps (Reserve), of the United States Army, and engaged in organizing and training the construction forces. I am a citizen of enough financial standing so that if anyone can win a judgment against me for anything I may have said in this article, he can collect it.

(Signed) CLAIR FOSTER, W6HM.

The list of "Q" signals approved by a sub-committee of the Madrid Conference, but not yet formally adopted at the time we write, carries these signals down to QUJ. There are, however, no changes or additions of especial interest to amateurs. The additions are chiefly signals to be used in mobile or aeronautical services. There are practically no changes in the list of miscellaneous abbreviations.

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Remittances should be payable to the order of R9, LTD., negotiable at par in U.S.A. funds. Cash, stamps, "bearer" instruments, etc., are at sender's risk. U. S. postage stamps are acceptable in small amounts; 1½c and 3c denominations are preferred.

We cannot start subscriptions with back issues. Subscriptions for longer than two years in U.S.A., or one year elsewhere, are accepted only subject to possible adjustment on account of varying tariffs and postal rates.

Notice of change of address (which should state old and new addresses) must reach us by first of month preceding nominal date of issue with which it is to become effective; we do not supply back issues nor pay forwarding postage because of failure to receive such advance notice.

R9 is issued the 10th of each month under date of the following month. Closing date for editorial copy: 20th of each month.

We handle unsolicited contributions with care, assume no responsibility therefor, will destroy those not usable unless accompanied by an addressed envelope with sufficient postage (or equivalent); suggestions printed in R9 for possible articles are not regarded as solicitation thereof.

FREE RELAYS

Until further notice, R9 will award each month a miniature Leach relay absolutely without charge to the subscriber who submits the best otherwise unsolicited technical article accepted for publication. Editors' decisions are final; unaccepted material will be returned only if accompanied by a self-addressed, stamped envelope. The winner may have his choice of any of the standard contact arrangements.



OSCILLATIONS

Hollywood, Calif.

Sirs:

It is a tonic to read a radio publication today that takes a definitely aggressive policy with regard to amateur rights.

The amateur is in need of a worthy champion, now. More power to you.

J. SESSIONS GORMAN

Springfield, Mass.

Sirs:

It is evident from the first page of your paper, that you have no purpose nor excuse for existence except your over-zealous, and over-emphasized disapproval of the American Radio Relay League.

Let's try to pause a moment in your diligent efforts in behalf of a foolish movement. Your publication merely is an eye-sore and is not even justified in its being. You people on the West Coast are too remote to realize the importance and the influence of the A.R.R.L. You seem to be so far separated from the league that you fail to conceive the fact that without the A. R. R. L. we are done. Within a year after the dissolution of the league we would, beyond a bit of doubt, lose our privileges as hams. The league is the back bone of the life of Radio in the country and the world, too, as far as amateurs are concerned. The league's activities are capable of interesting and holding the interest of thousands of hams. They keep us all on our toes and active in the many phases of action in amateur radio. No other radio organization is capable to put across such a thing as the ORS parties, the DX tests, the sweepstakes, and so on.

By working for the destruction of the league, you are working at the same moment for your own ultimate downfall. Literally cutting off your nose to spite your face, as the old adage goes. More amateurs are interested in the league and its activities, than the combined forces of all other radio amateur organizations in the country.

You should reconsider and realize the possible harm you are doing, as I see no good to your efforts.

LAWRENCE A. REILLY, WIBVP

Amateur Reilly falls into a common error: we do not disapprove of the League, merely disapprove some of its policies, which we seek to change from within by pointing them out to members and directors. No one wishes its dissolution—we doubt if anyone else wants its "DX tests" and similar functions, on which too much time and money are spent, which might better be devoted to the League's present prime reason for existence: militant defense against encroachments on amateur rights.—Editor.

Jasper, Alta.

Sirs:

It is rather early yet to give a definite opinion [on R9] but believe you are on the right track. The article in the November issue re

The Radio Trust by Rathborne, was sure a pip!

And what Canadian ham but felt at least a slight thrill of pride re your editorial on Madrid in the same issue, even though he had been in the game only a few months?—like myself!

Canadian hams may indeed consider themselves fortunate, firstly, for the conscientious and whole-hearted support of the A.R.R.L. officials they have elected; and, secondly, for the broad-minded and appreciative attitude of the government officials in whose hands their fate is placed.

Though I disagree with your opinions on a few trivial matters (which is only natural) I can safely say that I am with you 80 per cent at least. Stay with it!

C. R. JACOBSON, VE4FJ

Apologies to VK5HG

In the January issue we said: "VE5HG has QSO'd 1600 times with just three stations in the United States. This sounds like a real record. More in the next issue."

Our apologies—we should have said *VK5HG*. 1600 QSO's with just three stations anywhere would not be a bad record for reliability, but 1600 antipodean QSO's is a real one! See further notes elsewhere in this issue.

We read in the *T. & R. Bulletin* that a transmitting license in Malaya costs £3/5 for 30 watts, or about \$15.75 at par!

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25 percent discount on R9 subscriptions in groups of six or more ordered simultaneously. Available only to bona-fide 'ham' clubs—use your club letterhead. Discount figured on current U.S.A. rate, whether subscriptions are U.S.A. or foreign.

GENERAL MANAGER, R9, LTD.
Box 666, HOLLYWOOD



Antipodean QSO Record?

[Continued from page 10]

battery type receivers which assure a low noise level. At present most messages from Australia are routed VK6MO-VK5HG-W2CC, and thence by air mail to Washington, their destination. Messages bound for Australia usually are sent by W3QP to VK5HG, and thence to VK6MO.

The Department of Terrestrial Magnetism of the Carnegie Institute (Washington, D. C.) maintains a magnetic observatory in Watheroo, Western Australia to and from which these messages are handled. These are not QSO's in which the stations barely "click"; real messages are handled in both directions which concern magnetic conditions, magnetic storms, earthquake reports, instrument readings, and other scientific

information as well as orders for equipment, bank balances, and the like.

—Data from W2CC.

COMING IN "R9"

DIRECTIONAL ANTENNAE in Amateur practice. Herbert Hoover, Jr., W6ZH, tells how to increase your signal strength without increasing power.

SUPERHETERODYNES—Mr. Swift continues this interesting and instructive series.

FILTER CHOKES—Dr. Dellenbaugh concludes the article on the "swinging choke".

CLUBS, ATTENTION!—Suggested set of "instructions" for your Director for next A. R. R. L. Board Meeting. A good basis for your discussions.

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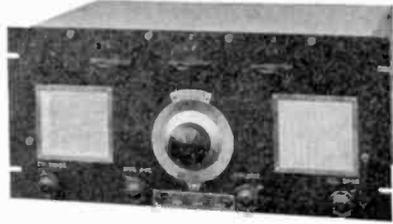
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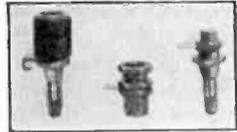
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Dustproof moulded bakelite case. Pressure type Chromium plated top and bottom plates, prevent tarnish. Crystal held in bakelite retention rings. Plug mounting ¼-inch spacing. Holder takes round or square crystal up to 1½ inches square and to 4 mm. thick.
Type 560-A—Price \$2.55

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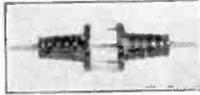


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QSL Bureaux

QSL Bureaux should notify us at once of changes; we will drop from list those not confirming correct QTH's to us at least once a year. More entries are welcome; there is no charge.

ARGENTINA—Radio Revista, Santiago del Estero 464, Buenos Aires.

AUSTRALIA—VK2-QSL Bureau, Box 1734 J.J., G.P.O., Sydney, N. S. W.

—VK3-QSL Bureau, Kelvin Hall, 55 Collins Pl., Melbourne, Vic.

—VK4-QSL Bureau, Box 1245 V.G.P.O., Brisbane, Queensland.

—VK5-QSL Bureau, 1 Henry St., Glenelg, S. A.

—VK6-QSL Bureau, 111 Gerald St., East Victoria, W. A.

—VK7-QSL Bureau, Anglesea Barracks, Hobart, Tas.

BELGIUM—Reseau Belge, 11, rue du Congres, Bruxelles.

CHINA (Except Hong Kong)—I.A.R.A.C., Box 685, Shanghai.

CZECHOSLOVAKIA—C.A.V., QSL Bureau, Praha II, P.B. 531.

FRANCE—R.E.F., 17 rue Mayet, Paris VI.

GREAT BRITAIN—R.S.G.B., 53, Victoria St., London, S.W.1.

HONG KONG—H.K.A.R.T.S., Box 651.

IRISH FREE STATE—I.R.T.S., R. V. N. Sadleir, Lonsdale, Roebuck, Clonskeagh, Dublin, S. 4

MEXICO—Liga Mexicana de Radio Experimentadores, Sinaloa, 33, México, D. F.

NORWAY—N.R.R.L.-Q.S.L., Postboks 2253, Oslo.

POLAND—L. K. K., Lwów, Bielowskiego 6.

ROUMANIA—(Under Cover) I. C. Bratescu, Str. Dr. Ciru Iiiescu, 6, Bucarest, 6.

SOUTH AFRICA—S.A.R.R.L., Box 7028, Johannesburg.

SWEDEN—S. S. A., Care Dr. Rolf, Alsten.

Convention Announcements

In response to several inquiries: we are glad to publish announcements of A.R.R.L. conventions in the hope that we may occasionally reach someone who is not reached by other convention advertising. Announcements in general should be confined to the date, place, and the name and address where requests for further information should be sent.

Believing that post-convention reports are in general only of limited interest, they will as a rule not be published, though exceptions may be made as circumstances warrant.

Those who ask for a candid opinion really mean candied.

—Los Angeles Times.

The Marketplace

(a) **RATE:** 4c per word, cash with order; minimum, 50c. Capitals: 7c per word.

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SELL: Teleplex with ten tapes, \$15; National DCSWS, \$28; Esco 500 V. 200 watt MG, \$25; RCA211, 852, 860, 204-A, 851, 861, and other apparatus. List free. W9ARA, Butler, Mo.

QSL's! Latest Handbook. Callbooks. Free sample, W8DED, Holland, Mich.

AMERICAN Broadcast condenser, new, table model (cost. \$360). \$50. Brand new. 2-button American mike. \$21. W6AVJ, Gardena, Calif.

THERMIONIC rectifiers: 866, two bucks. 1/4 cash. W6DDI, 281 Stockbridge Ave., Alhambra, Calif.

PUSH/PULL 80-meter phone transmitter, 210 pp. xtal, 210 pp. buffer, 203A Amplifier, Modulator, Class B; two 212D's plus 845 speech amplifier. \$140 including meters and tubes. W6AVJ, Gardena, Calif.



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Dual ratio full-vision dial (60:1 for ultra fine tuning)—Screen grid detector and pentode audio with "Trans-X" Coupling (An exclusive ROYAL development insuring maximum transference of energy and high signal gain)—Smooth regeneration control—Large plug-in coils covering from 14 to 200 meters. (200 to 550 \$1.17) or Amateur band spread coils for 20, 40 and 80 meter bands (160 Band \$1.17)—Completely enclosed and totally shielded by an attractive crystal finished cabinet with hinged cover. Correctly designed by experienced short-wave experts (not just thrown together to sell at a price!).



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Set of Tubes..... \$ 2.55

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Uses one of the new type 58 super-control screen grid pentodes, a 247 pentode audio amplifier, and a 280 rectifier. Especially designed for humless, quiet operation on Short Waves Ready to plug into AC line.

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A three tube set embodying all of the well-known superior features of the Royal Star plus a stage of high gain screen grid radio frequency amplification (232).

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The AC Star with an additional type 58 used as screen grid radio frequency amplifier.

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Royal Tested Tubes. \$ 2.95
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THE ROYAL OLYMPIC

The Royal Chief with an additional stage of 230 audio amplification for super-dynamic power. The Royal Olympic makes new records!

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A DeLuxe AC operated Receiver employing two 58's, a 56, a 47 and a 280.

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Thordarson. Delivers 1100 Volts at 150 MA, 7½, 7½ and 2½ at 7 amps. All center tapped. Completely shielded with leads to terminal board. 200 Watts 9 lbs..... \$2.95

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A **** Special Compact metal case containing three 1 mfd. and one 2 mfd. units. All 1000 Volt DC Working! Case is common ground connection. \$1.45, four for \$4.95.

Six .25 mfd. 500 Volt bypass units in metal case 2 x 2¼ x 1. Case is common ground connection. At least one is needed in every set! 43c, ten for \$3.95. Same, but with six .1 mfd. 39c each, 12 for \$4.10.

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Send your entire order for real service

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Every item an outstanding bargain! You get more for your money at Harrison's.

An excellent high inductance choke. to provide maximum filtering in any power pack. Consists of a 50 Henry 100 Mil and a 30 Henry, 125 MA choke in a silver finished metal case. In parallel will handle 200 MA and still have high inductance. No choke as good as this one has ever been offered at this low price. 7 lbs..... \$1.95

Heavy Duty 20 Henry, 400 Milliamper Power Choke. FB for choke input to filter. 3000 Volt insulation. 70 Ohms. Open frame mounting. 8½ lbs. Another Harrison "buy"—\$2.95.

Thordarson 20 Henry, 200 MA, 250 ohms 2000 volt insulation. Completely shielded. 6 lbs., \$2.70.

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