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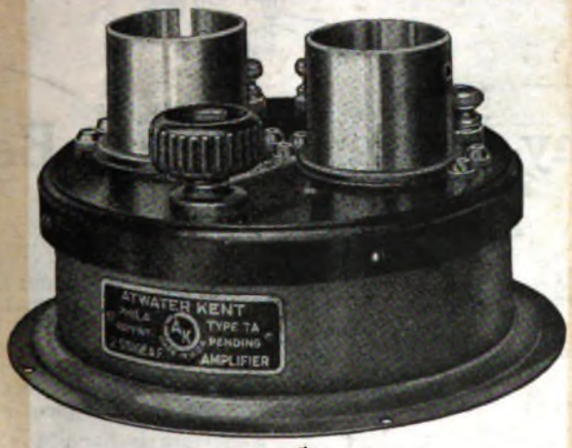

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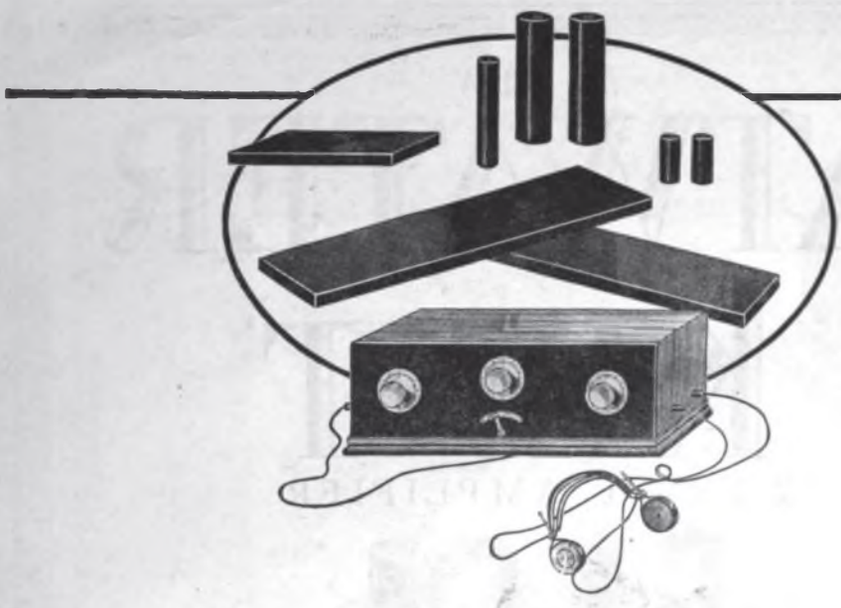

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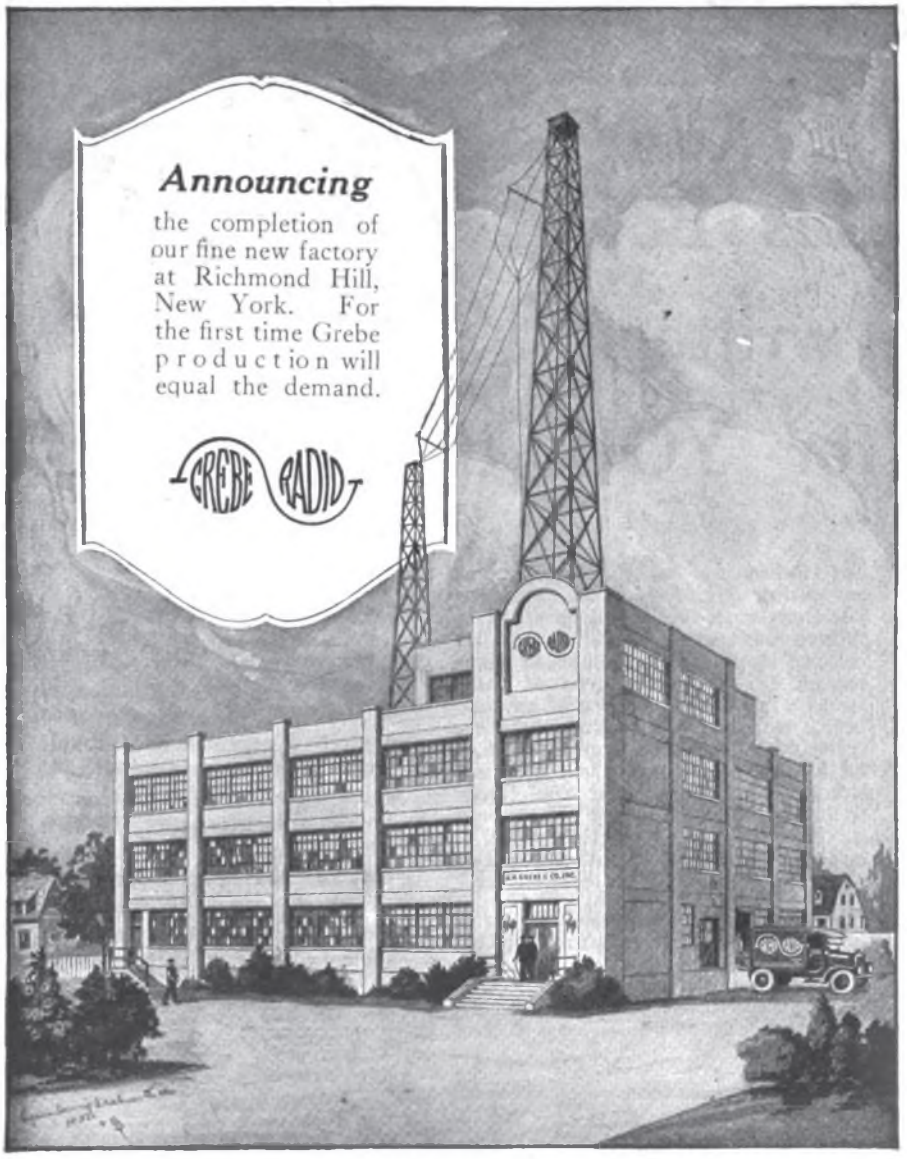

QST

The Official Organ of the A.R.R.L.

VOLUME VI SEPTEMBER, 1922 No. 2

Q S T is published monthly by The American Radio Relay League, Inc., at Hartford, Conn. Kenneth B. Warner (Secretary, A.R.R.L.), Editor and Business Manager. Edwin C. Adams, Advertising Manager.

Subscription price in United States, Possessions, and Canada, $2.00 per year. Foreign $2.50. Single Copies, 20 cents.

Entered as second-class matter May 29, 1919, at the post office of Hartford, Connecticut, under the Act of March 3, 1879.

THE AMERICAN RADIO RELAY LEAGUE, Inc.
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QST

A Magazine Devoted Exclusively to the Radio Amateur

Radio Frequency Amplification at Amateur Wave Lengths

By K. B. Warner

IT has been only a few months since we amateurs were commonly bewailing our inability to use radio-frequency amplification successfully at short wave lengths because of the inter-electrode capacity of our vacuum tubes. Of course we knew it was possible to do it using separately-tuned coupling circuits between the successive stages but that was a method requiring worlds of patience to say the least, and quite out of the question for amateur relay work. Then came rumors of successful circuits that worked well with several stages when coupled by some new trick transformer that was being put on the market, and shortly, almost before we knew it, there were numerous makes of such transformers offered the amateur world and more were coming every day.

With the advent of all of these transformers manufactured by perfectly reputable companies, numerous questions arise in the mind of the practical amateur. Do they really work? Are they as good as our present amplifier equipment? Are they sufficiently reliable for relay work? Are they worth the effort and expense? What does one do to make them actually work? And so on. Now the author is a practical telegraphing amateur and cannot help but view every radio innovation from that angle and consequently these questions and a great many more of the same sort occurred to him. In recent weeks numerous articles have been written on the subject but they have not answered these questions; indeed many of them look like they were written with no understanding of the subject; they are evidence of the keen desire for knowledge of how to apply this form of amplification practically, yet they haven't filled the bill. *QST* accordingly resolved to get the done if it were to be had, and to this end addressed a rather fearsome questionnaire to representative manufacturers of radio frequency transformers. For much of the information herein we are indebted to the American Radio & Research Corpn., the Coto-Coil Co., the Radio Corporation of America, the Mu-Rad Laboratories, and the Radio Instrument Co., for their comprehensive replies to our queries. The information we present is in the form of a composite, assembled from many sources, and will not always apply literally to every type of manufactured amplifying transformer. We believe, however, that in the main it is entirely accurate and reliable and may be used as a guide by the practical amateur in the selection of his amplifying equipment.

An Early Method

Perhaps the simplest workable method for inter-stage coupling in short-wave R.F.A. (radio frequency amplification) is the use of a tuned impedance, as described on page 57 of *QST* for last November and on page 35 for February last. This impedance may well be a variometer, and the possessors of the variometer-tuned-plate-circuit receiver can rig up a single-stage R.F.A. with no additional expense than that of the tube and its appurtenances. It works pretty well, probably with considerably greater amplification than newer methods provide in any one stage, and if one stage were sufficient we think nothing further would be necessary. However, such an arrangement must be carefully tuned for each wave length and when several stages are desired the multiplicity of adjustments becomes so complex as to put this method completely in the discard. American manufacturers have been at work to develop a scheme whereby this exact tuning for every minor change in wave length would be eliminated, so that the amplifier would operate over a substantial frequency range just as an audio amplifier does. It is the result of their labors which is described in this ar-

ticle, and it takes the form of a radio frequency transformer, in most cases a two-winding transformer altho at least one firm is obtaining excellent results with an auto-transformer arrangement, and it may be air-core or iron-core. With such transformers it is possible to build a multi-stage amplifier in which no adjustment is necessary when tuning from one wave length to another.

R.F.A. Practicable

Because of the concentration of talent which in late months has been directed on the problem of R.F.A., a very remarkable development has been made and radio amplification on short waves is now undeniably successful. There is plenty of room for improvement in design and construction, some of the manufacturers freely admit that their products can be vastly improved upon for 200-meter work and some transformers in fact are quite impossible for amateur work, and there is added difficulty because R.F.A. is a new subject and rather fussy in the adjustment of some of its features. Likewise it has its limitations, as we shall shortly point out, and perhaps it is not to be compared with the super-regenerator or the super-heterodyne, but the former has hardly been reduced to a practical working device as yet and the latter costs money because of the unavoidably large number of tubes required. In the meantime R.F.A. looms large in many possibilities and it may be said that it is entirely feasible, one of the most effective ways of receiving, and in many respects easier to operate than the conventional receiver.

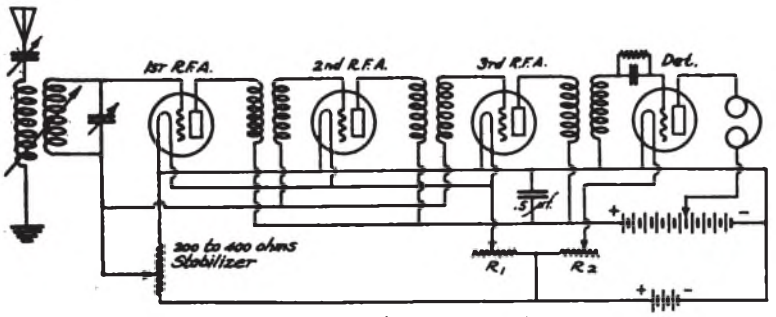


Fig. 1. *Three radio stages on a common rheostat, and a hard detector tube — the favored circuit.*

The Sacrifice of Regeneration

While regeneration of a fashion is obtained with the simple one-stage circuits previously referred to, every experimenter who has worked with R.F.A. thru the medium of the manufactured transformers now on the market has been perplexed at his apparent inability to make use of regeneration as commonly obtained. He has reasoned that if a regenerator gave a certain performance on a detector tube alone, then it ought to work several times better with a radio amplifier ahead of it. *This is not true.* It is almost impossible to make use of regeneration as we commonly know it in connection with R.F.A. on short waves. Some such effect as regeneration of course occurs as a feedback thru the capacity of the tube and is controllable as hereinafter described, but the more usual methods of reaction, such as a plate variometer or a tickler, commonly are abandoned. Intentional regeneration *may* be used up to a certain degree but is so extremely critical in a set which is properly amplifying that it is not recommended except to the most skilled of amateurs. None of the five firms whose assistance we solicited makes use of regeneration. This introduces a most important factor into the consideration of R.F.A., and one which must be considered by every user: *it takes two stages of R.F.A. preceding the detector before any benefit is obtained over a regenerative detector alone.* It takes about "a stage and a half" to compensate for the loss of regeneration; in other words, a non-regenerative detector with one radio amplifier ahead of it commonly will not be as sensitive as a regenerative detector without amplification, while with two radio stages preceding it, it will be somewhat superior. Additional stages of course will make it incomparably superior, but it is distinctly to be understood that a total of at least three tubes is going to be utilized by the operator who expects to improve his results by the use of R.F.A The reason for this is that regeneration is itself the simplest and most effective kind of radio frequency amplification, equal, indeed, to something between one and two stages of transformer-coupled R.F.A. as obtained with present models. Therefore, until several tubes are put into service, no gain is experienced.

With sufficient tubes, three or more, the gain in R.F.A. is wonderful, but if only two tubes are available they should be used as a regenerative detector and audio amplifier, respectively; and if a total of three are at hand they should be used

either as a regenerative detector and two audio stages, if at least a moderate signal strength is important, or as a non-regenerative detector preceded by two radio stages, if maximum sensitivity (range) is desired and low audibility is no hindrance. The actual receiving range of the last-named arrangement is the best of the three but except for signals at its extreme range it will not give audibilities at all comparable with the regenerative detector with one audio stage. More about this comparison later.

These values are an average of the performance claimed on 200 meters for the factory-made transformers now on the market, and of course vary with the make. On 360 meters it is altogether probable that one radio stage will compensate for the loss of regeneration, whereby two stages would be several times more sensitive and three stages enormously better.

British amateurs have developed the R.F.A. portion of their circuits to a further degree than we have, and some notable success was achieved by them in this direction during the Transatlantic Tests. Their greater activity in this field is attributed by Mr. Godley partly to their failure fully to appreciate the advantages of the tuned-plate-circuit regenerator, and to their lack of gaseous detectors. Their successful work on the waves as short as 200 meters seems generally to have been accomplished by interstage coupled circuits separately tuned by condensers, and altho we freely admit that results are obtained thereby perhaps noticeably superior than with the fabricated transformers on the American amateur market, it is to be noted that such an arrangement is at best a laboratory experiment, necessitating the careful adjustment of every circuit by means of a wave-meter whenever the operating wave is changed, and is in no sense adaptable to amateur relay traffic as we know it. Instead we are using transformers somewhat less sensitive in results, much less selective and with our dependence for selectivity placed in a loosely-coupled tuner, and thereby we secure a device which operates over a considerable wave band without readjustment.

The Number of Stages

In its present state of development there is a limit to the number of stages of R.F.A. which may be employed successfully on amateur waves. That limit is the building up to a condition so sensitive that it is impossible any longer to control conveniently the tendency to self-oscillation brought about by static coupling between the input and the enormously-amplified voltages of the output, and also by some direct feedback in adjacent wiring. Very naturally the *number* of stages depends upon the amplification constant per stage and the difficulties of increasing the number are more serious the higher the amplification per stage. For example, the British "55" seven-stage amplifier gives an amplification of only two or three times per stage, which is what makes it possible to use seven stages. Compare this with sets using our new transformers in which the voltage step-up per stage is sometimes as high as 80 and it will be seen how the signal voltage on the detector may very quickly be built up to a value where extreme care in wiring and shielding is necessary to prevent self-oscillation. At present we cannot exceed three or four stages, depending upon the make, before the voltages build up to a value likely to send the whole circuit into oscillation without control. It is expected, however, that methods shortly will be devised whereby several additional stages may be kept under control.

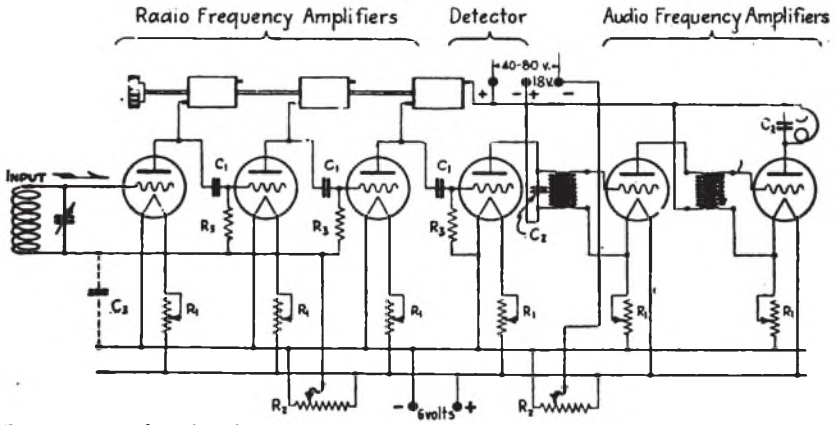


Fig. 2—Reactance couplers for three radio stages, soft detector and two audio stages, all with separate rheostats.

Radio vs. Audio

A reasonable comparison betwen R.F.A. and A.F.A. can hardly be made, because the principles differ radically. There is no question but that a stage of audio amplification increases the audibility of a reasonably strong signal much more than a stage of radio amplification does, because the detector will handle at best only a certain amount of power, but it seems to be a thoroly-established fact that A.F.A. does not increase the *range* of a receiver, it is said that a signal which cannot be heard on a detector alone, under perfectly quiet surroundings, cannot be heard with any amount of audio amplification. In fact, if the signals are weak it is possible that a stage of A.F.A. will increase the tube noises and other undesirable sounds in greater proportion than the desired signals and actually make the latter unreadable.

On the other hand an additional stage of radio amplification unquestionably increases the range, and signals which are inaudible on a detector can be brought in very nicely thereby. This is because of the so-called "threshold" value of incoming signal voltage below which a detector does not respond noticeably, and it is the purpose of R.F.A. to boost up the incoming voltage to a value which will operate the detector. This it does with practically no tube noises, because such noises are audio frequencies and are not transferred thru the radio stages. Since R.F.A. extends the receiving range, its value is chiefly in amplifying weak signals, and it is a fact that strong signals such as local ones are scarcely increased at all by radio amplification—thereby improving the reception ratio of weak and strong signals. Likewise we must claim for R.F.A. a greater "workability" because it makes possible operation on a loop or other small collector where advantage may be taken of the directional selectivity and better signal-stray ratio of such devices.

The gist of the whole matter is that a stage of radio amplification enables a stage of audio amplification to work to far better advantage. Both are necessary. Audio amplification is by no means to be discontinued. The decided improvement which radio amplification gives cannot be realized unless audio amplification is used too. "Audio for audibility, radio for range."

The chief disadvantage of R.F.A. is the expense of the additional tubes and sockets and the batteries for their operation. Considerable hope for improvement in this respect is held out in schemes for simultaneous radio- and audio-amplification on the same tubes, such as that given by Mr. Stone in November 1921 *QST*. British amateurs already are experiencing very good results in this manner.

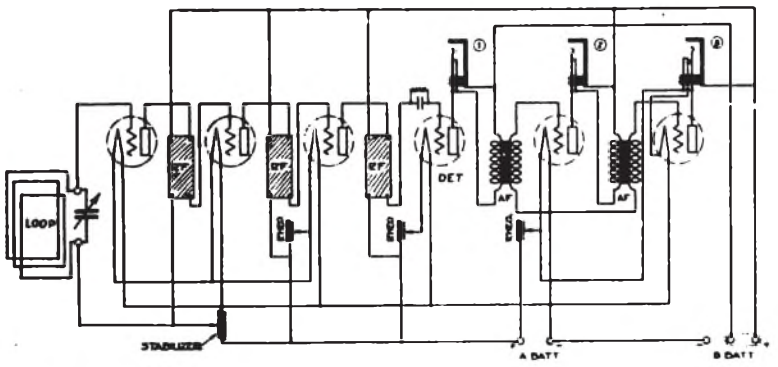


Fig. 3 *Loop reception on three radio stages, operating on one rheo, hard detector, and two audio stages on a common rheo.*

Control

A set of cascaded radio amplifiers with unbiased grids will oscillate because of feedback thru the valve capacity, and such oscillation will build up to the characteristic limits of the tubes. Accordingly it is necessary to have some method of controlling the action, as obviously the tubes should not oscillate for the reception of damped or modulated signals. The common system employed for this control is the use of a so-called "grid stabilizer," which is nothing more than an A-battery potentiometer of 200 to 400 ohms to which the filament side of the R.F.A. transformer secondaries are connected in order that a *positive* bias may be put upon the R.F.A. grids. When the positive voltage on the grids reaches a certain value, oscillation is stopped, and the action of the amplifier may be varied by the stabilizer either to an adjustment just below the oscillation point, which, as might be expected, is the best for the reception of damped or modu-

lated signals; or the entire series of tubes may be permitted to oscillate at an amplitude controllable within limits by the stabilizer setting, for self-heterodyne reception of C. W. signals. We will have more to say about this. A common stabilizer for all the radio stages is generally sufficient where the same type of tube is used throughout. This stabilizer adjustment is very similar in its manipulation to the control of regeneration—in fact such a set may be appreciably easier to operate than an ordinary three-circuit tuner.

Instead of using a stabilizer some of the British experimenters control the tendency of the tubes to oscillate by coupling a tickler in the reverse of normal direction, so that instead of feed back for regeneration its tendency is to neutralize oscillation. Thus by varying the coupling of such a reversed tickler sufficient "positive resistance" may be introduced into the grid circuits either barely to restrain oscillations or the tubes may be permitted to oscillate gently with the amplitude determined to a nicety by the coupling control. In cases where the use of a stabilizer shifts the axes of grid oscillation of certain tubes to an inefficient point on the characteristic curve in order to curb the tendency towards self-oscillation, it is altogether conceivable that better results would be had by the reversed-feedback method, where grids could function at the point of best amplification and the undistorted amplifier output be controlled by the tickler coupling. This idea will well bear looking into both by amateurs and by manufacturers.

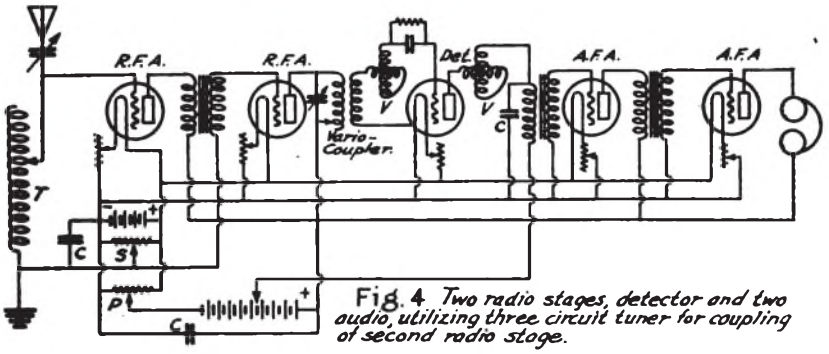


Fig. 4 *Two radio stages, detector and two audio, utilizing three circuit tuner for coupling of second radio stage.*

C.W. Reception

There is diversity of claims on the part of the manufacturers on the question of C.W. reception on their radio amplifiers. The manufacturers of air-core transformers in the main seem to believe that it can be done, while the iron-core makers recommend a separate heterodyne. The writer knows from experience with the latter type that it is practically impossible by autodyning; by adjustment of the stabilizer the set may be caused to self-heterodyne but the C.W. signals received are extremely feeble and entirely unsatisfactory. It is possible that with some types of R.F.A. transformers, if equipped with shielding filters in the detector and audio circuits, satisfactory self-heterodyne action can be had over a respectable portion of the wave length range. This is not to be recommended, however, because in oscillation the set radiates strongly and at least under stabilizer control its adjustment for optimum amplitude of local oscillation is so uncertain that the results are far from satisfactory, as might be expected in a control designed primarily to keep a set from oscillating. For flexible results in C.W. reception over all the wave length range of the transformers, a separate heterodyne should be employed.

We suggest to the manufacturers of radio amplifiers that a separate heterodyne would sell well as an auxiliary to R.F.A.

In connection with C.W. reception it is interesting to note the following extract from Ballantine in his new book "Radio Telephony for Amateurs." In discussing phone and spark reception he says: "If radio frequency and audio frequency amplifiers can be built with equal effectiveness the first method is inherently superior to the second—solely on account of the peculiarities of the detector. With heterodyne reception of C.W. signals this does not apply, for in this case the response varies as the first power of the signal voltage and the two methods are, at least from this point of view, equally effective." Altho this is a theoretical consideration and there are other considerations in practice which modify it somewhat, nevertheless R.F.A. offers a greater advantage to the receiver of damped and modulated signals than it does to the C.W. telegraph operator.

Design Considerations

Several forms of R.F.A. transformers are available on the amateur market. Most of

the manufacturers seem to have proceeded on the idea that resistance coupling was hopeless, reactance coupling fair, and transformer coupling best. Most of the designs therefore are two-winding transformers. Such a device is known to be best but with common air-core design it responds to such an extremely narrow band of frequencies

The Amrad 2-Stage R.F.A. using their plug-in type "Radiformers."

that its use is limited, without a multiplicity of adjustments which cannot be countenanced. Accordingly we find most of the transformers fitted with iron cores —after the practice of M. Latour—thin laminations of "high frequency steel," for the purpose of broadening the band of response, a few designs with cores of electrolytic iron either loose or formed under pressure with a binder, and only one manufacturer of two-winding transformers

The Amrad "Radiformer"

seems happily to have been able to solve the problem of broadening the wave band without the use of iron, which unfortunately gives rise to unavoidable core losses, particularly on the shorter waves, with loss of amplification. The figures quoted in this article apply to the average iron-cored transformer, however, so it will be noted that their performance may still be considered a practical solution of the R.F.A. problem.

In England a considerable discussion has been taking place in scientific circles regarding the action in R.F.A. transformers, it being vigorously held that when the two windings of such transformers are tightly coupled there is little of the true transformer effect and that the main transfer of voltage to the succeeding grid is attributable to a capacity effect between the windings; from which the conclusion is reached that reactance coupling is just as satisfactory as the more complicated transformers. One American manufacturer, in an effort to avoid iron losses and still keep clear of the tuning problems of air-core two-winding couplers, has designed a tapped reactance, partly wound with resistance wire, which has but a single adjustment to vary it rapidly thru a series of narrow wave length bands in any of which it operates with the efficiency of the usual air-core transformer. Such an arrangement is markedly sharp in tuning, making even a single-circuit tuner selective in action, contrasted with which is the fact that the iron-core transformers somewhat broaden tuning and a receiver equipped with them is not commonly as selective as the conventional regenerator.

A review of the various types on the market shows that we have transformers

The Mu-Rad Transformer

available with an average range of about 170 to 500 meters, which in the range from 190 to 220 meters may be expected to have around 75% of their maximum sensitivity. It is altogether probable that a special transformer for amateur waves would have a maximum at the desired spot even greater than that provided in the present wider-range transformers.

Not all of the R.F.A. transformers now on the market are suitable for amateur work, some frankly having been designed for the 360-meter broadcast wave, and the amateur purchaser should be careful to get transformers guaranteed to work on 200 meters and below.

Construction and insulation are equally important; there are some makes on the market with fibre insulation which show an insulation resistance as low as 5000 ohms between terminals with the windings disconnected, defeating the whole purpose of the transformer.

It is now definitely apparent that, at least with efficient transformers, a change in specifications is necessary in the transformers of succeeding R.F.A. stages. Briefly the reason is that the input impedance

of a tube depends upon the load in its plate circuit, the latter being reflected into the grid circuit thru the grid-plate capacity. It is obvious that the load in the detector output is different from that in the last amplifier stage, and this, in turn being associated with the detector tube input, is different from the impedance in the second amplifier stage, and so on; similarly the input impedance in which the signal voltage to be amplified originates is reflected into the plate circuit thru the tube capacity, and is different in the several stages. Consequently for maximum amplification the successive transformers should differ in their couplings and turn-ratios.

Circuit Arrangements

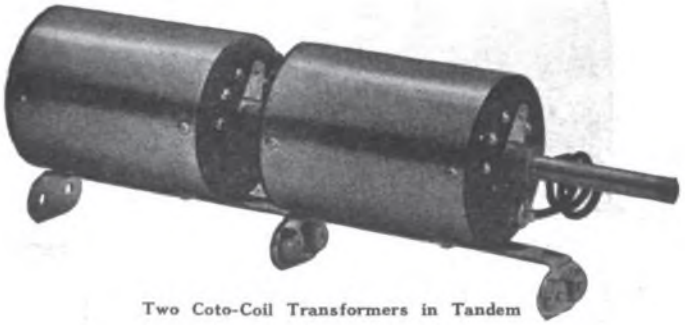
There is much less variety in the hook-ups recommended than there is in the transformers themselves. They differ only in details respecting rheostats, jacks, etc., and are primarily the same. The outstanding characteristic is the use of the stabilizer, to which is connected the filament side of the secondary winding of all of the R.F.A. transformers except the one immediately preceding the detector; for best detection this connection of the transformer preceding the detector is made direct to the filament, preferably the negative side.

Figure 1 is a typical circuit for three R.F.A. stages and a detector. The three amplifiers operate from a common rheostat, and another is provided for the detector, which also operates from a tap on the B battery. The stabilizer connection will be clear from this diagram. The addition of the 0.5 mfd. bypass condenser makes the circuit considerably easier to control.

Fig. 2 shows an arrangement for the auto-transformer or reactance-capacity coupling. The coupling condensers C_1 are preferably .00025 mfd. in capacity, altho their value may be anything from .0001 to .0005 mfd. The leaks R_1 will vary with the type of tube but 1 megohm generally will be found satisfactory. C_2 is a bypass of about .0015 mfd. and C_3 performs the same function as the condenser in Fig. 1 and should be 0.5 mfd. Two potentiometers R_2 are shown; the one on the left is the stabilizer, which is connected to the grid leaks when reactance coupling is used; and the one on the right is the usual B-battery potentiometer for fine control of the soft detector.

In Fig. 3 is shown an arrangement of three radio stages, a hard detector, and two audio stages, operating on a loop collector. The last three tubes are provided with phone jacks in their output circuits. This diagram otherwise will be self-explanatory.

Fig. 4 shows an arrangement whereby the usual three-circiut tuner may be used as the inter-stage coupling between the last R.F.A. and the detector. The actual tuner, T, is shown as a single circuit type and will be found sufficiently selective with the other adjustments provided. The vario-coupler of the tuner provides an air-core transformer of the best performance, its primary being tuned by the shunt condenser and its secondary by the series variometer, while the other variometer in the plate circuit provides regeneration if same is wanted and to the extent that it may be found possible to use it. S is the usual stabilizer and P the potentiometer for the soft detector, which also is provided with a tap from the B battery. The condensers C should be of 0.005 mfd. capacity and are of help in preventing undesired oscillation.



Two Coto-Coil Transformers in Tandem

Care in Assembly

A great number of things that have no effect upon audio amplification have a great deal to do with the successful operation of R.F.A. and if not carefully considered sometimes make a set unsuccessful for no apparent reason at all.

The most important precaution is in the arrangement and wiring. The wiring must be reduced to the utmost in simplicity, with not a wasted quarter-inch of wire, but at the same time the grid and plate circuits must be spaced apart or run at right angles. An excellent idea is to arrange the pieces of apparatus in the same relation as they have in a symbolic hook-up and wire them up as nearly like the actual diagram as possible. In multi-stage sets a metal-lined box with separate compartments for each tube and its transformer, is often of help, the negative side of the battery being connected to the shield and to earth.

Extraneous capacity is to be avoided and tube sockets should be selected with care;

those with diagonally-mounted springs are best. With some tubes an additional C-battery of a few volts in series with the stabilizer arm (positive side to grids) will be of assistance in controlling oscillation.

The internal capacity of the tubes determines the lower limit of the wave length band over which the set will operate; consequently low-capacity tubes are to be preferred. The Moorhead A-P tube is most in favor for this season, followed by the

The R.C.A. Transformer

R.A.C. 3 audion, then the Radiotron. Most of the manufacturers recommend a hard detector tube but a soft one may be used with vast improvement in results if it is quiet in operation. Some tubes, thru freaks in manufacture, have excessively high internal capacity and make unsatisfactory R.F. amplifiers altho they may be excellent as detectors or A.F. amplifiers.

Some Types

In conclusion we present some data on a few types of transformers available. No attempt has been made to cover the field—these are merely representative of the various forms on the market.

Amrad: Of a style designed to plug into the standard four-prong tube socket, or it may be wired in the usual manner if desired; primary and secondary windings in the form of alternate pies, universal wound, on a high-frequency iron core. Present model designed for broadcast reception. Amplifys some as low as 200 meters and as high as 650 but with a pronounced peak at 360 meters; rated by manufacturers as 300-600 meters. A new model is promised soon, designed for amateur work. Supplied with one design for first stage and another for 2d and 3d stage.

Coto-Coil: A single-winding impedance coupling, roughly tuned by means of a 6-tap switch and with part of the winding of resistance wire (also a small strip of .0015 iron in the magnetic circuit) to broaden slightly the band of response. Minumum wave 180 meters; efficient maxima on various switch settings, 220, 265, 315, 415, 540 and 750 meters respectively; may be stretched to 1000 meters. Several of these transformers may be connected in tandem and their switches operated by a common knob, preventing any complication of control. No information available on best wave length or on percentage of maximum amplification at 200 meters, but gives excellent results on broadcast wave with unusual sharpness of tuning.

Mu-Rad: A two-winding transformer without iron core, responsive over a band 170 to 500 meters with an air-core construction of patented design, eliminating iron losses. Supplied in models differing in coupling and turns-ratio for first, second and third radio stages. Claimed by maker that one stage is more sensitive than a regenerator at all wave lengths 170 to 500. Sensitive at 200 meters, design being such that that amplification at 200 is slightly greater than at 360, with another peak at 380 meters. Designed primarily for Moorhead A-P tubes.

Radio Corp. of America: Enclosed in steel stampings like their audio model.

Radio Instrument Co.'s "DX" Transformer

Made in two models, one for 5000 to 25,000 meters, with turns ratio 1 to 3; and another model for 200 to 5000 meters with a tap which divides it into two ranges at 500 meters, turns ratio 1 to 1; both models iron-cored. In the last-described model there are two ranges of maximum amplification, 360-400 meters and 600-1000 meters. Designed primarily for broadcast reception, on which wave length it seems to function excellently, but just begins to perform at 200 meters and rises rapidly in efficiency to 350 meters and above. Not suited to the amplification of amateur signals under 200 meters.

Radio Instrument Co.—"DX": A two-winding transformer wound on a straight open core of high-silicon steel of many thin

laminations; in appearance an oblong of 1-inch-square bakelite tubing with primary terminals at one end, secondary at the other, plugging into a special mounting. Same design used in each stage but three models for various wave length ranges: 170-450, 400-1200, and 900-3000 meters. Best amplification on the short-wave model is in the range 325-375 meters, with probably 75% of maximum amplification available at 190-220 meters. Works excellently on 200-meter damped and modulated signals.

Our Questions Answered

Thus it may be seen that rapid strides are now being made in the application of radio frequency amplification to short-wave amateur work, and the questions we had in our mind may now be answered; it really works, better than our present audio amplifier equipment, is well worth the effort and expense, and sets made along the lines suggested in this article will be found entirely reliable and fool-proof for relay work.

Notes on the Super-Regenerative Receiver

By L. M. Cockaday, 2XK*

THE latest invention of E. H. Armstrong is a development of such new and radical departure from any other receiving system that the amateur has to start all over again before he can become reconciled to its use. But it will come into extended use, in much the same manner as the inventor's previous invention, the simple regenerative receiver. After all, the newer device *is* an improvement over the older one; the ordinary limitation to amplification (self oscillation) has been overcome while at the same time the regeneration has been increased almost indefinitely. This fact alone assures the adoption of the circuit by the DX telegraphic amateurs in the future.

At present they have a sort of fear of tackling the job of making such a receiver or doing any experimental work with it, because of hearsay that it is too complicated, or that it is a trick circuit. Nothing of the kind. It's great, and it's simple!

Fig. 3

As Mr. Armstrong has already explained the functioning of the three methods so clearly and his words have been repeated in the press so many times we will not again repeat them here, but after stating these methods we will offer some notes gathered while experimenting with an adaptation of one of these methods.

First method: Super-regeneration may be obtained by varying the amount of regeneration with respect to the damping of the input circuit of the first tube. (Fig. 1, July *QST.)*

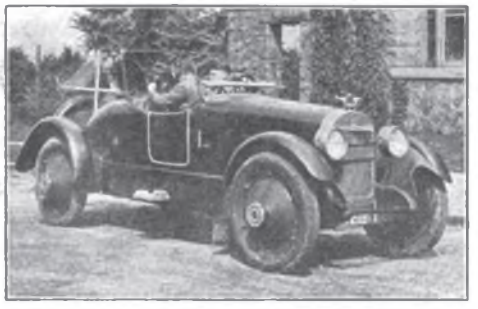


Fig. 4

Second method: It may also be accomplished by varying the damping of the input circuit of the first tube with respect to the regeneration. (Figs. 2 and 4, July *QST.)*

Third method: It may be obtained by varying both the damping and the regeneration with respect to each other, keeping the proper phase relations. (Fig. 3, July *QST.)*

The second method is recommended for the amateur's consideration because of the simplicity of construction and control and because it may be adapted to the reception of all types of signals.

The construction of a set embodying this principle is shown in Figure 1. The best results were gotten with this construction up to the moment of writing.

*Technical Editor, "Popular Radio."

The parts necessary are listed below with the same designations as shown in the photograph.

C_1—0.002 mfd. fixed condenser
C_2—0.001 mfd. variable condenser
C_3—0.0005 mfd. grid condenser and 2 meg leak
C_4—0.0005 mfd. fixed mica condenser
C_5—0.001 mfd. variable condenser
C_6—0.002 mfd. fixed mica condenser
L_1—Single layer solenoid as described
L_2—200-turn honeycomb coil
L_3—Variometer (one with high maximum and low minimum values of inductance)
L_4—1250-turn honeycomb coil
L_5—1500-turn honeycomb coil
L_6—Loop antenna as described
R_1 R_2 R_3—5-ohm rheostats
J_1—Double-circuit jack
J_2—Single-circuit jack
T—Audio-frequency amplifying transformer

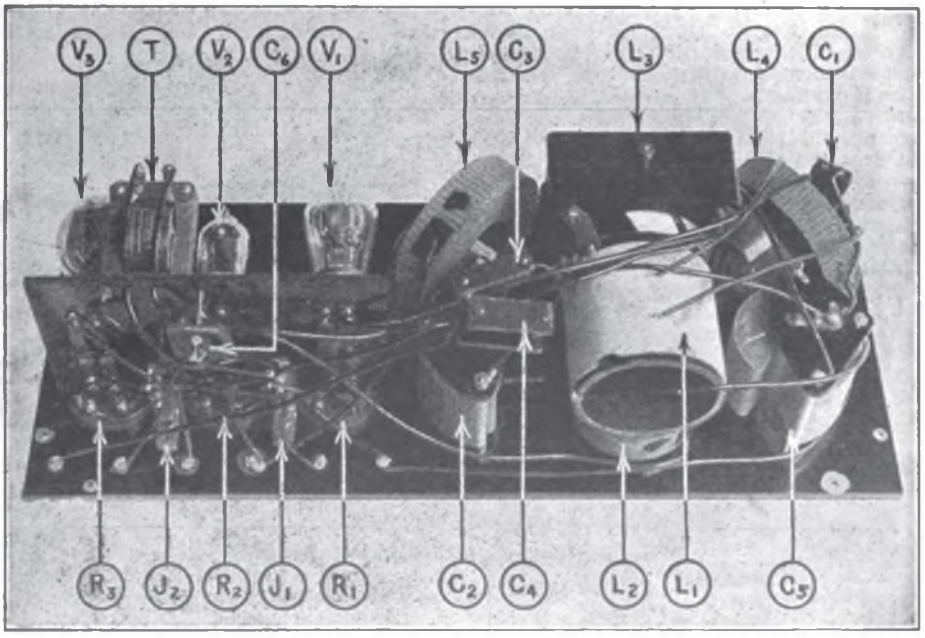


Fig. 1

V_1—Radiotron U.V.201
V_2—Moorhead or W.E. "J" tube (any hard tube will work)
V_3—Hard amplifier tube

The instruments are placed on a panel as clearly shown in Figure 1, and connected up as indicated in Figure 2 where the same designations are used throughout, so there can be no mistake.

The coil L_1 consists of a single layer solenoid of 60 turns with three evenly spaced taps brought out to binding posts for connection to the loop for adjusting the inductance where different sized loops may be used.

The set as it was first made used a 3 volt biasing battery in the grid circuit of the tube V_3, but the two binding posts for connecting this battery were shunted by a copper wire, it being found that the set worked just as well without any biasing batteries at all. The grid circuit of the tube V_1 contains the conventional condenser shunted by a grid leak. This is quite an advantage as two batteries are thus eliminated.

The diagram fully illustrates the connections to the binding posts on the front of the panel by comparison with the photo in Figure 3. The binding posts in the diagram are arranged as looking at the front of the panel. The loop used was wound on a cross frame (30 inches across the arms) and consisted of fifteen turns spaced ½ inch between turns. Tubular braided wire was used as this was found to be far superior to any other wire for this purpose.

Looking at the set as shown in Figure 3, the lower left hand large knob controls the wave length (C_2), the top large knob controls the regeneration (L_3), and the right lower large knob controls the frequency of the tube V_3 (oscillator). For maximum amplification most of the capacity of this condenser (C_2) should be included in the circuit, but for the clarity of telephone signals and C.W. this will have to be forfeited a little by reducing the capacity considerably.

Of course we know that it has been generally understood that the super-regenerative circuit excludes C.W. because the oscillator tube stops the detector tube from oscillating, but nevertheless if the second tube filament is turned down to a rather critical point, the amplification is retained at a near maximum, and C.W. signals *can be received.*

The only explanation we can offer is that when the second tube filament is reduced in brilliancy, the amplitude of the oscillations generated by the tube is decreased, and their effect of stopping the detector tube from self oscillation at intervals is also reduced, thus allowing the detector to start oscillating at intervals between the slower frequency pulses of the second tube. This would produce an audio frequency beat when tuned properly with C.W. signals, which might at the same time be amplified, when its radio frequency component is fed back due to regeneration. This is only a theory, but the set actually picks up C.W. when in this condition very efficiently although with slightly different sounds than the ordinary regenerative set.

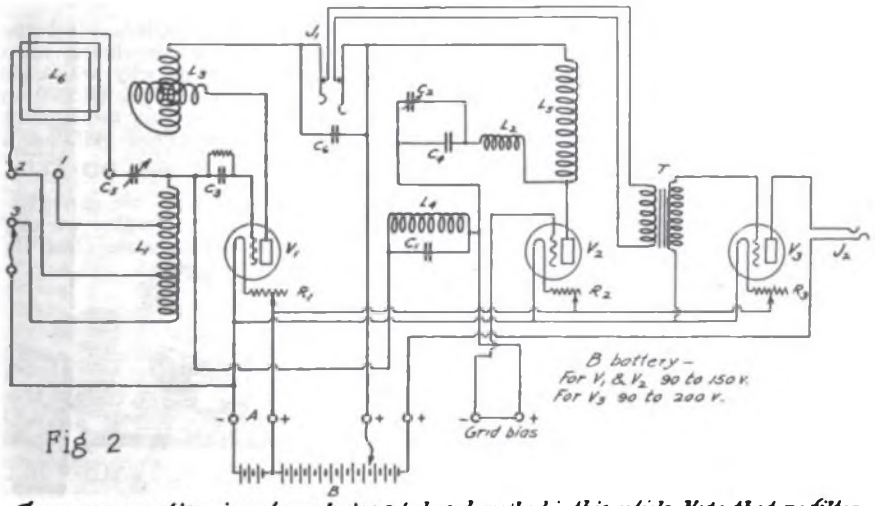
A different adjustment is required for spark—the filaments must be turned up higher; sparks at best sound mushy but can be read without difficulty although the true note is somewhat distorted.

For telephone reception the same procedure is gone through as for sparks, although the operator must make a choice between clarity of signals and degree of amplification. This adjustment is controlled by condenser C_3; with the condenser set nearer the 0 setting the quality will be improved and with the condenser nearer the 100 setting on the scale, the amplification will be increased although interference from the oscillator frequency will be noted.

It will be noticed that in this circuit no filter is used except the by-pass condenser C_6 which is connected across the primary of the transformer T. This is all the filter necessary when using the first tube as the detector instead of the second tube as is ordinarily done.

There are four people in New York now using this type of set employing this circuit and they swear by it, and already other people are building them with success after seeing the set demonstrated. The writer has one of them mounted on his car as shown in Figure 4, with which broadcasting and amateurs can be heard for blocks.

With the few notes given herewith, any amateur should be able to construct a super-regenerative set that will work, and when he becomes fully acquainted with its operation, and really understands it as only operating experience can teach, he will also swear by it and very probably improve on its design for his own particular purpose.



Super-regenerative circuit employing 3 tubes described in this article. Note that no filter circuit is necessary and also that no biasing batteries are used. There are three taps on coil L, for correct adjustment for different sized loops. The loop terminal should be shifted to 1, 2 or 3 and signals tuned in. The one that brings in the loudest signals of course is the one to use.

Another Station in Hawaii

Radio Gunner T. A. Marshall, in Honolulu, has a 50-watt C.W. transmitter going now with about 4 amperes in the antenna, and some of the California stations should hear him. He is getting 6KA and 6ZG like local stuff and can hear almost everything going.

With "Malihini" and Dow both in T.H., traffic for the islands ought to be a cinch this winter.

QST SUBSCRIPTION CONTEST

'TENTION! HEADS UP! *QST* is going to have a real subscription contest! Flattering ourselves that it does every radio man good to read *QST*, we want some more subscribers, and we're going to make it immensely interesting for A.R.R.L. folks to help us get them. We think a great big lot of subscriptions can be secured just now and so we're perfectly willing to offer a great big lot of prizes. We're going to bust all records for subscription prizes by offering a series of FIFTY PRIZES in radio apparatus totalling TWO THOUSAND DOLLARS! Yes, sir,—

50 PRIZES TOTALLING $2000.00

Get your breath, O.M., and read on. Do you realize that now is the psychological time for a sub contest? We've got ten thousand members of our A.R.R.L. who are real amateurs, who have known all about *QST* for years, and who are capable of forming themselves into the most efficient fleet of subscription-takers you ever heard tell of. Then, starting this month, we have about two million radio fans who are prospects—folks interested in radio, blindly floundering around trying to find a radio magazine that will tell them something interesting, and all primed waiting for an A.R.R.L. member to show them what a *QST* looks like and put them on the books

MAKE IT BE YOUR NAME THAT THE EDITOR PUTS ON THIS ORDER

for a year or two. Now is the time for all good men to come to the aid of the game. We want these subscribers badly; newsstand accounts are messy things to handle, and besides our advertisers consider paid-in-advance subscriptions as the main thing that counts, and, most important of all, we want as many as possible of the new-comers to learn about our A.R.R.L. It helps amateur radio, you know—helps all of us. Those are the reasons why we're going to have a subscription contest with 50 amperes in the antenna—and this announcement is the surprise we promised you last month.

HOW CAN WE DO IT?

How do you suppose we can give away all this money? It's simple: we can't, unless we get the subscribers. But if we do

OODLES OF CATALOGS FROM WHICH TO CHOOSE

get them we can set aside so much from each subscription, the same as if it were commission to a regular agent, and we can apply the fund thereby created to the purchase of prizes for the fellows who do the work—A.R.R.L. co-operation.

A string of fifty prizes gives a chance to everybody who's willing to work hard. There will be great big prizes, medium sized ones, and little ones, graduated all down the line. Of course we have to arrange it so that we at least make expenses in the contest and that means that we have to place a "threshold minimum" on each prize, because if we only had two contestants and they only turned in a couple of subs apiece we couldn't give away $2000. The big prizes can only go to the fellows who work like the dickens and produce some wonderful results, but the big feature that distinguishes this contest from all others is that it provides some really big rewards for the chaps who can deliver the goods, and at the same time it offers handsome prizes for the results that a magazine would experience in an ordinary subscription contest, and yet it still provides a large number of additional smaller prizes so that the contestants who show any pep at all are certain of finding it more than worth their while.

HERE'S THE DOPE

What do you need for your station? Whatever it is, *QST* proposes to buy it for you. We're going to buy $2000 worth of America's best radio apparatus from *QST*'s advertisers and give it to the winners in our contest. We don't know what it's going to be—it's going to be what YOU want. We're not going to offer a transmitting set as first prize and a receiving set for second prize because the fellow who wins first prize may need a receiver badly and not need a transmitter at all—we're going to let *him* be the picker. Whatever he wants is his. In other words, the $2000 in prizes will be awarded in the form of any desired radio apparatus selected from the catalogs of *QST*'s happy family of advertisers. The distribution is as follows:

Grand First Prize,	**$300**	**worth of apparatus**
2d Prize	**$200**	" " "
3d Prize	**$150**	" " "
4th Prize	**$100**	" " "
5th Prize	**$100**	" " "
6th Prize	**$100**	" " "
7th Prize	**$75**	" " "
8th Prize	**$75**	" " "
9th Prize	**$75**	" " "
10th Prize	**$75**	" " "
11th Prize	**$50**	" " "
12th Prize	**$50**	" " "
13th Prize	**$50**	" " "
14th Prize	**$50**	" " "
15th Prize	**$50**	" " "
16th Prize	**$25**	" " "
17th Prize	**$25**	" " "
18th Prize	**$25**	" " "
19th Prize	**$25**	" " "
20th Prize	**$25**	" " "
21st Prize	**$25**	" " "
22d Prize	**$25**	" " "
23d Prize	**$25**	" " "
24th Prize	**$25**	" " "
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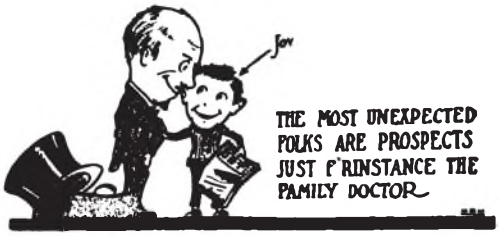
31st Prize	**$10**	" " "
32d Prize	**$10**	" " "
33d Prize	**$10**	" " "
34th Prize	**$10**	" " "
35th Prize	**$10**	" " "
36th Prize	**$10**	" " "
37th Prize	**$10**	" " "
38th Prize	**$10**	" " "
39th Prize	**$10**	" " "
40th Prize	**$10**	" " "
41st Prize	**$10**	" " "
42d Prize	**$10**	" " "
43d Prize	**$10**	" " "
44th Prize	**$10**	" " "
45th Prize	**$10**	" " "
46th Prize	**$10**	" " "
47th Prize	**$10**	" " "
48th Prize	**$10**	**worth of appartus**
49th Prize	**$10**	" " "
50th Prize	**$10**	" " "
	$2000	

Say, O.M., what would you do if you were told you could have $300 worth of new apparatus? We're going to be real mean and tempt you. Do you know that $300 will buy you everything you can think of for a 100-watt C.W. set—tubes, sockets, motor-generator, transformer, meters, everything from soup to nuts? Or, supposing you have an A1 transmitter stop a min and consider that a super-heterodyne wouldn't make a bad receiver for this next winter and reflect upon the fact that $300 will buy everything that the human mind can devise in the way of parts for rigging up a real one! Or suppose you are a laboratory hound but need the jack for some real meters and precision instruments—some real condensers and some inductance standards and a capacity meter and things that you dream of but don't know when you're going to get—*QST* is perfectly willing to hand them to you on a silver platter for a



little hard work on your part. Think of the third prize, even—if you need anything in ordinary receiving equipment, for example, that will buy you the finest short-wave regenerative tuner in America and add a bang-up good two-step amplifier to the bargain. Suppose you didn't win anything higher than sixth prize, it's a whole big hundred dollars, and a hundred dollars means a pile of apparatus when a fellow makes up a list of what he needs—it isn't many of us who can drop casually into a supply store and buy a hundred dollars worth of apparatus whenever the fancy strikes us. Yet nothing will give *QST* greater pleasure than to send $100-worth of equipment to you—stuff of your own picking. By the way, O.M., how'd you like to have a nice lil C.W. set with four 5-watt tubes—you know, perfectly capable of covering from 6ZAC to French 8AB under the right conditions—how'd you like that? Parts for a mighty nice one, including tubes and meters, for a hundred washers. Even if you won tenth prize and wanted such a C.W. set, the $75 tenth prize is still enough to buy almost everything necessary.

What do you think of super-regeneration?

Or have you your doubts about this radio-frequency amplification stuff? Would you like to try them and see for yourself? Costs money to experiment—unless you let *QST* buy your stuff for you. Just think—even down to the fifteenth prize the amount is $50.00!

You see, fellows, it's you chaps who are practical amateurs to whom we are making this offer—you're the folks who need apparatus and at the same time you're the ones who can get out and tell the world about *QST*. Do you get our idea? We're not offering you a nice pretty rotary gap for a prize when mebbe you junked the spark a year ago—we're letting you DO YOUR OWN PICKING—but by heavens if you want a spark set all you have to do is hump a little and we'll send you a Type E transformer and a made-to-order he-gap on a big synchronous motor and a condenser that will hold the beast and an oscillation transformer out of 1-inch copper pipe and a barrel of porcelain insulators for an antenna—just let your imagination run riot: you can't think of anything we won't get for you if you'll do your part.

Even if you live in a little village and your possibilities are extremely limited, we're offering a total of FIFTY prizes and surely there's lots of room for you. Even those last prizes are worth $10 and that means that for a very small effort on your part you can have the makings of a step of amplification or that meter you've wanted, or a couple more tubes, or a REAL pair of phones—doesn't make any difference to us.

MINIMA

Now about those "threshold minima"—of course we have to require a minimum number of subs to qualify for the various prizes, as we can't afford to let some bird walk away with our $2000 for ten subscriptions. The First Prize goes to the contestant turning in the greatest number of subscriptions, the Second Prize to the one with the second greatest number, and so on down to the Fiftieth Prize, BUT—

In order to be eligible for the Grand First Prize of $300 you must turn in at least 500 subscriptions.

In order to be eligible for the Second Prize of $200 you must turn in at least 400 subscriptions. In order to be eligible for the Third Prize of $150 you must turn in at least 300 subscriptions.

In order to be eligible for Fourth Fifth or Sixth Prize of $100 each, you must turn in at least 200 subs.

To be eligible for any of the four $75 Prizes, Seventh to Tenth inclusive, you must turn in at least 150 subs.

For any of the five $50 Prizes, Eleventh to Fifteenth inclusive, you must turn in at least 100 subs.

To be eligible for any of the $25 Prizes, of which there are ten from Sixteenth to Twenty-Fifth inclusive, you must turn in at least 50 subscriptions.

To be eligible for any of the twenty-five $10 Prizes, numbered from Twenty-Sixth to Fiftieth, inclusive, you must turn in at least 25 subscriptions.

In our previous subscription contests our Main Prize has been $50. Just think—in this one the prize values even down to the Fifteenth Prize are as high as $50.00! If we offered merely the last 36 prizes listed, this would be better than any of our previous contests, but we've added 14 bigger prizes running into real money for the men who mean business.

THE GUN IS FIRED

WE'RE OFF! This subscription contest is hereby declared open immediately. It will run until November 10th, seventy days. By the time you finish reading this you will have decided you want to enter, and the thing to do is to write a letter at once to the Contest Manager and ask to be entered and to send you some subscription blanks PDQ, and meanwhile you get busy lining up your friends. You'll have to

work like sixty but that's all there is to it. As you send in the subscriptions you get, with a money order to cover the amount, we'll keep careful score and we'll get out bulletins to contestants every week that will show your standing. That's simple, isn't it?

Fellows, this thing is a cinch! The country is lousy with folks wildly interested in radio and you ought to get subscriptions from every one you meet in not more than two minutes. Every aerial marks at least one prospect! *QST* will do these folks worlds of good, because they're looking for something nowadays that will answer their questions and not merely amuse them with pretty pictures, yet they've never been told about *QST*. That's all you have to do. Every little village has a hundred or more of them and in the cities they run into the tens of thousands—really! You've seen hundreds of single-wire aerials as you go about your home-town, haven't you? Put some sample copies under your arm, your sub blanks in your pocket, and armed with your best smile you drop around and see these folks. Presto! a subscriber—just like that! You don't have to know them—you're limited to your personal friends—your prospects have a sign hanging outside the house right now—every aerial means a ten-to-one shot for a sub.

Then think of the crowds around the radio supply stores at noon—go get 'em! And the membership of your radio club, which is many times what it was when we held our previous contests—line 'em up. your amateur friends—get them to help you, solicit their own renewals to *QST*. Do you know that the winner of the First Prize in our last contest lived in a very small town and won first honors by taking subscriptions from all his friends *over the air?* You can do that too. Why, when we ran our last dinky little contest it was a hard job to sell subscriptions; of course every radio amateur would subscribe but you had to dig to find folks outside the amateur class who were interested; once in a while you would find that your doctor or minister had a streak of wireless interest but it was rare. To-day? Shucks, there're MILLIONS of them!

QST's idea in this contest is to provide intensely interesting possibilities for the contestant in every kind of locality and particularly appealing incentives for real workers. Have you spare time which you would like to turn into radio-cash? Here's your chance. Are you out of work and yet wild to get some new stuff for this winter? Oh boy, here's your meat! In fact, daggone it, we aim to make this contest so interesting that it's worth any ham's time to take a week of his vacation and do nothing but work for us—it's awfully hard to earn $300 in a week any other way. If you're serious about this thing you can think of dozens of ideas which will help you: you're not necessarily limited to your own home town; borrow the family flivver some day and chase over to the near-by towns and go over them with a fine-tooth comb too, and don't miss any aerials on the drive over; and what's the matter with a little ad in your home-town newspaper, if you mean business?; there's no limit to the possibilities!

Now let's put all of these ideas into the form of regulations to govern the contest:

RULES OF THE CONTEST

(1) This contest is open to any member of the A.R.R.L., but only to members. Entries will be received only from individuals.

(2) The contest is declared open with the publication of this issue of *QST*. It will close at midnight on November 10, 1922. To be fair to contestants in the western states, subscriptions addressed to us may be placed in the mails in your town up to midnight of that date—the cancelling stamp of your post-office will be the guide. Subscriptions filed in the mails

after midnight of Nov. 10th will not be counted.

(3) Fifty prizes totalling $2000.00 in value will be awarded as hereinbefore described, subdivided as we have listed; and in order to qualify for any prize listed the minimum number of subscriptions specified therefor must be turned in. The right is reserved to withhold any prizes not qualified for by the submission of the specified minimum of subs.

(4) Only full-year subscriptions at $2.00 each will be received in this contest. They may be new subscribers, renewals, or extensions of existing subscriptions. Full amount must accompany the filing of all subscriptions.

(5) To enroll in this contest, submit your name and address to the Contest Manager, *QST* Subscription Contest, 1045 Main St., Hartford, Conn. You will be sent immediately a few sample copies of *QST* and a supply of special subscription blanks. All subscriptions must be filed on these special blanks, which must bear your name in order that proper credit can be given you. Try to anticipate your needs for further blanks by requesting them sufficiently in advance, but if you run short WIRE US.

(6) The prize winners will be announced in *QST* for December. The value of the prizes will be awarded the respective winners in the form of any apparatus, equipment, supplies or parts which they may select from the catalogs or advertisements of any *QST* advertisers, and will be delivered without expense to contestants. If a contestant desires apparatus valued in excess of the prize won, *QST* will purchase it for him if he will deposit the difference in value with us.

Are you out for blood? Whoop her up, you chaps, and get going. The first workers in each community get the easy pickin's, and you don't want somebody else to scoop up the gravy in your village. We'll buy your new apparatus for this coming winter's season if you'll send in your name for enrollment and get a supply of blanks. Do it right now!

CONTEST MANAGER, **QST Subscription Contest,**
1045 MAIN ST., HARTFORD, CONN.

Progress on Super-Regeneration

By K. B. Warner

AS far as concerns the reception of long-distance damped and modulated signals, super-regeneration so far has failed to live up to expectations. By this writing a great number of amateur experimenters have got into motion and slowly we are beginning to accumulate a fund of practical data acquired in the hard school of experience. Almost all of these experimenters have secured some measure of success but not of the order expected. In most cases absolutely terrific local signals have been obtained, and within say fifty miles of broadcasting stations the reception has been about all that could be desired; but when it has come to trying for long-distance 200 meter amateur spark telegraphy the attempts have been flat failures in every case which has come to our notice.

This is a sad disappointment. Let us look into the matter and see if any reasons can be found for this failure. In the first place if there are any signals present from nearby stations they will be amplified—never fear—to such a volume that the phones can't be worn for any length of time; that in itself precludes much DX work: one can't expect to fish for weak sparks two thousand miles away while a half-horse-power of sound energy from a sink gap ten miles away is being squirted in one's ears. Then again the super is full of strange noises and critical in its adjustments; doubtless these defects can be eliminated but so far they have handicapped operation. There is still another reason for this lack of success, however, and we believe it is the basic one. In his paper before the I.R.E. Mr. Armstrong presented oscillograms of the tube action. Let us quote from his paper:

"....*These oscillograms show phenomena which are in accordance with the explanations already given, but, in addition, show evidence of self excitation. It has been stated in the preceeding pages of this paper that the basis of super-regeneration was the discovery that a variation in the relation between the negative and positive resistances prevented a system which would normally oscillate violently from becoming self-exciting. An examination of the oscillograms will show that this is not strictly true, as a free oscillation starts every time the resistance of the circuit becomes negative. It will be observed, however, that this free oscillation is small compared to that produced by the signal, and therein lies the complete explanation of the operation of the system.*"

It seems to us that the above paragraph

explains the trouble. Super-regeneration does not entirely prevent self-oscillation. As far as moderately strong signals are concerned, such as might be expected on a loop from a nearby station, the effect of these feeble local oscillations is entirely negligible—"and therein lies the complete explanation of the system." Now these weak locally-excited oscillations are initiated by some irregularity of operation of the tubes, such as a miniature volcanic eruption in the filament emission, and the

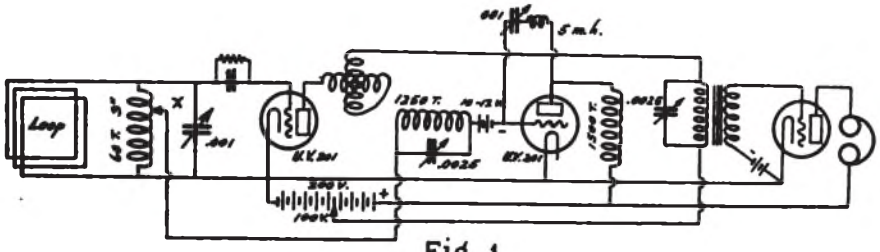


Fig. 1

original effect is of infinitesimal order, but it builds up rapidly during all of the period that the circuit resistance is negative. Altho negligible in the case of strong signals it seems entirely reasonable to consider that the amplitude of this free oscillation might be very formidable when compared with a *weak* signal; in which case the effect of super-regeneration wouldn't obtain for the weak signal—in fact, a weak signal would actually encounter an oscillating tube!

We are not trying to find theoretical fault with the system. It's the other way about: the system has failed completely in DX spark reception and we are trying to find a theoretical reason why. The above would seem to answer the question. It may be possible by some innovation or even by a more skilled operation of the present circuits to eliminate the tendency towards self-oscillation but until that is done the system does not compare, for DX damped reception, with an amateur short-wave regenerative circuit with a soft detector and two steps of audio amplification, *even on the same loop!* Amplifications of signal strength from 100,000 to 1,000,000 times, perhaps, but increase in *receiving range*, no! We may be wrong, but as we view the matter to-day the chief appeal of this particular form of super-regeneration is going to be for loud-speaker reception of nearby broadcasts by the "cliff-dwellers" of big cities where it is impossible or undesirable to erect an outdoor aerial and where operation will be confined to short distances. As a result, the system has been dubbed "stupid-regeneration."

We have been advised to use the super on'y on a loop. As a matter of fact it seems quite impossible on an aerial except under perfect atmospheric conditions. Strays and induction clicks and miscellaneous electrical disturbances are amplified to such an extent that a weak sig has no chance. The set must be operated on a loop and sheltered as competely as possible from stray electrical disturbances and atmospherics. Then if any strong signals are still picked up on the loop, the set will amplify them. That condition of course leaves very much to be desired.

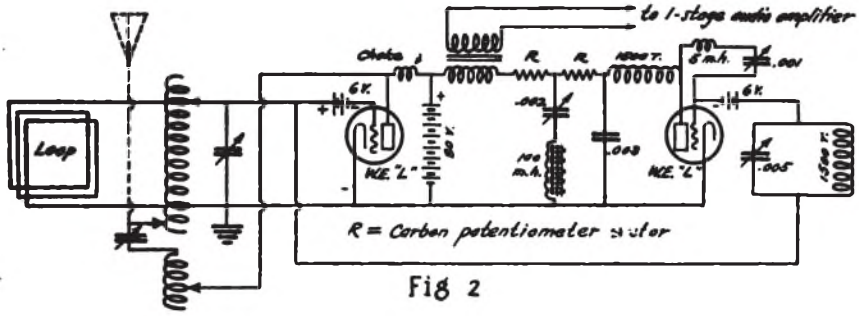


Fig 2

Now to get over all this gloom, we have a pleasant surprise. The system is delivering the goods on C.W. telegraph reception in a most surprising manner. We say surprising, because here is a system designed not to oscillate but to regenerate, and to super-regenerate and still not oscillate, a system specifically designed for the reception of damped and modulated signals and supposedly incapable of C.W. reception without a separate heterodyne, and here it copies 'em like a charm. 2XK, for example,

is willing to say that on his 3-tube super, working on a nine-inch loop, he has copied more DX C.W. signals than he ever heard on any regular receiving set on an aerial, and 2BML substantiates him that it is F.B. Both use essentially the circuit of our August article.

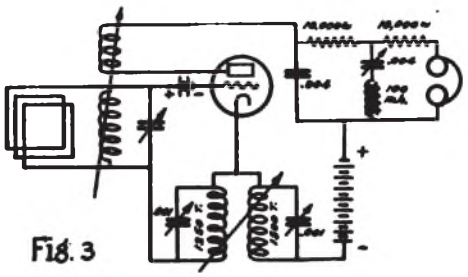


Fig. 3

Let us see if we can find an explanation for this unexpected C.W. reception. Frankly we don't know and are only guessing. 2BML believes it possible that he is heterodyning the incoming C.W. signal with some harmonic of his super-audible variation frequency, producing beats which then of course are amplified in the normal super manner. 2XK, after slightly rearranging his circuit so that detection is accomplished in the first tube and after carefully selecting his tubes for their jobs, picks up C.W. by decreasing the *amplitude* of the variation-frequency energy by dimming the generator tube filament. When we consider that the superimposed variation frequency alternately increases negative resistance, permitting free oscillation, and positive resistance, choking off the oscillations, and that normally a rather considerable amount of energy is required of the variation generator, it seems that perhaps by dimming the generator filament the ratio of the negative periods to the positive periods would be increased to an extent which would permit the heterodyning of incoming C.W. signals without the regenerative amplifier actually being in unrestricted oscillation. Still another possibility of accounting for C.W. reception is that these same feeble locally-excited oscillations which exist thruout the periods of negative resistance heterodyne the incoming C.W. In any event we may say that thru some attribute of one tube or the other, audible beats are produced which are then regeneratively amplified the same as telephone signals.

Progress

All these things mean progress. Already we amateurs are digging up real information on these circuits. This is exactly the condition *QST* hoped for in offering $100 in prizes for the description of the best sets which are successful in receiving DX telegraphy. Altho it is very evident that the super-regenerator cannot hope to compete with the super-heterodyne, which remains the last word in short-wave reception, it is so much simpler and less expensive that it justifies any effort to adapt it to practical amateur work. If any reader of these lines has not read about *QST's* contest, let him see page 10 of our August issue. Four prizes, of $50.00, $25.00, $15.00 and $10.00, are offered for the best manuscripts describing practical adaptation of the principle of super-regeneration to the reception of short-wave telegraph signals (but not especially telephony) received by *QST* up to Oct. 1st. This means one more month. Altho we have had an initial disappointment over super-regeneration, it has opened unexpected possibilities in another direction and there is all the more incentive to make it work.

As evidence of the trend which amateur work is taking in the simplification of the armstrong circuits, consider Fig. 1, a modification of our August diagram, which has been used with considerable success. The first tube is caused to do the detection, and a condenser with leak is employed instead of the C-battery; the regeneration is controlled by the ordinary plate variometer instead of the detested tickler; and the complicated and expensive filter-trap across the amplifier input (necessary to relieve the amplifier of the heavy component of variation-frequency energy) is simplified to a single large variable condenser across the inductance of the amplifier-transformer primary—it has to be tuned to the variation frequency, of course, but it eliminates the extra chokes, condensers, and resist-

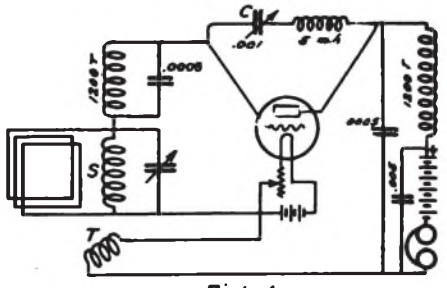


Fig. 4

ances. The loop is still shown shunted across the pick-up inductance, an arrangement which seems to give greater stability. Notice variable contact X, which is decidedly to be recommended for control of the resistance variation introduced into the regenerative circuit.

Mr. R. B. Bourne of 2BML has succeeded in adapting the ubiquitous Reinartz Tuner to super-regeneration in the circuit shown in Fig. 2, which in theory is quite the same as our August diagram and differs only in the practical differences made necessary by the Reinartz circuit arrangement. 2BML has had excellent results in the reception of phones and DX 200 meter C.W.

The set worked under disadvantages, as a loop was used in a radio shack entirely surrounded by a big counterpoise. 4DL in Palm Beach, Fla., C.W. was heard on the loop, and an amateur phone somewhere in South Carolina. Spark signals sound "frazzled" on this hook-up unless their decrement is very low. In fact this circuit is at its best in the reception of I.C.W., particularly 500-cycles-on-the-plate. 8AQO paralizes the phones at 2BML, and 1VQ, using one 5-watt tube with some form of grid modulation, has been heard 600 ft. from the phones on the equipment indicated. Of course it is possible that 2BML is experiencing some kind of an antenna effect from his counterpoise, but if that's all that is necessary to make the super work we will all be willing to operate our loops under our aerial. 1FS, by the way, gets good results by hooking his antenna to the grid side of his loop but using no ground connection.

T is the usual plate variometer but inductively coupled to S, for signal-frequency regeneration. The coupling at variation frequency is accomplished thru the inter-electrode capacity of the tube and controlled by condenser C, which should have a small choke of about 5 m.h. inductance in series with it to keep out the radio frequency.

In conclusion we present a freak circuit (Fig. 5) for which we make no claims at all—we merely exhibit it as evidence of what a disordered mind will create after studying this super stuff for a few weeks. A member of the *QST* staff gave birth to this circuit while under the influence of hypnotism—no kidding. We haven't had time to try it but it seems theoretically sound and certainly original. The first tube is the regenerative detector and the second an audio amplifier, between which is a tuned filter to keep the variation-frequency energy away from the amplifier. The vari-

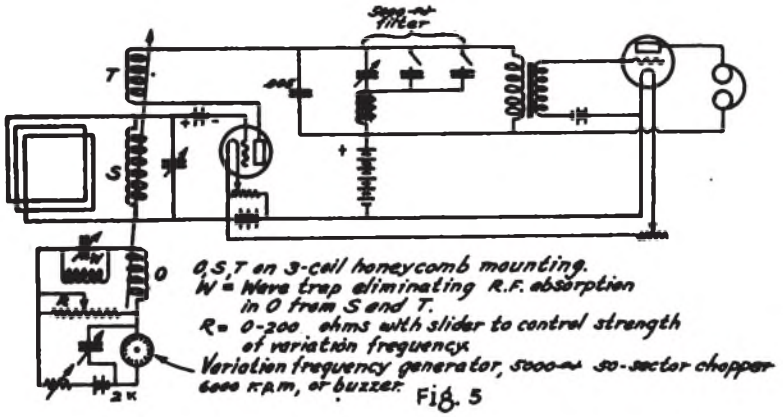


Fig. 5

The circuit of Fig. 3 is a one tube "flivver" circuit which has been given much publicity in newspaper radio columns. Nobody knows where it started. Nor why a filter should be necessary. It "works," as far as giving distinct evidence of the presence of the super effect is concerned, but it is extremely hard to control the variation-frequency generation by means of the coupling between the two big honeycombs, and, in common with all the one-tube circuits on which we have received reports, the amplification is not satisfactory until the variation frequency is reduced to well within audibility, necessitating a separate detector as in Fig. 1 of our July article. Then it works, but of course is no longer a one-tube circuit. For those interested in such circuits, Fig. 4, due to P. F. Godley, is of greater possibilities. The secondary S and its condenser are the regular closed circuit of a short-wave tuner, and the tickler

ation frequency itself is generated by a *chopper* or *buzzer* at the relatively low frequency of 5000 cycles, and introduced into the detector circuit electromagnetically. Try it some rainy afternoon.

One sugestion: keep a note book as you experiment with super-regeneration. Keep a record of the circuits you use, their constants, and the results experienced. It will come in handy.

More Daylight Transcons

What is your daylight range? Would you like to participate in the second A.R.R.L. Daylight Transcons on Thanksgiving Day, November 30th, and Sunday December 1st? If you have a good daylight transmitter and receiver and if you want to participate in these tests, get in touch with your Division Manager who is organizing daylight routes for the tests.

F.H.S.

Daylight Transcons Fail

By F. H. Schnell, Traffic Manager

THE first attempt at relaying a message across the United States during daylight failed. Nevertheless, the Divisions which handled the Transcon messages have gained much valuable information since it thereby became apparent that good "DX" work could be done during daylight, and new daylight routes are being established in these Divisions.

The eastern part of the country had considerable QRN and not as many stations were on the job as expected.

A brief summary of what happened is given for each days work.

July 2d

East-bound

Hiram Percy Maxim
Hartford Conn
This is the pioneer of daylight success
Wise (6ZX)

At 8:55 A.M. 6ZS OK'd for this message, while at 9:15 A.M. it was given to 6GR also. Feeling that everyone should have a whack at it, 6ZX then gave it to 6AWT at 9:35 A.M. Nothing further heard from this message.

West-bound:

ARRL Transcon Nr 1
6JD Los Angeles
Greetings from east to west
Robinson (1CK)

The route of this message was 1CK-1AZW - 1AW - 1VQ - 2AWS - 3DT where it died. When it reached Hartford 1ANQ picked it up and passed it along to 1AWB who gave it to 1AJP. From 1AJP it landed at 3DT for the second time but QRN prevented further relaying of it.

July 4th

East-bound:

Hiram Percy Maxim
Hartford Conn
We look forward to a visit from you
Wise

At 8:05 A.M. 6GR OK'd for this message. No further trace of it appears until we find 6IV picking up 6EA calling 6ZS. 6IV tried frantically to raise 6EA but without success. 6IV then phoned 6GT who got on the job and took the message from 6EA. It got no further.

West-bound:

The Maine message evidently failed to start. 1CPN got impatient waiting for it so started one himself which read as follows:

6ZK Sunnyvale Calif
How is the weather there answer
Morse (1CPN)

1CPN immediately pushed it to 1ANQ-1VQ-3DT-3CN where it landed at 10:35 A.M. While 1CPN was passing it to 1ANQ, 1AZW grabbed it off and 1AWB snatched it from him. 1AWB passed it to 2AWS and while this was going on 2TS took a shot at it and landed it OK. While 2AWS was giving it to 3CBK, 2TS was shooting it along to 3BG. 3ZO came to the rescue and picked it off from 2TS. 3ZO then gave it to 3AAY who landed it at 3JJ at 1:43 P.M. It died here, but there was just one scramble from start to finish as none of the fellows was going to let this one linger very long. It moved from Worcester, Mass., to Washington, D. C., (about 350 miles) in jig time. Some very classy relaying was done in handling this one and the whole gang was combing the either for any kind of sign of it.

July 9th

East-bound:

Hiram Percy Maxim
Hartford Conn
What will be next on the program
Wise

This one started by "DX" phone from Sacramento. It landed at 6EN who gave it to 6AJH where it died as there was no possible chance of getting it out of San Ysidro during daylight. The next jump east is about 400 miles.

West-bound:

(from Lewiston, Me.)
Elizabeth Spencer
Los Angeles Calif
Best regards from all your friends
Louis Plummer

Clear routing is not available on this message. It seems it moved from 1FM to 1SC to 1CFI. At this point 1BKQ picked it up from 1BKR and OK'd for it at 12:06 P.M. From 1BKQ it moved through 1CHJ-2ANM-2BIG-2AWF, where it died. This one took an entirely different route and in the attempt to get it off by broadcast, 2AWF burned out his 50-watter.

We do not feel discouraged because no single message got all the way across. We did well under the circumstances, and much better than could have been done two years ago. The fellows in the central part of the country were somewhat disappointed because they had a half dozen routes all "greased" and they wanted a chance to show their speed.

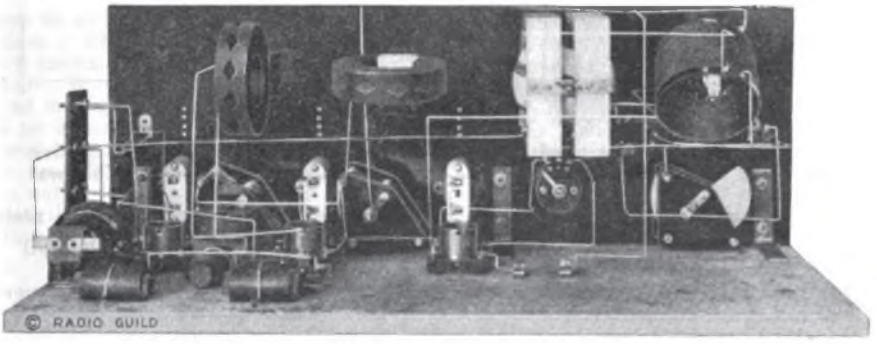
We will have another chance at Daylight Transcons just as soon as the weather gets cold enough to keep the fellows indoors on Sundays.

Operating the Super-Regenerator*

By Kenneth Harkness

IT has been our experience that there are a good many amateurs who, after a few experiments with super-regeneration, are inclined to doubt the varacity of Mr. E. H. Armstrong's contention for his new invention. We are afraid that there are a doubting few who harbor the belief that he concealed a three-stage power amplifier in that grip, in which—on the night of the demonstration at the Radio Club of America—he so carefully kept the loud speaker.

Another theory advanced by these experimenters for their failure to make their super-regenerators work is that perhaps Mr. Armstrong did not really give out all the dope—that he still has something up his sleeve about it.



Both these ideas, in addition to being rather ridiculous, are of course quite false. Mr. Armstrong has nothing up his sleeve or stowed away in an old notebook which has not been revealed. He gave a complete explanation of the theory of super-regeneration in his address delivered to the Institute of Radio Engineers on June 7th. In that address he did not, of course, tell radio engineers how many turns of wire or what size of condensers were used to obtain the super-regenerative state. It would have been quite superfluous to volunteer such information at that time. The information he gave in that address, however, was quite sufficient to enable anyone to calculate the proper constants to be used in a super-regenerative circuit. Later, for the benefit of those who were frankly puzzled to know how to proceed in the application of the circuit, Mr. Armstrong at a meeting of the Radio Club of America gave all the proper values to be used to obtain results for different purposes. At both of these meetings he demonstrated his super-regenerative receiver as compared with an ordinary regenerative receiver and two-stage amplifier. He did not have a power amplifier concealed in his hat or his suit case on either occasion. The results astounded everyone who heard them. We were present at both these meetings. The receivers were placed side by side. Each required three tubes and the same loop was used for an aerial in each case. The signals on the regenerative receiver and two-stage amplifier were scarcely audible a few away from the loud speaker. When the super-regenerative receiver was connected, the signals were tremendous—they filled the entire hall.

These same results are being obtained by others today who have built super-regenerative receivers in accordance with the instructions given by Mr. Armstrong. With a small loop, three tubes, about 200 volts of plate batteries and a loud speaker they receive the radiophone broadcast loudly and clearly. The cost of the apparatus, so far as the receiver is concerned, is about the same as an ordinary regenerative receiver.

There are some, however, who have failed to obtain any response from the receivers they have constructed and the reason for this failure to obtain proper results is often in the individual himself. It is not so terribly difficult to operate as some would have us believe. This is particularly true of the circuit shown in Fig. 1 but it must be remembered, however, that super-regeneration is an entirely new method of reception and the effects which apply to ordinary receivers do not necessarily apply to the super-regenerator. So the operator must familiarize himself with the conditions and learn by practice certain sounds which will indicate certain effects. We have learned to operate ordinary regenerative receivers in this manner. What we must remember is that a time existed when its successful operation seemed a con-

*Photographs by courtesy of Radio Guild, Inc., N. Y City.

siderable achievement. We must approach the operation of the super-regenerator in the same manner, because the effects about which we learned concerning other circuits will only partially help us in the tuning of this new circuit.

The parts required for a super-regenerative receiver are enumerated in the legend of Fig. 1, which is the best of these circuits to use.

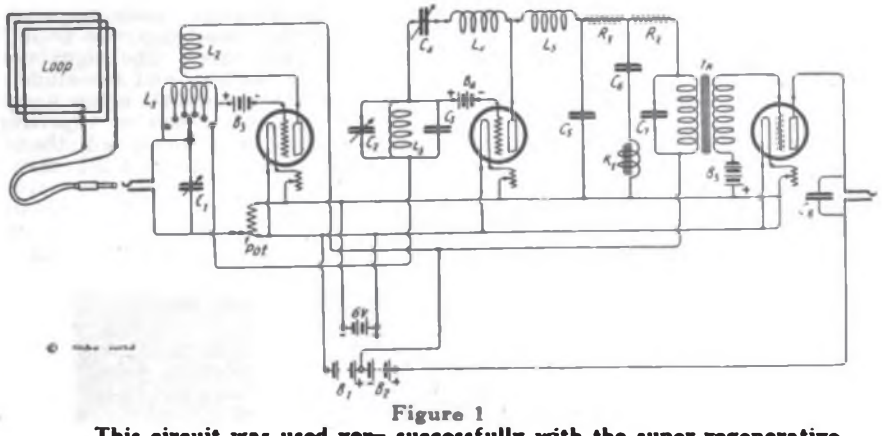


Figure 1

This circuit was used very successfully with the super-regenerative receiver illustrated in this article. The constants used were as follows:

L-1	Stator of vario-coupler
L-2	Vario-coupler with 100 turns on secondary
C-1	.0005 m.f. variable condenser
C-2	.001 m.f. variable condenser
C-3	.002 m.f. fixed condenser
L-3	D.L.-1250
L-4	5 mil-henry inductance coil
L-5	D.L.1500
C-4	.001 m.f. variable condenser
C-5	.005 m.f. fixed condenser
C-6	.005 m.f. fixed condenser
R-1, R-2	12,000 ohms non-inductive resistors
K-1	.1 henry iron-core choke coil
C-7	.002 m.f. fixed condenser
T-R	Audio frequency transformer—high ratio
C-8	.001 fixed condenser
B-1	100 volt plate battery
B-2	100 volt plate battery
B-3, B-4	Variable grid batteries
B-5	22½ volt grid battery

In the accompanying photographs one method of assembling this apparatus is shown. This arrangement was used with considerable success. It will be noted that the photographs show a variometer which is not indicated in the wiring diagram. This was used in the plate circuit of the first tube, to give a fine and simple control of the oscillation of this tube. This is not shown in the wiring diagram because, if the secondary of the vario-coupler is wound with 100 turns, the variometer is not required.

Most of the apparatus used in the super-regenerative receiver is quite familiar and its location will be recognized from the photographs.

Inquiries have been made concerning the choke coils and resistances in the filter circuit. These can now be purchased from radio dealers and it would be advisable to purchase the resistances. Almost any type of small iron-core choke coil can be used in the filter circuit. Final adjustments can be made by varying the capacities of the condenser in the filter circuit. The 5 mil-henry choke coil may consist of a D.L. 250 or 300 but it can be constructed by winding 210 turns of No. 28 S.C.C. wire on a form 5 inches in diameter. The length of the coil will be about 3¼ inches.

A suitable sized loop for the reception of 360 meters may be easily constructed on a frame 3-ft. square, by winding 7 turns of wire spaced about ¾-inch apart.

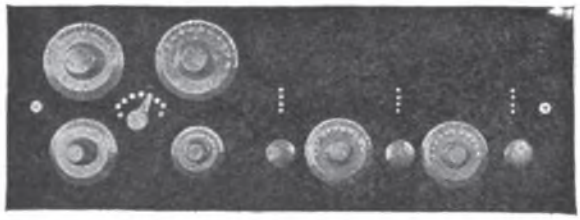
Western Electric "E" tubes are the best tubes to employ in this circuit as the results obtained with "E" tubes are greatly superior to other types. 100 volts should be used on the plate of the first two tubes and 200 volts on the last one. This is obtained by placing two 100-volt plate batteries in series with a center tap, as indicated in Fig. 1.

The use of grid batteries is essential to the operation of this circuit. The values of the grid voltages vary considerably, but are usually in the neighborhood of from 10 to 15 volts for each of the first two tubes and 22 volts for the last tube.

To operate this circuit certain effects should be sought which indicate that the circuit is functioning properly. Upon heating the filament a high-pitched whistle should be heard in the phones. This whistle indicates that the second tube is oscillating.

The feedback of the first tube should then be adjusted to obtain oscillation—which is indicated by the familiar click when the grid connections are touched and is accompanied by a loud roar in the phones. With both tubes oscillating a series of heterodynes should be heard if any of the variable elements in the circuit are moved. The circuit may be adjusted until this effect is obtained. It may be necessary to vary the grid batteries and the variable condensers to obtain these effects but unless these heterodynes of harmonics are heard the circuit is not correctly functioning. When the proper state has been obtained these heterodynes should be gradually tuned out. By varying the condenser across the loop, voice and music from a transmitting station will become audible. The condensers C-2 and C-4 and the feedback coil L-2 should then be adjusted to obtain maximum amplification. The potentiometer will be found very useful in obtaining the critical grid voltage. It is not very difficult to find the point of maximum amplification without distortion or whistling, if these instructions are followed.

As far as DX work is concerned the writer has not had time to experiment much along these lines. This particular circuit is not suitable for C.W. reception. By this we refer to straight C.W. telegraphy; this circuit will receive modulated C.W., of course. For straight C.W. reception it is better to use three separate tubes—one as regenerative amplifier, the second as oscillator and the third as detector. This is necessary because, with C.W. reception, the second tube must oscillate at a low audible frequency.



Excellent results on distance work have, however, been obtained with the reception of radiophones, using super-regenerative receivers constructed as shown in the photograph. Recently we received a letter from a gentleman in Philadelphia who constructed a receiver as described and who declared "We have very clearly heard Pittsburgh, Anacostia and Atlanta, Ga." We have also received other letters from all over the country indicating that radiophones are being received distances of 400 and 500 miles regularly with this design of receiver.

A Summer Test to Hawaii

ONE night in early July Station 1AW in Hartford was just about to call it a night and turn out the bulbs when an 8-station called and asked "QTC?" Mr. Maxim's west-bound hook was empty but the QRK was so good that he itched to send a message and so on the spur of the moment he cooked up one without ever writing it on paper:

Radio 6ZAC
Hawaii
Radio summer transpacific test
QSL if you get it
Maxim

Then he forgot the matter until the receipt of a letter from Cliff. Dow, 6ZAC himself, Wailuku, Maui, dated July 8th, advising that the previous nite at 7:44 he had grabbed off the message as 6EN, Duvall of Los Angeles, was sending it to KDU. Not only that, but 6ZAC copied 6EN's SVC one minute later: "Pse QSL by mail if tt msg is delivered tnx—6EN."

This proves conclusively that a "test" is not necessary to keep communication open thru the summer if the stations on the coast will stay on the job. 6ZAC says that all the C.W. stations are pounding thru just as QSA as ever but that he can rarely find anybody QRX-ing on 375 meters, which is his wave. 6KA and 6EN on the night in question were readable fifty feet from the fones on two steps and a pair of Baldies. If Dow had a Magnavox he could send their sigs back to them.

6ZAC now takes his work to California as a matter of course and this winter will be out for some *distance*. To this end the antenna system has been rebuilt and now consists of a 6-wire cage 90 ft. at the high end, coming obliquely down to a short mast near the house, and with two 4-wire cages 12 ft. apart as a counterpoise. All the great DX work of 6ZAC has been done on 3.5 amps from one 50-watt tube and the coming winter with two tubes and the new aerial should see some real reaching-out. Atlantic Coast amateurs beware!

There seems no question about 6ZAC's ability to hear what's sent to him even if he can't find anyone to listen to him. Perhaps the most remarkable thing about that summer message to Hawaii was how it got

(Concluded on page 32B)

The Greatest of All Amateurs

By Hiram Percy Maxim

I HAD the great good fortune the other evening to meet the greatest of all radio amateurs. The occasion was a memorable one. Through the courtesy of the Radio Corporation of America I and some fifty others sat down to dinner with him at the Ritz-Carlton Hotel in New York City. I had never seen him before. Few of us American amateurs had even seen him. The dinner was given in his honor. It was one of the most pleasant dinners I have ever attended, and every one of us A. R. R. L. people would have thoroughly enjoyed it could we all have been present. It would be a pity to allow such an event to pass down into history and not be recorded, and I am going to tell about it.

—Photo by Kadel & Herbert

It seemed to me that most of the men who had distinguished themselves directly or indirectly in radio either were present or sent regrets that they could not attend. As I sat there and looked about and recognized the different famous men, I thought that there was probably more radio brains per square inch present than had ever gathered before. The toastmaster was Mr. Young, Chairman of the Board of the Radio Corporation. He arose after the dinner and said that he was not going to call upon any one who knew anything about radio. Unless he adhered to this rule he warned us that we would be there for a couple of days. He said it would bar him from calling upon Dr. Pupin of Columbia University, Mr. Alexanderson, Mr. Colpitts, Commander Hooper of the U.S. Navy, and fellows, he included Mr. Maxim, of the American Radio Relay League, and Mr. Paul Godley of the same organization. He referred to the American amateur as one of the greatest forces in radio to-day, and put into actual words all of the things we have struggled so many years to accomplish. It certainly was a great pleasure to see that we American amateurs had been successful in getting over the fine things that we stand for. It proved that good Americanism, honorable dealing with our fellows, straightforward methods, dignity, and good fellowship will win in the end every time. I glanced at "Paragon Paul" as Mr. Young paid the American amateur his compliments, and was deeply pleased to see the famous Godley smile slowly spread over the entire countenance. Our Paul caught the spirit of the thing, too.

Many national characters who might pass as not knowing anything about the technical side of radio spoke, although how Mr. Nally, president of the Radio Corporation, got by is open to suspicion, and his eloquent words of appreciation of what the Greatest of All Amateurs had done for humanity were tremendously impressive. Several speakers mentioned the personality of the guest of honor. It was worth special mention, for both Mr. Godley and I know what was meant. Overtopping all the wonderful work this fine gentleman has done in radio, stands his lovable and modest personality. Again it emphasized the queer fact that radio begets fine personalities. It seems to do something to a man to bring out the human side of him.

Presently the dinner and the speeches were over. Dr. Alfred Goldsmith was good enough to think of us and he secured an autographed dinner card and gave it to me. The little act was deeply appreciated, and I later gave the precious paper to Mr.

Warner, and it will hang upon the wall of The American Radio Relay League headquarters for many years, I hope. Then I had a few words with the Greatest of All Amateurs. I told him I wished I might convey to him the inspiration he had been to thousands of young Americans. His reply was characteristic of him. He said, *"And I wish, Mr. Maxim, I might convey to them the inspiration they have been to me!"*

There is your message, fellow American amateurs. It comes direct and first-handed from Guglielmo Marconi, a good fellow, animated by precisely the same thoughts and aspirations that animate us, a real dyed-in-the-wool brass pounder, a knight of the dot and dash, and the Greatest of All Amateurs.

[Editor's Note—Mr. Marconi in his address before a joint meeting of the A.I.E.E. and the I.R.E. told of many new developments of great interest to amateurs.

In England, he said, a large amount of investigation had been carried out in recent years on the efficiency of valve transmitting circuits and the radiation efficiency of aerial circuits, so that now it is possible to obtain in commercial work an efficiency from the anode input of the tubes to the aerial of seventy per cent, and an efficiency of radiation into space (of the antenna current) as high as fifty per cent; that is, an efficiency from the power input to the actual radiation into space of about thirty-five per cent; and this on waves as long as 20,000 meters, which have been notoriously inefficient as regards actual radiation. He did not disclose the methods used to secure this increase in efficiency but said that in short-wave stations it was hardly worth the extra expense involved, probably because of the natural greater radiation efficiency of the higher frequencies.

Tuned amplifiers, both radio and audio frequency, Mr. Marconi said were of the greatest technical interest. Quite amazing results could be had when the proper care was taken in the design of air-core h.f. transformers to keep electrostatic coupling between the windings to a minumum and to provide an impedance in the primary equal to the internal plate-to-filament resistance of the tube. The same idea is applicable to iron-core audio transformers, but an iron magnetic shunt is necessary between the windings to sufficiently loosen the coupling. between the primary and secondary circuits.

Mr. Marconi has a fascination in the transmission effects to be encountered in Antipodal regions. The ease which signals can now be received on the opposite of the globe from the transmitter show there is something to the idea of the waves traveling around the earth by various routes and reuniting near the Antipodes. He told of recent scientific expeditions to points near the Antipodes of various high-powered stations, particularly an expedition to South America which made numerous observations on the signals of NPO, Cavite, on the other side of the globe. Received on a loop direction finder (unilateral) it was not particularly surprising to find that in such a location (within 2000 miles of the Antipodes) the constancy of direction was not maintained and the signals often would change direction, sometimes coming from a direction which indicated they preferred to travel a distance of 14,000 miles rather than come by the shortest route. Sometimes during the unstable periods when the direction was shifting the signals would arrive by two or more routes and, altho quite steady and normal when received on the one-way loop, would interfere with each other when received on a simple vertical aerial in such a way as to produce slow beats resembling Morse letters transmitted very slowly!

Mr. Marconi then told of the very remarkable work done by Mr. C. S. Franklin, of the British Marconi Company, in phone operation on waves under 15 meters in length. Tube transmitters are used, with reflectors at both the transmitter and receiver. The reflectors provide about 200 times the energy that would be received without them, and seem completely to have eliminated fading, which might be expected to be so severe at such wave lengths as to make operation impossible. In order to take advantage of these benefits a very short wave must be used, as a reflector (particularly a revolving one) represents serious constructional difficulties for long waves. The lecture-room set demonstrated by Mr. Marconi used a wave length of *one meter* and was so extremely directional that a very small revolution of the reflector completely eliminated the signal at the receiver. The reflectors consist of a number of vertical conductors of a height of 1.5 wave lengths arranged on a cylindrical parabolic curve with the aerial in the focal line. A telephone circuit over 97 miles between London and Birmingham is providing good clear speech at all times on a wave length of 15 meters by virtue of such reflectors. The aerial itself in this case is somewhat over a half wave length long. The radiation efficiency at such small wave lengths is amazing high, about 300 watts being actually radiated into space from an anode input of 700 watts.—K.B.W.]

Some Good Dope on Mast Construction

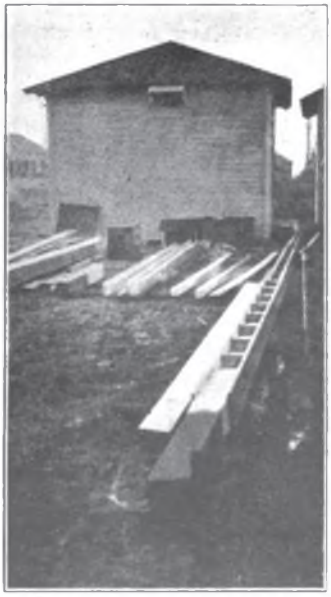
By L. A. Bartholomew, 6LC

FELLOW radio bugs, did you ever look at an 80-foot mast made up of such material as 1" pipe or 2x2 and wonder by what trick it ever stayed up?

The writer has had a number of aerials at different places, mostly in Michigan, and the rottenest luck was with the mast part. Ice and wind storms caused the worst trouble.

It was decided to put up some real masts that would stand in any weather. The photographs explain better than words how they are constructed. Altho the masts described are but 52 feet high, they are of such construction as will hold up a large aerial during the heaviest wind storms and can be safely climbed to the top should this be necessary, as for example, in putting a new rope thru the pulley.

Referring to Fig. 1, it will be seen that the inside of the mast is hollow, but of such construction as to make it very light and rigid. The mast is made up on the ground in sections, the sections progressive-



ly smaller near the top so that each section fits inside the section below it. Three sides of a section are made first by nailing together two wide pieces and a narrow piece in the form of a trough. Use 8d. finishing nails, except at the joints, where No. 12 1½" flathead wood screws should be used. Blocks 1¾" thick are put inside of the mast 18" apart. When the sections are slipped into each other, machine bolts are put thru each joint taking care that they go thru the blocks inside. Put in extra blocks at the joints for this purposes. ⅜" holes are drilled two-thirds of the way thru at every block, on alternate sides. This is to provide a place for ⅜" rods to be inserted for steps in case it is necessary to climb the mast after it is up.

The mast should be painted inside and outside with two coats of white lead. Red

lead should be used on all metal parts that are not galvanized. Large size screw eyes are used for fastening the guy wires, and several turns of galvanized iron wire are wrapped around the mast thru the screw eyes which keep them from pulling out when under strain.

The outside dimensions of the sections as shown in the photographs are as follows: 7 in. x 7 in., 5½ in. x 5½ in., 4 in. x 4 in., and 2½ in. x 2½ in., the top section being a solid piece. The lap at the joints is 80" in each case except the top joint at which the lap is 24". A bottom piece made of red wood or cedar 5" square and 5' long was fastened inside of the bottom section so that 3½' were left outside of the hollow part of the mast, but which set entirely in the ground when the mast was erected; in other words, the bottom piece

(Continued on page 32B)

EDITORIALS
de AMERICAN RADIO RELAY LEAGUE

Carrying On

DID you read our July editorial entitled "Holding Our Own," O.M.? We want you to take it to heart. We telegraphing amateurs, in the performance of a useful work, are entitled to a share of the ether. In our effort to be fair to the newcomer and let him have his chance to listen to concerts, many of us have "bent over backwards" and seem afraid to touch the rubber. We want to emphasize that the broadcast listeners should be given a chance, and that every effort should be made to divide the hours in each community so that harmony may prevail, but we want to emphasize at the same time that such an arrangement means that we amateurs should retain a place in the ether for ourselves. The broadcast listeners should be helped to appreciate that we have some rights, too, and that after standing by the larger portion of the evening to give them quiet air we expect to be able to start up for the rest of the night without being called names.

Broadcasting is essentially a matter for the early evening hours, and likewise it is essentially a short-range proposition. We do not decry the interest a broadcast listener may have in endeavoring to get a phone station many hundreds of miles away in the late hours of night—in fact we're glad to see it because it is evidence of awakening amateur symptoms—but that is not ordinary broadcast reception. We have all kinds of QRM in our own work and the novice listener who tries for DX phones at all hours is an amateur with us—but nothing more. We should treat him as a brother-amateur—QRX when there's something special doing and play the game with him as a good fellow—but we are not going to permit it to be considered a crime to start up our message relaying at 10 o'clock or 10:30 after having been quiet up until then. In other words, he must play fair with us too. Fellows, this is a serious matter. There are many in our League who seem almost afraid to operate at any time of day or night, and this must not be. Our government counts us a big national asset and licenses us to operate. Let us hammer in the idea once more that we must always be considerate of the other fellow and remember that the newcomer listener isn't on to the ropes and that therefore we must make due allowance for what he thinks are his rights, but for the sake of all that we hold dear STAY ON THE JOB!

K.B.W.

The Fall Reopening

HAVING just returned from our noon visit to the beanery around the corner and feeling somewhat super-regenerated, we venture to intimate that there is going to be considerable radio business this fall.

We amateurs had succeeded by last fall in pretty well eliminating talk of "radio seasons" in our work—we worked right thru the summer except in the southwestern states where admittedly it was a mighty discouraging effort. But the new crop of broadcast listeners do not bloom all the year around; most of them quit the game this summer and left the sweltering static-filled ether to us. Now they will be coming back, for September marks the weakening of O.M. Static and the laying of plans for winter activities.

Everyone seems to be counting on a big radio business, both from the returned novices of last season's crop (if they be hardy perennials) and several times that number of brand-new-comers. The summer slump, altho disastrous to many new dealers, has been of some benefit to the manufacturers: many of the wild-cat companies gave up the ghost and those that live thru until the fall revival will be the real ones, and the breathing spell was gratefully received by the legitimate manufacturers as an opportunity to reorganize manufacturing facilities.

But it seems certain that there is going to be a period of dullness for most manufacturers at the start of the new season. The shelves of most dealers are groaning under a miscellany of ill-chosen and awfully-constructed junk left from last season, and the warehouses of the jobbers are filled with the same kind of stuff, purchased at a stiff price when anything with the name of radio affixed to it was thot to be worth whatever its holder asked for it. Their capital is tied up in such apparatus and parts now, and even tho the manufacturers have reorganized and brought forth much

better products for the new season, the old stuff will have to move first. We're not talking about the old-established amateur houses now; we mean the thousands of unknowns who climbed on the band-wagon regardless of their lack of radio knowledge, eager to cash in on the novice broadcast boom. The jobbers are going to be compelled to move the junk they now have before they can buy new apparatus, and the dealers will have to get rid of it for them. Thank heaven we are not a poor uninformed novice listener!

K.B.W.

These Funny Numbers

SOMEHOW or other we managed to snaffle a four-day vacation last week. Just before we left we inspected all the preparations for this issue of *QST* and decided that 128 pages was the proper number and by dint of much persuasion we induced our Advertising Department to print their forms first this month so that we could angle for the elusive bass in a nearby lake. When we returned we found much to our disgust that the energetic Advertising Department had roped in several more pages of advertising than had been counted on and darned if they hadn't encroached on our reading pages just that much; not only that, but they had gone ahead and printed the aft section of the magazine so that the page numbers couldn't be changed in accordance with our desire to increase the total number of pages. We wanted to do that, of course—you don't suppose we'd let that infamous business department crowd us against the front cover, do you? Not much!

But how to get around it was quite a problem, and we have had to adopt the expedient of lettered pages instead of numbered. So we've got eight extra reading pages inserted right here in the magazine. We hope nobody will object to the funny numbers.

K.B.W.

Clipping Coupons

A PUBLICITY man was in our office the other day and we were complaining about our inability to find a news-clipping service that met our needs. "Why don't you ask your members to send you clippings from their local papers?" he asked. And that settled the matter right there.

There are many reasons why it is desirable for our A.R.R.L. headquarters to have a comprehensive clipping service. It gives us a finger on the pulse of public sentiment in radio, it posts us on developments, often gives us the lead to a good article for *QST*, enables us to chronicle creditable amateur activities, and gives our headquarters office a chance to safeguard amateur interests whenever anything incorrect or unjust is said about amateurs. At various times we have subscribed to many clipping services but they have loaded us with tons of "radio columns" and little or no amateur news, and even when they tried to confine themselves to things of amateur interest they were misled by the newspaper characterizations of broadcast listeners as "amateurs" —a commercial clipping service can't be expected to know the difference.

Right in our A.R.R.L. we have the makings of a clipping service that can't be touched—that can cover papers in every corner in the land and do so swiftly and efficiently. Will you do your part? It will be a big help to the headquarters office, particularly this fall when novice interest resumes with a bang. It won't be much trouble—try to get the habit, when you read a radio item of any sort in your paper, of taking out your pen-knife and clipping it out, pencilling on its rear the name of the paper, town and date, and periodically mailing your collections to us. Will you do this? Tnx, OM.

K.B.W.

A SUMMER RELAY TO HAWAII

(Concluded from page 29)

across the continent. At this writing we haven't heard but transcontinental relay traffic has been pretty badly "shot" this summer and yet this message got thru beautifully. Who handled it?

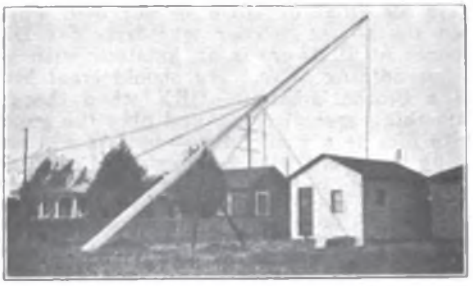
K.B.W.

DOPE ON MAST CONSTRUCTION

(Continued from page 32)

that sets in the ground is as large as the inside of the first section, as shown in Fig. 2.

A home-made windlass was constructed of scantling and pipe. Altho a crude affair, it served the purpose excellently. An idea



of raising the mast can be gained by referring to Fig. 3.

The material for one mast consists of the following materials. All dimensions are net. The pieces should be surfaced

(Concluded on page 41)

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.

DEMON Static received the severest blow of his career during the month of July in the Roanoke Division. Just what he looks like can be determined by glancing at the cover of this month's *QST*. This picture was taken hurriedly as Demon Static was last seen heading for parts unknown and it is a safe bet that he will steer shy of the Roanoke Division for many moons or as long as that bountiful spirit of enthusiasm remains king among the good stations in that division.

St., Casper, Wyoming, has been appointed manager of the Rocky Mountain Division vice M. S. Andelin, resigned. There is a good deal of room for improvement in the Rocky Mountain Division and the rapid rise to the front of this division will be noticed under the capable guidance of 7ZO who is an old timer in amateur radio. Lend a hand, men, and bring your division to the top. It can be done.

A spark station cops first honors again. Come on C.W. and show some speed! Give the spark credit when it takes the honors.

Message Traffic Report By Divisions

JULY

DIVISION	CW. Stns.	CW. Msgs.	CW. M.P.S.	SPARK Stns.	SPARK Msgs.	SPARK M.P.S.	TOTAL Stns.	TOTAL Msgs.	TOTAL M.P.S.
Atlantic	10	401	40	1	6	6	11	407	37
Central	18	597	33	13	793	61	31	1390	45
Dakota	8	153	19	6	66	11	14	219	16
Delta	1	11	11	0	0	0	1	11	11
East Gulf	3	24	8	5	150	30	8	174	23
Midwest	4	151	38	5	133	27	9	284	32
New England	16	650	41	10	482	48	26	1132	40
Northwestern	3	61	20	7	477	68	10	538	54
Ontario	3	72	24	0	0	0	3	72	24
Pacific	11	136	12	10	480	48	21	616	29
Roanoke	29	1092	37	7	86	12	36	1178	33
Rocky Mountain	5	140	28	1	12	12	6	152	25
Vancouver	2	16	8	4	55	14	6	71	12
West Gulf	13	340	26	30	693	23	43	1033	24
Total	126	3844	31	99	3433	34	225	7277	32

C.W. Messages, 3844—53%
Spark Messages, 3433—47%
Total Messages, 7277

It was a banner month for the entire division and the greatest number of messages ever handled was the result of this fine co-operation. What will it be in good weather? "F. B.," we say, and QTA next month.

Traffic has reached its lowest ebb, but this is not discouraging at this time of the year. We look for a decided pickup commencing with September and with our organization almost perfected we have a right to expect a tremendous increase of messages handled and with more speed in delivery.

Norman R. Hood (7ZO) 1022 South Ash

B. B. BLISS, JR., 7OT
Boise, Idaho
Northwestern Division
270 messages

TRAFFIC REPORT

Atlantic Division—C.W.: 3ZO, 208; 3ANJ, 46; 8CEJ, 39; 8AMM, 26; 3FS, 23; 3WV, 15; 8NB, 14; 8AMQ, 11; 8CJH, 10; 3ANO, 9; total 401. Spark: 8TC, 6.

Central Division—9AIU, 19; 9CP, 30; 8ZAG, 43; 8AM, 7; 8AND, 7; 8CAZ, 47; 8ZZ, 52; 9DDY, 56; 9BJR, 27; 8AQZ, 47;

8CMI, 23; 8BVR, 80; 8AZH, 16; 8FT, 2; 8ZH, 19; 8BKO, 13; 8TJ, 5; 9CBA, 104; total 597. Spark: 9ME, 145; 9CP, 26; 9ZN, 110; 8AGT, 15; 8AHY, 44; 8AZH, 4; 8CWC, 4; 8FT, 94; 8CLD, 39; 8UC, 63; 8AIZ, 49; 8ZO, 192; 8TJ, 8; total 793.

Dakota Division—Twin Cities, 69; 9BBF, 15; 9YAJ, 17; 9BAF, 13; 9BAV, 4; 9AOR, 13; 9GW, 2; 9CDV, 2; 9ASF, 18; total 153. Spark: 9ZC, 6; 9FX, 5; 9BRI, 18; 9BOF, 10; 9AVZ, 15; 9AIF, 12; total 66.

Delta Division—C.W.: 5DA, 11.

East Gulf—C.W.: 4KF, 19; 4HZ, 3; 4DL, 2; total 24. Spark: 4BI, 60; 4HS, 50; 4GM, 8; 4EZ, 29; 4DZ, 3; total 150.

Midwest Division—C.W.: 9BSG, 79; 9BZI, 20; 9BGH, 20; 9AMU, 12; total 131. Spark: 9JA, 54; 9DRA, 17; 9FK, 44; 9ARZ, 15; 9ARA, 3; total 133.

New England—C.W.: 1AGH, 42; 1ANQ, 50; 1AWB, 130; 1AYU, 28; 1ASF, 30; 1BAS, 32; 1BGF, 8; 1BKQ, 113; 1BQK, 16; 1CDO, 25; 1CK, 32; 1COT, 18; 1HX, 46; 1IV, 44; 1OZ, 30; 1QP, 6; total 650. Spark: 1ACO, 12; 1AYU, 116; 1BJS, 28; 1BRQ, 41; 1CK, 16; 1DY, 112; 1FM, 84; 1LZ, 21; 1SC, 30; 1WQ, 22; total 482.

Northwestern Division—C.W.: 7SC, 37; 7QE, 19; 7LR, 5; total 61. Spark: 7OT, 270; 7BK, 125; 7NW, 27; 7MF, 18; 7BG, 14; 7IW, 14; 7KJ, 9; total 477.

Ontario Division—C.W.: 3JI, 26; 3JK, 9; 9AL, 37; total, 72.

Pacific Division—C.W.: 6ZB, 1; 6AHF, 8; 6AJH, 8; 6AVR, 8; 6FH, 20; 6GF, 37; 6LV, 14; 6ZX, 11; 6AS, 10; 6ASJ, 12; total 129. Spark: 6EC, 8; 6TW, 2; 6ZB, 5; 6FH, 7; 6GR, 212; 6ABX, 9; 6VK, 72; 6AS, 70; 6TC, 2; 6CC, 93; total 480.

Roanoke Division—C.W.: 3ZZ, 115; 3IW, 107; 3BLF, 103; 3MK, 42; 3BIJ, 40; 3TJ, 20; 3BMN, 16; 3ACZ, 10; 3BNE, 10; 3ATZ, 5; 3HL, 3; 3AUU, 8; 3BZ, 31; 3AEV, 11; 4GX, 9; 4DC, 10; 4ID, 21; 4MW, 121; 4DS, 41; 4GH, 71; 4LP, 10; 4DQ, 27; 4BX, 95; 4KC, 48; 8BDB, 42; 8AMD, 30; 8SP, 26; 8CHO, 8; 8CAY, 12; total 1092. Spark: 3AOV, 1; 3ACK, 8; 3BVC, 20; 4IE, 32; 4MF, 12; 8WD, 8; 8BAZ, 5; total 86.

Rocky Mt. Division—C.W.: 9AMB, 80; 9DTE, 20; 9DHI, 15; 7LU, 15; 7ZO, 10; total 140. Spark: 7ZV, 12.

Vancouver Division—C.W.: 5BQ, 11; 5CT, 5; total 16. Spark: 9BD, 32; 5DO, 5; 3EC, 10; 5CZ, 8; total 55.

West Gulf Division—C.W.: 5NS, 56; 5VA, 42; 5JL, 24; 5IR, 25; 5QS, 55; 5ZAY, 31; WTK, 17; WRR, 47; 5ZAT, 25; 5ZG, 7; 5AE, 5; 5BA, 3; 5ZX, 3; total 340. Spark: 5OI, 11; 5UD, 3; 5DY, 13; 5AL, 2; 5TU, 83; 5IC, 15; 5MK, 12; 5TP, 67; 5NS, 20; 5TC, 19; 5QU, 15; 5AG, 6; 5PE, 76; 5ZAF, 46; 5IR, 110; 5ACQ, 9; 5AEJ, 13; 5QI, 27; 5PI, 14; 5WA, 42; 5ZAW, 3; 5ZC, 15; 5ZAE, 15; 5ACU, 10; 5ZAN, 10; 5HC, 10; 5KN, 16; 5OC, 4; 5PZ, 1; 5XAD, 6; total 693.

ATLANTIC DIVISION
Chas. H. Stewart, Mgr.

The reports received by the Division Manager this month are still meagre due to the fact that up to the 15th of July the re-organization had not been completed. This condition will soon change as new appointments of traffic officers are made, but it will take a little time yet to get matters working smoothly.

The Division Manager is gratified to find that some of the League have had enough "pep" to respond to the call which he made in last month's report for volunteers to fill vacancies in the traffic organization. Remember, fellows, it is up to you to come forward and do your part; the work of the Division cannot be carried on by the Division Manager alone. There are plenty of cities that have not yet been heard from where City Managers are to be appointed. As stated in last month's report, it will, of course, be impossible to give an appointment at present to all who may offer their services, but we will at least have the advantage of having the names on file of those who are willing to help to aid us in filling future vacancies, as there are changes continually taking place, due to one cause or another.

The Traffic Manager has called the attention of the Division Manager to the fact that he has received some complaints regarding the absence of message and other traffic reports for this Division. In most cases the trouble has been due to individual stations for not sending in their reports. It has been noted that some of the excuses made for not sending reports have been that it was not known to whom to send the reports, but as the name and address of the Division Manager appears in a prominent place in the front part of *QST*, he does not think that such excuses are valid. Instead of criticisms, it would be much better for those who are making the criticisms to do something of a constructive nature.

Frederick B. Ostman (2OM), 180 Broad street, Ridgewood, N. J., has been given the appointment as Executive Assistant for the Northern Section; and Edward B. Duvall (3EM), 3909 Cottage Avenue, Baltimore, Md. as Executive Assistant for the Southern Section.

James F. Rau, (3FM), 2085 E. Kingston Street, Philadelphia, has been appointed Assistant Division manager for the Eastern Pennsylvania District. Other appointments of District Superintendents and City Managers have been made, and if sufficient space is alloted in *QST*, a complete directory of appointments in each State will be given in the next issue, including addresses and the territory covered by each. If space is not available it may be possible to give one

or two States at a time until all are published.

As a guide to the future with regard to sending reports—if you do not know who your Dist. Supt. or City Mgr. is—send your reports to the Executive Assistant for the section in which you are located. If you are located in New York or New Jersey they should go to Mr. Ostman; if you are in Pennsylvania, Delaware, Maryland or the Dist. of Columbia send them to Mr. Duvall. The Executive Assistant will then advise you to whom your future reports should be sent.

3QV, 3BJY, 3BG are DX men but nil reports. 3ADX is doing mighty fine work and frequently on the job but no report.

In District No. 6 (Penn.,) the summer weather is responsible for the general lull in this district, the fone craze is about over and the fellows are looking over their sets for the coming DX season. 8HR has no definite plans for the winter but expects to install C.W. (Eventually they all will do that.—ADM.) 8XN expects to do a little DX on their 2 K.W. spark but the main trouble is getting ops to work the set. 8PQ is going to junk the spk and take a chance at C.W. (Not necessary to take a chance it's sure fire stuff.) The D.S., 8BQ has fine intentions of installing 300 watts of C.W. (Let's hope his intentions materialize.) 8DT is talking about C.W. (Don't talk abt it, *use* it.)

What we want at this time is some "pep," less criticism, and more real co-operation, and we will soon get the affairs of the Division in good shape for the active season which will soon be upon us. If you want any appointment either as a traffic officer or as an official relay station write to the Executive Assistant in charge of your Section, and he will give the matter his attention and let you know what he is able to do. He cannot recommend the appointment of everyone who applies, but he will have your name on file from which he can fill future vacancies.

CENTRAL DIVISION
R. H. G. Mathews,, Mgr.

During July a general pickup in traffic has been reported thoughout the division, although this increase is not shown in the number of messages reported.

ILLINOIS: Mr. Klaus has been relieved and Mr. N. Cutright Smith, 9AIH, of Hoopeston, Ill. appointed Assistant Division Manager for Illinois. Mr. Smith is busy reorganizing his State, the tentative organization being as follows:—

Illinois has been divided into four districts, this division being made by drawing a north and south line through Rockford and East and West line connecting Quincy and Danville. The section at the upper left hand corner of the State after this division is made is No. 1. Mr. Burke, 9NQ of Galesburg, being District Superintendent. The upper right hand section is district No. 2 with Mr. Bergman of 9CA, Dwight, Ill., as District Superintendent. The lower left-hand section is numbered district No.3, the District Superintendent being Mr. Cain, 9MC of Roodhouse. The remaining section, the lower right hand one, is No. 4 with Mr. Nash of 9UK as District Superintendent.

OHIO: Interest in relay work is on the mend and getting new inspiration since the new organization has become fairly well started in lining up stations. The District Superintendents are getting in touch with the various stations in their respective districts. More co-operation is wanted on the part of the individual stations in sending in reports of the traffic handled. Come on fellows. Let the rest of the gang know what you are doing at your station. Your District Superintendent cannot report your work unless you let him know what you have been doing.

The following City Managers have been appointed: Painesville, John D. Bay, 8TT; Canton, Henry L. Ley, 8ZV; Dayton, Edward P. Getter, 8AIM. Relay stations and Radio Clubs in these cities are asked to give their city Managers all the support and co-operation possible. These men will appreciate you help n reporting bits of live, interesting radio news and the activities of your clubs.

Cincinnati, Dayton and Columbus stations are doing good work in spite of the QRN and the wind and electrical storms that have been a menace to aerials in several sections of the state. 8AIM is being remodeled and repanelled, 8FT is out of commission due to a burned out secondary, and 8ARS is closed for the summer.

A spark coil station has been erected at the camp of the Middletown boy scouts and is going in good shape. The camp works the distance of over 18 miles with 8AHY on daily schedule and handles from one to three messages daily. This is the only convenient means of communication for the camp and has therefore proved valuable.

INDIANA: The fellows are beginning to take more active interest in their work. Most of the traffic is going thru by spark since some of the fellows who had C.W. stations in operation have reinstalled their spark transmitters as being more reliable.

District No. 1. 9ME, 9AKD and 9FS were the only ones on the job. The other stations reported no traffic. Mishawaka has one station, C.W. with the call letters 9DNJ.

District No. 2. Only one report was received this month which was from 9AIU. 9AIU has no difficulty in working stations over 125 miles in daylight which proves a great help in handling traffic. QRM has been so bad lately that there is no hope of

hearing any stations excepting locals. 9CP has been on the air and has been able to work DX with spark better than with C.W. Two new stations have popped up in the district that are in fine places to help with traffic. They are 9DEK, at North Judson, and 9BLC, at Lafayette. Both are C.W. stations and are doing good work.

DAKOTA DIVISION
N. H. Jensen, Mgr.

Traffic may be light, but most encouraging reports are coming from all over the Division about the preparations being made for work this fall and winter.

SOUTHERN MINNESOTA: 9DR is doing fine work with 100 watts. Has worked 16 states. City Manager Carpenter of Minneapolis will have station 9DX going very soon. 9APW had a serious fire at his home and lost all of his apparatus. Several of the regular routes are being kept open and traffic is moving in small quantities. 9YAJ is doing experimental work in the laboratory at St. Olaf's College this summer. He has been engaged as an Instructor in Physics for the coming year in that school. A 2000 volt 1500 watt motor-generator has been ordered for 9YAJ. 9BKP is on the air regularly with both C.W. and spark. Fellows, if you want to see a real station, and an up-to-date antenna system, go over to New Ulm and give 9BBF the once-over.

NORTHERN MINNESOTA: 9BAV reports that he will clear with 9AUA every night at 9:30 whenever atmospheric conditions permit. 9AOR will be on every Monday, Wednesday and Friday nights from 10 P.M. to midnight. 9CDV should prove a good station for east and west traffic. He is now frequently in communication with Twin City stations and also with 9YF and 9AUU.

NORTH DAKOTA: 9BZF of Jamestown is installing a 20 watt C.W. transmitting outfit. 9AUU and 9BFQ are doing very good work locally. With many new C.W. stations going in this summer, the prospects are excellent for handling a great amount of traffic thru North Dakota as soon as QRN drops off somewhat.

SOUTH DAKOTA: 9YAK and 9AYW in the southern part of the State are on occasionally. 9BRI is doing good work, as also are 9ASF at Aberdeen and 9AVZ at Pierre. 9BOF at Salem is making improvements in his station.

DELTA DIVISION
John M. Clayton, Mgr.

The Delta Division is being reorganized entirely. Mr. Hubert E. deBen, 5ZAU, of New Orleans has been appointed Executive Assistant and will be in charge of reports and will be chief adviser to the Division Manager. Mr. Halph Pemberton, 5WF, of Scott, Arkansas has been appointed Assistant Division Manager for the state of Arkansas; Mr. W. C. Hutcheson, 5DA, of Wind Rock, Tenn. has been appointed Assistant Division Manager for Tennessee; Joe A. Pullen of the famous 5ZAB at Houma, La. has been appointed Assistant Division Manager for Louisiana. To date no appointments as District Superintendent have been made in any of the Districts in the Division. However, we will have completed our Division organization by next month. All members who are engaged in active relay work should get in touch immediately with their Assistant Division Manager and secure an appointment as an Official Relay Station. No City Managers have been appointed under the new organization.

Relay work increased considerably during the past month. This is a rather unusual occurence for this part of the year. The recent slump in the broadcasting outfits, has no doubt, a lot to do with this state of affairs.

ARKANSAS: 5JD, Kinsolving, has resigned as District Superintendent for the State. Not much traffic moving thru the state now. However 5JF, 5CB, 5XAC, 5ABY, 5ZAZ (ex 5OI), 5WF and 5RO are on the air occasionally. 5CR at Little Rock will be on shortly with the spark set and a small C.W. set. 5ZAZ at Fayetteville is rebuilding the station and will have his record buster 20 watt C.W. back in operation. 5DQ going OK now and then.

LOUISIANA: Relay activities are increasing. 5ZAB is being remodelled on elaborate scale which will result in it being a much better and bigger station with remote control for spark and 20 watt C.W. 5ABA has recently opened up with 10 watts C.W. and is tearing things asunder out his way. 5ZAP and 5UK have been demonstrating their prowess and will doubtless prove to be invaluable stations next fall.

MISSISSIPPI: 5YE has been operating on irregular schedule due to heavy QRN which has invaded his part of the globe. 5ZAU, no other than ex-5ZP of Nola, now at Bay St. Louis, Miss. will be ready for operation in a very short time.

TENNESSEE: Relay activities rather light in this state. A report was received from only one City Manager. Activity in Knoxville is still very slow. The fellows would rather listen to broadcasting and go swimming than relay messages. Station 5RE is now operating with one 5 watt tube and seems to be kicking up some racket but has relayed only a few messages. 5WO has his 15 watt set ready for action but is doing very little work. (Probably waiting for broadcasting to let up) 5WS, the City Manager of Knoxville, is very quiet but will be going full force this fall. 5DO, Memphis, reports his station in operation

and handled quite a few messages during the month. (Excellent spirit DO, keep it up.) Mr. Hutcheson, A.D.M., 5DA of Wind Rock has been away during the month and consequently was unable to operate the set. He handled 11 msgs. during the short time he was on, however. (Good work Hutch—may your tribe increase.)

EAST GULF DIVISION
B. W. Benning, Mgr.

FLORIDA: Jacksonville: District Supt. M. D. Clark reports that in spite of summer weather the gang is keeping up its interest and new stations are being put into shape for real work this fall. 4HZ with 10 watts of C.W. has made his debut into the DX game and is now going strong. 4EZ has replaced his half KW spark with a full KW and has increased his range accordingly. 4EZ to 4FD continues to be the ONE reliable short jump relay that works thru all weather; and practically all of Florida messages are handled over this route at present.

Louis Bookwalter reports there are two *real* stations in West Palm Beach, 4DZ, spark and 4DL, C.W. 4DL is reaching out practically every night and reports working a few stations in the second, third, fourth and fifth districts. This, along with the DX done by 4DZ on spark, is a real accomplishment for stations located as far south in Florida as they are.

GEORGIA: 4FD and 4GN have been tearing off traffic by the armful. 4GL has been on a few nights but outside of this we have no dope from Atlanta. Atlanta fellows failed to report on time and it is only by hard work on our part that we are able to report the following. 4BI, 4GM, 4HS and 4KF are the only stations in Atlanta that are doing any work at present in the relay line. 4BI spark and 4KF C.W. are doing the best work. These two stations are doing relay work with the same ease that is expected in winter weather. 4HS and 4GM sparks are also doing nice work.

ALABAMA: ! ! ! Mac has come across with a letter giving us some dope on Alabama. 5XA has been closed down all summer undergoing repairs, removal, remodeling and much new equipment added. 5XA will undoubtedly be one of the best equipped amateur stations in the south next year and we will be able to handle all sorts of traffic (HOT DOG!—B.W.B.)

Just one parting word or two, fellows. You probably noticed the blank space that was the report of the East Gulf for last month. We won't try to make any alibi about it but will just say this: IF YOU EXPECT REPRESENTATION IN *QST* YOU WILL HAVE TO GET YOUR REPORTS IN ATLANTA BY THE 28th OF THE MONTH.

ALASKAN DIVISION
Roy Anderson, Mgr.

The writer made a journey to Hyder this month and found another radio enthusiast in the form of E. L. Dale, of the radio service at that place. 7IT is experimenting with burnt out bulbs and worn out storage batteries. His persistency will one day yield him a lifelong membership in the Morningside Sanitorium. Several new members decorate the A.R.R.L. Alaskan membership list, but these new fellows are unusually quiet, considering that they are supposed to be *wireless amateurs.*

MIDWEST DIVISION
L. A. Benson, Mgr.

IOWA: July was marked by a number of severe lightning storms which made it quite impossible to handle a great amount of traffic. 9BSG did good work in pushing messages thru Des Moines and 9FK managed to hold Clinton open, using both spark and C.W. 9BGH with 5 watts and 9BZ with 10 watts keep pumping thru the Q... 9DRA on spark and 9AMU on C.W. are heard again. 9AEQ is cutting thru fine on both spark and C.W. and offers a route to Omaha. A good station is needed at Sioux City to connect with 9BGH.

NEBRASKA: 9HG, 9DPB, and 9HT have been sticking it out. 9DQE pounds thru on his C.W. of low power. The broadcasting is dying away and amateur operation is being resumed. 9WI continues to move traffic. Lou Chancky has been appointed Route Manager, and R. J. Rockwell has been appointed District Superintendent.

NEW ENGLAND DIVISION
P. F. Robinson, Mgr.

Traffic has shown a decrease for the past month but a large number of stations stick on the job in spite of QRN and hot weather. 1BGF has been reported in every district which is something unusual for a station on the Atlantic coast.

1ANQ is back on the air again after a long lay-off. 1BM has taken up C.W. 1QP has tried out 23 new designs of antenna in the hope of finding a better radiator for C.W. 1SC continues his good work on both spark and C.W. 1ASF spends his time trying to make the super-regenerator work. (Let us know how you come out, OM.—T.M.) McShane at 1BRQ keeps the gang up in Maine on the job. From 1BDV to 1VT stations pound away nightly. QRN does not seem to bother them at all. "LW" of 1DY has everything running smoothly, but "LN" is seldom heard. 'Smatter OM, is there a lady in the case? 1CK is experimenting with a 5 watt tube set, and keeps the old spark on the job for traffic work.

NORTHWESTERN DIVISION
H. F. Mason, Mgr.

Re-organization of this division is nearly completed. During the sumer lull in relay work, the division officers are lining things up in a manner that will bring big results when winter comes. If you haven't received your official relay appointment yet, or haven't been reporting messages handled, please get in touch with the Asst. Mgr. in charge of your State without delay. They are:

Montana: H. E. Cutting, Box 517, Bozeman, Montana.

Idaho: B. B. Bliss, Jr., 417 Bannock Street, Boise, Idaho.

Oregon: Royal Mumford, Rt. #1, Box 15-A, Vancouver, Washington.

Washington: K. W. Weingarten, 3219 North 24th Street, Tacoma, Wash.

These men are out to improve relay work, by lining up relay activities in their respective States. Do your part to improve relay work, by reporting activities and traffic handled to them.

At present, heavy static prevents the handling of much traffic in the eastern and central parts of the division, but along the coast, its effect is not near so pronounced upon relay work. There are many low powered C.W. stations on the air throughout the division, and if you spark fellows will only tune for them, and give them your traffic when the QSS is bad, you'll find that they will put it through for you. (Righto!—T.M.)

MONTANA: Practically no traffic is being handled on account of QRN, and many stations are off the job for this reason. Accordingly, the A.D.M. is too busy going after new Dist. Supts. to try to make up a report for this month. 7ZU at Billings is doing his darndest to keep the Northern Route east open all summer, but there just isn't anyone on with whom he can handle traffic consistently in either direction. He is using both spark and C.W.

IDAHO: There are quite a few stations on the air, but impossible to do anything outside of local work, owing to the intense QRN. 7AEM, and 7OK are two new stations in Boise, who are alternating with 7YA and 7OT. 7WG and 7JF in the northern part of the state are also locked up by QRN, but are heard at times. Mr. Bliss, A.D.M., is to be congratulated on the progress he is making towards getting his state in readiness for the coming relay season.

OREGON: With static, broadcasting, and vacations, there is mostly NIL for a reports from this State this month. However, 7NA, 7TO, and 7VF of Portland deserve mention for their consistent work in the face of adverse conditions. 7IW, D.S. at Eugene, is the only station handling traffic in his city. The rest are all rebuilding and putting in C.W.

WASHINGTON: Eastern District. L. C. Maybee, D.S. at Pasco, reports traffic moving west with good regularity, but eastern traffic is moved with much difficulty. 7GE was QSO with 7AAB at Billings, Mont., when F. S. from 9ZN was operating there, during his vacation trip, but owing to 7AAB's QRS with the code, it is impossible to get anything through now. 7TH in Walla Walla has a ten watt C.W. set, and is anxious to help out by QSRing eastbound traffic. At Spokane, 7QW, 7NL, and 7OF are worked OK from Seattle, but bad QSS is experienced in working them from Pasco. Also, these Spokane stations have great difficulty in passing traffic to stations further east.

Grays Harbor District: Walt Hemrich, D.S. reports everything OK in his district. Traffic for the south or east may be routed thru Grays Harbor stations with the assurance that it will be promptly forwarded. C.W. is playing an important part here. One is on every night, and they can't get enough traffic to satisfy them. 7KJ, 7NW, and 7SC are handling the bulk of the traffic.

Tacoma District: Wm. Motz, 7QE has recently been appointed D.S., and states that 7BG, 7QE and 7AW are handling some relay traffic, but that much unnecessary local work during relay hours interferes to quite an extent. A number of new stations have been installed.

Seattle District: Mr. Kinsey, 7PO, having gone to sea again, a report from this city is totally lacking this month.

ONTARIO DIVISION
A. H. K. Russel, Mgr.

Owing to the D.M. taking a holiday a little early in the month, this report only can take in the information of the Toronto district.

Toronto continues to be converted into a C.W. hive and there is a new one to be heard nearly every night now, though most of them haven't got busy on the DX work yet. The latest converts to C.W. are 3GE and 3FO. The spark will be kept in the case of 3GE as a standby. 3CZ has been practically out of business in the relay line, due to his taking over the post of engineer of the broadcasting plant at CFCA. 3JI and 3JK to which is now added 3FC, all keep Toronto on the map. 9AL also has been on the air a little more than usual, due to his wife having gone to the country on a vacation.

PACIFIC DIVISION
J. V. Wise, Mgr.

Due to the vacation season very few reports have been received; districts that reported are as follows:

Dist. B—Our old friend, 6FK, of San

Diego, has been forced to resign as District Superintendent as his time is taken up with other things. Mr. L. Picker, 6AJH, San Ysidro, succeeds him. With the summer QRM and the ARC QRM to battle very little DX work has been done, and few messages handled. The following stations handled traffic for the district, C.W. 6EC, 6TW, 6ZB; Spark—6AHF, 6ZB, 6AJH and 6AVR. 6GT and 6IV a little further north, deserve special mention for their aid in getting traffic through.

Dist. G—6EX, 6VK, 6HP, 6ZI, 6AQU and 6ZAF are handling the larger amount of traffic to and from Oakland. 6ZI and 6ZAF are still working 6ZAC, showing the merits of C.W. during the static season. Stations north and south are easily worked direct regardless of static.

Dist. H—6GR spark carries away the honors of both the division and the district with 212 messages to his credit. Almost a continuous watch is kept at this station as two operators are on the job. 6GF and 6FH are breaking through in nice style on C.W. The one peculiar thing is the fact that few sevens have been heard here since the middle of May. Getting traffic north has been hard work as well as very slow.

Dist. J—All stations in this district have closed for the remainder of the summer. 6AJR will be on again with a 50 watt C.W. plant.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Last month we promised Schnell 1000 msgs. this time. And we went ourselves one better with 1178. A little team work and a traffic report from nearly everyone did the trick. Fellows, your Division Manager is proud of you and congratulates every man. Here is how it was done.

NORTH CAROLINA put it over with a rush this month. The splendid spirit evidenced throughout the State makes us feel good all over. Several of the fellows were so doggone anxious to get the maximum number of msgs. that they wired in the dope at the last minute. That's the real spirit.

First District: 4GX and 4DC are doing all the work in this section since all the Winston-Salem bunch is quiet now due to rebuilding and moving stations. This district, formerly the most active in the state, will push forward with 4EN and 4CX back in the game. 4GX and 4DC, both in Greensboro, have been reported in Lewisburg, W. Va., in daylight by 8AMD which is very fine work indeed. The majority of the msgs. handled by these two stations have been in daylight.

Second District: 4MW, 4GH, 4DS, 4IE, 4KC, and 4LP are all going strong in this district as the traffic report shows. 4MW is the Boiled Owl of the lot. 4KC has been away most of the month but comes forward at the last moment with a traffic report. 4GH, who rambles all over N. C. and keeps well in touch with everyone, reports unprecedented activity and enthusiasm all over his district, and the state. 4IE is a big aid on spark during the summer. 4DS and 4LP are both reaching out and handling traffic regularly.

Third District: 4ID is doing all the relay work done in his district. Don't let one man do it all, fellows. You Charlotte fellows forget that broadcast stuff and come back into the fold, we need your help.

Fourth District: 4MF is reaching out on spark.

4EA has given up spark for C.W. (Had to in order to prevent Civil War in New Bern, HI!) A 20 watt C.W. will soon blossom forth.

4BX is with us strong now on C.W. He is clearing all points north and south, maintaining schedules both ways, boasts two operators and is a real *relay* station.

WEST VIRGINIA seems to be the only state in the division that has not fully recovered from the usual summer sickness.

8AMD heard all of the following and worked a good many of them in daylight: 3BZ, 4DC, 4GX, 3AEV, 8CAY, 8SP, 8CHO, 8AVW, 8BDB and 3BLF. He seems to have done the best daylight work of anyone in the division, having worked both 3BZ and 3AEV at Danville, an unheard of thing before.

In the Fifth District, 8BDB is by far the most active station and is clearing stuff in great shape as the traffic report shows. 8SP has improved the 100-watt C.W. set and is going strong. 8AFD is now QSA everywhere with straight and I.C.W. 8WD is rebuilding and has one 80 foot stick up in the air. He and 8BAZ are the two spark men in the state. 8CHO, on 10 watts of C.W., is doing far better work than he ever did on spark. 8CAY is heard sometimes and on the 4th of July logged stations as far west as Canton, O. in daylight. He was also heard in Danville, Va. in daylight.

VIRGINIA: The outstanding features of the month's work in the Old Dominion are the extraordinarily large number of msgs. handled and the opening up of reliable daylight work between Norfolk and Richmond. The daylight transcons are chiefly responsible for bringing about the latter condition. Some of the stations working surprised themselves.

First District: Portsmouth and Norfolk are staging a grand comeback. On July 14th extensive tests were held at NAM to eliminate interference on short waves and some very interesting results obtained. Local A.R.R.L. men assisted in making audibility readings. A filter system now used promises to almost eliminate the mush.

July 4th seems to have been a red letter day for the gang and communication was had with Richmond in daylight; something new in this section. 3BNE, 3ACK, 3MK, 3BVC, 3ACZ, and 3ZZ were able to work and handle traffic with the Capitol and a Sunday schedule has been arranged with 3BLF, 3TJ and 3BIJ at Richmond. 3ATZ, 3BVB, and 3ADJ will be ready for work when overhauling is completed.

Newport News stations are coming along fine with the following being lined up 3AAG, 3AAH, 3IE, 3AFJ, and 3AFG. 3MK has his 100 watt C.W. set going now and is batting off at a rapid clip. 3ZZ will soon be there with 500 watts but in the meantime the little 10 watt outfit is doing valiant work.

Second District: 3TJ participated in the 4th of July work and is reaching out in good shape. The A.R.R.L. is represented in Petersburg by two live bugs, 3BNM with 10 watts and 3AUU with 50 watts. The signals of both stations are fine and the traffic report testifies as to their energy. Good work!

Third District: Conditions around Richmond are improving greatly with a number of converted B Ls turning to the relay game. The following stations are counted on to do good work. 3BVL, 3AJG, 3HI, 3BQX, 3BUL, and 3BNN. 3BIJ, Richmond, has lost one of his 50s and is now hopping about on one leg but getting there just the same. Richmond stations are working on regular schedules north and south which accounts for the large amount of traffic handled there.

Fourth District: 3BLF, Richmond, is holding down this district alone. Rectifier trouble has hindered but despite that msgs. have been handled, mostly on regular schedules.

Fifth District: This likewise is a one station district with 3IW *the* station with a traffic report that is mighty good. 3IW has hooked with Richmond in daylight which, considering the QRM from high power stations and hams around Washington, is very good. His sigs are strong everywhere and he is one of the most consistent traffic men in the division.

Eighth District: 3BZ and 3AEV both manage to squeeze in a few msgs. between business and A.R.R.L. organization work. Daylight work with Richmond and Greensboro accounts for a good bit of their traffic.

Ninth District: Stations are scarce in this district at present, 3CA, 3RF, and 3BIY are out for overhauling. 3BIY is undergoing a real overhauling since he has just added an O.W. to the oufit. 3HL has junked the spark and is now working C.W.

Tenth District: 3AOV has had very little time for radio but looks forward to the day when he will be back with both feet and C.W.

NOW fellows here is something worth digging for. To the station having the largest percentage of increase in traffic handled between August 20 and December 20 over the traffic handled April 20 to Aug. 20 we are going to award a combination 0-15 and 0-150 volt voltmeter. A precision instrument to keep the batteries in good shape and general testing purposes. If you handled no msgs. during April 20 to Aug. 20 period or if during any month in that period no msgs. were handled a handicap will be set equal to the average number of msgs. handled by similar stations of the same power in your immediate vicinity. The instrument is donated by a concern interested in Citizen Radio. A fair chance for all. Who gets the Xmas present?

Lets go!

ROCKY MOUNTAIN DIVISION
N. R. Hood, Mgr.

The reorganization of the Rocky Mountain Division now shows the following lineup: N. R. Hood, 1022 So. Ash St., Casper, Wyo., Division Manager; R. C. Schryver, 2111 So. Franklin St., Denver, Colo., A.D.M. for Colorado; Philip Laskowitz District Supt. in and around Denver; Glen Garner, 583 36th St., Ogden, Utah, A.D.M. for Utah; Ralph Baker Supt. Dist. No. 1 in Southern Utah; Evan Seegmiller, Supt. Dist. No. 2 in northern Utah; and F. N. Mitchell, Box 575, Greybull, Wyo., A.D.M. for Wyoming. No Dist. Supts. assigned as yet for Wyoming.

The division is now on a business basis and results are now showing up altho the summer season has been a hard time to reorganize and to keep interest up at the same time. Routes north and south thru the division run as follows: Denver, Cheyenne, Douglas, Casper, Greybull, and thence to Montana points. The Utah north and south routes are thru Richfield, Salt Lake, Ogden, and thence into Montana. Routes east and west run thru Colorado into Utah and from Nebraska thru Wyoming into Montana and other points in the Northwest Division.

COLORADO — 9BJI, 9DTH, 9DUC, 9AYU and 9BXA have all been on their vacations which accounts for small amount of traffic from Colorado this month. 9AMB is still carrying on relay work in his customary manner. He has installed a 5 watt set for the first thousand miles and saving the 50 watter for DX work. Wonder what he calls DX work. A good many fellows are rebuilding for next winter. 9DVA who had the wonder 10 watt set last winter is building two 125 foot masts and a shack on the edge of Denver and as he puts it there will be just one relay from New York to Honolulu and that will be 9DVA's 200 watt set. 9AJA who has been in Chicago last winter is with the Colorado amateurs again located in Denver. 9DHI

is rebuilding, installing 10 watts C.W. for his ½ KW spark and a Reinartz tuner. Colorado will be a C.W. state 100% judging from the progress made in the installation of C.W. sets in that state the last few months.

WYOMING—7LU is being heard from the west coast as far east as the Ohio river. A daylite route was open thru the State from 7ZV spk. at Douglas to 7ZO C.W. at Casper to 7LU C.W. at Greybull and during the tests 7LU and 7ZO were in touch with all tubes out of their sockets but one lone 5 watter and worked 170 miles daylite over mountains and bad lands. QRN is fierce in this State especially around Casper and Douglas, there being lightning storms about fifty evenings out of each week which fill the Wyoming ether with QRN.

VANCOUVER DIVISION
W. D. Wood, Mgr.

The month of July in the Vancouver Division has been rather slow in the relay field, but other amateur activities are going ahead nicely.

No traffic has been handled with any Canadians outside of the local work. The only eastern Canadians to get across the Rockies this month are 4BV and 4CB, both on C.W. To the north, Prince Rupert has been unable to reach Vancouver so far, but things are going ahead up there and 5CX and 5AX will be on C.W. this fall. 5CT and 5DX have got across to the nearby "7s." To the south 7BK, 7GE, 7VZ and numerous other sparks are still easy to work, but not as reliable as in the good season. QRN makes a worse mess of things in the summer than QRM does in the winter. 6KA comes in at Vancouver like a local station and is heard here almost any night. 9BD can work 7QW in Spokane any night "rain or shine." 7QW is on C.W.

WEST GULF DIVISION
F. M. Corlett, Mgr.

NORTH TEXAS SECTION: Every station in and around Waco seems to be undergoing repairs which has cut down the traffic handled considerably. 5ZAF has moved his station to the Sanger Bros. Department Store. Relay work can be done almost any time during the 24 hours. 5IQ has rebuilt both his receiving and transmitting sets. 5MK at Ennis, Texas, is moving to Dallas.

OKLAHOMA: You fellows who think you know just where to tune in order to get Oklahoma stations just as well scratch new marks on your tuner. U. S. Radio Inspector Deiler has been in our section and with the aid of his "leather box" has caused several stations to make radical shifts in regard to wave length and decrement; operators of C.W. stations are also getting some *real* dope as to what their wave length actually is and will no longer have any excuse for using anything from 200 on up.

To LeRoy Moffett, Sr., dad of 5HK, we hand the cake for being an expert mast builder. Moffett has just succeeded in completing a 122 foot mast which stands solidly, without the use of a single guy wire. Some pole we say! 5ZG has a new C.W. set. 5BM is busy rebuilding during the summer. 5ZM is pounding through in fine shape on spark but atmospheric conditions will not allow much traffic via this method. 5PU, 5LB and others are on the job part of the time. 5ADQ is a new spark that has started up in Oklahoma City. As is always the case, about every station in the state during these summer months is being "re-built" (which usually takes all summer!). Rebuilding is something that we must do sooner or later and of course summer is picked as the best time for it, but what we can't see is why everyone, seemingly, dismantles their set at the same time. This entirely eliminates short jump routes just at the time when they are actually needed and the inevitable result is indicated by reports similar to ours of this month; few or no messages handled. Whaddusa Ohlahoma "ops," can't we improve this situation and handle a little more traffic?

SOUTHERN TEXAS SECTION: It is most encouraging to see all districts come in with their reports voluntarily, and on time. East Texas is just scintillating with enthusiasm over prospects and early attempts at short relay work. 5KN has pepped up the gang and has developed 5OC, 5PZ, and 5XAD—two sparks and two C.W. Our fondest hopes of a traffic outlet to Nola are taking shape thru their efforts. Galveston shows signs of fight because they have not had sufficient representation in the section reports. That's the stuff, fellows. Glad that you have shown signs of life, the space is here for all live wires, so if you fellows will only live up to half of your threats, we will be most proud of you in our traffic organization. 5CQ has divided, Mora moving to La Marque and Levy continuing. 5ACR on C.W. is the most consistent station. 5TT and 5BV are spark, while 5VY, 5IM, and 5ADY are dashing it out with 5 watters with prospects of the usual increase in number of tubes. Goose Creek has two good stations in 5AEI and 5AFY. Houston is being represented during the summer month by 5AE, 5BA, 5PB, 5NK, 5PO, 5NN, and 5ZX, all C.W. 5XB will be a feast for the eye as well as the ear this season, the A.D.M. having recently made a tour of inspection in that district and found things being put in fine shape. 5ZP has a single

(Concluded on page 41)

International Mix-ups

In the "Calls Heard" section of the *June QST*, "Ex-3AHA" mentions hearing a C.W. station signing 2LZ call 2OM and later ask station 2MZ what wave 8MT works on, and then calling 8MT, etc. The report read as if ex-3AHA believed these to be U.S. amateur calls, but Leon Deloy, French 8AB, volunteers for the sake of accuracy that they probably were not. 8MT is a French amateur somewhere in Somme and French 8AB has itself worked British 2OM and we know from the British magazines that there are such stations as 2LZ and 2MZ. Thus we have a very pretty international tangle: American ex-3AHA, while in harbor in Germany, overheard British 2LZ calling French 8MT!

Very shortly the need will become imperative for an international agreement where the nationality of the amateur stations, both the caller and the one called, will be evident by the call, the intermediate signal, or some special prefix. Mr. Deloy suggests that the initial of the nationality might serve as a prefix to the call letters.

Another Transatlantic Echo

As an outgrowth of last winter's Transatlantic Tests we have had the pleasure of meeting Marconi Inspector D. E. Pearson, the checking operator who sat in with Paul F. Godley at Ardrossan as a representative of British amateur radio. Mr. Pearson arrived in New York recently on the S. S. "Elysia" from Glasgow to Boston and while in port was the guest of Mr. Godley. Our readers will remember that at the request of Mr. Philip R. Coursey, editor of "Wireless World," the British Marconi company kindly placed the invaluable services of Mr. Pearson at the disposal of our representative and Mr. Pearson was on the job thruout that history-making but tortuous ten days.

At dinner at the Engineers' Club in New York on July 31st the A.R.R.L. president, traffic manager, treasurer, and secretary had as their guests Mr. Pearson, Mr. Godley, and Mr. H. H. Beverage, developer of the "Beverage wire" the use of which contributed substantially to the success of Mr. Godley's mission. Mr. Beverage, it will be remembered, sailed on the same vessel as Mr. Godley, and had just returned to this country after nine months in South America, Africa, England and Central Europe.

Mr. Pearson is a most likable fellow, immensely interested in American amateur radio, and keen for the possibilities of two-way amateur telegraphy between the two great English-speaking nations. We told him, by the way, how his assignment at Ardrossan had been the envy of every American ham—how any amateur in the U.S.A. would have given a leg to have sat in with Mr. Godley on the Scotch coast and heard our American signals come rolling in. "Well," he smiled, "when I think of the weather we had some of those nights, there was many a time they could have had the job!" But he didn't mean it. He confessed that when he first heard of Godley's arrival he had scouted the possibility of receiving signals, but when he saw that superheterodyne he decided that he would withhold judgment—it had more tubes than any amplifier he had previously seen. And now he has an immense respect for its performance and for the accomplishment of the American amateurs whose signals "got over."

We hope that Mr. Pearson can come back to this country soon—there are thousands of amateurs eager to meet him and shake his hand.

Canadian Regulations

The Canadian Radiotelegraph Act of 1912 does not lay down any operating rules but gives the administrative department the power to make regulations from time to time, making revision of regulations possible at any time without unnecessary red tape and delay. The department is very favorable to the amateur and is willing to let him have his fair share of the ether. They do not recognize any distinction between the various classes (telegraphers and broadcast listeners) and are very anxious that these two groups live at peace with each other without interference from headquarters.

The wave length limits favor C.W. transmission, amateurs being permitted up to 180 meters for spark and up to 200 for C.W., while experimental stations observe

the same maximum for spark but may use 275 for C.W. The maximum power permitted is 500 watts, which is not all that might be desired for spark, but the spark is rapidly dying in Canada and nobody wants or can afford more than that in C.W.

Chinese Strays

With communication to Hawaii an established fact we all wonder what next. We have dared to venture several wild guesses which came true and now we are looking for new lands to conquer. Mr. E. T. Lockwood has been an ardent pusher of radio in China and we are greatly indebted to him for the following information gleaned from some of his interesting letters.

It is rather apparent that the Peking government has been so busy with political affairs of much importance that amateur radio has not been seriously considered except to give out the general order that no radio stations are allowed. In places this rule has not been carried out against foreigners, or in cases where the circumstances are extenuating, or where a special license has been granted. Shanghai, the principal port and probably the most influential city of China is, for the most part governed by an international Municipal Council and is not subject to jurisdiction of the Chinese government. Here amateurs have been permitted to erect stations and transmit on whatever they please without restriction. Several government and commercial stations are in the vicinity. FFZ, owned by the French government, often reprimands the amateurs near their wave but no drastic action has been taken to curb the few too enthusiastic hams.

It has been estimated that there are a hundred amateurs in Shanghai. They have never gotten together to form a club because of the difficulties of nationality, being mostly American, British, French, Italian, Japanese and Chinese. Because of the legal reasons mentioned above the Shanghai experimenters form most of the amateurs in China and for the most part confine their efforts to receiving. There are perhaps four or five amateur stations equipped to transmit with moderate power but they have no place to communicate except across town. As in nearly all parts of the world except the United States and some European countries, material for construction of sets is very scarce. Vacuum tubes and other equipment are rated as a commodity and not only retail for several times their value in America but are classed by the customs officials the same as guns and ammunition, and often require special permits from Pekin in order to import them. These permits needless to say cost much time and trouble.

It appears that amateurs in Japan would be under such restrictions that the establishment of a high power relay station would not be permitted. This necessitates direct operation between Hawaii and China for relaying to this country. The distance is greater than we have yet attempted, for from the U.S. to Hawaii is but a third of the way to China. We hardly dare venture a guess as to the power necessary but with the coming of better methods of receiving we still have high hopes of completing the trans-pacific jump. Needless to say the traffic both ways would be heavy as the cable rate is $1.50 per word and delays are frequent.

British Broadcasting

British manufacturers are extremely busy in anticipation of a broadcasting boom this winter. The importation of receiving sets has been forbidden and all the sets will be British-made. Altho doubtless this will be a disappointment to some American manufacturers, such action was necessary to protect British industry against Germany, who it was feared would push in crystal sets for next-to-nothing.

Meanwhile we have no reliable information on the conditions under which broadcasting will be carried out in England. We understand the matter has been settled in some manner but at last reports the Postmaster General and the manufacturers still had their differences. Majority sentiment seems to be in favor of forming a broadcasting company with sufficient capital to build the eight contemplated broadcasting stations, to cost approximately £20,000 each, the money to be subscribed by the various firms in proportion to their status. To operate the stations it has been proposed that the manufacturers pay to the operat-

(Concluded on page 41)

Two complete receiving stations are being installed in a 72 family apartment house in Newark, N. J., with a directive loop on each set pointing to a particular broadcasting station. An operator is in charge of the equipment and connects the programs picked up to two complete circuits that run to each of the 72 apartments, so that the tenant may plug into either concert.

Denver has a new broadcasting station of considerable size—KFAF. It was installed by E. F. Horn and is one of the largest on the west coast, employing two 50-watt tubes

for the master oscillator and Heising modulation and amplification of this modulated high frequency energy by means of two 250-watt tubes giving a total output of 550-watts into an antenna 120 ft. high. The station was built by the Western Radio Corporation.

A short time ago Mr. Geo. R. Call of 9ZU had the opportunity of installing and operating a receiving set on a special train of the Chamber of Commerce on a tour of South Dakota.

The equipment consisted of a Westinghouse RC set with a two step power amplifier and magnavox. The aerial was a single wire about ten inches above the two rear steel coaches. Ground connection was made to the truck of one car. The operation of the loud speaker did not prove satisfactory when the car was in motion as the noise to be overcome was too great and the rattling of the tubes and horn made considerable surplus noise. The receivers not only made the signals more clear but kept out a great amount of extraneous noise.

Leaving Sioux City, Iowa, the station of the Sioux City Radio Laboratory was picked up while broadcasting the morning news and heard all over the observation car. The station of the University of South Dakota at Vermillion was heard connecting up with Sioux City and was informed of the departure of the special train. The passengers were then given a talk of welcome and were informed they would be met at the station.

When the train had pulled ten or fifteen miles out of Vermillion the Dean of the Engineering College gave a very eloquent farewell address over the radiophone. This was very easily picked up and greatly enjoyed by all who heard him. All along the route there were a number of amateurs who were at the railroad station with copies of all the broadcasts thinking possibly they had not been picked up on the train. Both Sioux City and Vermillion were heard up to about 225 miles, or a point just west of Chamberlain. Those interested in the stock market were kept informed and many news items were picked up while enroute.

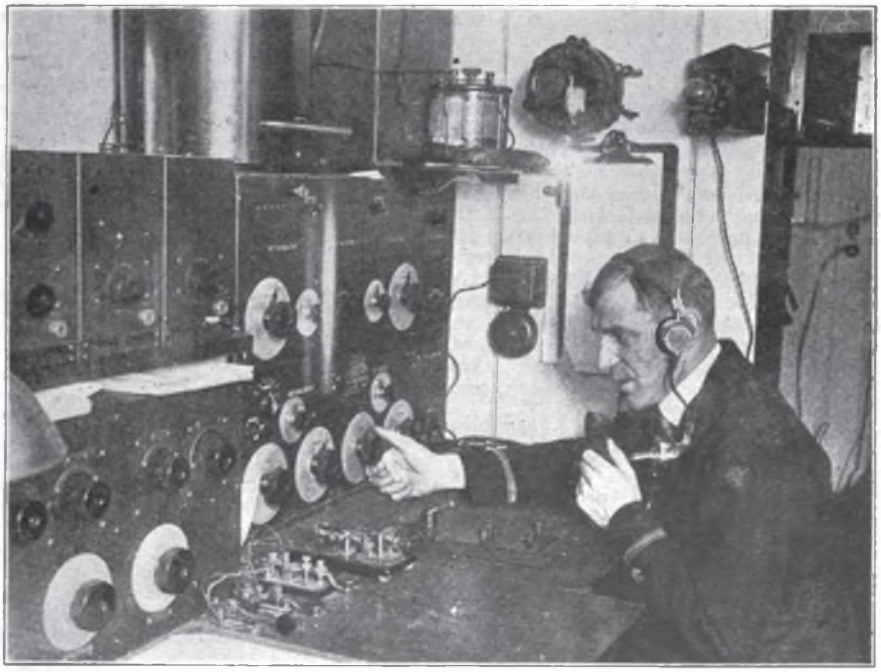
When following power lines a continual a.c. hum was heard and induction from railroad telegraph wires, fans, and generators on the train caused some annoyance. These troubles must be remedied before communication with moving trains is perfected to a high state, which does not appear to be very far in the future. Experiments such as these contributed to the advancement in this field and point out the uses to which communication with moving trains can be put.

WJZ in a Row

Recently we mentioned that the broadcasting stations in the vicinity of New York had got together and agreed upon a division of operating hours, co-operating much as we amateurs do in a local "Plan." All but WJZ. WJZ, it is said, has declined to join with fifteen others in a schedule, holding that its better programs justify it in broadcasting continually from 7 p.m. until midnight. Petitions are being sent Commerce, we hear, urging the revo-

cation of WJZ's license; meanwhile WJZ is taking a poll of public opinion to see whether the station shall continue on the air all night or shall cease altogether—which the management threatens as an alternative.

WJZ is operated jointly by the Radio Corp. and Westinghouse. In the meantime a new G.E.-R.C.A.-Westinghouse station is being constructed in the heart of Manhattan and upon its completion will supplant WJZ. We hear that J. O. Smith will be the manager of the new station.



THE RADIOPHONE ROOM ON THE S. S. "AMERICA." The "America" is equipped with experimental Western Electric phone equipment and many of our readers have listened in to her long distance experiments with 2XJ, Deal Beach, N. J., over remarkable distances. Above the bell at the operator's right may be seen an oil-filled variable condenser sitting within a coil of heavy wire. These form a wave trap which is part of the circuit arrangement which makes duplex working possible so that conversation may be carried on in both directions simultaneously, like a land telephone. The "America" is also equipped with an Armstrong super-heterodyne receiving system, we understand, the first vessel to be so outfitted. (Photo by Kadel & Herbert.)

Texas Time Division

The Dallas Radio Club and the Ft. Worth Radio Club, acting at the suggestion of West Gulf Division Manager Corlett, recently appointed committees who met with representatives of the many broadcasting stations which those two cities now have, and as a result an allocation of operating hours was agreed upon which will prevent conflicts, eliminate interference, and do much to restore the harmony of pre-broadcasting days. The schedule is as follows:

8:00 a.m. to 9:00 a.m. Broadcasting
9:00 a.m. to 10:50 a.m. Amateurs
10:50 a.m. to 11:05 a.m. Quiet for time signals
11:05 a.m. to 4:00 p.m. Broadcasting
4:00 p.m. to 6:00 p.m. Amateurs
6:00 p.m. to 8:55 p.m. Broadcasting
8:55 p.m. to 9:01 p.m. Quiet for time signals
9:01 p.m. to 10:00 p.m. Broadcasting
10:00 p.m. to 8:00 a.m. Amateurs

The broadcasting stations in each city are getting together themselves now, and subdividing the portions of the day scheduled for broadcasting. Such an arrangement is heartily to be commended; the broadcasting stations do a minimum of self-jamming, amateur interference is eliminated, and the amateur gets a portion of the evening to operate in peace without being smothered by the fuzz from local broadcasters and without feeling that ten thousand of his townsmen are heaping damnations on his defenseless head. The present plan is a concrete exhibition of that co-operative effort we have so strongly urged upon our members.

(Concluded on page 41)

Every now and then an application for affiliation with the A.R.R.L. is received from some club which seems to have been organized for the purpose of utilizing the good name of our A.R.R.L. on its stationery as a lure for the innocent novice who is seeking information. The novice has come to know that good sound advice comes from an A.R.R.L. man and he seeks such acquaintances in the various clubs throughout the country. A number of these clubs can be recognized by the fact that they are so eager to use "affiliated with the A.R.R.L." on their stationery or monthly publication that this form is being used even though the club has not been affiliated. A club is affiliated only after the Operating Department has satisfied itself through an investigation that the club is worthy of such affiliation and the Board of Direction has given final approval of acceptance, and such announcement appears in *QST*.

The A.R.R.L. has no desire to affiliate clubs which have a tendency towards commercializing the interest of the amateur and when satisfactory evidence cannot be given as to the worthy qualification of clubs filing application for affiliation, the A.R.R.L. will not consider such application any further unless the investigation shows the purpose a righteous one.

True, we want more clubs to affiliate with us so long as they can conscientiously share our views in the same spirit, but we must draw a line on the club that is organized from the commercial standpoint and hopes to thrive on the use of the name of the A.R.R.L. without authority.

Worcester County Radio Association

A radio exhibit to consist of receiving and transmitting equipment is to be held under the auspices of the W.C.R.A. during the New England Fair at Worcester, September 2nd to 6th. The radio show will be held in a large building suitable for a number of exhibits.

South Jersey Radio Association

During the month of September the new Armstrong super-regenerator will be demonstrated by members of the club. The demonstration will be for the benefit of the public. The club boasts of 200 members with practically every member a member of the A.R.R.L. (Let us know how you come out on the A. S/R.—T.M.)

Radio Club of Hartford

The Radio Club of Hartford will resume its meetings beginning with September. During the summer months the club ceases its meetings because so many of its members are away on vacations and there is no enjoyment when interest is at low ebb.

New Haven Radio Association

"One of the best organized clubs that ever held a meeting," is the boast of the New Haven Radio Association. The roll contains the names of 300 members. A great many of the novices are being instructed in the telegraph code for which a complete set of Victor records has been loaned to the club. The records are loaned to different members for several days and in that way everyone has a chance at them.

Flint Radio Association

Probably no other club in the middle west has done as much for the novice as the Flint Radio Association. Hours are so regulated that the broadcast listener does not know what local QRM means and he knows that after 10:00 P.M. the telegraphing A.R.R.L. man comes on the air. The club has done much through the medium of local newspapers, advising the novice against these "fly-by-night" radio shops. (We need some more "Flint" Clubs—T.M.)

The South Bend (Ind.) Radio Association gave the first radio dance ever held in South Bend on June 28th. The dance was a great success and everyone enjoyed themselves.

The radio club is holding meetings thru the summer every other Friday night at the Y.M.C.A. On July 14th a debate was scheduled on the subject, "Resolved that spark is inferior to the continuous wave method of transmission." All A.R.R.L. radio clubs are invited to correspond with this live wire bunch by addressing, V. A. Bloomquist, 510 Sherman Ave., South Bend, Ind.

Radio Club of Irvington, N. J.

Edward W. Heim gave a very interesting talk on audio amplification at a recent meeting which was well attended. Questions are answered at every meeting for the novice. Thursday is the meeting night.

The club is anxious to correspond with other organizations. Address all communications to the club at 17 Union Ave., Irvington, N. J.

West Philadelphia Radio Association

Meetings are held every Thursday evening in the lecture hall of the Library Building, at which time interesting papers are read. 95% of the club members are members of the A.R.R.L. The officers are: A. R. Muncey, Pres.; M. J. Duddy, Secy.; and C. W. Lyon, Treas.

The Year Book of the C. C. R. A.

Bound in a handsome blue cover with the emblem of the Chester County Radio Association done in blue, white, and gold, comes to us the year book of this association.

Its pages chronicle the activities of the C. C. R. A. for the past year. The description of 3ZO and 3XW is illuminated with splendid half tones. With a cut of the charter of affiliation with the A.R.R.L., appears a list of the names of members of the association. Several highly interesting articles are given, including a brief outline of the new Armstrong super-regenerative receiver.

We congratulate the C. C. R. A. on the very excellent piece of work and thank the members for their kindness in sending a copy to headquarters.

OPERATING DEPARTMENT

(Concluded from page 35)

tube 50 watt set in good shape and doing about all the work for that district.

South Central Texas has not been a busy district this summer because of incessant QRM from the 2KW fone set at WCM which seems to find use for most of the hours of the day and nite, but with the coming of DX season some arrangement will be made whereby 5ZU, 5QA, and 5ZAG, three efficient C.W. stations will be in the air. South West Texas, while not a fast growing traffic moving district is, however, fast growing in renewed interest in A.R.R.L. work. Mr. Nettleton is back again after a trip into the heart of old Mexico and is glad to report the installation of a 15 watt fone and C.W. set that will put him back on good terms with the fraternity. 5ZAE and 5ZAN seem always tied when it comes to continued pep.

WINNIPEG DIVISION

J. A. Gjelhang, Actg. Mgr

4CB has installed a C.W. station for 4GB. Static is still very bad most nites for any long distance work, but occasionally we hit a fair nite. 4BR is again on the air with a 20 watt English tube doing very nice work. 4BV is still going but is very busy rebuilding and experimenting.

4CB is rebuilding and waiting for new parts. He has a small receiving set of two steps of R. F. A. and detector going temporarily which works very well so far. 4CB will be heard all over the Province when we get better radio weather.

Come on, fellows, "blow you horn" to your Dist. Supt. Give him something to report and show that you are alive. I can't report your troubles or anything else when I don't hear from you. Get busy right now on that "All Canadian Transcontinental." We want that going by winter and by all means don't let the Winnipeg Division be one of the last in line, be one of the first and the rest will follow.

DOPE ON MAST CONSTRUCTION

(Concluded from page 32B)

on two sides only and total approximately 125 board feet.

1 piece	5½ in.	x 5½ in.	x 5 ft.	redwood or cedar
2 pieces	¾ in.	x 7 in.	x 16 ft.	yellow pine
4 pieces	¾ in.	x 5½ in.	x 16 ft.	
4 pieces	¾ in.	x 4 in.	x 16 ft.	
2 pieces	¾ in.	x 2½ in.	x 16 ft.	
1 piece	2½ in.	x 2½ in.	x 12 ft.	

A mast of any height can be made by modifying the dimensions somewhat, but it is hoped that the reader has obtained some helpful suggestions from this article which will aid in building a mast to meet his needs.

OUR RADIOPHONE LISTENERS

(Concluded from page 39)

The station of the Ft. Worth "Star-Telegram" and of the City of Dallas, WRR, are A.R.R.L. member-stations, handle A.R.R.L. traffic and their operators are members of the local affiliated clubs. Another pleasant feeling is had by reading the radio department of the Dallas "Times-Herald;" they have a radio editor who is a radio man and writes intelligent radio articles! This paper is a friend of the amateur, boosts the A.R.R.L., boosts good old WRR, and donated some real jack towards sending the Dallas crowd to the National Convention last year.

INTERNATIONAL AMATEUR RADIO

(Concluded from page 37)

ing company a certain percentage on their sales or, as an alternative suggestion, that the government collect an additional fee with each "listening-in" license, the additional sum to be placed in a common fund to provide for the programs.

Who's Who in AMATEUR WIRELESS

NICHOLAS H. JENSEN

"Nick," as he is known locally, was born May 19, 1884, at Maquoketa, Iowa. Remaining single until a few weeks ago he has given lots of time to League work. His main occupation is Chief Deputy United States Marshal for South Dakota. In this work he takes active part in keeping 22,000 Indian inhabitants on the straight road and seeing to it that all *poor* moonshine is destroyed.

Bro. Jensen first became interested in radio in 1917 when the Navy Recruiting Officer asked what the Morse characters were for C and Y. He apparently answered correctly and "signed on the dotted line" (and twenty other dotted lines). Doing the required time at Great Lakes Training Station and Harvard he absorbed *all* of radio. His longest stay was on the U.S.S. Florida where for over a year he hung around the Grand Fleet of

(Concluded on page 58)

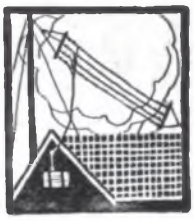
ALFRED EDWARD BANKS

Major Banks of San Diego, Cal., entered the amateur game to promote radio for his two sons and then, despite his forty odd years, became as great a fan as either of them. "A really good operator is hard to make after boyhood days have passed," he says, "and to become facile at copying after forty is a difficult problem." Notwithstanding this he gets as much kick out of the radio art as the most enthusiastic youngster and besides is the father of a couple of good ones.

Beginning as 6IY he at first confined his efforts to spark and adopted a non-resonant type transformer with a high note. The Boy Scout problem interested him to the extent that he instituted one of the first radio schools for Scouts in the United States, 6VL, and was instrumental in organizing and perfecting a plan for teaching which has been useful in many other

(Concluded on page 58)

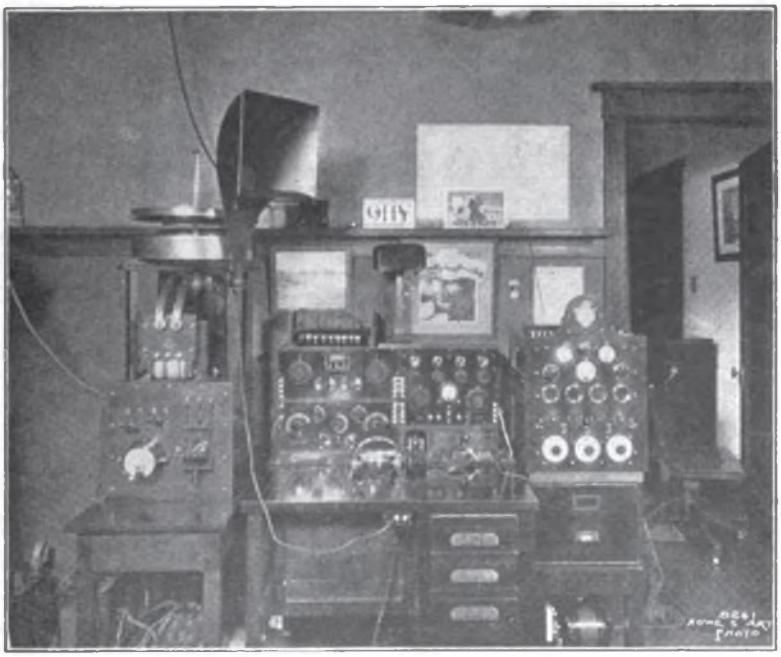
Amateur Radio Stations



9HY, Chicago, Ill.

Station 9HY is located at 6027 Kimbark Ave., Chicago, Ill., and was completely designed and built by J. H. Jay and C. W. Clark.

A CW set using CW, ICW, and MCW is the principle transmitting unit, while a one-half KW spark set forms a secondary transmitting unit. Either may be used by throwing a switch.



The receiving set comprises a long wave tuner employing duo-lateral coils, a short wave regenerative tuner, and a detector and three stage amplifier. Either the long or the short wave tuners may be used by throwing a four pole double throw switch. Wave lengths of from 150 meters to 20,000 meters can be covered. The long wave tuner is made up of a triple-coil geared mounting with two 43-plate variable condensers, the latter being a series-parallel condenser. The short wave regenerative tuner is made up of the usual plate and grid variometers with double-tap coupler. Vernier variometers are used in series with the large variometers, which gives an adjustment much finer than a mechanical vernier. In tuning-in CW a complete throw of the vernier variometer dial is equal to but three white lines on the large variometer dials. The tuner is completely shielded with grounded copper plates. The long and short wave tuners are in identical mahogany cabinets and form a symmetrical lay-out with one above the other.

The detector and three stage amplifier unit is mounted in a large mahogany cabinet. A grid variable condenser and a 43-plate variable phone condenser are included in this unit, as is a 0 to 50 volt meter for giving detector "B" battery readings. A three way cam switch gives an off, "A" battery, and "A" with "B" battery positions. When set upon a low cabinet the above unit forms a complete symmetrical

receiving unit with connections made by short nickel plated bars. There is no howling on three stages as the amplifying transformers are spaced very far apart, the same being true of the tubes.

A small cabinet with one stage of radio frequency forms an intermediate unit between the short wave regenerator and the detector and three stage audio frequency amplifier unit. The plate variometer of the regenerator acts as the radio frequency air core transformer. In this same cabinet is also contained an "A" battery potentiometer.

As the complete receiving set occupies the entire length of the mahogany office desk upon which it is mounted, a provision had to be made for the key under the detector and amplifier unit. A low cabinet with a drawer and an arch opening for the key was made for the above unit which elevates it to the level of the other cabinets. The complete receiving assembly is mounted on plate glass as is the key. A typewriter is enclosed in the desk ready for use by raising a portion of the desk top.

Brown adjustable and Baldwin phones are used. A loud speaker with large horn is used which gives good volume.

Flanked on both sides of the desk are the transmitting sets, the spark set on the left and the CW set on the right. The transmitting units like the receiving units are made to fit into a symmetrical scheme of arrangement. A narrow mahogany table was constructed for the spark set upon which was built a much smaller table arrangement for enclosing the muffled rotary gap. This smaller table placed upon the larger table is covered on the side next to the desk with mahogany as is the top, while the front supports a switch board. On the switch board are mounted the antenna switch, a double pole, single throw switch for throwing the key either in the spark set circuit or the CW circuit, another double pole single throw switch for cutting in either quenched or rotary gaps, and a large Jewel 0 to 5 amp. thermo couple meter.

On top of the little table are mounted an Acme one half KW transformer, a Thordarson oil condenser, and a very large oscillation transformer. The oscillation transformer is supported over the transformer and condenser in a flat position by four legs. All insulation is very heavy and leads as short as possible. The rotary gap is designed to give the best results with the Acme non-resonant transformer, while an Amrad quenched gap with a line resistance can be used also.

The CW set uses 4 five watt U.V.202 Radiotrons which can be used in two different modulating circuits. Flexibility has been the keynote in the design of this set, and experience the chief advisor. The English circuit described by Mr. Whittier is used for the oscillating circuit, with a grid coil wound with No. 12 wire coupled inside of the antenna inductance. Either Heising constant current modulation with two tubes as modulators may be used or four tubes may be used as oscillators with a magnetic modulator for modulation. Four air core honeycomb chokes are mounted in a bracket directly underneath the socket shelf, so that a choke is connected near the sockets to each grid. This prevents one tube surging back into another.

Either rectified AC or motor-generator can be used for the plate supply, the set being so wired that either may be used by throwing a four-pole double Federal switch. An Acme 200-watt 550 volt unit rectified through two DeForest rectifying tubes is used for the rectified AC supply. The motor-generator is a special Ray-Di-Co unit with a double-commutator generator delivering 150 watts at 750 volts. It will deliver 1,000 volts open space, and is rated at 150 watts conservatively. A Radio Corporation tone wheel is coupled between the motor and generator, the 1,750 RPM of the motor-generator giving the desired frequency. The center of the tone wheel was turned out on a lathe and it is insulated from the motor generator with bakelite so that it will not ground through this unit. A double brush is used. The filter system is made up of eight 1-mfd. Federal condensers and three 1½-henry Acme chokes.

When using motor-generator the filament winding of the Acme unit is used to light the filaments while the secondary is thrown out of the circuit. In this way the Acme unit serves both as a power unit and a filament heating unit. The motor-generator is used for phone work and ICW, while rectified AC is usually used for straight CW. Very good modulation is obtained on phone with no hum or objectionable carrier wave. A double-throw double-pole switch changes the generator commutator connections from series to parallel, giving either 750 or 550 volts respectively. A big jump in radiation is obtained with the highest voltage with no great stress on the tubes. Although rated at 5 watts, 20 to 40 watts are put into the tubes. The difference in the results did not warrant using larger tubes, and the 5 watt tubes certainly are better economy.

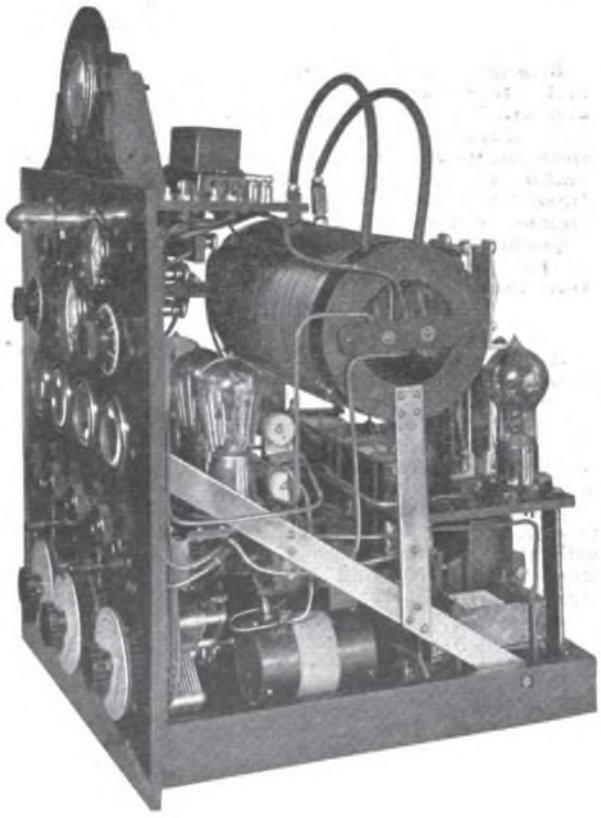
All instruments are mounted on a base and panel, and the whole is placed in a cabinet with small doors in the sides and top for accessibility and ventilation. At the rear of the base is mounted the 200 watt Acme unit with condensers at each side, while over it is a fibre shelf upon which are mounted the two rectifying tube sockets, the chokes, and four Federal condensers. Thus the power and rectifying circuit together with the filter is all in one unit isolated from the rest of the set. Farther forward on the base are mounted

two large fixed condensers over which are supported two 5000-ohm grid leaks and two inductance coils. The antenna inductance is large, consisting of 36 turns of No. 8 brass wire 6 inches in diameter, and is supported by heavy brass uprights fastened to the brass panel supports.

On the panel are mounted an 0 to 600 volt Firco meter, a General Radio hot wire ammeter, a Jewel 0 to 200 milliammeter, and a Jewel 0 to 15 volt AC meter. A small dash pilot lamp is placed over the meters to light the dials. On each side of the meters a 6 ampere rheostat is mounted, one for the rectifying tubes and one as an auxiliary filament control to the oscillators and modulators. Below the meters are four glass peek holes in line with the tubes, which are mounted on a shelf back of the panel. These peeks are large, giving a full view of the elements of the tubes, and bevelled nickel plated brass rims holding bevelled plate glass are inserted in the holes to trim them up.

Below the peeks are mounted four General Radio 2½ ampere rheostats, one for each tube filament. Each individual filament can be set and then all adjusted together with the auxiliary filament rheostat. Below the rheostats three variable condensers are mounted. Just above the condenser dials the two Federal switches are placed, one for sending and receiving, and one for phone, I.C.W. or C.W. The down position of this switch is for phone, the middle position for tone wheel, and the up position for straight C.W. No binding posts whatever are used on the panel, thus giving a clean appearance. The binding posts are mounted high in back of panel on a terminal board, and a hard rubber shelf at right angles to the top of the panel acts as a guide with properly spaced holes to space and feed the leads to the terminal board. On top of this shelf are placed the binding posts for the motor generator and tone wheel, while the Federal switch for throwing from motor generator to rectified AC is mounted to one end of this shelf. Three rotary switches are also mounted on this shelf. One switch is for shorting the milliammeter out of the circuit, which is subject to injury while sending straight CW due to its violent ducking when the key is pressed. Another switch cuts the high voltage plate meter out of the circuit, while the third switch cuts the antenna series condenser out of circuit, which at times increases radiation. At other times this condenser is necessary, however.

For flexibility and actual results this CW set has exceeded expectations. On straight CW using only two 5-watt U.V.202 Radiotrons, 1,100 miles has been covered. Six stations in New York, Syracuse, Philadelphia and other stations in the east have all reported CW sigs QSA. Langley Field, Va., also reported having heard phone, which is the best the set has done on phone. Modulation has been reported very good with voice and music. The spark set has been logged as far as Wilmington, N. C., but it is far from being the equal of the CW set. Antenna current on straight CW with two 5 watt tubes has been as high as 2 amps, and seldom less than 1.8 amps.



All wood work in the entire set is of antique brown mahogany with a four-coat rubbed piano finish. A 100 amp. hour 12 volt Willard battery furnishes the receiving filament supply, with eight large cells from a farm light plant for reserve. A Homecharger charging unit of large size keeps the batteries up.

(Concluded on page 58)

Remember that fool stuff in *QST* recently about "sending milk by radio?" It's been tried, and, if we may believe the serious assurances of several newspapers in widely scattered parts of the country, with considerable success. The Rochester "Times-Union," for example, solemnly relates the triumph of the local Macaroni in receiving a quantity of milk by radio from Brooklyn, in the presence of numerous witnesses. How can they be that way and live?

QST, Jr.

Armstrong hasn't the only super-regenerator by a darn sight! Coincident with his invention Mrs. K. B. Warner brought out a new model, Betty Jean, weight 8 pounds net, regenerates freely over the whole scale, guaranteed not to warp, crack or mildew.

K.B.W. is named as joint owner of the new device and while not entirely familiar with all the various knobs, dials and constants, he is learning rapidly and hopes shortly to eliminate all howling and other undesirable effects. We earnestly advise the use of a super-audible frequency.

Some confusion has occurred over the choke in Fig. 1 on page 12 of June *QST*, describing the Reinartz transmitter. How can the r.f. get thru the choke, we're asked. That choke is unfortunately all-too-prominent in the figure; actually it is harmless enough. It's meant to represent one of those very small chokes which are put in grid leads when tubes are operated in parallel to prevent the establishment of parasitic oscillations at ultra-radio frequency. Twenty turns of small wire on a ½-inch tube should be about right.

"The Modulator," the amateur magazine of the Second District, was purchased from its publishers by the Second District Executive Radio Council on July 19th and henceforth will be operated by the Council as its organ, beginning with the August number. Wm. F. Crosby continues as its editor. The council will have a publication committee consisting of R. H. McMann, president of the council, F. B. Ostman, 2OM, A. A. Hebert, A.R.R.L. treasurer and director, Mr. Crosby and Mr. Hufman.

Mr. F. D. Webster, call 1AM, (a bit early), past president of the Radio Society of M.I.T. and present treasurer of the Boston Executive Radio Council, has joined the sales organization of the General Radio Company, specializing in meters.

It is with deep regret that we are advised of the death of three of our members, Justis Benderoth of Pine Bush, N. Y., Edward F. Roscoe, Jr., 1BQP, better known as operator of 1IBZ, and Everett C. Espy, owner and operator of 8PN of Vandergrift, Pa. Mr. Espy, age 22, has been interested in radio since 1910 although in the DX class only since the war. He had been sick for some time but up until almost the time of his death was active in the local radio club, of which he was vice-president and a charter member.

On page 8 of the August issue the statement was made that if no audio frequency amplifier is used in the super-regenerator the phones may be connected across the .005 mfd. condenser. This is not exactly right as there would be no B battery connection to the first tube. The phones should be connected in place of the primary of the amplifying transformer and the filter circuit may be eliminated if the high pitch of the variation frequency is not distressing or if this frequency is above audibility. The .005-mfd. condenser then is a by-pass across the phones and B battery.

We have the dope that Dr. Louis Cohen, Consulting Engineer for the War Department, has at last perfected a method for eliminating static on short waves. We know all about it except what is used and how it is done. These little details will be cleared up later we are promised.

Amidst all the new things we now hear that John Hays Hammond, Jr., has a method of secret transmission and reception of concerts so that only certain special receiving sets can hear. Good!

1CAE needs a portable, folding, collapsible, counterpoise that will automatically spread out after dark and fold up before daylight without the neighbors or mosquitoes knowing about it. QTC?

Read 'em and Weep

6ZE with two 5-watt tubes and 500 cycles A.C. was heard by 8BHE on one tube on 200 meters.

6OM and 6ZZ heard by 1BDU and 1BIY on honeycombs and detector.

1BQD reported 250 miles using 110 volts on plate of tube having 1 watt output.

5OI heard off coast of Alaska putting out one ampere from two 5-watters.

6ZX on 15 watts heard by 8CZN in Cleveland.

6ZG works 6ZAC QSA on one five watter.

8EA on 100 watts copied 500 miles west of Astoria, Oregon.

8CAZ on 10 watts copied in California.

8ZZ using 50-watt phone copied over a thousand miles.

9ARZ on one 5-watt tube copied 500 miles west of North Head, Washington, or 2300 miles.

6ZZ has heard 1QP on 20 watts and 1KA.

6KA, 6EN, and 6XAD have been reported quite consistently on the Atlantic coast by a number of stations.

1OZ and 2BLP were working on phone about 11:30 on Sunday morning, May 16th, when 2BLP came back with this: "Sorri, OM but will have to sign off now, because I'm on the local volunteer fire department, the fire whistle is blowing, and I've got to go fight the fire. Cul 73 ... — . —" Several Bridgeport amateurs heard both sides of the conversation and it has become a standing joke.

Amateur Radio Scores

On August 4th an unidentified man was killed at a railroad crossing near Oxford, Chester County, Pa. He had a card bearing the name of H. E. Rice of Springfield, Mass., but all details were uncertain. The doctor called Mr. H. A. Beale, Jr., who tests his phone sets at 3XW-2ZO every evening, and arranged for Mr. Beale to read off the description of the dead man. The message was picked up and delivered many places and by midnight the "Springfield Republican" called on long distance telephone and identified the dead man. This is just one more incident of rapid valuable public service chalked up to the credit of amateur radio—and Mr. Beale.

Through a typographical error in the advertisement of the Thordarson Elect. Mfg. Co., of Chicago, in July *QST* the line "Price as illustrated" was made to read $1.50 instead of $4.50 to conform with the large type to the right of the cut of the transformer.

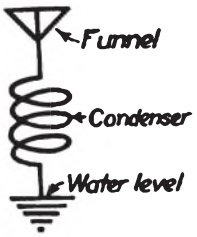
Is your hair red? Are your ears too big? If so you are the type that makes the best radio operator, according to Lieut. Commander Richard Condon of the Naval Militia. If you are not loved by the pretty girls you will get along fine with radio. Page 1TS.

HUXTRA!!! Cards and letters have been flooding this office with the tip that 9ZN, the old spark hound, is putting in two 250-watt bottles and is going to use 500-cycle juice on the plates!

Three—Six—Oh!

I think that I shall never know
A wave length worse than 3—6—0,
A wave that has no dot or dash
But sounds like lots of flying hash.
I know a wave that has it beat,
Whose neat C.W. sounds so sweet;
It is the wave of 2—0—0
But never tune to 3—6—0.

—J. W. Eckenrode.



Has anyone noticed the similarity between our A.R.R.L. emblem and the American Rum Runners League?

We note in one of the wonderful "Radio Column" conducted by one of those alleged experts, that as a sign of the remarkable interest this newly discovered hobby has for its devotees, it may be noted that they have banded themselves into an association known as the American Radio Relay League, which, although it is but a few months old already has thousands of members. Ugh!

Mrs. Marie Whitaker, General Delivery, Kansas City, Mo., has asked our aid in locating her lost son, Sidney LeRoy Whitaker. She has traveled from coast to coast but has heard nothing from him since 1919.

Kruse, down in the Gulf, says the static is so terrific he uses a chin-strap to keep it from lifting the phones off!

On page 29 of July *QST* a formula appeared incorrectly. It should have read:

$$S_2 = \frac{E_2 S_1}{110}.$$

9BS in Chicago is unduly flattered on the number of cards he finds at his house every night when he gets home, altho he is not operating his station. To make a long story short, send your reports on 9BS to Mr. H. R. Byerlay, Ingersoll, Ontario.

The mail address of our Central Division Manager, R. H. G. Mathews, is now 332 S. Michigan Ave., Chicago, Ill.

Old kid 9S.P. Wright had a "telling" article in the American Radio Journal June 15th that is worth the time of any radio dealer to look up.

Calls Heard

HEARD DURING JULY
Unless Otherwise Specified

S. S. Gulfcoast, July 14, 80 miles west of Key West
All C.W. on one tube. QSA thru heavy QRN: 8ALN, 4DQ, 5AAM, 5DO, 5UK, 5IR, 5VA, 6KA (QSA vy), 8BXH, 8UC, 8ZAF, 9AIX, 9AO, 9DUG, 9BSG.

Can. 3JI, 21 Tennis Cres., Toronto, Can.
C.W.: 1HX, 1II, 1OA, 1QP, 1RD, 1VT, 1XX, 1AWB, 1AWZ, 1AZD, 1BAS, 1BFE, 1BHJ, 1BKA fone, 1BKQ, 1BSJ, 1CCZ, 1CHJ, (1CMK) 1CPN, 1CRF, 1CVE, 1CXB, 2FP, 2SQ, 2TS, 2UD, (2AFP), 2AWS, (2AQH), 2BEH, 2BIG, (2BIR), 2BML, 2BNZ, 2BQH, (2BQU), 2BRB, 2BRC, 2CDO, 2CCD, 2CES, 2CFI, 3BA, 3DM, 3CC, 3GH, 3MK ,3OA, 3OT, 3TJ, 3ZZ, 8ADX, 8AFB, 8AFG, 8ANJ, 8ANO, (8BNU), 8BRW, 8BSL, 8BTY, 8BUV, 8CBM, 4BX, 4DC, 4GX, 4KC, 4LP, 8AM, 8AN, (8BO), 8CG, 8EW, (8HJ), 8KH, (8KU), (8NB), (8ND), 8OW, 8PJ, (8QB), 8SM, (8TJ), 8UC, (8UE), 8ZH, 8ZZ, 8ACF, 8ACR, (8ADR), (8AFD), 8AFY, 8AGR, (8AHK), (8AMM), 8ANB, (8AOB), 8AQO, (8AQV), (8AQZ), (8ASZ), 8ATU, 8AUA fone, 8AVD, 8AVL, (8AWM), 8AWP fone, 8AWX, (8AXN), (8AYB), (8AYT), 8BBD, 8BDU, (8BEF), (8BEO), 8BFX, (8BIL), 8BJS, (8BMM), (8BNU), 8BPH, 8BRC fone, 8BRM, 8BRQ, (8BUX), (8BWA), 8BXT, 8BZF, (8CAZ), (8CBJ), 8CCX fone, (8CEI), 8CFP, (8CGN), 8CGX, 8CHO, 8CID, 8CJH, 8CKO, (8CON), (8CPX), 8CTK, (8CTN), 8ZAE, 9CP, 9DR, 9FK, 9FP, 9OX, (9UH), 9US, (9UU), 9AAP, 9AIX, 9AOG, (9APS), (9BLC), 9BSG, 9CBA, 9DFB, 9DGM.

4DY, 612 Beresford Ave., Winnipeg, Man. (1 tube)
Spark: 9AYW, 9ZC.
C.W.: 8ASM, 8BEF, 8BPL, 8CAZ, 8CGX, 8CMI, 8KG, 8UC, 8VY, 9AOR, 9AUA, 9AXF, 9BHD, 9BSG, 9DR, 9DKY, 9DGM, 9GL, 9HW, 9NX, 9PI, 9US, 9XL.

M. V. Chesnut, Duncan Cove, N. S. (Near Halifax)
C.W.: 1AL, 1CK, 1EE, 1XM, 1QN, 1ABY, 1ACA, 1ACS, 1ACU, 1AGS, 1ANQ, 1ARY, 1AZW, 1BAS, 1BGF, 1BKQ, 1BZW, 1CCZ, 1CHJ, 1CNR, 1CPN, 2HW, 2FP, 2KL, 2TS, 2UD, 2AJA, 2ANM, 2AWF, 2AWS, 2BEH, 2BGM, 2BLP, 2BIR, 2BQU, 2BQH, 2BRB, 2BUM, 2CDO, 2CES, 2COL, 2XAJ, 3BG, 3DT, 3FP, 3FS, 3VW, 3IW, 3XW (fone), 3ZO, 3ZZ, 3AFB, 3AIS, 3ALN, 3ANO, 3ATZ, 3BNU, 4DC, 8AX, 8BB, 8NV, 8PT, 8XE, 8ADN, 8ALF, 8APH 8AQO, 8ASM, 8ASZ, 8AVD, 8AVL, 8BPL, 8BRC, 8BRF, 8CJH, 8CPX, 8CSY, 9ARK, Can. 9AL.

1CUE, Lincoln, N. H.
Spark: 1AA, 1DY, 1LZ, 1ACO, 2FZ, 2NZ, 2AWF, 8CCX.
C.W.: 1CE, 1GV, 1HK, 1MA, 1PT, 1PY, 1QN, 1TP, 1XM, 1XX, 1ACS, 1ACU, 1AGH, 1AGI, 1AKQ, 1AQW, 1AZW, 1BGF, 1BJS, 1BKQ, 1BPZ, 1BQI, 1BRQ, 1CBP, 1CCZ, 1CED, 1CES, 1CFI, 1CHJ, 1CNE, 1CNR, 1CPN, 2BG, 2DN, 2EL, 2KK, 2NF, 2FP, 2OM, 2SQ, 2UD, 2ZM, 2AER, 2AWF, 2AWH, 2AWS, 2BEH, 2BKL, 2BML, 2BQH, 2BRB, 2BRC, 2BTJ, 2BUA, 2CGX, 2CKK, 2CLP, 2COL, 3BV, 3CM, 3GX, 3GZ, 3OT, 3TS, 3ZO, 3ZZ, 3ACY, 3AIS, 3ALN, 3ANO, 3ARB, 3ATZ, 3AWE, 3AWH, 3BFU, 3BLF, 3BNU, 3BRW, 3BQD, 3BQU, 3CBM, 8LB, 8XE, 8ABL, 8ACF, 8AMM, 8APH, 8AVL, 8AWM, 8AWP, 8BJS, 8BZF, 8CJH, 8CKO, 8CPX, 8CUK.

1AZD, Gloucester, Mass. (All C.W.)
(1FF), (1GV), (1HX), 1PT, (1SC), (1VT), 1XM, 1ACS, (1ADC), (1AGH), (1ASF), (1AZW), (1BAS), (1BBM), (1BDI), (1BDV), (1BES), (1BLN), (1BNT), (1CFI), (2BG), 2BN, (2FP), 2KL, (2QR), (2NZ), 2TS, 2ACW, 2AJA, 2ARY, 2BDV, 2BCK, 2BCH, 2BFX, (2BNZ), (2CBG), 2CBW, 2CHZ, 2CMS, 3BM, 3BZ, 3CC, (3FS), 3FU, (3IW), 3MK, 3ZO, 3AAO, (3ADX), 3BCF, 3BIV, 3BVI, 3BLF, (3BNU), (3BRC), 3BRW, 3BTV, 4BX, 4DC, 4GL, 4ID, 8AI, 8BD, (8BQ), 8EW, (8HJ), 8KW, 8MP, 8PK, 8VC, 8XE, 8ZZ, 8AFD, 8ARL, 8ALF, 8AMM, 8AOL, (8ARI), 8ASM, 8AWM, (8AVD), 8AVL, 8AVT, 8AXC, 8AZV, 8BBD, 8BCF, 8BIC, (8BIL), 8BQO, 8BQZ, 8BRT, 8CAZ, 8CCX, 8CFP, 8CHL, 8CKO, 9AL, 9EI, (9AIX), 9ALK, 9AWH, 9CBA.

1ACU, Groton Long Point, Conn.
C.W.: (1GV), 1HX, (1IV), (1OZ), 1PY, 1QN, 1RH, (1SW), 1XM, (1XX), (1ACS), (1AEG), (1AGH), (1AGI), (1AIP), 1AJP, 1ARY, (1AWB), (1AZW), 1BFE, 1BGF, (1BKQ), (1BQT), (1CBP), (1CCZ), (1CJA), 1CPN, (2BG), (2FC), 2FP, 2FZ, (2KL), (2MJ), (2NZ), 2OE, (2OM), 2RM, 2RY, 2SQ, 2TS), 2AHK, 2AJA, (2AJF), (2AJW), (2AWS), 2AWT, (2AZC), (2BDU), 2BDG, 2BEB, (2BEH), 2BEM, (2BFZ), (2BIR) 2BJO, (2BLP), (2BML), (2BNL), (2BNZ), (2BQH), (2BQU), (2BRB), (2BRC), (2BUF), 2BUM), 2BYC, (2CAH), (2CBG), (2CBW), (2CCD), (2CCU), (2CEI), 2CES, (2CLJ), (2CNZ), (2COL), 2CPK, 2CRT, 3AS, 3BA, 3BG, 3BZ, (2DT), (3FR), 3FS, 3HL, (3MK), 3OD, 2OT, 3PB, 3QV, 3RW, 3TJ, 3VW, (3XA), 3ZO, 3ZZ, 3ABB, 3AFB, 3AIS, 3IPB, 3ALN, (3ANJ), 3ANO, 3BGT, 3BHL, 3BIT, 3BJY, 3BNU, (3BVC), 3CBM, (4BX), 4DC, 4GX, 8AM, 8BG, 8BQ, 8JU, 8UC, 8SE, 8SP, 8XE, 8ACF, 8AFD, 8AMM, 8ANB, 8AQO, (8ASZ), 8AVD, (8AVL), (8AWM), 8BDB, 8BDN, 8BDU, 8BKE, 8BRC, 8BRM, (8BRW), 8BXH, 8CFP, 8CGX, 8CJH, 8CKM, 8CKO, 8ZAC, 8ZAE, 9EI, 9AIX, 9APS, (9CBA), Can. 9AL.
Spark: (1BVB), (1CDM), (2DI), (2DN), (2MN), (2OM), 2AID, (2BQZ), (2BSC), (3BFU), 3FP, 3QX, (3BVC).

1GV, Providence, R. I.
(1ACU), (1AGH), (1AJU), (1AZD), (1AZW), (1BKQ), (1BQD), (1BQK), (1BWJ), (1CBP), 1COZ, (1CDO), (1CFI), 1CGF, 1CHJ, (1CMK), (1CMP), (1CPN), (1CRF), (1EE), (1FS), (1HX), (1PT), (1PY), 1SC, (1YK), (2BML), (2BQH), (2BQU), (2BRC), (2BUM), (2CBG), 2UD, 2VC, (3AEV), (3ADX), (3AFB), 3AJD, 3ALN, (3ANJ), (3ANO), (3ATZ), (3BIJ), (3BLF), (3BNU), (3BVC), 3CBM, 3FS, (3DT), 3IK, (3IL), (3LP), (3MK), 3OT, (3VW), (3WF), (4DC), 4DQ, 4GX, (4IL), (8AN), (8AFD), 8ATU, 8AQV, (8AVD), (8AVL), 8AWM, 8AWP, 8AXB, (8BBD), 8BDU, 8BEO, 8BKE, (8BLT), (8BNU), 8BNY, (8BPH), 8BPU, 8CAF, 8CCX, (8CKO), 8CWH, (8SE), 8SP, 8VY, 8XE, 9AXF, 9CBA, 9CBH, 9EI.

1BJS, Damariscotta Mills, Maine
Spark: 1AA, 1CE, 1CK, 1DY, (1FM), 1FS, (1LZ), 1MA, 1OR, (1ACO), 1AED, 1AIR, 1BCF, (1BDV), 1BOE, (1BPZ), 1BRI (1BRQ), 1BUB, 1BVB, 1BZN, 1CED, (1CGU), (1CHJ), 1CSS, 2DN, 2EL, 2FP, 2KK, 2NF, 2OM, 2PF, 2RM, 2ACW, 2AWF, 2ARB, 2BYS, 3BFU, 8XE, Canadian (2AS).
C.W.: 1DH, 1DY, 1GV, 1HK, 1HX, 1KC, 1PO, 1RD, (1UL), 1VQ, 1XM, 1XX, 1ZE, 1ACS, 1ACU, 1ADL, 1AGI, 1AHS, 1AJU, 1ANQ, 1ASF, 1AWB, 1AWD 1AZD, 1AZW, 1BCF, 1BDI, (1BDV), 1BEA, 1BES, 1BGF, 1BHR, 1BID, 1BKA fone, 1BQE, 1CBP, 1CCZ & fone, 1CFI, 1CHJ, 1CLZ, 1CMP, 1CNE, 1CNR, 1CPN, 1CXC, 2BG, 2HJ, 2KL, 2NQ, 2NZ, 2SQ, 2WR, 2ZL, 2AJA, 2AWF, 2AWH, 2AWS, 2AXC, (2BJO), 2BML, 2BNZ, 2BQU, 2BRC, 2BUM, 2CBT, 3CM, 3FS, 3OD, 3OT, 3XA, 3XW fone, 3ZZ, 3ACK, 3AJD, 3CBM, 8OV, 8QZ, 8SP, 8VY,

8XE, 8ACF, 8AGO, 8AOL, 8APT, 8AVL, 8BRL, 8CKO.

2BQU, Staten Island, N. Y. C. (1 Tube)

C.W.: 1AR, 1ES, (1GV), 1HK, (1IV), 1KC, 1MX, (1OZ), 1PR, 1PT, (1QN), (1QP), 1SC, (1UL), (1VQ), (1XM), (1XX), 1YK, (1ACU), 1AGH, (1AGI), 1ASF, 1AST, (1AWB), (1AYQ), (1AYZ), (1AZW), 1BAS, (1BDV), (1BES), 1BKP, (1BKQ), 1BQT, (1BWJ), (1CCZ), 1CGZ, (1CHJ), 1CIC, 1CIK, 1CIZ, (1CJA), 1CMK, 1CNE, 1CNR, (1CPN), (1CQW), 1CXB, 2ANM, 3AS, (3BZ), 3CC, 3FS, 3GK, (3IW), 3LR, 3LP, 3OD, (3OT), 3PB, 3QV, 3TA, (3TJ), (3VW), 3WF, 3XA, 3ADX, (3AFB), 3AJD, 3AJH, 3ALN, (3ANJ), 3AUW, (3AWH), 3BGT, 3BIT, 3BIJ, 3BJY, 3BLF, 3BQT, 3BRW, 3BTY, 3BUP, (3CAN), 3CBK, 3CBM, (4BX), 4BY, 4DC, 4GL, 4LP, 4MW, 4XX, 5FV, (8AN), 8CK, 8DV, 8EA, 8HH, (8HJ), 8JU, 8KG, 8KH, 8OW, 8QB, 8TB, 8UC, 8UE, 8VQ, 8XE, 8XV, 8ACF, 8AFD, 8AIO, 8AJT, 8AMD, 8AMQ, 8AOB, 8AQF, 8AQO, (8AQZ), 8ARI, 8AUA, 8AVL, 8AWM, 8AWP, 8BAS, 8BAZ, 8BBD, 8BDB, 8BEF, 8BIL, 8BKE, 8BOH, 8BPU, 8BQU, 8BRW, (8BVM), 8BVT, 8BXH, 8BXT, 8BZM, 8CAZ, (8CFP), 8CKM, (8CKO), 8CJO, 8CJS, 8CJY, 8CLJ, 8CMI, (8CON), 8ZAC, 9EI, 9PA, 9UH, 9UU, 9ZN, 9AAW, 9AJH, 9AIX, 9AJA, 9AON, (9APS), 9AXF, 9CBA: Canadians (3JI), (9AL).

Spark: 1DY, 1CHQ, 3ABB, 3AJD, 3BEY, 8EW, 8RQ, 8UC, 8AVJ, 9DZY, Canadian 3GX.

2BIR, Nutley, N. J.

C.W.: 1ACS, (1ACU), 1AKG, 1ANT, 1ARY, 1AWB, (1AZD), 1AZW, (1BAS), 1BEC, 1BKQ, 1BQE, 1CAK, 1CHJ, 1DY, 1ES, 1FM, 1GV, 1HK, 1HX, (1ON), 1PT, (1VQ), 1VT, (1XM), 1YK, (2ANM), 2AWS, 2BKT, (3ADX), 3AFB, 3AJD, (3ALN), 3ANJ, 3AUU, 3AWH, 3BGT, 3BIJ, 3BIT, 3BLF, (3BNU), (3BVC), 3CBM, 3CQU, 3DT, 3EM, 3FS, (3IW), 3LP, 3LR, (3MK), 3OD, 3OT, 3QI, 3VW, 3ZM, (3ZO), 3ZZ, 4BX, 4DC, 4HW, 4MW, 5FV, 8AFD, 8ALF, 8ALV, 8AMD, 8AMQ, 8APH, 8AQV, 8AQZ, 8ASM, 8ASZ, 8ATU, 8AUY, 8AVD, 8AVJ, 8AVL, (8AWP), 8AWT, 8AXB, 8AXK, 8BBD, (8BDB), 8BEF, 8BEO, 8BFM, 8BFX, (8BIL), 8BJS, 8BMM, 8BPL, 8BPR, 8BRC, 8BRQ, (8BRT), (8BTR), 8BVT, 8BWZ, 8BZF, 8CBJ, (8CCX), 8CEI, (8CGN), 8CJH, 8CJK, 8CJS, 8CJY, 8CKK, 8CKO, 8CNT, 8CON, 8CPX, (8CTN), 8AX, 8AN, 8BO, 8BZ, (8DV), 8EA, 8KG, 8KH, 8KU, 8PT, 8QB, 8SE, 8SP, (8TG), 8UC, 8XE, 8ZZ, 9AJH, 9APS, 9AXF, 9BHD, 9BLC, 9BSG, (9CBA), 9DR, 9EI, (9IO), 9NX, (9UH), 9XL, Canadians 3BP, 3BV, (3JI), (3JK).

Spark: 1AMQ, (1CDM), 1LZ, 3AHK, 8AYM, 8BDA, 8BRL, 8EB, 8EW, 8IL, 8TC, 8TK, 8WZ, 8ZO, 9AAW, 9DCX, 9DYZ, 9AM, 9UH, 9ZN.

2AFP, Paterson, N. J. (All C.W.)

(1ACU), 1ADL, 1AIP, 1AJL, 1AKG, 1AR, 1ARY, 1ASF, 1AUN, 1AWB, 1AWO, 1AZD, 1AZW, (1BAS), 1BBW, 1BDI, 1BES, 1BEN, 1BKP, (1BKQ), 1BNT, 1BWJ, 1CBH, 1CCZ, 1CGQ, 1CHJ, 1CIK, (1CK), 1CNR, 1CPN, 1CQW, 1CRF, 1EE, (1HX), (1II), 1IX, (1ON), 1PM, 1QN, 1QP, (1RD), (1VQ), (1XG-fone), (1XM), (1XX), 3ADT, 3AFB, (3AGC), 3AIS, 3AQH, 3AUW, 3AWH, (3BGT), 3ANO, 3ANS, 3AQH, 3AUW, 3AWH, (3BGT), 3BHL, 3BIJ, 3BIT, 3BJY, (3BLF), 3BNF, 3BNU, 3BG, 3BTY, 3BUR, 3BUV, 3BV, 3BZ, 3CBM, 3CC, 3CCC, (3CG), 3DM, 3EM, (3FS), 3IL, (3IW), 3MK, (3OT), 3PB, 3QV, 3RV, (3TJ), (3VW), 3XAW, 3XW-fone, 3ZO-fone, 4BQ, (4BX), 4CO, (4DC), (4DL), (4GX), (4LP), 5AAM, 5DA, 5FV, 5WO, (8ABO), (8ACF), (8ADR), 8AFD, 8AFL, (8AGO-fone), 8ALB, 8ALD, 8AMD, (8AMM), (8AMQ), 8ANB, 8ANE, (8AQF), (8AQZ), 8ARD, 8AUX, 8AUY, 8AVD, 8AVL, 8AWT, (8AWM), (8AXB), 8AXC, 8AXH, 8AXK, 8BDU, 8BEK, (8BEO), (8BLX), 8BNU, (8BO), 8BPU, 8BRC, 8BRT, 8BRW, 9BRZ, (8BUQ), 8BUX, 8BXA, 8CAY, 8CAZ, 8CBJ, (8CGN), 8CID, (8CJH), 8CJY, (8CKM), 8CLJ, 8CLP, 8CMM, 8CNB, 8COI, 8CON, 8CPX, 8CQL, 8CTN, (8CUU), 8CWW, (8DV), 8HM, (8JL), 8JS, (8KH), 8LB, 8PN, (8PT), 8QY, 8RW, (8SE), 8SZ, 8TO, (8TG) (8UC), (8UE), 8UK, (8VY), 8WA, (8XE), (8XG), 8XH, 8ZAE, 8ZK, 8ZN, 8ZZ, 9AAP, 9AEU, 9AIX, 9AJA, 9AJH), 9APH, 9ARK, 9AXF, (9BCT), 9BLC, 9BLD, 9CBA, 9DGQ, 9DR, 9EI, 9HW, 9II, 9IO, (9UH), 9UU, 9ZN, Can. (3BP), (3GX), (3JI), 3JK, (9AL), Dalite: (1ACU), 1AWB, 1CGQ, (1ON), (1VQ), 8ANS, 8AWH, 8BIJ, (8BNO), (8OT).

3ZO, Parkesburg, Pa., (All worked on C.W.)

1HX, 1BAS, 1BKQ, 1CHJ, 2BG, 2NZ, 2SQ, 2ANM, 2BIR, 2CBG, 2CES, 3DM, 3FS, 3GX, 3LP, 3OT, 3QV, 3SJ, 3ZS, 3AAO, 3ADX, 3ALN, 3ANJ, 3AQG, 3AUV, 3BEY, 3BIJ, 3BIT, 3BJI, 3BNK, 3BNU, 3BTY, 3BVA, 8HJ, 8XE, 8XJ, 8ZO, 8ZZ, 8AQV, 8AQZ, 8ASZ, 8AWP, 8BRT, 8CLD, 9EI, Can. 9AL.

During Daylight Transcons—Spark: 3BO, (3GX), (3II), (3QN), (3QW), 3ABB, (3AWE), 3BEC, 3BEI, (3BSL), 3BTY. C.W.: 2NZ, 2TS, 2UD, 2WB, 2AFP, 2AMF, 2AWS, 2AZC, 2BEH, 2BTJ, (3BG), 3CG, 3CC, 3CM, (3FR), (3FS), (3GC), 3JI, (3LP), 3OT, 3QP, 3AAO, (3AAY), 3ABW, (3ADX), 3AGC, 3AIK, 3AJB, 3AJD, 3ALJ, 3ANJ, 3AOD, 3APD, 3ASP, 3AUW, (3AWH), 3BEF, 3BFC, (3BIT), 3BJI, 3BJP, 3BJY, 3BRW, 3BTY, 3BUV, 3CAN, (3CBM), 3CCC, 8QZ, (8XE), 8AVL.

3BIT, Lancaster, Pa., (All C.W.)

(1EE), 1IV, 1XM, (1AGH), (1AGI), (1ANQ), (1AWB), (1BKQ), 1CCZ,(1CHJ),(1CMK),(2HW), (2KL), 2NZ, (2RY), (2BEH), (2BJO), (2BLP), (2BNZ), (2CEG), (3BZ), (3CC), (3DM-fone), 3MK, (3OT), (3XW-fone), (3ZO),(3AAO),(3AAY), 3AFB, (3AIS), (3AJD), (3ANJ), 3ATZ, 3BBN, (3BIJ), (3BNU), (3BVA), (3CBM), (3CBP-fone), (4DC), 4GL, 4GX, 5LL, 5ZA, 6XAD, 8HP, 8LF, (8SP), (8XE-dalite), 8ZZ, 8ADG, 8ANB, 8BDB, (8BEF), (8BPL), (8BRC), (8BXH), 8BXT, (8BZF), 8CJH, 8CJY, 8CGX, (9UU), (9APS), 9AIX, 9AZA.

3RB, Philadelphia, Pa.

Spark: 2OM, 8AIB, 8BDA, 8EW, 8RQ, 9AAW.

C.W.: 1AAO, 1AGH, 1AGI, 1AJU, 1AWB, 1AZW, 1BCF, 1BES, 1BGF, 1BHJ, 1BKQ, 1BQE, 1CAK, 1CCZ, 1CHJ, 1CMK, 1GV, 1HX, 1PT, 1XM, 1XX, 2ACD, 2AFP, 2AWF, 2AXK, 2BEH, 2BFZ, 2BG, 2BJO, 2BKT, 2BML, 2BNZ, 2BQV, 2BRB, 2BRC, 2BUF, 2BUM, 2CBT, 2CF, 2CHE, 2CNK, 2CNZ, 2FP, 2IG, 2KL, 2NZ, 2OE, 2UD, 3AAO, 3AEV, 3AFB, 3AIS, 3AJD, 3AJV, 3ALN, 3APD, 3AS, 3BHL, 3BIJ, 3BIT, 3BLF, 3BLP, 3BNU, 3BUV, 3CBM, 3CG, 3MK, 3MO, 3WF, 3ZO, 3ZZ, 4BX, 4DC, 4GS, 4MW, 5FV, 5SP, 8ACF, 8AFD, 8AHC, 8AHR, 8ALB, 8AMM, 8AMQ, 8AN, 8APH, 8APT, 8AQO 8AQV, 8ASM, 8ASZ, 8AVD, 8AVL, 8AWM, 8AWP, 8AXB, 8BAL, 8BBD, 8BDB, 8BDU, 8BEF, 8BIL, 8BO, 8BOG, 8BPH, 8BQU, 8BRC, 8BRL, 8BRW, 8BXH, 8BZF, 8CAZ, 8CBJ, 8CEI, 8CFP, 8CGX, 8CJH, 8CJY, 8CKO, 8CNW, 8CON, 8CPX, 8DV, 8GA, 8HJ, 8JU, 8KG, 8KS, 8OW, 8PT, 8SE, 8SP, 8UC, 8UE, 8UK, 8UZ, 8VQ, 8WR, 8XE, 8XY, 8YD, 8ZA, 8ZZ, 9AJA, 9AJP, 9ARK, 9DR, 9EI, 9HW, 9IO, 9UU, Canadians, 3BV, 3KO 9AL.

3GX, Reading, Pa.

Spark: (1AKG), 1BHJ, 1BOE, 1BPZ, 1CEK, 1CHQ, (1HO), 1SC, 1SN, (2ACW), 2AWF, (2BJO), 2EL, 2FP, (2OM), 2UE, 3ACK, (3ACY), 3AHK, 3ASO, 3BPO, 3DY, 3FP, 3HJ, (3OK), (3QN), 3XC, 3ZS, 4BI, 4FD, 4IE, 8ACZ, 8AIB, 8AIX, 8AIZ, 8AJT, 8ANW, 8AVX, 8AVJ, 8AWX, 8AYM, 8AZF, 8BAF, 8BDA, 8BQA, 8BUN, 8BUY, (8CDI), 8EB, (8EW), 8MU, 8OI, 8RQ, 8TC, 8TS, 8UC, 8VE, 8VH, 8XXV, 8ZO, 9AAW, 9AGR, 9APS, 9DHZ, 9DX, 9EF, 9KI, 9UH, Can. 9BS.

C.W.: 1AFZ, 1AUN, 1AWB, 1PY, 1XM, 1BQT, 1CQW, 1HX, 2ANM, 2AWF, 2BG, 2BJO, (2BML), 2CBQ, 2FP, 2JW, 2NZ, (8AAO), 3AAV, 3ALN, 3ANJ, (3AWH), 3BLH, 3BTY, 3BUP, 3BVA, 3BVC, 3BZ, (3CC), 3FS, 3GC, 3GK, 3HD, 3IW, 3JK, 3MK, 3OA, 3OT, 3QV, 3VW, (3ZO), 4BX, 4DC, 8AFD, 8AIO, 8AMD, 8AQO, 8AQV, 8ATU, 8AWM, 8BDU, 8BEO, 8BPL, 8BRW, 8BSJ, 8BXH, 8CAY, 8CBJ, 8GO, 8KH, 8OW, 8SE, 8SP, 8UE, 8XE (daylight), 8ZAF, 8ZQ, 8ZZ (fone), 9IO.

4HZ, South Jacksonville, Fla.

Spark: 4BI, 4BW, 4FD, 4HS, 4IE, 8OI, 9DZY, 9AAP, 9DCX, 9UH.

C.W.: 1IV, 2AFP, 2BRB, 2BT, 2FP, 2KL, 2NZ, 3AFD, 3ALN, 3AUU, 3BG, 3BIJ, 3BLF, 3BMN, 3CBM, 3IPD, 3KM, 3LR, 3ZZ, 4BX, 4BZ, 4DC, 4EN, 4GS, 4GV, 4KP, 4KU, 5DA, 5FV, 5UK,

8ACF, 8ALB, 8AMP, 8AWN, 8BFH, 8BK, 8BO, 8BOF, 8BRM, 8BVT, 8CFP 8CKO, 8JU, 8KG, 8KP, 8SP, 8UE, 8XE, 8YE, 8ZAF, 8ZZ, 9AIX, 9CBA, 9DCR, 9EI, 9UU.

4BX, Wilmington, N. C.

C.W.: 1GV, 1HK, 1QN, (1QP), 1XM, 1XX, (1ACU), 1AGI, 1BGF, 1BKQ, 1BQE, (1BQT), 1BWJ, (1CCZ), 1CHJ, 1CMK, 1CNJ, 1CNR, 1CPN, 1CTK, 1XAE, (2BG), 2FP, 2FZ, (2KL), 2ND, 2NK, (2NZ), 2QV, 2RY, (2SQ), 2TS, 2UD, 2AER, 2AFP, 2AWF, (2AWS), 2AZC, 2BEH, 2BGI, 2BJO, 2BML 2BNZ BOX 2BQH (2BQU), (2BRB), (2BRC), 2CES, 2CNK, (2COL), 2XAJ, 8AS, 8BG, (2BZ), 8CC, 8CR, (8FS), 8GH, 8HL, 8IP, (8IW), 8LP, 8LR, (8MK), (8OT), 8QV, (8TA), (8TJ), (8VW), (8ZZ), 8ABX, 8AFB, 8AJD, (8ALN), 8ALR, (8ANO), (8AUU), 8AUW, (8AWH), (8BHL), (8BIJ), 8BIT, 8BJY, (8BLF), (8BMN), (8BNU), 8BUC, (8CBM), 8CBO, 8CJY, 4BL, (4DC), (4DL), 4DS, 4DQ, 4EI, (4EN), 4GH, 4GL, (4GX), 4HW, (4ID), 4KC, 4KF, (4LP), (4MW), 4LZ, 5DA, (5FV), 5UC, 5UK, 8AM, (HJ), 8JU, 8KG, 8LB, 8OW, (8PT), (8QB), (8SP), 8TC, 8UE, 8UC, 8VQ, (8XE), 8ZO, 8ZN, 8ZX, 8ZZ, 8ACF, 8ACP, (8AFD), 8AIO, (8AMD), (8AMM), 8AOS, 8AQO, 8ASD, 8ASZ, (8AVD), (8AVL), 8AWM, 8AWP, 8AWZ, 8BDA, (8BDB), 8BDH, (8BDU), 8BFM, (8BFX), 8BIZ, 8BOG, 8BPL, 8BPU, 8BRM, 8CAY, 8CAZ, (8CBJ), 8CCX, 8CEI, 8CFP, 8CJY, 8CKM, (8CKO), 8IQN, 8ZAE, (8ZAF), 9EI, 9OX, 9UH, 9UU, 9AIX, 9APS, 9AON, 9AXF, 9BDG, (9BHD), 9BLN, 9CBA.

Spark: 2EL, 2FP, 2NZ, 2OM, 3BEI, 3BVC, 4BI, 4FD, 4GN, 4HS, 4IE, 9AMT, 9DHZ, Can. 3BV, 9AL.

5TC, Box 1557, Fort Worth, Texas

Spark: 5AG, 5ABY, 5GK, 5HZ, 5MK, 5NC, 5PE, 5QA, 5QU, 5TG, 5TP, 5TU, 5VE, 5WU, 5XAC, 5ZAE, 5ZAF, 5ZAV, 8ZO, 9APK, 9AQE, 9DDZ, 9DSD,9KI 9UU, 9ZV, 9ZUT.

C.W.: 4BQ, 4EL, 4ER, 4FT, 4MW, 5AE, 5AAE, 5BA, 5DO, 5FV, 5IR, 5JL, 5KB, 5LA, 5MA, 5OI, 5QS, 5SP, 5UK, 5UU, 5UO, 5VA, 5ZAT, 6KA, 6BES, 6ZF, 7ZU, 8VR, 9ACU, 9AEY, 9AIX, 9AOG, 9AON, 9AOX, 9BSG, 9CCV, 9DUN, 9NX, 9OX.

5GP, Anniston, Ala.

Spark: 4IE, (5BP), (5ON), 5SM, 5TU, (5VV), 8UC, 8ZO, 9ACB, 9DZY, 9KI, 9LF, 9OX.

C.W.: 2FP, 3BLF, 3BV, 4CR, 4DC, 4EB, 4GH, 4GU, 4HW, 4ID, 4IV, 4IW, 4KF, 4LP, 4MW, 5AAM, 5AAR, 5AE, 5DO, 5EK, 5FO, 5FV, 5IR, 5KC, 5LA, 5LJ, 5MA, 5NM, 5NS, 5NV, 5SP, 5UK, 5VA, 5ZAS, 5ZG, 8AMD, 8BDU, 8BFX, 8BXH, 8BZF, 8CGX, 8DAK, 8GV, 8KH, 8SP, 8UC, 8UZ, 8XE, 8XJ, 8ZZ, 9AAP, 9AGR, 9AIX, 9AJG, 9AOG, 9AON, 9APS, 9AQJ, 9ARK, 9ATA, 9AXB, 9AXF, 9BAK, 9BCT, 9BDB, 9BRL, 9BRS, 9BSG, 9CCS, 9DKH, 9DXN, 9DZ, 9EI, 9NX, 9WA, 9YA, 9YE.

5TU, Box 356, Commerce, Texas

Spark: (5ABY), (5AE), (5AEJ), (5AET), (5ACQ), (5AG), (5AL), (5FI), (5FZ), (5GK), (5HZ) (5IC), (5IR), (5JI), (5MK), (5NC), (5NI), (5NS), (5NU), (5OI), (5PE), (5QA), (5QI), (5RB), 5SO, (5TC), (5TI), (5TP), (5UD), (5VA), 5XAC, 5ZA, 5ZAF, (5ZAV), (5ZAW), (5ZC), 8UC, (9ABV), (9AQE), (9DZY), 9LF, 9HT, (9ZV).

C.W.: (5AE), (5BO), (5DI), 5DO, (5DY), 5EK, (5FV), 5IR, (5JB), 5KC, 5MA, (5NS), (5UK), (5UN,) (5TH), (5VA), 5ZA, (5ZG), 6KA, 8UC, 8ZZ, (9ABV), (9AOG), 9BSG, (9CCS), 9DUG, (9DUN), 9NX.

5DO, Memphis, Tenn.

C.W.: 2FP, 2NZ, 3ALN, 3BLF, 3BZ, 3HL, Can. 3KO, 4AZ, 4BX, 4DC, 4DG, 4FW, 4HW, 4JH, 4KC, 4KF, 4LP, 4MW, 5AAM, 5ACF, 5DI, 5FO, (5FV), 5GK, 5HI, (5IR), 5JB, 5JL, (5KC), 5LA, 5LK, 5MA, 5NM, 5PB, 5PL, 5SP, 5UE, (5UK), 5UO, (5VA), (5XY), 5ZA, 5ZAS, 8AFT, 8AN, (8ANB), 8AP, 8APT, 8ASZ, 8AUA, 8AWM, 8AWT, (8AXB), 8BAK, 8BDB, 8BDU, 8BFM, 8BFX, 8BKE, 8BNU, 8BRM, 8BRQ, 8BZI, 8CAZ, 8CGX, 8CKO, 8KH, 8SP, 8UC, 8VQ, (8VY), 8XE, 8XY, 9AAP, 9ABV, 9ACP, 9AEP, 9AIX, 9AJA, 9AJP, 9AMI, (9AOG), (9AON), 9APS, 9ARB, 9ARK, (9AUS), 9AXF, (9BDB), 9BED, 9BHL, 9BOG, 9BQW, (9BSG), 9CAY, 9CBA, 9CFI, 9DAK, 9DPM, 9DR, 9DSG, (9DUN), 9DUG, 9DWK, 9DXN, 9HW, (9IO), 9KP, 9LQ, (9NX), 9OX, 9PA, 9UU, 9XE, 9XL, 9YAJ.

Spark: 4BI, 4FD, 5TU, 5XAC, 9CP, 9DZY, 9KI, 9LF, 9YM.

6FH, Sacramento, Cal.

Spark: (6AO), (6AR), (6AAU), 6ACR, 6AHQ, 6AIU, 6AJH, 6AKI, (6AKT), 6ALA, 6ALD, 6ALU, 6ALW, (6AMK), (6AMZ), (6AQU), (6ARK), 6AWH, 6AUP, (6AVD), (6AVR), 6BH, 6BMI, 6BJU, (6CC), (6DP), 6EA, (6GT), (6HC), (6IB), 6KE, (6MH), 6OD, (6OL), 6QY), (6TC), 6TU, 6UP, 6VX, 6ZU, 7BK, 7FI, (7KJ), 7NN, (7NW), (7TJ), 7TO, 7TW, (7VF), (7AEA), Canadian 9BD.

C.W.: 6ALU, (6ASJ), 6AWP, (6AWT), (6BF), (6BCD), 6BEG, 6BES, 6BFE, 6BJC, 6BKB, 6BMD, (6BQC), 6BQQ, 6BSA, (6CU), 6DR, (6EA), (6EB), 6EN, (6FT), (6GY), 6JD, 6KA, 6LV, 6NX, 6OO, 6RR, 6TI, 6ZF, 7LU, 7OZ, (7SC).

6AWP, 407 West First St., Santa Ana, Calif.

C.W.: (5ZA), 6AIF, 6AIY, (6AK), (6AKW), 6AOT, (6ASJ), (6ATP), (6AUN), (6AWT), (6BJD,) (6BKB), (6BPU), 6BQF, 6BSA, 6DF, 6EK, (6FH), 6GH, 6IB, (6KC), 6KU (6LU), 6NN, 6OV, 6PI, (6TI), (6TW), 6XAS, 6XH, (6ZA), 6ZAA, 6ZAC, 6ZAE, (6ZAF), (6ZF), 6ZG, (6ZN), 6ZL (6ZT), 6ZX, (6ZZ), (7DP), 7NF, 7NA, 7NI, (7MF), (7OZ), 7SC, 7XG, 7XF, (7ZU), (9AYU), 9WD, (9WU), (CL-8), Can. 9BD.

Spark: (6AAK), 6AAU, (6ABU), (6AEH), 6AGT, (6AHF), (6AJH), 6AJR, (6AKL), 6AMZ, 6AR, 6AS, (YATU), 6BDQ, (6BJU), (6BJY), 6BJV, 6CC, 6CS, 6GR, 6GX, 6HC, (6IC), 6IU, (6KC), (6VK), 6VX, 6ZAM, (6ZB), 6ZQ, (6ZU), 6ZX, (6ZZ), 7KB, (7LY), (7MF), 7MP, 7NF, (7OT), 7TJ, (7ZU).

6OD, South Pasadena, Calif.

Spark: 5IF, 5OF, (5ZA), (6AK), (6AR), (6AS), 6BM, (6BW), 6CC, 6CP, 6CV, (6DP), (6EX), (6FH), 6FJ, (6FK), (6GF), (6GR), (6GT), (6GX), (6HC), (6HP), (6IB), (6IC), (6IM), (6KC), (6KM), (6KX), (6LU), (6MZ), (6NG), (6OC), (6OH), (6PJ), (6PO), (6PR), (6QK), (6QR), 6QY, (6TO), (6TU), (6TV), (6VK), (6VX), (6WG), (6WZ), (6XH), (6ZB), 6ZD, 6ZE, (6ZI), (6ZJ), (6ZK), (6ZU), (6ZX), (6ZZ), (6AAH), (6AAK), (6AAU), 6AAW, 6ABM, (6ABU), (6ABW), (6ABX), 6ACM, (6ACR), 6ACW, (6ADA), (6AEH), 6AEI, (6AFP), 6AEY, (6AGF), (6AHF), (6AIF), (6AIN), 6AJD, (6AJH), (6AJR), (6AKL), 6AKT, (6ALA), 6ALV, (6AMK), 6AMW, 6ANG, (6ANI), (6AOE), (6AOR), 6APE, (6AQU), 6AQY, 6ARK, (6ARS), (6ARW), 6ASN, (6ATU), (6AUD), (6AVB), (6AVM), (6AVV), 6AVX, 6BAK, 6BCJ, (6BGL), (6BIU), (6BJV), 7BK, 7BP, 7BH, 7FI, (7FJ), 7GA, 7GJ, 7GQ, 7HF, 7IN, 7IY, (7MF), 7JD, (7OT), 7TJ, 7XD, 7YA, 7ZJ, 7ZT.

C.W.: 5ZA, (6AK), 6FH, (6GF), 6HC, (6JJ), 6KU, 6OO, 6ZB, 6OH, (6ZI), 6ZS, 6ZX, 6AAT, 6AEH, 6ASJ, 6ASV, 6AWT, (6ATP), 6BJY, 6BMD, 7MF, 7XF, 9DN, 9WD, 9AMB, 9AYU, 9BJI, 9DVA.

7NW, Hoquiam, Wash.

Spark: (6ABX), 6ABW, 6ACR, 6ALA, (6AMK), 6ANG, 6ARK, (6AVM), (6CC), (6DD), (6EX), 6FF, (6GF), (6IB), 6IC, 6TU, (7AEA), 7BH, (7BK), 7BZ, (7EX), 7FH, (7FI), (7GE), 7HF, (7IW), (7IY), (7KE), 7KZ, 7MF, 7OF, 7OW, (7TO), (7TW), (7VE), 7VF, 7WG, 7ZK, (3EC), Can. 5CT, (9BD).

C.W.: 6AAT, 6ABX, 6BCD, 6GR, 6KA, 6RM, 7AEA, 7DD, 7LU, (7MF), 7NA, (7OZ), (7QW).

7TH, Walla, Walla, Wash.

Spark: 6GF, 6GI, 6HC, 6ABU, 6ACR, 6AMZ, 6ARK, 7BK, 7GE, (7JW), 7NW 7OF, 7RA, 7TO, 7UW, 7VL, (7VF), (7ABY), (7AEA), (CL8), Can. 9BD.

C.W. 6EN, 6FF, 6FT, 6KA, 6AWT, 6BSA, 7IA, 7LU, (7NA), 7QW, 7RN, 7ZU. Fones: 7IA, 7RN, 7XF, 7ZU.

7GE, Pasco, Wash. (1 Tube)

Spark: 6CC, (6EX), (6GR), 6IB, 6LC, 6LG, 6NN, 6RM, (6TU), (6AJR), 6AQU, 6AMK, 6BAK,

6ALD, 6ABU, 6AAU, 6AGF, 6ABX, 7AW, 7AX, (7BG), 7BH, (7BK), (7BZ), 7CU, (7EO), 7EY, (7FI), 7FQ, (7FR), 7GA, 7HD, (7HI), (7IW), (7IY), (7JW), (7KE), (7KJ), 7KM, (7NN), (7NW), (7OH), (7OT), (7NL), 7OF, (7RO), (7TO), (7VE), (7VF), (7VZ), (7WG), (7WM), 7YA, (7YS), 7ZK. (7TJ), (7AAB), CL8.

C.W.: 5WH, 6FF, 6GF, 6GX, 6GY, 6JD, 6KA very QSA, 6KC, 6KU very QSA, 6LO, 6NX, 6OI, 6PI, 6UO, 6AWT very QSA, 6BES, 6AAT, 6ASJ, 6BCD, 6BMU, 7BS, 7LU very QSA, (7QE), (7QW), (7RN), (7SC), (BTS), (7NA), 9AYU, Can. (5AK), 3EC, (9BD).

8AVJ, Canajoharie, N. Y.

Spark: 1AA, 1ADC, 1AMQ, 1AW, 1BJS, 1BOE, (1BPZ), 1BRQ, 1CE, 1CHQ, 1DY, (1FS), 1LQ, 1SN, 2ACW, (2ARB), 2AWF, 2BQZ, (2CGJ), (2DN), 2EL, 2FP, (2OM), 3AHR, 3AWE, 3BEI, 3BEU, 3BP, 3BSE, 3HB, 3HJ, 3II, 3AFV, 3AJT, (3AOI), (3AOT), 3APB, (3APU), 3AXX, 3BAC, 3BAH, (3BCW), 3BDA, 3BJS, (3BLH), 3BUN, 3BYP, 3BZ, 3CJH, 3EJ, 3IL, 3KY, 3MU, 3RQ, 3UC, 3UE, 3VE, 3VQ, 3XE, 3ZO, 9AAW, 9AFS, 9BS, 9LF.

C.W.: 1ADC, 1ADL, 1AGH, 1AGP, 1AJU, 1ANQ, 1AQW, 1ARY, 1AWB, 1AZD, 1AZW, 1AZX, 1BCF, 1BES, 1BGF, 1BKA fone, 1BKQ, 1BNT, 1BWJ, 1CAE, 1CBH, 1CBP, 1CCZ, 1CFI, 1CGR, 1CHJ, 1CHK, 1CJH, 1CMK, 1CNK, 1CNM, 1CNR, 1CPN, 1CQW, 1HK, 1PY, 1RN, 1SC, 1XX, 1YK, 2ANM, 2ATR, 2AWF, 2AWH, 2BAA, 2BEH, (2BIG), (2BML), 2BQH fone, 2BQU, 2BRC, 2COS, 2FP, 2KL, 2RY, 3AAO, 3AFB, 3ANT, 3AJL, 3AUU, 3AWS, 3BG, 3BLF, 3BNU, 3BRW, 3BTY, 3BVC, 3CBM, 3CLJ, 3HL, 3HY, 3IW, 3LR, 3OT, 3PS, 3RW, 3VJ, 3VW, 3ZM, 3ZO, 3ACF, 3AFD, 3APH, 3APT, 3AQO, 3AVD, 3AVL, 3AWP fone, 3AZF, 3BEO, 3BFX, 3BJH, 3BNU, 3BRC, 3BRW, 3CAZ, 3CBJ, 3CCX, 3CIO, (3CIV), 3CJH, 3CJY, 3CKO, 3CNW, (3CPG), 3CUK, 3HJ, 3JU, 3SP, (3TB), 3XE.

8BCW, Gen. Del'ivery, Rome, N. Y.

Spark: 1DY, 1HO, 1LZ, 1OE, 1ACO, 1AKG, 1BPZ, 1BRQ, 2DN, 2EL, 2FP, 2JG, 2OM, 2RM, 2TJ, 2AHU, 2ARB, 2BJO, 3CN, 3FP, 3GX, 3IN, 3QN, 3ACY, 3AHK, 3AWE, 3EO, 3EW, 3HL, 3RQ, 3TC, 3UC, 3ACF, 3AHU, 3AIB, 3APB, 3AVJ, 3AXX, 3BAC, 3BDA, 3BQT, 3BZU, 9UH.

C.W.: 1GV, 1QN, 1PT, 1SC, 1XM, 1XX, 1YK, 1ACS, 1ACU, 1AGH, 1AGI, 1AJU, 1AWB, 1BKQ, 1BWJ, 1CBH, 1CDO, 1CMK, 1CPN, 2BG, 2DA, 2FP, 2JW, 2NZ, 2OT, 2TS, 2UD, 2AFP, 2AGH, 2AQF, 2AWH, 2AWS, 2AYG, 2AYV, 2BAA, 2BEH, 2BFE, 2BFZ, 2BJO, 2BLP, 2BML, 2BNZ, 2BQH, 2BQU, 2BRB, 2BUM, 2CBG, 2CBT, 2CKL, 2CMS, 2COL, 2BFI, 3BV, 3BX, 3CC, 3IW, 3OT, 3ZO, 3ZZ, 3AFB, 3ANJ, 3ANO, 3BIT, 3BNU, 3BTY, 3BVC 3CBM, 3CCC, 4BX, 4XX, 8AX, 8HJ, 8KG, 8OW, 8SE, 8SP, 8UK, 8XE, 8AQF, 8AVL, 8AWM, 8BDO, 8BDU, 8BNU, 8BNY, 8BPH, 8BPL, 8BRC, 8BUT, 8BXH, 8CBJ, 8CBO, 8CJH, 8CKO, 8CON, 8CPC, 9ARK.

8BHF, Fairport, N. Y.

C.W.: 1ARY, 1BKQ, 1CAZ, 1CHJ, 1CNR, 1HX, 1VQ, 1XM, 2AER, 2AFP, 2AJA, 2BEH, 2BQH, 2BQU, 2BRB, 2COL, 2FP, 2KL, 2OT, 2SQ, 3ADX, 3AFB, 3AIS, 3ALN, 3ANJ, 3ANO, 3APD, 3BIJ, 3BIT, 3BLF, 3BNU, 3BRW, 3CBM, 3CC, 3DT, 3KO, 3OT, 3ZO, 3ZZ, 3ACF, 3AHK, 3AIO, 3ALB, 3ALF, 3ALV, 3AMM, 3AMQ, 3AN, 3AOL, 3APT, 3AQZ, 3AVD, 3AWM, 3BDU, 3BEO, 3BMM, 3BNU, 3BO, 3BOA, 3BPH, 3BRM, 3BUX, 3CAY, 3CAZ, 3CCX, 3CEI, 3CFP, 3CGQ, 3CJH, 3CJY, 3CKO, 3COI, 3CON, 3COO, 3HJ, 3KG, 3KH 3LZ, 3OW, 3QB, 3SE 3SP, 3UC, 3XE, 3ZAF, (QRA?); 3ZX, 3ZZ, 9AIU, 9APS, 9BDB, 9BSG, 9HW, 9IO.

Spark: 1SN, 2ARB, 2BJO, 2NF, 2OM, 3BEI, 3BU, 3GX, 3QN, 3ALW, 3APB, 3AZF, 3BAH, 3BDA, 3BGT, 3CTZ, 3CUO, 3CYD, 3DAA, 3EA, 3EW, 3IL, 3TC, 3TK, 3VE, 3VH, 3VQ. Phone: 1CIZ, 1CKA, 3XW, 3AQO, 3AWP, 3AZD, 3BOA.

8ZO, 1375 Franklin Ave., Columbus, Ohio

Spark: 1AA, 1AKG, 1AOK, 1ARY, 1AW, 1BDT, 1BEO, 1BRQ, 1BVB, 1CHJ, 1FM, 1GM, 1WQ, 2AAF, 2ARY, 2AWF, 2EH, 2FP, 2OM, 2RM, 2TS, 3ABB, 3AHK, 3AOV, 3BFU, 3BVC, 3GK, 3IW, 3WF, 3WR, 3ZS, 4AO, 4BI, 4CX, 4EZ, 4FD, 4FS, 4GM, 4GN, 4GU, 4HS, 4IE, 4YA, 5ARY, 5EB, 5GK, 5LA, 5MA, 5PE, 5TU, 5XB, 5XJ, 5XU, 5ZAA, 5ZAC, 5ZAF, 5ZAK, 5ZZ, 6TV, 8AAP, 8ACF, 8AER, 8AFK, 8AGP, 8AHY, 8AIB, 8AIT, 8AIZ, 8AJX, 8ALQ, 8ALU, 8ANW, 8ASL, 8ASY, 8ATU, 8AUX, 8AVH, 8AXN, 8AY, 8AYM, 8AZF, 8AZH, 8AZR, 8BAH, 8BAZ, 8BDA, 8BDV, 8BEP, 8BFH, 8BGT, 8BHD, 8BHO, 8BNA, 8BNK, 8BQA, 8BRL, 8BRM, 8BXC, 8BXX, 8CGZ, 8CJZ, 8CKV, 8CMF, 8CMI, 8CMY, 8CP, 8CPP, 8CTD, 8CUO, 8CWB, 8CWD, 8EA, 8EB, 8EO, 8EW, 8KG, 8KJ, 8KY, 8LQ, 8MU, 8NR, 8NZ, 8OI, 8RQ, 8TC, 8TK, 8UC, 8UN, 8VH, 8VQ, 8WD, 8WU, 8WZ, 8XE, 8YR, 8YU, 8ZY, 9AAW, 9ACB, 9AES, 9AFK, 9AGG, 9AGR, 9AIR, 9ALP, 9AMK, 9AMT, 9AMX, 9AOY, 9APK 9APS, 9ARG, 9AVH, 9AYK, 9AYW, 9AYY, 9AZA, 9BAK, 9BDF, 9BK, 9BRS, 9BYA, 9CP, 9DAY, 9DCX,9DDZ, 9DGX, 9DHZ, 9DI, 9DKY, 9DMJ, 9DPB, 9DSD, 9DTN, 9DWM, 9DWX, 9DXE, 9DXT, 9DZI, 9DZX, 9DZY, 9FK, 9FS, 9GX, 9HR, 9HT, 9JA, 9JX, 9KA, 9KI, 9LF, 9MC, 9ME, 9MS, 9OE, 9OF, 9OR, 9OX, 9QC, 9RC, 9TI, 9UH, 9US, 9VL, 9WX, 9WY, 9XE, 9XI, 9XT, 9YAK, 9YB, 9YJ, 9YM, 9YQ, 9ZH, 9ZJ, 9ZN, 9ZV, 9ZX.

C.W.: 1ACG, 1ACU, 1AJR, 1AJU, 1AR, 1ASF, 1AUZ, 1AWB, 1AZW, 1BDI, 1BGF, 1BKA, 1BKQ, 1BQI, 1BQT, 1CAK, 1CCD, 1CCZ, 1CGQ, 1CHJ, 1CIK, 1CIT, 1CNE, 1CNR, 1CNW, 1CQP, 1CQW, 1CVE, 1GV, 1HK, 1HX, 1ON, 1PM, 1QN, 1QP, 1VT, 1XAD, 1XG, 1XM, 1XX, 1XZ, 1YK, 2AFP, 2AJA, 2ANM, 2APB, 2AWS, 2BDU, 2BEH, 2BEN, 2BFU, 2BFZ, 2BG, 2BIR, 2BIT, 2BLB, 2BLP, 2BNZ, 2BQH, 2BQU, 2BRB, 2BRD, 2BRT, 2BTW, 2CES, 2CIM, 2DN, 2FP, 2KJ, 2LR, 2MJ, 2NZ, 2SQ, 2TS, 2UD, 2VH, 2WB, 2WF, 2XB, 2XM, 3ADX, 3AJD, 3AL, 3ALF, 3ALN, 3ANJ, 3ANO, 3ARN, 3AUU, 3AUW, 3AXE, 3BFU, 3BG, 3BGT, 3BHL, 3BIA, 3BIJ, 3BJK, 3BLF, 3BMN, 3BNU, 3BQ, 3BRW, 3BVA, 3BVC, 3BZ, 3BZH, 3CBM, 3CC, 3CCC, 3CKM, 3FP, 3HL, 3IL, 3IW, 3JJ, 3JK, 3LR, 3MA, 3OT, 3SY, 3TW, 3VW, 3XW, 3ZO, 3ZZ, 4BX, 4BY, 4DC, 4DF, 4DK, 4DS, 4EB, 4EH, 4GH, 4GL, 4GX, 4HW, 4II, 4IV, 4JH, 4KC, 4KF, 4KP, 4LJ, 4LP, 4MT, 4MW, 4QT, 4ZB, 4ZC, 4ZZ, 5AA, 5AAM, 5ABN, 5DA, 5DI, 5DO, 5FO, 5FV, 5JB, 5JL, 5KC, 5LA, 5MB, 5NS, 6NV, 6SO, 5SP, 5UK, 5VA, 5XA, 5XAB, 5XC, 5ZA, 5ZAP, 5ZAT, 5ZAY, 5ZG, 6EN, 6KA, 6TV, 6ZAC, 6ZG, 7KX, 8AAL, 8AAZ, 8ABV, 8ACF, 8ACH, 8AFD, 8AFY, 8AGN, 8AGR, 8AGW, 8AGX, 8AIG, 8AIM, 8AIO, 8AJU, 8AK, 8ALB, 8AM, 8AMD, 8AN, 8ANB 8AOL, 8AOI, 8AP, 8APT, 8AQ, 8AQF, 8AQO, 8AQV, 8AQZ, 8ARD, 8ARK, 8ASM, 8ASQ, 8ASZ, 8ATU, 8AVD, 8AVH, 8AVK, 8AVM, 8AVT, 8AWM, 8AWP, 8AWT, 8AWX, 8AWZ, 8AX, 8AXB, 8AZH, 8BAS, 8BAZ, 8BDB, 8BDO, 8BDU, 8BEF, 8BEN, 8BEO, 8BEX, 8BFM, 8BFN, 8BFX, 8BHY, 8BIL, 8BKE, 8BKN, 8BL, 8BLT, 8BMM, 8BNO, 8BNU, 8BNY, 8BO, 8BOG, 8BOX, 8BPJ, 8BPL, 8BQF, 8BRM, 8BRL, 8BRQ, 8BRT, 8BRZ, 8BUX, 8BVT, 8BWA, 8BXF, 8BXX, 8BZF, 8BZO, 8CAB, 8CAG, 8CAY, 8CAZ, 8CBC, 8CBJ, 8CCX, 8CDK, 8CDZ, 8CEI, 8CFP, 8CGN, 8CGO, 8CGX, 8CKM, 8CKO, 8CLD, 8CMI, 8CNP, 8CON, 8COO, 8CPX, 8CQZ, 8CSL, 8CTN, 8CTP, 8CVE, 8CWE, 8CWP, 8CWS, 8CWX, 8CXX, 8CYB, 8CYT, 8CZW, 8DAK, 8DAL, 8DD, 8DH, 8DV, 8DZ, 8EA, 8FT, 8GH, 8HH, 8JL, 8JU, 8KG, 8KH, 8LZ, 8ML, 8MP, 8NB, 8NJ, 8PT, 8QB, 8SP, 8TD, 8UC, 8UE, 8UK, 8UZ, 8VQ, 8VY, 8WR, 8XE, 8XU, 8XV, 8YD, 8YE, 8YG, 8YR, 8YU, 8ZAE, 8ZAG, 8ZE, 8ZF, 8ZG, 8ZH, 8ZM, 8ZN, 8ZY, 8ZZ, 9AAP, 9AAW, (hi) 9AB, 9ABV, 9AIX, 9AIY, 9AJA, 9AJH, 9AJP, 9ALS, 9ANA, 9AOG, 9AON, 9APM, 9APS, 9APV, 9ARG, 9ARK, 9ARM, 9AUA, 9AXF, 9BAA, 9BDB, 9BGH, 9BHD, 9BLC, 9BSG, 9BUD, 9BZI, 9CBA, 9CEN, 9CP, 9DA, 9DBC, 9DCP, 9DCR, 9DFB, 9DGM, 9DKY, 9DR, 9DXN, 9EI, 9FK, 9GL, 9HW, 9IO. 9KP. 9LQ, 9NX. 9OX, 9PA, 9PF, 9PK, 9PW, 9QE, 9UH. 9US, 9UU, 9WU, 9XAC, 9XAQ, 9XI, 9XL, 9YAE, 9YAJ, 9YAM, 9YF, 9YI, 9YQ, 9ZJ, 9ZL.

Fone: 1XAD, 2XB, 3XW, 3ZO, 8ANB, 8AWZ, 8AZH, 8CGX, 8CLD, 8CMI, 8CWP, 8YD, 8YU, 8ZZ, 9BDB.

Canadian—Spark: 2EH, 3BP, 3GN, 3GX, 9BS. C.W.: 2EF, 2FZ, 3BP, 3BV, 3JI, 3JK, 9AL.

8AB, Port Huron, Mich.

C.W.: 1GV, 1XM, 1AWB, 1BCF, 1BKQ, 1CNR, 1CPN, 1GXB, 2BE, 2BG, 2FP, 2KL 2NZ, 2OT, 2SQ, 2SZ, 2AFP, 2ANO, 2AUZ, 2AXK, 2BEH, 2BLP, 2BQH, 2BRC, 3BG, 3BP, 3BZ, 3CM, 3IW, 3LP, 3OT, 3PB, 3ZO, 3AJD, 3ALN, 3ANY, 3BEH, 3BIJ, 3BIZ, 3BLF, 3CBM, 4DC, 4DS, 4GH, 4GL, 4GX, 5EK, 5FV, 5ZA, 8AM, 8AN, 8BG, 8EB, 8FT, 8HJ, 8KH, 8OW, 8SP, 8UC, 8UE, 8VQ, 8VY, 8XE, 8XJ, 8ZO, 8ZZ, 8ACF, 8AIB, 8ALM, 8AQZ, 8ARW, 8ASM, 8AVD, 8AVL, 8AVY, 8AWT, 8BDB, 8BDU, 8BPL, 8BRQ, 8BXA, 8BXH, 8CKO, 8CLD, 8CNA, 8ZAF, 9AL. Canadian: 9AR, 9BH, 9BZ, 9DO, 9DR, 9EI, 9ET, 9FK, 9IO, 9OR, 9OX, 9PA, 9UH, 9US, 9UU, 9WU, 9XL, 9XM, 9ZJ, 9AAU, 9AIX, 9AJA, 9AJH, 9AMT, 9AON, 9APS, 9AQJ, 9AXF, 9BHD, 9BSG, 9CBA, 9CGC, 9DCR, 9DEK, 9DFB, 9DRG. Spark: 5ZL, 8BXC, 9FS, 9ZN, 9ZV, 9DXE.

8CEF, Monessen, Pa.

Spark: 1BPZ, 1CHZ, 2ARB, 2ACW, 2AER, 2ARY, 3AJD, 3II, 3EJ, 3HJ, 4IE, 8EW, 8EB, 8FQ, 8RQ, 8UC, 8VQ, 8XE, 8ACF, 8AIB, 8AIZ, 8AJT, 8ALW, 8AZF, 8BAZ, 8BEP, 8CSD, 8ZO, 9KI 9DC, 9AAW, 9ZJ, 9YB, 9AFK, 9AGR, 9AIR, 9APS, 9DCX, 9DZY, 9YAC.

C.W.: 1GV, 1KC, 1RD, 1XM, 1ABY, 1ACS, 1ACU, 1ANQ, 1AWB, 1BQT, 1CCZ, 2DA, 2BG, 2FP, 2FZ, 2EH, 2NZ, 2UD, 2WR, 2AFW, 2AFP, 2BEH, 2BFZ, 2BJO, 2BNZ, 2BQD, 2BQH, 2BML, 2BRB, 2BRC, 3FS, 3IK, 3IW, 3MK, 3LP, 3LR, 3OT, 3SX, 3VW, 3WF, 3XW, 3ZO, 3ANO, 3BGT, 3BIJ, 3BRW, 3BSJ, 3BTY, 3CBM, 4BX, 4DC, 4FF, 4LP, 5AAM, 8CI, 8DV, 8EA, 8GA, 8LJ, 8NV, 8OI, 8SP, 8UE, 8XE, 8ZH, 8ZZ, 8ACF, 8AIM, 8AFY, 8AMM, 8ASZ, 8AVL, 8AWM, 8BDB, 8BDU, 8BGG, 8BMM, 8BPL, 8BRM, 8BRW, 8BSJ, 8BTR, 8BRT, 8BUT, 8BZF, 8CEI, 8CFP, 8CJY, 8CKO, 8CLD, 8CVY, 8ZAE, 8ZAF, 8ZAG, 9AL, 9EI, 9HW, 9AMT, 9ALC, 9APS.

9BAF, Brainerd, Minn.

C.W.: 1XM, 2FP, 2BEH, 3LR, 3QV, 4BC, 4BQ, KF4, (5EK), 5DO, (5RL), 5FO, 5LJ, 5SP, 5ZG, 6KA, 7LU, 7ZU, 8AIO, 8AM, 8AUB, 8AXB, 8BFX, 8BRW, (8CAZ), 8JL, (8MP), 8KH, 8UC, 8UK, (8VY), 8XV, 8ZZ, 9AL, 9AIY, 9AIX, (9AAP), 9AJA, 9AJH, (9AKD), (9AMI), 9AMU, (9AOG), (9AOR), 9APS, (9ARK), (9ARZ), 9ASF, 9AUU, (9AUA), 9AXF, 9BAP, (9BBF), (9BGH), (9BKP), (9BHD), 9BBB, (9BQW), 9BZI, (9BSG), 9CP, (9CBA), (9BJB), (9CDV), 9CCV, 9DX, (9DR), 9DUG, 9DXK, 9DIO, 9EI, 9EW, (9FK), (9GL), 9HW, (9IL), 9KP, 9OO, 9PN, (9QE), (9QF), 9UU, 9VE, (9YAJ), 9YAK, 9US, 9YF, 9ZX.

Spark: 8AZF, 9AAW, 9ASK, 9AYW, 9AXU, 9AAR, 9DSM, 9DZY, (9LF), (9MF), (9XT), 9ZC.

9DWK, Jackson, Mo.

Spark: 4BI, 4FD, 4IE, (5ABY), 5TU, 8AIB, 8BBL, 8BDA, 8OI, 8UC, 8ZY, 9AAW, 9ABV, (9ACB), 9AFK, 9AIR, 9AMK, 9APS, 9AVH, 9AWY, 9AYY, 9CP, 9DAY, 9DDZ, 9DHZ, 9DJB, 9DQO, 9DTN, 9DWM, 9DWO, 9DXE, 9DXT, 9DZY, 9FK, 9GX, 9KI, 9LF, 9QR, 9WY, 9XT, 9ZN, 9ZV, Canadians 3GX, 9BS.

C.W.: 2CC, 2CDR, 2FP, 2NZ, 2VW, 3AFB, 3ANO, 3BG, 3BLF, 3BZ, 3CBM, 3IW, 3JK, 3ZO, 3ZZ, 4BX, 4CX, 4DC, 4DQ, 4GH, 4HW, 4JH, 4KF, 4LP, (5AAM), 5DO, 5EK, 5FO, 5FV, 5IR, 5JB, 5KC, 5KP, 5LA, 5MA, 5ND, 5SP, 5UK, 5UO, 5XC, 8ACF, 8AFD, 8AIO, 8AM, 8AMD, (8ANB), 8AWM, 8AXB, 8BDB, 8BDM, 8BDU, 8BEK, 8BFM, 8BFX, 8BGG, 8BKE, 8BPL, 8BRC, 8BRG, 8BRW, 8BVT, 8BZF, 8CAZ, 8CJY, 8CKO, 8DAK, 8EA, 8KH, 8PT, 8SE, 8SP, 8UC, 8UK, 8UZ, 8VY, 8XE, 8XJ, 8YG, 8ZAG, 8ZG, 8ZN, 8ZZ, 9AAP, (9ACB), 9AEP, 9AGS, 9AIU, 9AIX, 9AIY, 9AJP, 9ALS, 9AOG, 9AON, 9APS, 9AQJ, 9ARK, 9AXF, 9BAA, 9BCT, 9BED, 9BEM, 9BGH, 9BHD, 9BHI, 9BLC, (9BLO), 9BSG, 9BXW, 9BZI, 9CBA, 9CCS, 9CCV, 9CGK, 9DCR, 9DEK, 9DFB 9DKY, 9DR, (9DWY), 9DXN, 9DYN, 9DZW, 9HW, 9IO, 9JG, 9LQ, 9OX, 9PA, 9PW, 9QE, 9UU, 9YAJ, 9YB, 9ZAF, Canadians 8KO, 9AL

9CIV & 9BAC Milwaukee, Wis.

Spark: 2FP, 8AIB, 8AIZ, 8AZF, 8BBU, 8BDU, 8BEP, 8BGT, 8CKV, 8EA, 8EO, 8NZ, 8RL, 8TB, 8UC, 8XE, 8EW, 8BDH, 9AAW, 9ACB, 9AJH, 9AMT, 9ANP, 9APN, 9AQE, 9AUA, 9AVP, 9AYW, 9AZA, 9BCF, 9BSZ, 9DAY, 9DNC, 9DPB, 9DQO, 9DSM, 9DSO, 9DXE, 9DZU, 9DZY, 9FK, 9GC, 9LF, 9MS, 9NQ, 9OF, 9TO, 9XT, 9ZJ, 9BMG, 9BS, 9ZN, 9YQ.

C.W.: 1CNR, 1XM, 2AFP, 2BG, 2BNZ, 2FP, 2NZ, 3ALN, 3ANO, 3BA, 3BP, 3FS, 3OT, 3WF, 3ZZ, 4BX, 4DC, 4MW, 5AAM, 5DO, 5FV, 5ZA, 8ACF, 8AFY, 8AIO, 8ALB, 8AM, 8AMM, 8AN, 8ANB, 8AOL, 8AQO, 8AQZ, 8ARD, 8ASM, 8ASZ, 8AUA, 8AVD, 8AVL, 8AWM, 8AWP, 8AX, 8BCZ, 8BDB, 8BDM, 8BDO, 8BDU, 8BFM, 8BFX, 8BKE, 8BO, 8BPL, 8BPU, 8BQG, 8BRC, 8BWL, 8BXA, 8CAY, 8CAZ, 8CBJ, 8CGX, 8CJY, 8CKM, 8CKO, 8CLD, 8DAK, 8DV, 8EA, 8KG, 8KH, 8LX, 8OW, 8PT 8SP, 8UC, 8UE, 8VQ, 8VY, 8ZAG, 8ZZ, 9AFN, 9AIU, 9AIX, 9AJH, 9AL, 9ALS, 9AMU, 9AOG, 9AON, 9APS 9AQE, 9ARK, 9ATU, 9AXE, 9BAP, 9BBF, 9BCH, 9BGH, 9BHD, 9BSG, 9BZI, 9CAZ, 9CBA, 9CCV, 9CGK, 9CP, 9DCG, 9DFB, 9DGE, 9DJM, 9DPT, 9DR, 9DSD, 9DUG, 9DZW, 9EI, 9FK, 9GL, 9HK, 9IO, 9JG, 9NU, 9NX, 9OX, 9PO, 9SL, 9US, 9UU, 9XL, 9YAJ, Also, 8AIM, 8BVT, 8ATU, 8BXH, 8AIG, 9DKY.

9DR, 1830 Stevens, Minneapolis, Minn.

(2FP), 3ME, 4GH, 4MW, (5EK), (5FD), (5FO), 5SP, 5ZA, (7ZU), 8AQ, 8BU, 8FF, 8KH, 8LF, 8LQ, 8SP, 8UE, 8UK, 8UZ, 8VY, 8WR, 8XT (8ZZ), 8ADN, 8AGO, 8AQN, 8ASM, 8ATU, 8AWM, 8AYA, (8AXB), 8BDO, 8BDR, (8BEF), 8BXH, (8CAZ), 8CBJ, 8CGX, 8CJH, 8CKO, 8CMI, 8DAK, 8DKA, (9CP), (9EI), (9FK), (9GL), (9HT), (9HW), (9LM), (9MF), (9QE), (9UU), (9XL), (9XT), (9ZC), (9AAT), (9AAW), (9ABV), (9AIX), (9AIY), (9AMI), (9AOG), (9AOR), (9ARZ), (9AVX), (9AXF), (9BAV), (9BBF), (9BCF), (9BGH), (9BHD), (9BKJ), (9BKP), (9BLC), (9BSZ), (9BTI), (9BTT), (9BZE), (9CBA), (9CDV)), (9DEH), (9DFB), (9DJW), (9DKY), (9DQM), (9DZY), (9YAJ), Can. 3KO.

9AUA, St. Paul, Minn.

Spark: 5ZZ, 8UC, 9HT, 9KI, 9LF, 9ZC, 9AAW, 9AMK, 9AYW, 9BDF, 9DEH, 9DPB, 9DZY.

C.W.: 2FP, Can. (3BV), 4EY, (4KF), 5AJ, 5EK, 5FV, 5SP, 5ZG, (8AN), 8UC, 8UE, 8UK, (8VY), 8XE, 8ZAG, 8ZZ, (8AFY), 8ANB, 8APT, 8ASM 8ASZ, 8AWM, 8BDU, 8BXA, 8CGN, 8CJS, 9EI, (9FK), (9HW), 9KP, 9NX, 9OX, 9QE, (9US), 9WA, 9XL, (9YAJ), 9AAP, 9AJA, 9AMB, (9AMI), 9AMU, (9AOG), 9AON, (9AOR), (9AUS), 9AXF, (9BAF), (9BAV), 9BGH, 9BHD, (9BKJ), (9BKP), (9BSG),(9BTT), 9BZI, (9CAH), 9CBA. 9CCS, 9CFI, 9CLC, (9DKY), 9DQM, 9DUM, 9DXD, 9DXN, 9DWK.

9AHC, Ellendale, N. Dak. (One Tube)

C.W. 2FP, 4KF, 5AAR, 5CY, 5DI, 5DO, 5EK, 5FV, 5JB, 5JL, 5SJ, 5SP, 5UK, 5VA, 5ZA, 6EN, 6KA, 7LU, 7ZU, 8AVH, 8AXB, 8BDB, 8BDU, 8BEF, 8BXH, 8EA, 8KH, 8UC, 8UE, 8VY, 8XJ, 8YD, 8ZZ, 9AAP, 9ABV, 9AIX, 9AIY, 9AJA, 9AJH, 9AJP, 9AMB, 9AMI, 9AOG, 9AON, 9AOR, 9ATU, 9AUA, 9AUS, 9AVZ, 9AXF, 9BAV, 9BBF, 9BED, 9BHD, 9BKP, 9BLC, 9BQW, 8BRL, 8BSG, 9BZI, 9CBA, 9CFI, 9CP, 9CSV, 9DBL, 9DFB, 9DGE, 9DKB, 9DKY, 9DR, 9DSD, 9DUG, 9DUI, 9DUN, 9DWY, 9DXN, 9EI, 9FK, 9GX, 9HW, 9OX, 9PI, 9QE, 9UU, 9VE, 9YAJ.

Fone: 7ZU, 9ASF, 9PI.

Spark: 5TU, 7ZV, 9ABV, 9AFK, 9ANP, 9APN, 9AQE, 9AVZ, 9AYW, 9AZA, 9BRI, 9CP, 9DPB, 9DSD, 9DZY, 9FX, 9HT, 9KI, 9LF, 9YAK, 9ZC, 9ZV.

9DMV, LeRoy, Kansas (1 Tube)

C.W.: 4DC, 4DN, 4KU, 5AR, 5DH, 5DO, 5FO, 5JB, 5NV, 5UA, 5UK, 5XY, 5ZA, 8BD, 8BM, 8CP, 8SC, 8SN, 8VU, 8YO, 8ZZ, 8ASG, 8AWM, 8BMR, 8GAG, 8IFD, 9AP, 9CF, 9CP, 9CS, 9DR, 9EI, 9FK, 9FO, 9HA, 9KD, 9MX, 9YA, 9AAI, 9AAP, 9AAS, 9ABV, 9ACN, 9AIX, 9AIY, 9ALR, 9AOG, 9AON 9ARK, 9BCR, 9BED, 9BGH, 9BGS, 9BHD, 9BIP, 9BLC, 9BMY, 9BSA, 9BSG, 9BSR, 9BZI, 9CAO, 9CBA, 9CEE, 9CLI, 9CLN, 9CSA, 9DHB, 9DJB, 9DSD, 9DSG, 9DUN, 9DYN, 9DZY.

Spark: 5QA, 5ZA, 9KI, 9LA, 9LP, 9SY, 9WI 9YI, 9ZW, 9ZH, 9YR, 9ABV, 9AQE, 9ASN, 9BSZ 9BXJ, 9CFI, 9DCQ, 9DJB, 9DZY.

Radio Communications by the Amateurs

The Publishers of QST assume no responsibility for statements made herein by correspondents.

How One Novice Views Things

Manchester, N. H.

Editor, *QST:*

Have been reading with considerable interest the comments of dyed-in-the-wool radio amateurs on phone broadcasting. Will you allow a novice space to state his ideas?

First and foremost let me state that the present craze for broadcasts is being overdone. Stations are springing up like mushrooms and it isn't a healthy state of affairs. My humble opinion is that unless a novice graduates from the broadcasts and learns the code and has ambitions to own his own station, his interest soon dies. Therefore let us not discourage the beginner but lead him to delve deeply into the mysteries of radio communication.

Now as to the howl about interference that comes from some beginners. He sits down at his set, usually the wonderfully selective single circuit turned out on the Ford plan. He hears a hum or buzzing or perhaps the oscillations from other sets like his own and straightaway he damns the amateurs and says they should be shut off, etc. Now I am a former telegrapher and so I picked up the continental in about two weeks time; I used to growl about amateurs until to my surprise I found the interference from spark stations almost without exception was from commercial stations, mostly ships. I found the amateur very considerate and invariably when some really good broadcast was on and the amateur was going with his spark set all I had to do was phone them and they gladly shut up. This made me think they were a pretty decent bunch. Then I got hold of a copy of *QST* and straightaway got the bug myself and the broadcasts held no more charm for me.

If the novice will get the advice of some A.R.R.L. member and start off with a really selective set and not the contraptions masquerading as tuners, and will get the help of our League members in his vicinity, he will find QRM negligible save for a commercial station as noted. Moreover the increasing use of C.W. by amateurs makes for less QRM.

My suggestion is that the District Superintendents should keep the spark stations of their district quiet between 8 and 10 P.M.; that is enough for any decent listener to hog the time. I don't see any reason for cutting out C.W., however, for in this city there is one 200-watter and several smaller ones and if they don't interfere with me less than a mile distant surely it is a question of proper tuning and a selective set. If the listener doesn't want to go to that trouble, why let him grouch. I hope the day isn't far distant when all amateurs will be on C.W. for it is really marvelous the way I can pick up fifteen or twenty a night with scarcely any effort. Have copied 5ZA on detector alone and on second stage could hear him out on the street.

Incidentally, can some brother tell me how to get rid of a terrific leak that makes communication impossible for days? Even on a loop you can't get a thing. Every set around me is affected the same way. We have looked for leaky power lines, motors, and every source we can think of, to no avail.

More power to the simon-pure amateur, and let's pull for less broadcasting and work for the real interest of the game. And you C.W. key pounders—start right in at dusk and go to it; I hate to sit up all night waiting for you to start.

Sincerely,
M. J. Ryan.

By Request

THE HONORABLES, THE SENATE OF THE UNITED STATES IN CONGRESS ASSEMBLED:

SIRS:

TARIFF PROTECTION TO A MONOPOLY IN RADIO APPARATUS

Your petitioners, believing that there exists a monopoly in the manufacture, sale, use and importation of radio apparatus, submit that such monopoly should not be encouraged by tariff protection and that radio apparatus, particularly *vacuum tubes, should be placed upon the free list.*

Reference is made to (1) the testimony before the Radio Conference Committee appointed early this year by the Secretary of Commerce, (2) one of that Committee's basic recommendations to the effect that radio apparatus should be freed of existing restrictions, and (3) the fact that importation of radio vacuum tubes—even for Government purposes—is virtually prohibited by the combine and/or its affiliated interests. Thus America is restricted to tubes of comparatively inferior quality and

to a most limited selection as to power and type. For instance, four-element tubes are not obtainable in this Country, though freely made and used abroad.

We do not presume to express an opinion as to whether a legitimate patent monopoly can legitimately be combined with all other patents and patent rights of like nature. It is manifest, however, that such combinations can be used to defeat the anti-trust laws, are contrary to public policy and should not be fostered by tariff protection.

We believe that the Army and Navy Departments have a large surplus quantity of radio vacuum tubes the disposal of which have been tied up by those interested in the monopoly. Enquiries made abroad meet with replies to the effect that importation of such tubes into this Country is prohibited—not by reason of the tariff, but by the control here of foreign patents and patent rights.

Your petitioners pray that radio vacuum tubes be placed upon the free list—at least for research and amateur experimental purposes.

Respectfully submitted,
The Plainfield Radio Association,
In behalf of itself and other New Jersey Radio Clubs and Associations.
J. P. W. Taylor,
President.

[The above communication is published in this department at the request of the Plainfield Radio Assn. The Editor has not crystallized his ideas on the subject as yet and accepts no responsibility for the petition.—Ed.]

More on Msg Delivery

East Orange, N. J.

Editor, *QST:*

Re the letter of Mr. R. C. Schryoer, 9AWL, I think the comment and suggestions looking toward a remedy of the "Rotten Msg. Delivery" evil, which has saddled us from the beginning of amateur radio are in order. One thing we frequently hear over the ether is:—"Got any kids over there? Hr msg 4 John Doe, Rush." Usually the "kids" are not available, and we ourselves either don't feel like laying down the cans and running out to deliver it, or don't know just where such and such street is, and they haven't any fone etc., so finally the msg. sinks to the bottom of the pin, and later the waste basket.

That same temptation has confronted me, and I've solved it. Uncle Sam's postmen know streets and numbers admirably, so I keep a stack of penny post-cards at hand, and as soon as a msg. arrives it is copied on one of them and friend wife dumps them in the mail-box on the way to the movies, or it goes first thing in the morning en route for work. A better plan would be to buy two-cent envelopes and put the msg. on an A.R.R.L. blank. In this way there is no delay, and delivery is sure. Moreover, no messages are permitted to roost here more than ten hours, or, they're mailed the morning after the night before at the very latest. I don't think a stack of 25 penny cards or envelopes will bust anybody, and besides, give Uncle Sam a chance to make a few cents on the local haul.

Very truly yours,
E. W. Lehmann, 2AHM

Honeycomb Coils

Providence, R. I.

Editor, *QST:*

Recent issues of QST contain some articles throwing more light on the use of honeycomb coils and their manipulation generally. As we ventured to ask for more light on this subject in an earlier issue we are grateful accordingly, for we have by no means attained any great skill and proficiency with these coils and fancy we still hear WSO about as loudly as the experts hear POZ, and we are frequently guilty of using amplification at that—whereas the expert seems to need but the single bulb, the more credit to him accordingly.

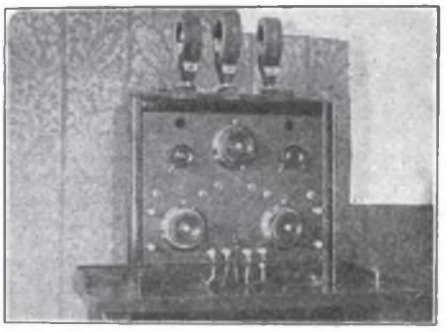
One contributor finds our experience "astonishing" and states that it was the operator and not the coils which "sweat" in his case, and even suggests that our locality may need the attention of the prohibition authorities. Perhaps it does, but if it was so "dry" the operator had to sweat we wouldn't live in it. Incidentally we notice that recent editions of these coils are equipped with different straps or fastenings from the earlier type, and 2ATV reports the use of celluloid bindings which stand the hot weather O. K.; so we do not feel that our experience was ours alone.

There seems to be nothing novel in the hook-up used by most contributors and with like apparatus one would expect like results, at least to a reasonable degree. However, one amateur uses L-1500 in the secondary for NSS and wishes he had about an L-2500 while another uses L-1250. The first amateur uses a .001 condenser in shunt and turns in about 85 degrees of capacity, the second uses a similar condenser and but 52 degrees of capacity. However condenser scales vary, some reading from 0-50, some 0-90, and others 0-100, 0-180 and even 0-200. Also the condenser may themselves vary somewhat. But since maximum inductance and minimum capacity is advisable why not use the largest inductance available for NSS—it is none too large! Again one amateur uses L-1000 in the primary for a wave of 15,500 meters and L-750 for a wave of 16,900; which seems a little odd. In our own case we have never been able to use a larger coil than L-500 for NAA or time and the coming of summer forced the use of L-400. A friend uses L-600 to advantage. In summer we have had to use smaller coils

for 'most all wave lengths, but with a friend's Grebe CR-5 receiver no noticeable differences were found due to the weather. One amateur we believe recommended somewhat larger ones than shown in the DeForest catalog for most waves. So all in all there seems to be no such thing as an absolute standard for these coils and the amateur who attempts to give exact data for their use may find himself glorified or abused in accordance with the results obtained by others. Like the "time, the place and the girl" all factors must coincide—but generally don't. (Ask 1ZE, who writes about such things.)

But it should be possible to outline briefly the general procedure adopted in tuning these coils and to follow with a short statement of the results attained. We have Mr. Groves invaluable articles and a recent contributor's article promises to be most interesting in these respects. Personally we are inclined to believe that a large part of the trouble experienced with these coils is due to the primary circuit, the selection of a proper primary coil. On the long waves particularly stations may be heard with 'most any old coil in the primary and with the condenser spun around like a top. Even without any primary coil long wave stations may often be heard quite distinctly. The addition of the proper primary coil, properly tuned, ought therefore to step-up the signals enormously. But we have not yet obtained the step-up expected. No doubt the selection of the primary coil depends in some measure upon the aerial but the difference in the size of most amateur aerials in comparison to the wave length to be received must be small. Thus we find most amaturs using coil L-750 in the primary with a .001 condenser in shunt for the average long wave station, or a larger coil with the condenser in series. We have tried various coils, with both shunt and series condensers of various capacities and have tried out several aerials, and have also listened in elsewhere, and invariably NAA comes in louder than NSS. In fact it is on say 600 to 2500 meters or so that we have had the best results with these coils. Here the tuning of the primary is fairly sharp with proper loose coupling. Incidentally a friend calls our attention to a statement in Robison's Manual of Radio Tel. & Tel. which says "It has been found that the ordinary 'tickler' coil circuit does not function well on the longer wave lengths, but is particularly good on the shorter ones." Possibly the detuning in the secondary circuit is responsible for some of the trouble on the long waves—has any amateur tried out the separate oscillator or heterodyne with honeycomb coils? It requires the use of another bulb of course, but we should like to see the results obtained with a proper heterodyne compared with those of a tickler hook-up and one step of amplification (Two bulbs in each case). Won't someone who has been able to make the very most of the tickler circuit try out this heterodyne on the long waves?

Another difficulty we have experienced is on short waves. At times (much too often) we cannot set the bulb to oscillating with a clear and pronounced click. It gets to oscillating after a fashion but the whole procedure is too "mushy". At such times any distance becomes difficult if not impossible since there is no critical position for the reception of radiophone music etc. from the tickler coil; i.e., a point where the bulb is most sensitive without spilling over. We



have tried every possible adjustment of the "A" and "B" batteries and every size of tickler, and we have exhausted the radio bug's rather specialized vocabulary on it, to no good. Sometimes it will and sometimes it won't, mostly the latter; surely a V.T. is of the feminine gender. No wonder the Y.L. has such success at 1XE—she understands the nature of the thing; besides 1ZE says she is over six feet tall and that is intimidating by itself—we are but five foot eight. Perhaps the remedy is to be found in the use of a tuned plate circuit rather than tickler feed-back, as suggested by Mr. Groves, and perhaps the man who insists on using these coils on waves below 600 meters merely invites trouble, quien sabe? But for the sake of the "universal receiver" it seems necessary to obtain the best results possible with them on all wave lengths. Hence the struggle. We have tried out the single layer coils issued as a substitute for honeycombs on short waves but find that on such waves the size of the primary coil depends entirely upon the aerial, and our aerials failed to coincide—also the tickler coil was not equal to its task. Some home-made coils did better—but looked worse. Maybe we shall try again. Incidentally does any one else addicted to a single bulb use the class II or amplifier, as Mr. Groves does? If not, can his exceptional results be accounted for in this way so far as apparatus goes—it seems to be the only novel feature of his set, and a bulb that only requires two volts fila-

ment current for maximum strength signals and that can be run on four dry cells in series-parallel is novel enough in these days of U-V's.

We have visited several stations, ship and shore, and have usually found an expensive regenerative receiver and a two-step amplifier and an aerial that made us the reverse of homesick, but unfortunately such stations were not engaged in receiving the long waves. Has any amateur visited a long wave receiving station; if so what is the equipment used, from aerial to ground inclusive? In reporting the results of such reception we have often noticed that the message mentioned that one or more steps of amplification were used. Wherefore we have wondered again whether those of us, of a commoner clay than the expert one-bulbers, may not need a little help in bringing Europe next door. True we have read that Marconi received signals from Europe with only a kite and a coherer, but we should hardly mention clay in his connection let alone common—besides if *we* wanted to put up a kite the wind wouldn't blow.

Touching the matter of home-made or self assembled sets we wished to get the coils off the panel and out of the way so to speak and so ventured to place them on top of the cabinet and the photograph shows the general appearance of the set which we think fairly compact and efficient. The panel is about 9" x 11" and shows the primary, secondary and plate condensers, the two rheostats and the necessary binding posts. On back are also the two bulbs (one step of amplification), transformer and the necessary Murdock connecting blocks to accomodate the leads from the coils on top. We have two aerials, both single wire, one 130 feet long by some 30 feet high and the other about 200 by 40. We should prefer a shorter and higher aerial, also a better set, but greatly fear that we are no more proficient in affairs of the pocketbook than in our hobbies, wherefore we pray the indulgence of those whose apparatus, like their skill, more truly approaches the ideal.

A Novice.

Stupid-Degeneration

Mi dere Meestair Armstrong and Meesetir Warner et Cie:

i write at deese time to tell you how vair mooch oblidge i am for dat wonderful circuit wich you put out last month. i am de firs man to try heem an also de las because i am now a martyr to de radio and also in de hospeetal. i connect her up like you say an she no work so i invent new way wich work so good dat de seegnals bust de bulbs and de glass go in my snoot and blue fire she burn me an de fones make de tar melt from de earcaps an burn my ears and my beeg honeycombs are burn an my money is gon an everyting an i hav now won (1) audiotron left wich were not connect at do time an a Grebe CR-3 wich I also had hook in an wich now is no dam good an wich de primairy an secondairy are fuse togaither an wen any dam fool tell you to use amplify transformaire for filter choke do not believe heem. i also am redy to make some more favorable an valuable data by saying dat you should nevaire use no B battery of 120 volt in dat super regenairative cirkit because you will be soup too if she do like mine. Et is better to use de flashlite battery first, and den add de beeg one. Et is a fine cirkit tho an shood work ver fine wen you receive liteneeng.

i tank you for dat cirkit,
Mike O'Farad.

1AAW Unearthed?

Editor, *QST:*

Perhaps you have heard of a fellow who signed off 1AAW during the Trans-Atlantic tests. I had a powerful transmitter and thought I would sign 1AAW on the small chance of getting some DX stuff around the states but I never dreamed of reaching Godley. I chose the call 1AAW because it struck me as having a good swing. At the time my station was in ——— Maine but as Maine is a large state I can be assured of the fact that you will never find the station. I will give you a hint and that is, if you draw a line 110 miles in from the coast, and parallel with the coast, my station will be somewhere in there. In a way I am scared of admitting more so that is why I won't sign this.

I assure you that I am not as dumb as you would think. I know that you have already thought over the post mark several times but it will not do you a bit of good because I am motoring thru here and will be near N. Y. City when you get this. I am wearing gloves in writing this so tough luck again. If I can ever be of any help to you please call on me.

"RADIO FOR EVER"

[We have no proof that the above was written by the operator that signed 1AAW during the Trans-Atlantics. The real sender may still be lying in quiet. At least we want more data before we let the matter rest.—Ed.]

Immortal Waves

Editor, *QST:*

While you are passing around all the prizes for various accomplishments I think it would be well to give the following record a look-over and see if station 2FS can't collect one or more.

In the "Calls Heard" of August we see station 2FS on C.W. reported by Canadian 2DC.

The waves from the transmitter at 2FS have travelled a distance of 3,866,196,000,000 miles!

The proof of this is that since the last time that 2FS was in operation, October 1 1921, until the reported reception at Montreal, the signals must have gone around the earth a matter of 154,647,844 times.

Come on now, Eddie, please send all prizes by express, *prepaid* as due to the summer slump we have no surplus cash to pay expressage on large shipments.

73's

Howard L. Stanley.

[It has come to our attention several times that stations have been reported in "Calls Heard" department when these stations had been long non-existant. Let us call our readers attention to the rules regarding reporting "Calls Heard" published at the head of this department in the June issue. Come on, gang, with better lists.—Ed.]

G.M.T.

Elizabeth, New Jersey.

Editor, *QST:*

In your circular, Rules and Regulations of the Operating Department, I note that Eastern Standard Time is specified for listening in sections A, B and C.

I am interested to know if you have considered the use of Greenwich Meridian Time (G.M.T.) in the place of Eastern Standard Time. Next winter you will begin to talk with Europe and the question of a common or international time standard is one of the first to be decided upon. Also our own country including Alaska covers quite a range of latitude. As radio is now a world-wide affair and one time standard is necessary to avoid confusion there is no question but that G.M.T. should be used as it is independent of local, railroad, daylight saving or sectional time and it is already in quite common use in marine work. (See Radio Service Bulletins.)

Some of the Canadian railroad schedules are now on the basis of 24 hour time and it would be a great improvement over present conditions if all the railroads on this continent could be operated on one 24 hour unchanging time standard not affected by zones, local or seasonable changes.

As our country covers such an expanse of latitude nothing will be gained by using any standard other than G.M.T. and it seems that the amateur radio operators of this country have a great opportunity in making the benefits of G.M.T. more generally known.

Cannot this be discussed in *QST?*

Yours very truly,

E. M. Tingley.

Paralyzed Transformers

Radio 2AZA.

Editor, *QST:*

A year or so ago there appeared in *QST* an appeal from a Houston radio club asking for assistance in combating "paralyzed" audio-frequency transformers. The appeal held my attention because it was a repetition of my own case though on a larger scale.

I had had a two step amplifier which was made by a company of unquestionable standing and of course it made me wonder a great deal when I sat down to work the thing after I had had it a while and it refused to give me a single peep. Thinking that the soldering flux might have been doing some corroding on its own hook I proceeded to operate on the transformer. After removing the lugs I again connected the leads to their respective binding posts and was rewarded by the same sphynx-like silence.

Before I had time to do any more to it I was called to a "job" in Virginia. They had three fishing steamers and a small land station and I was rather suprised when I discovered that practically all of the sets had at least one of the "paralyzed" transformers. Remembering my own experience I discouraged any efforts to dissect them, but while hunting around to try to find out what was the matter my fingers touched the two primary binding posts of the sick transformer. Lo and behold the signals came rolling in as of yore! After a short period of pride in my achievement I realized that it would be impracticable for me to stand with my hand in that position and operate my set. I recalled the pencil mark grid leak resistance and tried it; the results were fine. I think the fact that the resistance was variable added to its merits. Shorting the primary cut out the signals. I and my fellow operators soon cured the transformers in all the sets by this means.

Armed with this knowledge I set about to try to fix my own amplifier. The resistance across the primary helped somewhat but with this one I found that if I took a piece of No. 22 D.C.C. wire and connected the top primary binding post to the top secondary binding post the signals were restored to their normal strength. Thus it will be seen that the two methods were effective in different cases.

Why this sort of thing works I don't pretend to know and I should be greatly obliged to anyone who can explain it to me. In all the cases which I have mentioned it was the transformer in the first step of amplification which was at fault.

Yours truly,

Paul C. Oscanyan, Jr.

Induction from Telephone

Editor, *QST:*

Here is something that we need help on. The telefone office in this town has a machine which they use to supply their juice for ringing purposes. This machine runs off of the 110 volt line. It consists

of some sort of a vibrating unit that makes a small spark every time the vibrator makes and breaks contact. Now every time this spark occurs, we can hear it via radio and when we get 2 steps and a Magnovox hooked on it makes enough noise to drown out all the worst static that ever ticked in this country. It will even drown out 9YAK's noise.

To cut this short, I would very much like to know if any of the readers of this little book have ever had any experience with this trouble and if so what did they do to stop it? We have tried connecting a resistance of carbon rod across the points and grounding the center; have enclosed it in a metal box and grounded that; have taken off two or three condensers and the noise is as bad as ever. At a distance of two or three blocks it is still audible but does not bother very much. This machine is made by the Leich Electric Co., but they can give us no remedy for the trouble.

Very truly yours,
S. R. Wilson, 9ALM.

N. H. JENSEN

(Concluded from page 42)

the British Navy and finally assisted in taking over the German High Seas Fleet.

Finding himself in Sioux Falls, S. D., in the fall of 1919 he became interested in amateur radio and the A.R.R.L. Although he has not been situated in such a way that he could have a station of his own, he has stood many watches at 9UT and 9AIG. He was chosen by the Y.M.C.A. Radio Club (affiliated) as Chief Operator and City Manager, A.R.R.L., but due to his persistent work for the League he was soon made District Superintendent and has recently been appointed Dakota Division Manager, which position he holds with "courtroom" dignity.

AMATEUR RADIO STATIONS

(Concluded from page 45)

The antenna is composed of five strand tinned copper wires 45 feet long and 70 feet high. Two masts 30 feet high elevate the antenna from the apartment building roof upon which it is located. It is of the "L" type with lead-in wires fanned to the edge of the roof. The end opposite the lead-in is fanned out. Hollow spruce masts are used to elevate the antenna and are guyed with 8 guys apiece. The spreaders are also of hollow spruce, the masts and spreaders being well varnished. Ground is made to the steam line and city water system. A counterpoise tuned to the ground system will be added.

A. E. BANKS

(Concluded from page 42)

Scouting centers.

During this period Major Banks acquired the special license, 6ZB, and installed one of the early C.W. sets in the southern section of the 6th district. The 20-watt set was heard as far west as Hawaii and as far east as Kingston, Ontario, New Jersey, and Florida. Most amateurs have some constant wail. ZB seems to concentrate his disgruntlement on the arc mush from neighboring NPL and spark harmonics, which he says prove most discouraging to good reception.

6ZB is one of the charter members of the Sunset Radio Club, the San Diego organization recognized by and affiliated with the A.R.R.L., of which, needless to say, he is also an enthusiastic member. He was recently elected to the Board of Managers of the C.W. Club of America. Major Banks saw two years duty in the Army during the recent war and served eight months in France in the Medical Corps in the capacity of Divisional Staff Officer. He is still commissioned in the Medical Reserve.

Putting the "howler" to sleep

THERE'S more than one "howler" to put to sleep these days. Your radio set can put on the greatest squalling and howling demonstration you ever dreamed of. The surest way to stop this howling and keep it peaceful is to add an Acme *Audio* Frequency Amplifying Transformer.

Most any amplifying transformer can magnify the incoming sounds but it also amplifies the howling and distortion of stray fields in the circuit. Acme Transformers with their specially constructed iron cores and coils eliminate this disagreeable feature—and it only takes five dollars to buy one.

Type A-2 Acme Amplifying Transformer
Price $5 (East of Rocky Mts.)

Acme assures your receiving a large volume of sound that possesses the natural tones so lacking in the ordinary receiving set. Then, too, you will want the Acme *Radio* Frequency Transformer which costs the same as the Acme *Audio* Frequency Transformer. It can be used on both crystal detector and vacuum tube sets. It greatly increases the range of either.

You can buy either transformer at your nearest radio store or write the Acme Apparatus Company (pioneer transformer and radio engineers and manufacturers), Cambridge, Massachusetts, U. S. A. (New York Sales Office, 1270 Broadway.) Ask also for interesting and instructive booklet on the use and operation of amplifying transformers.

ACME

for amplification

MILES PER WATT AGAIN

The good relay weather will soon be here, and the time has come to make your long planned improvements. It is not going to cost quite so much as you had counted on, as we have made some price reductions that should be of interest. In planning your "miles per watt record" for this winter choose apparatus that in the past has held records for efficiency.

TYPE 214A
Filament Rheostat

FILAMENT RHEOSTATS AND POTENTIOMETERS

2.5 Amps.—2 ohms for power tubes
1.5 Amps.—7 ohms for receiving tubes
Panel mounting and portable types—Smooth operation—No grating or clicking.

NEW PRICE $2.25

400 Ohm Potentiometers for grid biasing

NEW PRICE $3.00

Use a high resistance potentiometer and save your battery.

TYPE 156
Vacuum Tube Socket

TYPE 156

The standard of all vacuum tube sockets.
The contact springs are heavy enough to carry without arcing, the current for 5 watt power tubes.

NEW PRICE $1.25

TYPE 247
Variable Air Condenser

The TYPE 247 Condenser is now made in the .0005 M. F. capacity as well as .001 M. F. Its electrical losses are but ¼ those of the ordinary variable condenser.

.0005 M. F. Mounted, Calibrated	$5.50
.0005 M. F. Unmounted	3.25
.001 M. F. Mounted, Calibrated	6.00
.001 M. F. Unmounted	3.75

Send for Free Radio Bulletin 911-Q

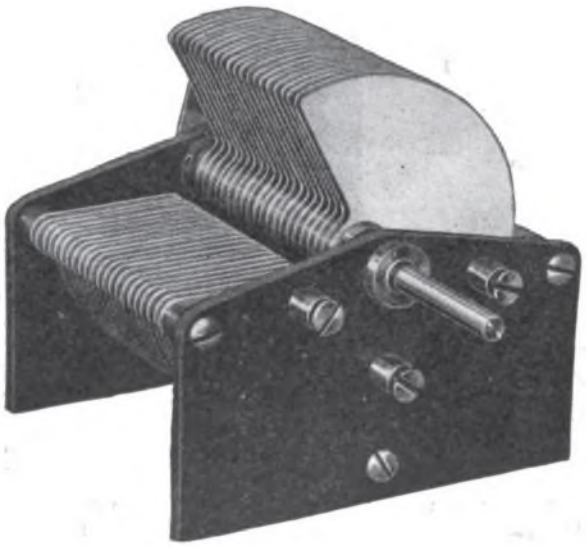
GENERAL RADIO CO.

MASSACHUSETTS AVENUE AND WINDSOR STREET
CAMBRIDGE 39, MASSACHUSETTS

Standardize on General Radio Equipment Throughout

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words "General Radio." The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.

Wimco Announces



THE WIMCO VARIABLE CONDENSER

After months of experimentation to produce a really good Variable Condenser, we take pleasure in introducing to the trade The WIMCO Variable Condenser, which will be furnished in 43, 23 and 3 plate type. Tests conducted by the Washington Radio Laboratory show that The WIMCO Variable Condenser of the 43 plate type has a resistance, at maximum capacity, of but .018 ohms, and the capacity at zero on the scale is but 15 micro-microfarads. These values, we believe, are lower than in any other condenser manufactured for general amateur use.

Deliveries on The WIMCO Variable Condenser will begin September 15th and we are now accepting Jobbers and Dealers orders.

We have a very attractive proposition for the Jobber, and solicit your inquiries.

THE WIRELESS MANUFACTURING CO.

CANTON, OHIO

Manufacturers — Distributors

Eveready "A" Batteries

—hardwood box, mahogany finish
—convenient handle, nickel plated
—rubber feet protect the table
—insulated top prevents short circuits
—packed vent caps prevent spilling

No. 6860— 90 Amp. Hrs.—45 Lbs.—$18.00
No. 6880—110 Amp. Hrs.—52 Lbs.—$20.00

Eveready "B" Battery No. 766
Equipped with 5 positive voltage taps ranging from 16½ to 22½ volts. Fahnestock Spring Clip Binding Posts—an exclusive Eveready feature. Price $3.00

Eveready "B" Battery No. 774
Equipped with 6 positive voltage taps at 4½ volt intervals ranging from 18 to 43 volts. Fahnestock Spring Clip Binding Posts— an exclusive Eveready feature. Price $5.00

For Better Results USE

EVEREADY

"A" and "B" BATTERIES

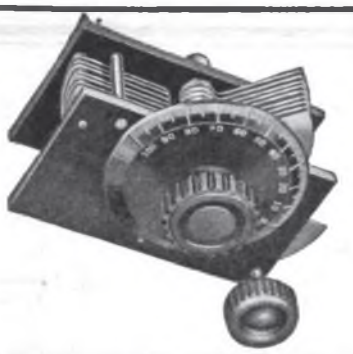
with your radio set

For sale by the better radio supply dealers everywhere

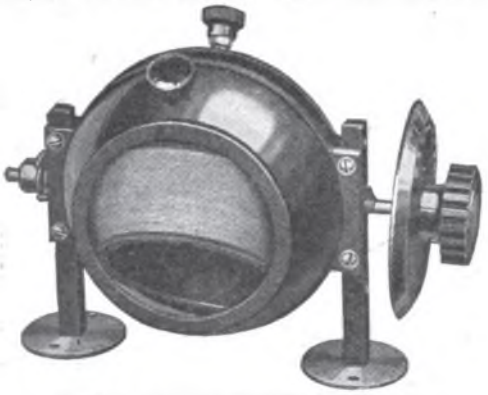
Send today for descriptive booklets

NATIONAL CARBON COMPANY, Inc.
Long Island City, N. Y.

Atlanta Chicago Cleveland
Kansas City San Francisco



Dayton Variable Condenser with Vernier Attached



Dayton Moulded Bakelite Variometer

DAYTON
Radio Products

A complete and meritorious line of Radio parts with every article guaranteed for accuracy and its capacity in Micro-farads. Sold only thru legitimate Jobbers, Dealers and Manufacturers. Variable and Vernier Condensers are made of hard aluminum plates mounted on Bakelite Panels; furnished with either square or round panels.

Type 3 P. C. Vernier with Knob.....Price	$2.00
Type 9 P. C. Condenser Cap. .0003 Mf...Price	3.35
Type 17 P. C. Condenser Cap. .0005 Mf. Price	3.95
Type 31 P. C. Condenser Cap. .001 Mf...Price	4.80
Type 45 P. C. Condenser Cap. .0015 Mf. Price	5.65
Condensers with Vernier attached 80c extra	
Variometers Bakelite Tube Type.....Price	4.50
Variometers Moulded Bakelite.....Price	7.50
Vario-Couplers Bakelite Tube Type.....Price	5.00
Vario-Coupler Moulded Bakelite.....Price	8.00
Genuine Bakelite Knobs and Dials 3" Price	1.00
Genuine Bakelite Knobs ¼-⅞.....Price	.35
Rubber Insulating Tubing (10 ft. Packages)	.45

Jobbers, Dealers and Manufacturers Write for Catalog No. 2 and Discounts

THE A-C ELECTRICAL MFG. CO.

Dayton, Ohio

Makers of Electrical Devices for Over 20 Years

Hot Wire or Thermo Couple?

For small size, small capacity radiation ammeters the hot wire mechanism is far superior to the thermo-couple type. That's why our small 3½" radiation ammeters are of the hot wire type.

The Roller-Smith Company being the only maker of both hot wire and thermo-couple types is in a position to *know* which is best—and it *does*.

Send for Bulletins No. AG-10 and No. AG-810.

They are free.

ROLLER-SMITH COMPANY

16 PARK PLACE, NEW YORK

Offices in principal cities in U. S. and Canada

Switches our main line, NOT a side line

WIS-  **WIN**

One of our leaders #755 Full bushing switch 1⅜" blade, spring contact washer, highly polished nickel parts.

Price 40c

Buy your switches from a switch concern, thereby getting full value and quality at the lowest prices. Switches ranging in price from 30c to $1.25 for all uses and requirements.

We have an attractive proposition for the trade. Circular S-1 listing our full line gladly sent upon request.

We can make prompt deliveries.

Willis Switch & Instrument Co.

8 Kingsbury St., Jamestown, N. Y.

RADIO MERCHANDISE

F. D. PITTS CO.

Incorporated

219 COLUMBUS AVENUE, BOSTON, MASS., U.S.A.

Announces a change of Policy

WHOLESALE ONLY

DISTRIBUTORS FOR

A. H. Grebe & Co. (New England)
Radio Corporation of America
General Electric Company
Westinghouse Electric & Mfg. Co.
Wireless Specialty Apparatus Co.
Magnavox Company
Clapp-Eastham Company
Western Electric Company
Acme Apparatus Company
DeForest Radio Tel. & Tel. Co.
Federal Tel. & Tel. Company
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Chelsea Radio Company
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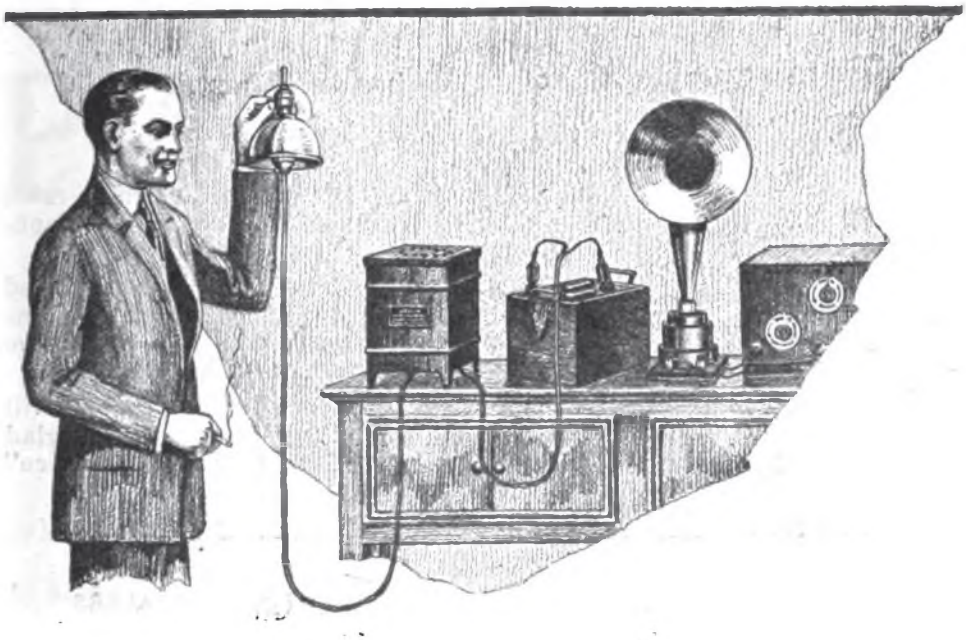
General Apparatus Co.
C. D. Tuska Company
American Eveready Works
Wireless Press
Mu-Rad Laboratories
Dubilier Condenser Company
Weston Electrical Instrument Co.
And Others

Dealers are urged to send for our latest stock sheets, listing desirable radio merchandise for immediate delivery at attractive discounts.

The retail and mail order business formerly conducted by the F. D. Pitts Co. at 12 Park Square, Boston; Providence, R. I. and Springfield, Mass., is now operated by the "Pitts Radio Stores, Inc." at the same addresses.



Charging Storage Batteries Easy as Turning on the Light

Tungar

The device that keeps batteries at home

Tube sets require storage batteries, and they in turn require charging. You can do this at home merely by turning on the electricity, if you have a Tungar Battery Charger.

Tungar is a device for changing alternating to direct current. It allows the current to flow only in one direction. It requires no attention while operating. Its first cost is not high and its cost of operation is extremely low.

Tungar Battery Chargers were developed in the Research Laboratory of the General Electric Company over six years ago. Thousands have been in successful operation ever since.

Do you prefer to carry your battery to a charging station, wait a couple of days or more, and then pay three times what it would cost you to charge it at home? Our new booklet on the application of Tungars to radio batteries will give you the details. Ask us for Booklet B-3640, if your dealer cannot give you one.

General Electric Company

General Office
Schenectady, N.Y.

Sales Offices in
all large cities

-7A-76

RHAMSTINE*

Announces A

RADIO FREQUENCY TRANSFORMER

Pat. Apd. For

$4.50 Postage 10c

Once more Rhamstine* has satisfied a definite radio requirement. The Rhamstine* Radio Frequency Transformer is now available to the many thousands of radio enthusiasts who have been waiting for a guaranteed product, made to a fixed standard in quality, and sold at a reasonable price. The type 1 R.F. Transformer complete with special base mounting sells at $4.50. While it has a range of 200 to 500 meters it is especially well-suited for the wave-lengths of the present broad-casting services.

Consistently good engineering has been followed in its design and by comparison it is the most attractive transformer in appearance that has ever been offered.

Complete circuit diagram is sent with each unit.

$1.75 Postage 6c

Pat. Apd. For

RHAMSTINE* Carbon Element POTENTIOMETER

Another new product from the Rhamstine* Shops is the carbon element Potentiometer shown herewith.

By using a carbon potentiometer in the circuit of a radio frequency set best results are obtained. The Rhamstine* Potentiometer is made for panel mounting, is compact and attractively finished. The price is $1.75. Immediate deliveries.

Manufactured by

J. THOS. RHAMSTINE*

2152 East Larned Street, Detroit, Mich.

*Maker of Radio Products

THE RADIO GUILD

adopts

Bradleystat

REGISTERED U.S. PAT. OFF.

PERFECT FILAMENT CONTROL

Price **$1.85** P.P. 10c

Following is letter from Radio Guild:—Just completed exhaustive tests, using Bradleystat in place of wire rheostats. It is finest filament control we ever used. We specify Bradleystats in all equipment and installations.

SEND FOR LATEST BULLETIN

Allen-Bradley Co.

Electric Controlling Apparatus

277 Greenfield Av., Milwaukee, Wis.

Mfrs. of graphite rheostats for 20 yrs.

Complete Enjoyment of Radio Telephony

is only possible with a Telephone of the very highest standard of efficiency.

Everett Double Radio Phones

have satisfied the most exacting Critics

Supersensitive—Clear—Light

Mechanically Perfect—Moderately priced

AT ALL DEALERS

Everett Electric Corp.

320 BROADWAY, NEW YORK

Now Ready!

The DICTOGRAPH Radio Loud Speaker

For the Home

SINCE the first announcement of the development of a Dictograph Radio Loud Speaker, interest on the part of the radio public has run high.

The great Dictograph organization, famous the world over for its marvelously sensitive "Acousticon" for the Deaf and loud-speaking telephones, has concentrated on the perfection of this new Radio Loud Speaker. It is worthy of the Dictograph name—and that means *Standard of the World!*

Here at last is the Loud Speaker you have been waiting for—a Loud Speaker that reproduces every sound—singing, instrumental music and voice—in full volume and with absolutely clear, natural tones, free from distortion or mechanical sounds. It is used with any vacuum tube radio set. No alterations are needed; no extra batteries—you simply plug in and listen.

Assured demand, volume production, and Dictograph resources have made possible a reduction from the price originally announced. Instead of $25, **the price is only $20—complete with 5 ft. cord.**

Ask your dealer to show you the **Dictograph Radio Loud Speaker.** Place your order now to assure early delivery. Dealers can be supplied by their jobbers or our authorized distributors.

Price
$20

Complete with 5 ft. flexible cord.

The handsome appearance of the Dictograph Radio Loud Speaker harmonizes with any home. It has a highly burnished spun copper bell horn attached to die cast, black enamel tone arm, finished with nickel trimmings. The cabinet is of solid ebony-finished hardwood and mounted upon rubber knobs to avoid marring highly polished tables. It is furnished complete with 5 ft. flexible cord. No extra batteries required.

DICTOGRAPH *Radio* HEAD SET

The Dictograph Radio Head Set has established a standard of quality impossible to secure in any other product—its use on an ordinary receiving set, whether crystal set or vacuum tube receiving unit, improves reception immeasurably. Insist on the Dictograph—Price $12. 3000 ohms resistance.

The Best Head Set in the World at any Price!

DICTOGRAPH PRODUCTS CORPORATION

220 WEST 42d STREET, *Branches in all principal cities* **NEW YORK CITY**

DUCK'S RADIO CATALOG No. 16

256 PAGES

Continuously since 1909 Duck's Radio Catalogs have never been equaled for completeness and great wealth of radio data

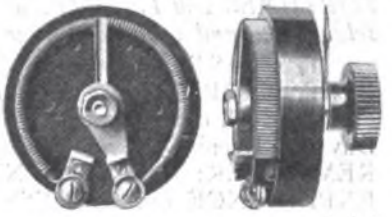
Send 25c in coin carefully wrapped for your copy of this wonderful book, the most unusual and complete catalog ever put between two covers. Not sent otherwise. Enormous cost and tremendous demand prevent distribution at a less retainer.

Over 50 pages of latest hook-ups (wiring diagrams) and invaluable and up-to-date data and information on radio. Not only a catalog, but a wonderful textbook on radio.

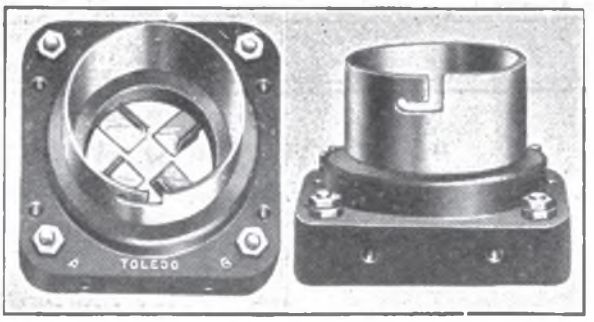
Never in the history of radio has there been such a catalog. The radio data and diagrams embracing upwards of 50 pages give the experimenter more valuable and up-to-date information than will be found in many textbooks selling for $2; and $1 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth-while radio goods found in this great catalog.

Duck Products have stood the test of time
The largest line in America---58 complete instruments---62 parts

Our new No. A650 Duck Rheostat (at right) has just the necessary amount of resistance to take care of the drop in voltage from the battery when fully charged to the battery at its minimum working voltage. The base is of moulded composition. The resistance element is wound on a black fibre strip, the element being securely fastened in a slot in the base. Contact arm is of phosphor bronze of the proper tension to insure perfect contact and smooth operation. Adjustable to any thickness panel up to ⅜ inch, 2¼ inches in diameter. An exceptional Rheostat at a most popular price. No. A650 Duck Rheostat, $1. Shipping weight 8 oz.



There are many Duck products that completely dominate all competitive types



No. A666 Duck's Positive Contact Bakelite Tube Socket is beyond doubt the most advanced tube socket on the market today. To our knowledge there is no other type of tube socket that cannot be forcibly criticized from some angle. Either the receptacle does not easily accomodate the varying diameter of the bases of bulbs, or the notch on receptacle is not just right, or the receptacle is easily subjected to breakage, or connections are in an inconvenient place, or, and most important of all, the type and style of the contacts do not insure positive, certain contact without considerable manipulation.
In our new socket all these defects in other bulbs are overcome. The contact springs are so constructed that contact is made, not only on the bottom of the tube terminal, but also on the side of the terminals. When the tube is put into the socket and turned in the notch, the terminal pins on the tube immediately exert a pressure on the side of the phosphor bronze contacts, making a contact that is firm and sure. The receptacle of our socket is of brass, beautifully nickel plated, and moulded into a bakelite base, with all connections on top No. A666 Duck's Bakelite Tube Socket, $1. Shipping weight, ½ pound.

DEALERS

We want live, responsible dealers in every city and town in the United States, both for the sale of our extensive line of radio apparatus and all other worth-while lines of radio goods, on all of which we can quote attractive dealers' discounts. We can offer you facilities and advantages that no other radio house can offer.

Our Nos. 700 and 701 dials and knobs (right) are of genuine black bakelite. Because of the ribbed construction of the dial it will not warp and being of bakelite it will not discolor. The threaded bushing in the dial which holds the knob is perfectly centered, as is the bushing in the knob itself which takes the shaft. This insures a perfect running dial. The bakelite knob is fastened to the dial by means of a threaded bushing. The set screw which secures the knob and dial passes through the compositon and also the brass bushing, thus preventing loosening. Either 1/4" or ¼" knob and dial, $1. Shipping weight, 4 ounces.

The WILLIAM B. DUCK CO., 243-245 Superior Street, Toledo, Ohio

MURDOCK RADIO

WITH less adherence to quality, we could make many more Murdock Phones.

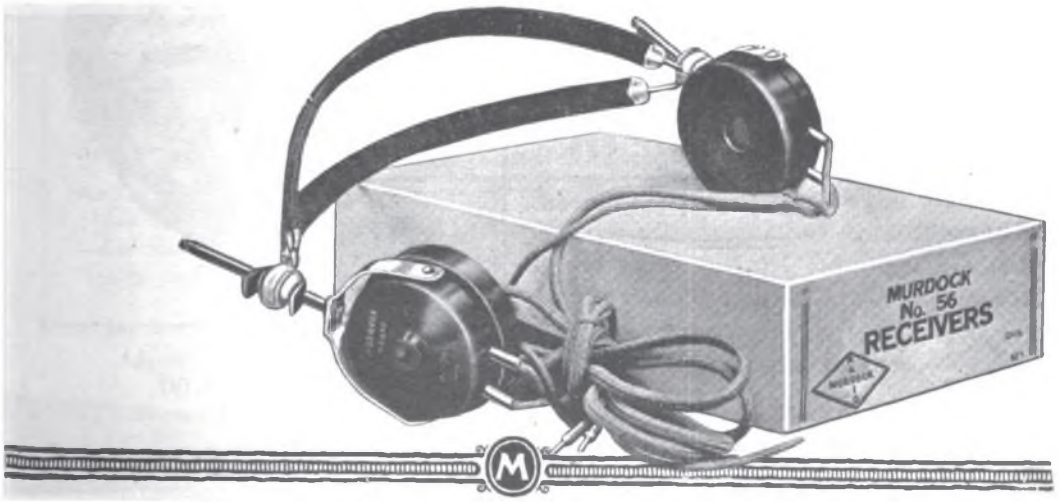
Murdock quality has sent the demand for Murdock apparatus far beyond our expectations.

Examine Murdock apparatus at your dealer's There are no other phones so good at so low a price. *After* you *have* bought, a 14 day trial privilege assures satisfaction with your purchase.

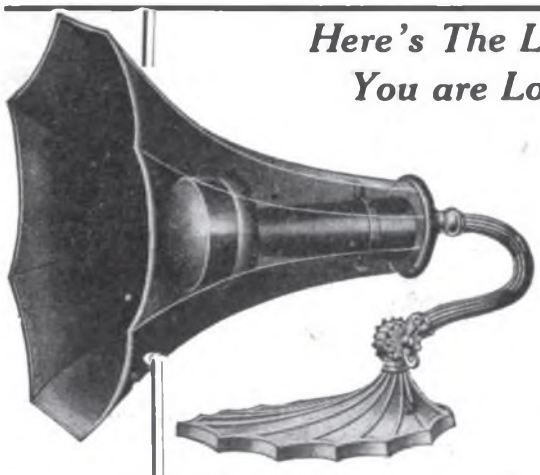
WM. J. MURDOCK COMPANY

343 Washington Avenue, Chelsea, Mass.
1270 Broadway, New York City
509 Mission Street, San Francisco, Cal.

No. 56—2000 ohm, $5.00
No. 56—3000 ohm, $6.00



TELMACOPHONE



Here's The Loud Speaker You are Looking For

You can pay more for a loud speaker, but you can't get better satisfaction or better value.

Exhaustive tests and research expert knowledge of acoustics and the finest detail of construction make the Telmacophone the best value obtainable.

Complete in every detail. Inverted horn, reflected tone. Equal in volume to any other horn twice its length.

No extras to buy. Nothing to get out of order.

Price complete $20. Fully guaranteed

Radio Division

TELEPHONE MAINTENANCE COMPANY

20 S. Wells St., Dept. D, Chicago, Ill.

DEALERS! We are distributors for many standard, reliable lines. Full discounts on the Telmacophone. Write for proposition on our complete line.

"Superlative" Amplification

No. 41

You Can Increase Your Range

Eliminate Howling and Distortion

Bring out the full clear tone in volume

WITH

JEFFERSON
Amplifying Transformers

Furnished in two types either mounted or unmounted. Coils specially wound with No. 40 and No. 44 wire on a core of the finest rolled Silicon steel.

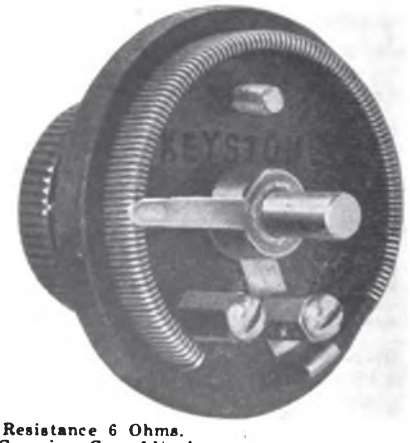
SEND FOR RADIO BULLETIN

PROMPT DELIVERIES

Jefferson Electric Mfg. Co.

425 S. Green Street, Chicago

KEYSTONE
FILAMENT RHEOSTAT



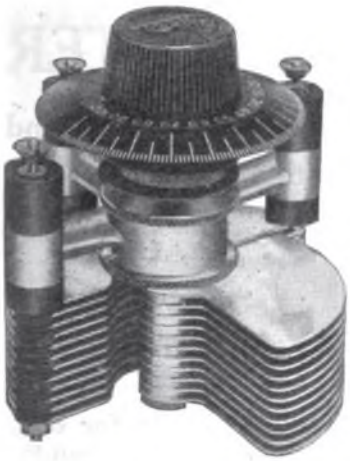
Resistance 6 Ohms.
Carrying Cap. 1½ Amps.
Base, moulded Bakelite.
2¼ In. Diameter.
All metal parts, made of brass, and nickel plated.
Large Knob, with polished pointer.

List Price $1.00

Manufactured By

Keystone Radio Company

Dept. Q, Greenville, Penn.



A Better Variable Air Condenser Because it is Made Better

Smooth control, sharp tuning, and permanent, rugged mechanical qualities are the points that distinguish **BETTER** variable air condensers from all others. COTOCO Condensers have established a reputation for low electrical losses and precise mechanical construction.

The best Way to Get Best Results is to Buy Radio Supplies by the Name

Cotoco

TRADE MARK REG. U. S. PAT OFF.

Our Other Specialties:

Amplifying Transformers
—for Audio Frequency
—for Radio Frequency
Honeycomb Coils

This name means RELIABILITY—means built to the specifications of Radio specialists—means better results for you.
If your dealer cannot supply you, send us his name and we will take care of you.

Write for Free Connection Diagrams For Radio Frequency Loop Aerial Set

COTO-COIL CO.

87 Willard Ave., Providence, R. I.

Instruments You KNOW Are Reliable!

Note: The Weston Electrical Instrument Co. has pioneered the development and manufacture of electrical indicating instruments for 34 years for every branch of the electrical field. The name WESTON on any instrument leaves no room for doubt about its complete reliability and superior state of perfection of the instrument—for the WESTON REPUTATION stands back of it.

Filament Voltmeter

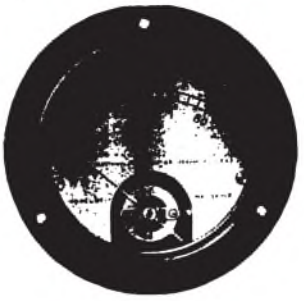


Plate Voltmeter

Antenna Ammeter

Weston electrical instruments

"STANDARD"—*the World Over*

For your own information you should send for our circular "J" which is authoritative on the need of dependable and accurate indicating instruments in all branches of Radio work.

This circular describes the large variety of Weston instruments for this purpose, each having a specific and essential use—and each having been developed after months of pains-taking laboratory experiments and tests.

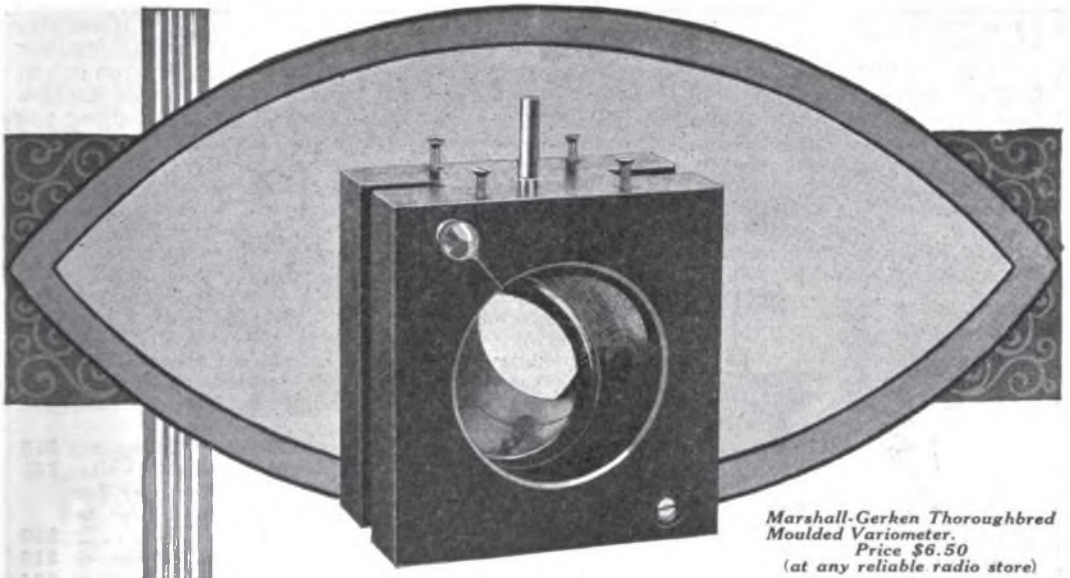
To know about Weston Radio instruments is to be kept fully abreast with the latest Radio developments—and to know, not only how to improve your entire Radio Service, but how to economize to the utmost in your operating expense.

Write, to-day, while you have the matter in mind. Just say "Send Circular "J". If your dealer cannot supply you with Weston Instruments we will be glad to take care of your wants direct.

Weston Electrical Instrument Co.

158 WESTON AVE., NEWARK, N. J.

Branch Offices in All Principal Cities.



Marshall-Gerken Thoroughbred Moulded Variometer. Price $6.50 (at any reliable radio store)

The Thoroughbred Variometer

A definite way to secure fine wave-length adjustment

CONTINUOUS wave transmitters are so sharply tuned that even a fraction of a turn of inductance makes an appreciable difference in the returns secured. It is therefore impossible to tune your receiving set with any real degree of accuracy so as to throw out undesirable stations and concentrate on the desired broadcasting stations unless you employ a variometer. By turning the knob of a Marshall-Gerken Thoroughbred Variometer a range of wave length values varying from two hundred to six hundred meters may be obtained as desired. You are certain of securing an exceptionally fine adjustment.

Connections are made in the rotating element through brush contacts so that the ball may be continuously rotated without breaking connections. There are no loose contacts to bother with and the rotary action is far more convenient than the movement of sliders along a tuning coil. Marshall-Gerken Thoroughbred Variometers are made in two styles, one for the Plate and one for the Grid. This is a valuable feature found only in these products. Their correct weight makes screws unnecessary for table operation and they are supplied with four screws for panel mounting. You can buy them from your nearest radio store for $6 50 apiece.

Other Marshall-Gerken Products produced in our large new factory are Vario-Couplers, "Read-'Em" Binding Posts in 17 styles, Two step amplifiers, Non-regenerative sets, Amplifier Panels, Detector Panels.

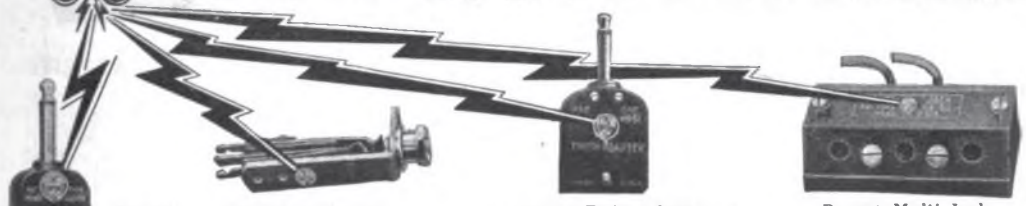
Grid and Phone Condensers, Fixed Condensers, Contact Points, Stop Pins, Switch Levers, Dials, Single Sockets, Rheostats, etc.

THE MARSHALL-GERKEN CO.

Jackson & N. 12th Street, Toledo, Ohio

PACENT RADIO ESSENTIALS

PLAY SAFE! LOOK ~ FOR ~ THE PACENT TRADE MARK



Pacent Radio Plug

Pacent Radio Jack

Pacent Twin Adapter

Pacent Multi-Jack

Pacent Audioformer

Pacent Universal Detector Stand

Pacent Duo-Lateral Coil

Why Take Chances?

The Pacent Trademark is a Safe Buying Guide

It Is Your Guarantee of Quality, Satisfaction and Service

In the ordinary purchases which you make every day, you invariably depend upon some mark of quality as an assurance of value and satisfaction. In buying radio materials the average purchaser is a great deal more dependent upon the reputation of the manufacturer than in buying everyday commodities. A radio instrument may look good and act bad. How much more important it is in this case, therefore, to look for the trademark of a competent, dependable manufacture. The Pacent trademark on any radio products is an absolute assurance of satisfaction.

What the Pacent Trademark Means to You

It means that the device bearing this trademark was made to fill a definite, important radio need: that is the meaning of PACENT RADIO ESSENTIALS.

It means that the product was originated by a radio expert and has passed the acid test of experience. The Pacent Universal Plug was the FIRST radio plug; the Pacent Jacks were the first radio jacks, and so with the Twin Adapter, Multi-jack and other PACENT RADIO ESSENTIALS. Every Pacent product is also backed up with Mr. Pacent's fifteen years personal experience in the radio industry.

The Pacent trademark means that the product is one of a group generally recognized by radio authorities as leaders in their line. Pacent jacks and plugs are standard with the largest radio manufacturers. Pacent Duo-Lateral Coils, besides being used in standard sets of wide distribution, were approved and used by Major Armstrong as important elements in his new super-regenerative circuit, together with other Pacent products. All PACENT RADIO ESSENTIALS are also approved and sold by the leading radio distributors.

Therefore, when you buy PACENT RADIO ESSENTIALS bearing the Pacent trademark you are absolutely sure that you are getting the best for your money. You are playing SAFE. Don't accept substitutes, imitations or something "just as good." Insist on seeing the Pacent trademark.

DON'T IMPROVISE—PACENTIZE

Send for Descriptive Bulletins

DEALERS AND JOBBERS—The Pacent Sales Policy is to a great extent responsible for the popularity of Pacent products. Write for outline of our Sales Plan.

PACENT ELECTRIC COMPANY

I N C O R P O R A T E D

Executive Offices:
150 NASSAU STREET
NEW YORK, N. Y.

Branch Offices:
PHILADELPHIA, PA. Bourse Bldg.
CHICAGO, ILL. 33 So. Clinton St.
WASHINGTON, D. C. Munsey Bldg.

Member Radio Section, Associated Mfrs. Electrical Supplies

When Marconi heard the AERIOLA GRAND

Underwood & Underwood

"It comes closest to the dream I had when I first caught the vision of radio's vast possibilities. It brings the world of music, news and education into the home, fresh from the human voice. It solves the problem of loneliness and isolation.

"The Aeriola Grand is at present the supreme achievement in designing and constructing receiving sets for the home—a product of the research systematically conducted by scientists in the laboratories that constitute part of the R C A organization."

G. Marconi

RCA

Look for this trademark at your dealer

The Importance of the Symbol R C A

Crude radio apparatus of a kind can be made even by embryonic organizations. But the vitally important inventions that have made radio the possession of every man, woman and child are those protected by patents owned by the Radio Corporation of America and developed as the result of costly research conducted in the engineering laboratories of the Radio Corporation of America.

The name-plate of a Radio Set is all-important in the purchase of radio apparatus. If it bears the letters "R C A" the public and the dealer are assured that at the time of its introduction it is the highest expression of the advancing art of radio.

In tone quality, in simplicity of manipulation the Aeriola Grand is unrivalled. A child can snap the switch and move the single lever that tunes the Aeriola Grand and floods a room with song and speech from the broadcasting station.

Any R C A dealer will be pleased to show you the Aeriola Grand and to let you judge its wonderful tone quality for yourself.

There is an R C A set for every purse—Prices range from $18 to $350.

Aeriola Grand with stand $350

Radio Corporation of America

WORLD WIDE WIRELESS

233 Broadway New York City Suite 2068

District Office 10 South La Salle St. Chicago, Ill.

Acme Wire in the Radio Field

Radio manufacturers will find in Acme Wire and Acme coil windings that high quality which has become recognized by makers of standard lines of electrical apparatus.

Experience in these old-established lines coupled with laboratory research has perfected the important details necessary to the production of the very fine sizes of magnet wire 40 to 44 B. & S. Gauge and the corresponding fine-wire coil windings.

Audio Amplifying Transformer Windings

Made exactly to specifications, using paper between layers of enameled or silk wire.

Radio Frequency Windings

Magnet Windings for Head Phones

Silk- and Cotton-Covered Magnet Wires

For winding Tuning Coils, Variometers, Vario-Couplers, Inductances and Transformers in all B. & S. gauge sizes from No. 8 to No. 44.

Enameled Magnet Wire

All standard sizes from No. 8 to No. 44 B. & S. gauge.

Enameled Antenna Wire

Made in single conductor or the new stranded cable. This is made of seven No. 22 B. & S. enameled wires twisted together into a cable.

Flexible Varnished Tubing ("Spaghetti")

High dielectric strength; maximum flexibility; perfectly smooth finish; oil-water- and acid-proof. Made in all standard sizes, black or yellow. Special sizes or colors to order.

We shall be glad to co-operate with any manufacturer of Radio Apparatus on any problems involving the application of magnetic wire or coil windings.

THE ACME WIRE CO., New Haven, Conn.
New York Cleveland Chicago

Acme Radio Users

Acme Apparatus Co.
Adams-Morgan Co.
Atwater Kent Mfg. Co.
Auth Electrical Specialty Co.
Chicago Telephone Mfg. Co.
Connecticut Telephone & Electric Co.
Chas. Cory & Son, Inc.
Dictegraph Products Co.
Eisemann Magneto Co.
Electrical Products Mfg. Co.
Elwood Electric Co.
Federal Telephone & Telegraph Co.
General Radio Co.
A. C. Gilbert Co.
Holtzer Cabot Electric Co.
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Manhattan Electrical Supply Co.
Standard Transformer Co.
States Co.
Thordarson Mfg. Co.
Wells Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Acme Wire Products

"Enamelite," plain enameled Magnet Wire; "Cottonite," Cotton-covered Enamelite; "Silkenite," Silk-covered Enamelite; Single and Double Cotton Magnet Wire. Single and Double Silk Magnet Wire. Also a complete organization for the winding of coils in large production quantities.

Acme Electrical Insulations

Flexible varnished tubing in all sizes and colors; standard or special.

Acme Radio Specialties

Audio Transformer windings.

Radio Frequency windings.

Magnet windings for Head Sets.

Enameled wire—especially the finest sizes, 40-44 B & S gauge. Silk and cotton covered magnet wire.

Enameled Aerial wire—single wire and stranded.

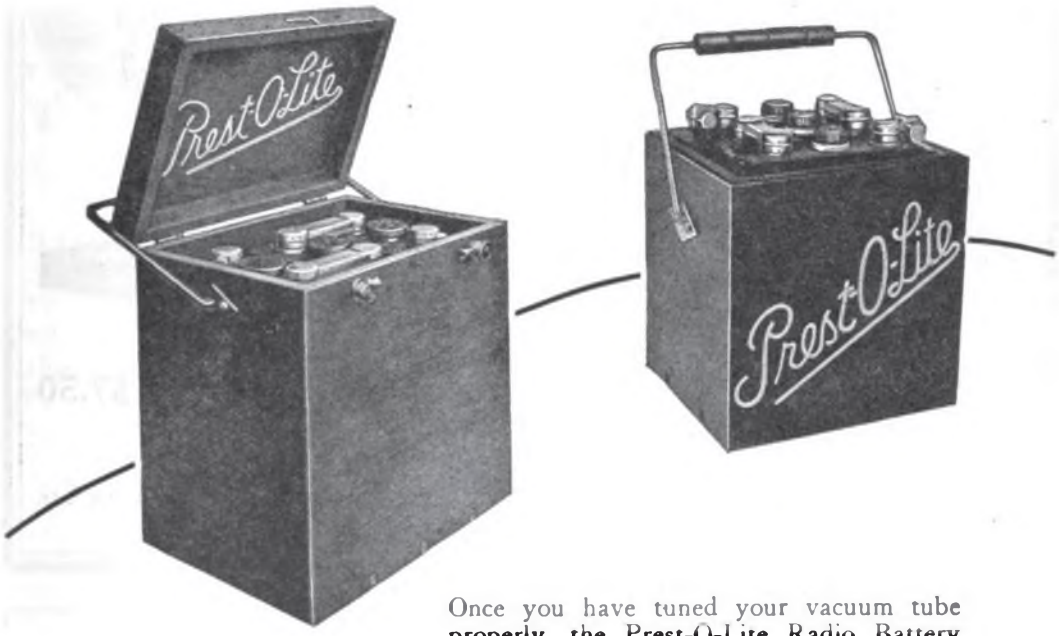
Illustrated Catalag will be sent upon request to Purchasing Agents and Engineers

AcmeWire

"It goes in the space"

ADJUST YOUR RADIO BATTERY

-Then Forget About It!



Once you have tuned your vacuum tube properly, the Prest-O-Lite Radio Battery holds it there. Continual adjustments to meet current variations are done away with.

The new Prest-O-Lite Radio Battery is a "chip of the old block." Though specially adapted to furnish the steady, uniform rate of discharge required for the vacuum tube, it embodies the same principles that have made Prest-O-Lite Automobile Batteries so popular.

It is a product of the same precision laboratories. It has the same long life. Its plates are Prest-O-Plates.

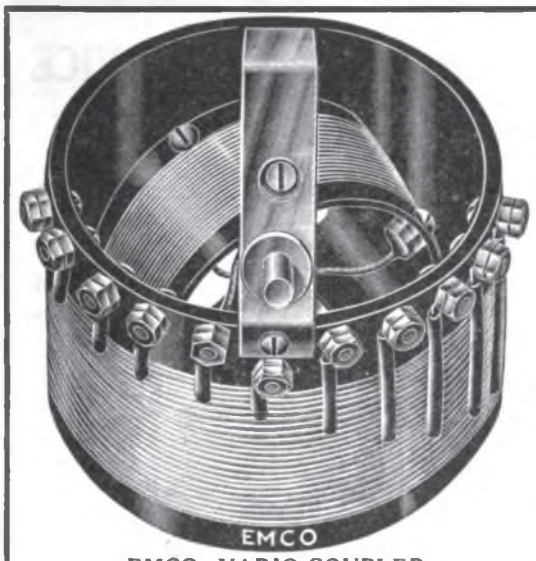
Buy a battery that you KNOW is right.

Prest-O-Lite RADIO "A" BATTERY

THE PREST-O-LITE COMPANY, Inc.

Carbide & Carbon Bldg., 30 East 42nd St., N. Y.

Eighth and Brannan Streets, San Francisco, Calif. In Canada: Prest-O-Lite Co. of Canada, Ltd., Toronto



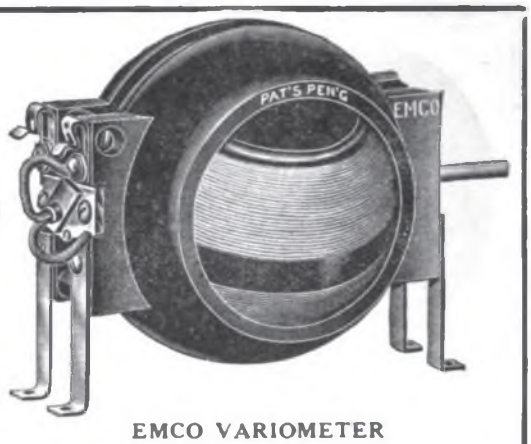
EMCO VARIO-COUPLER

Specifications

This coupler is of the 180 degree type, embodying new and original ideas. Rotor and stator of bakelite-dilecto tubing. All metal parts of brass.

Primary wound with 35 turns of #19 DCC wire with taps brought out every six turns for the first 30 turns and every turn thereafter. This arrangement utilizes every turn. Secondary wound with #22 SCC wire. 180 degree stop. No bearing contact. Note by the illustration that it is very simple to mount and connect.

Type E.M. 8 Emco Vario-Coupler Price $6.50



EMCO VARIOMETER

Specifications

Rotor and stators moulded of pure unadulterated bakelite that will not warp, shrink, or change color as hard rubber and other substitutes do. Intense heat does not affect it in any way.

Removable legs for panel mounting. All metal parts of brass. Shaft ¼ inch.

No sliding or bearing contacts, wires brought through hollow tube in rear. No shellac or other injurious solutions used. Fahnstock clips are provided for connections. 180 degree stop.

Type E.M. 7 Emco Variometer Price $7.50

If your dealer is not supplied, write direct giving dealers name.

Emco Radio Products Company

1856 85th Street, Brooklyn, N. Y.

RADIOIST

LOOK WE ARE NOW LOCATED IN OUR NEW HOME AND CAN PROMISE OUR USUAL SERVICE LOOK

ORDERS SHIPPED SAME DAY THEY ARE RECEIVED

A complete stock of parts and finished apparatus.

ROSE RADIO SUPPLY

Pioneers in the Radio Field

129 CAMP ST., NEW ORLEANS

Send 10c for latest catalogue

2nd DISTRICT OPS!

Have you seen the 2nd. District magazine?

Do you know what your friends are doing?

Are you interested in club doings and real "How to Make It" articles?

IF SO, you had better subscribe NOW to

THE MODULATOR

It's only a dollar a year, or ten cents a copy. Published every month.

THE MODULATOR

120 Liberty St., New York, N. Y.

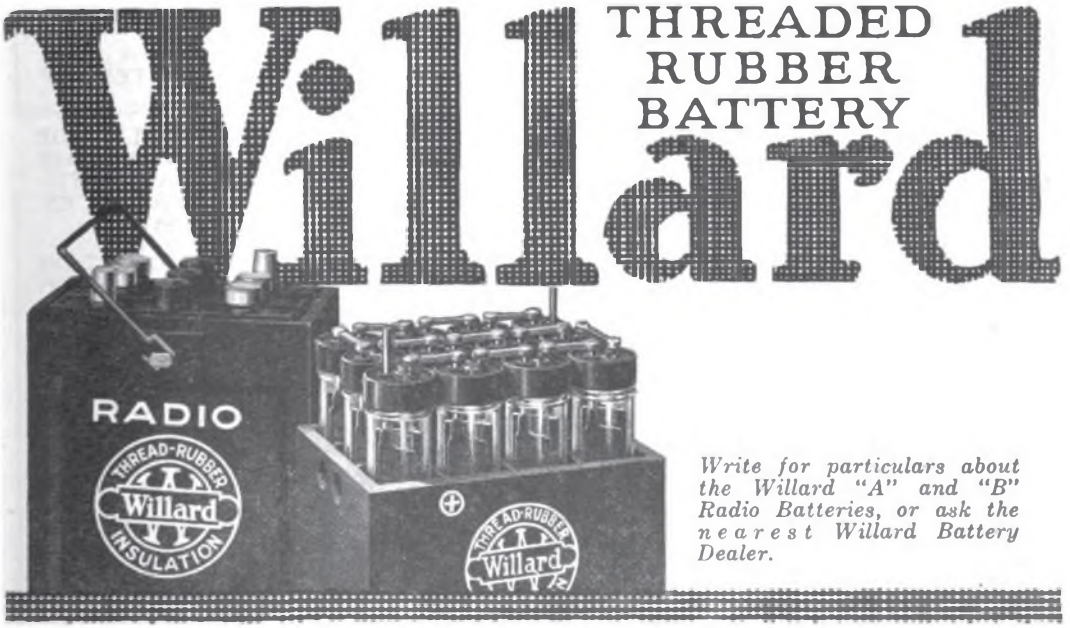
Tune In With These Real Radio Batteries

Hook up a 6-volt Willard ***All-Rubber*** Radio "A" Battery to your filament circuit, and two or more 24-volt ***Threaded Rubber*** Radio "B" Batteries to your plate circuit. Then note the difference in the way your set stays tuned—in the freedom from hissing and frying noises. These batteries give you results because they are ***built for radio.***

The 6-volt
All Rubber "A" Battery
has special heavy Radio plates —Threaded Rubber Insulation —one-piece rubber container, which eliminates all possibility of leakage.

The 24-volt
Threaded Rubber "B" Battery
has glass jars, well separated to prevent leakage—Threaded Rubber Insulation—rubber screw-caps. Holds its charge, and is easily recharged.

WILLARD STORAGE BATTERY COMPANY, Cleveland, Ohio
Made in Canada by the Willard Storage Battery Co. *of* Canada, Ltd., Toronto, Ont.



Write for particulars about the Willard "A" and "B" Radio Batteries, or ask the nearest Willard Battery Dealer.

RADIO PANELS AND PARTS

Start your set right. Pay particular attention to "insulation." Get a good panel and dependable parts. To make sure that you do get them look for the dealer displaying this sign:

CONDENSITE
CELORON

RADIO PANEL SERVICE

Condensite Celoron panels and parts are right. You can bank on them, for this strong, handsome, waterproof material (approved by the Navy Department, Department of Engineering) is extremely high in surface and volume resistivity and dielectric strength. It machines readily, engraves without "feathering," and takes a beautiful natural finish—polished or dull. This is why it is so widely used for panels, tube bases, mountings, variable condenser endplates, tubes, dials, knobs, handles, bushings, etc. We can machine all of these parts to your specifications.

Send today for our Radio Panel Guide

Are you an enthusiast? This Guide describes our panels in detail—tells how they are made and what they cost.

Are you a radio dealer? Learn about Celoron Radio Panel Service and how easily and profitably it enables you to supply your customers with panels and parts fully machined and engraved to their specifications. Write for our Special Dealer's Proposition today.

Diamond State Fibre Co.,

Bridgeport (near Philadelphia) Pa.
Branch Factory and Warehouse, Chicago

Offices in principal cities
In Canada, Diamond State Fibre Co., of Canada, Ltd., Toronto

Warren Radio Loop

NO AERIAL

LESS STATIC

If Dad says—
"NO AERIAL ON THIS HOUSE"
don't allow his QRM to worry you but purchase a

WARREN RADIO LOOP

The LOOP that made the Radio Roller Chair famous on the Boardwalk at Asbury Park, N. J.
Is just the thing for an apartment or den.
Is light in weight and easily portable.
Is produced under a new principle of winding.
Is wholly enclosed, thereby protecting the winding.
Is used in place of an outside aerial.
Is adapted for receiving in moving vehicles.
Takes the "tic" from static.
Eliminates all danger from lightning.
Can be used with any receiving instrument.
Can be used without tuner.

This picture of the Radio Roller Chair showing the Warren Radio LOOP was used as cover designs on "Wireless Age" and "Radio News" and featured in many other magazines and newspapers in the United States.

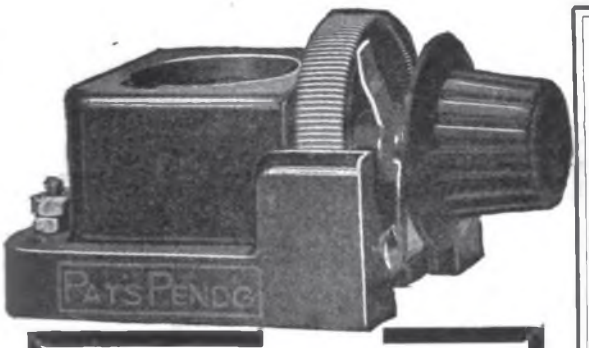
Send your order through your dealer or direct to us with his name.

Type-A-737 (300-700 meters).....$10.00
Type-A-7236 (175-1000 meters)..... 12.00

V-DE-CO RADIO MFG. CO.

DEPT. R, ASBURY PARK, N. J.

Send for Bulletin—No. A101



KING
Rheo-Socket
another
Radio Surprise

Price $3.00 f.o.b. N. Y. C.

Compact, increased efficiency, shorter connections, less wiring. Brings in stations you never heard before. Make this a part of your up-to-date set.

A high grade article in Red Bakelite with phosphor-bronze contacts and alloy resistance wires.

For Base or Panel Mounting

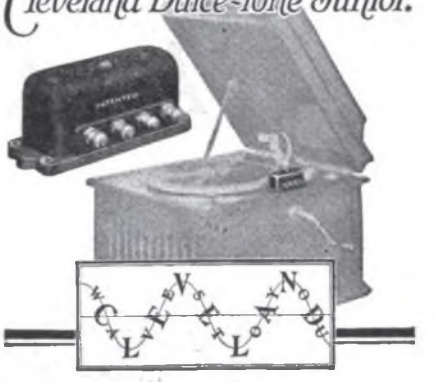
King Am-Pli-Tone

82 Church St., New York

Manufacturers of the Famous KING AM-PLI-TONE

Jobbers—wire or write for proposition

Cleveland Dulce-Tone Junior



RADIO MUSIC PERFECTLY REPRODUCED THROUGH YOUR PHONOGRAPH

The Dulce-Tone Junior converts your phonograph into the finest of loud talkers without detracting in the least from its power to play phonograph records.

The radio music comes to you with cello-like sweetness, even more clearly than that reproduced from your records.

The Dulce-Tone Junior is adaptable to any phonographic instrument. When you consider that you are using the wonderful sound-box, tone-arm and even the needle which has been perfected only after years of experimenting, you can realize the QUALITY and SWEETNESS of the tone which is so faithfully reproduced through the Dulce-Tone Junior.

Any one can attach the Dulce-Tone Junior in a few minutes. To operate, simply swing the tone arm allowing the needle to rest on the small center element of the Dulce-Tone Junior. This ingenious instrument eliminates the necessity of numerous expensive head-phones when entertaining a roomfull of people—is a true economy.

The Dulce-Tone Junior is the instrument of the century—an instrument that will improve any radio set. Put one on your phonograph today and realize the possibilities of radio music for quality of tone.

RETAIL PRICE.....ONLY $15.00
($17.50 West of the Rockies)

If your dealer does not handle the Dulce-Tone Junior, fill out the coupon below, mail it with one dollar and we will forward this wonder instrument to you C.O.D. at $14.00.

The Cleveland Radio Mfg. Co

241 St. Claire Ave., N. E. Cleveland, Ohio
Sole Licensees under KAEHNI Circuit Inventions and Patent Applications

COUPON

The Cleveland Radio Mfg. Co.,
241 St. Claire Ave., N. E.,
Cleveland, Ohio.

Enclosed find one dollar for which send me a Dulce-Tone Junior ($14.00 balance due C.O.D.) Send me your folder entitled "Waves to You Through Your Phonograph."

Name .....

Address .....

Town & State.....

the Radio Jobber, and Amateur

This business has a perfectly just right to be here; a better right to grow, and in this field is legitimate room for new experiments and developments.

But there is no room for hold-up shysters who endeavor to pocket gilt-edge profits through misrepresentations, false claims and defective apparatus.

To the promotion of the cause through personal service, tested apparatus, stabilized list prices and fair profits, we as a corporate body pledge our united support.

We are strongly organized to do our part to promote the cause we have labored to aid through its years of infancy.

Let the good words go forth—pull together—sit tight! Radio is now passing through a period of casual interest and enthusiasm. It will take its place as a dignified institution founded on conservative business principles because it is meeting a universal need.

It is the cause to which I have personally pledged my support because I know its possibilities are unlimited.

LEWIS J. CONRAD, President

ORGANIZATION, Inc.

General Offices and Salesrooms:

1545D North Wells St., Chicago, Ill.

RADIO APPARATUS

CROSLEY

Various combinations can be built up without discarding any apparatus.

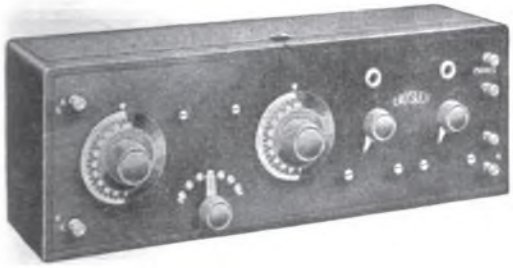
Better --- Cost Less

CROSLEY CRYSTAL RECEIVER NO 1, AUDION DETECTOR AND R. F. T. A.

This combination is equivalent to the Crosley Receiver No. VI, shown below. The elimination of the detector stand is accomplished in the same manner as described in the combination of the Crosley Crystal Receiver No. I and Audion Detector Unit. It has been found that as a result of the hook-up, interference has been reduced to a minimum. Easy to tune, this combination greatly increases the range and volume. Distant broadcasting stations come in loud and clear. One amplifier and one detector tube are required.

CROSLEY HARKO SENIOR NO. V AND R. F. T. A.

Another combination that gives the equivalent of Crosley's model No. V is accomplished by the hook-up of Crosley Harko Senior No. V. and R. F. T. A. This hook-up is made simply by connection of the binding posts directly across. An amplifier tube is used in the Harko Senior Unit with the grid leak and condenser bridged or short circuited. The detector tube is then placed in the radio frequency tuner. Thus this new unit contains the radio frequency tuner and the detector tube and its control. The combination of Harko Senior and Radio Frequency Unit are superior to any two-tube set that we know of. This unit also has the advantages of sharper tuning, eliminating interference and it reduces static to a minimum.



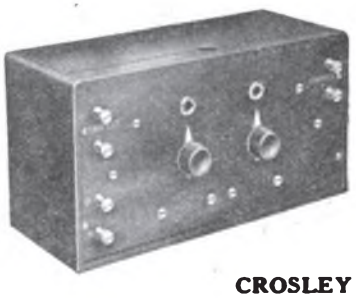
CROSLEY RECEIVER NO. VI

This Unit has approximately six times the range and volume of the Harko Senior. With it, distant broadcasting stations are brought in loud and clear-tuned sharply. It also eliminates static to a large extent.

The Crosey Receiver No. VI consists of tuner, one stage tuned radio frequency amplification and audion detector.

Mounted on formica panel, Adam brown mahogany finished cabinet, without tubes, batteries or phones—$30.00.

Crosley Receiver No. VI is equivalent to the Crosley Crystal Receiver, Crosley Audion Detector Unit and Crosley R. F. T. A. or Crosley Harko Senior No. V and R. F. T. A.



CROSLEY TWO-STAGE AUDIO FREQUENCY AMPLIFIER

With this unit, two stages of audio frequency amplification can be added to any type of radio apparatus. Can be used in conjunction with the Crosley Crystal Receiver No. 1 and Crosley Audion Detector Unit, Crosley Harko Senior No. V, Crosley R. F. T. A., or Crosley Receiver No. VI.

This unit increases the volume about one hundred times.

Designed to match up uniformly with the above mentioned units, without tubes, batteries or phones—$25.00.

CROSLEY HARKO SENIOR NO. V AND TWO-STEP AMPLIFIER

The working qualities of each of this combination have been described separately. This combination is not only equal in efficiency but the total cost of the separate unit is lower than that of any other three-tube outfit.

The controls are simple and are very limited in number, requiring very little skill in accurate adjustment.

WRITE FOR CATALOGUE

Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

CROSLEY MANUFACTURING CO.

DEPT. Q.S.T.1 **CINCINNATI, OHIO**

CROSLEY RADIO APPARATUS

Better --- Cost Less

Various combinations can be built up without discarding any apparatus.

CROSLEY CRYSTAL RECEIVER NO. I, AUDION DETECTOR, R. F. T. A. AND TWO-STEP AMPLIFIER

These various units hooked-up provide the same receiving instrument as the Crosley Receiver No. X shown on the opposite page. This four-tube set consisting of one stage of radio frequency, detector and two-stages of audio frequency, gives a combination that meets all the requirements of operators who desire the best on the market. The combined cost of the various units is far below that quoted by other manufacturers.

The combined units are easy to tune and as a result of the design of the various parts, together with that of the units themselves, static and other interference is reduced to a minimum. Better—Cost Less.

CROSLEY HARKO SENIOR NO. V, R. F. T. A. AND TWO- STEP AMPLIFIER

A combination of the Crosley Receiver No. V, the Crosley Radio Frequency Tuned Amplifier and the Crosley two-stage Audio Frequency Amplifier, is another hook-up which is equivalent to the Crosley Receiver No. X. This four-tube set, consisting of one stage of radio frequency, detector and two stages audio frequency, brings in clearly and distinctly, signals broadcasted within a radius of hundreds of miles from stations using a reasonable amount of power. The most inexperienced operators are able to obtain the best of results in using this combination because of its simplicity of tuning. Radio Engineers have expressed enthusiasm in the results obtained from this combination after it had been tested by them working under all conditions.

CROSLEY RECEIVER NO. VI, AND TWO-STEP AMPLIFIER

Still another hook-up equivalent to the Crosley Receiver No. X, is a combination of the Crosley Receiver No. VI and the Crosley Two-Step Amplifier.

The efficiency of this combination, one step of radio frequency, detector and two stages of audio frequency has been mentioned above. It might be added, however, that with it ship and shore stations on the Atlantic Coast are easily copied in Cincinnati, while radio telephone concerts and voice from Pittsburgh, Detroit, Chicago, Newark, N. J. and many other broadcasting stations are easily picked up. Even though the price of this set is lower than any other four-tube outfit, there is no better set on the market.

CROSLEY CRYSTAL RECEIVER NO. I, AUDION DETECTOR AND TWO-STEP AMPLIFIER

The Combination of the Crosley Crystal Receiver No. I, Crosley Audion Detector and the Crosley Two-Step Amplifier is the same as the Harko Senior and Two-Step hooked together. This combination is exceptionally efficient in the reception of signals broadcasted on the average wave length. Owners are well pleased with their ability to tune in on far away stations with the use of this outfit.

WRITE FOR CATALOGUE

Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

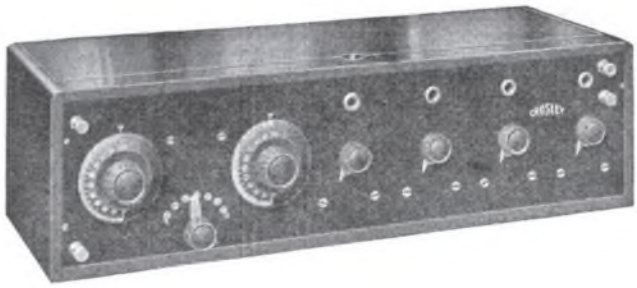
CROSLEY MANUFACTURING CO.

DEPT. Q.S.T.1 **CINCINNATI, OHIO**

RADIO APPARATUS CROSLEY

Better --- Cost Less

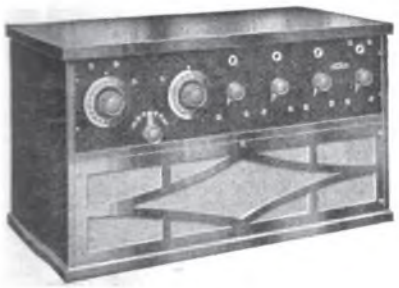
CROSLEY RECEIVER NO. X



In placing this receiver upon the market, we are offering you a unit whose range, volume and selectivity are remarkable. Nothing can be compared with it at double the price. Developed in the Crosley laboratories, this unit combines tuner, one stage of tuned radio frequency amplification, audion detector and two stages of audio frequency amplification.

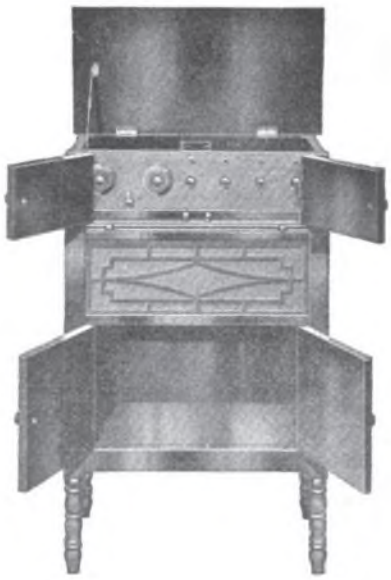
As shown, without tubes, batteries or phones, solid mahogany cabinet—$55.00.

Crosley Receiver No. X is equivalent to Crosley Receiver No. XI and Crosley Two-Stage Audion Frequency Amplifier.



CROSLEY RECEIVER NO. XV

This receiving set is the same as Crosley Receiver No. X., with the addition of a special sound resonating chamber for use as a loud speaker in connection with a pair of head phones. The addition of this sound resonating chamber is a feature that appeals to many persons. With it, every person in a room is usually permitted to hear the music or signals that are being received. Often it will be found that the entire house is filled with music broadcasted by some far away station.



Mahogany finished cabinet without tubes, batteries or phones—$70.

CROSLEY RECEIVER NO. XX

Crosley Receiver No. XX is the Crosley Receiver No. XV in an upright cabinet. A hinged lid when raised, allows the operator access to every part of the receiving apparatus. The doors, both upper and lower, are also hinged. Directly under the receiving apparatus is a highly finished board that slips in and out, forming a desk for the person operating the instrument. Wires lead from the binding posts on the receiving set to the batteries in the lower compartment.

Music received on this instrument will be heard throughout a large room and often throughout an entire house—the latter feature depending upon the power of the broadcasting station.

Mahogany finished. Without tubes, Batteries or Phones—$100.00.

WRITE FOR CATALOGUE

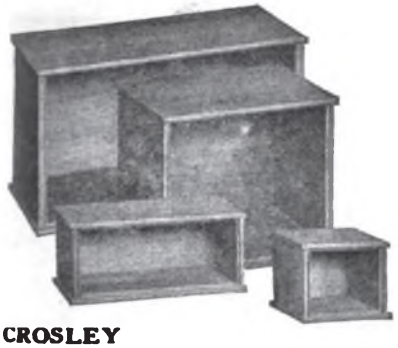
Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

CROSLEY MANUFACTURING CO.

DEPT. Q.S.T.1 **CINCINNATI, OHIO**

RADIO APPARATUS CROSLEY

Better --- Cost Less

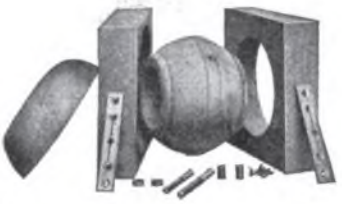


CROSLEY RADIO CABINETS

Realizing the demand for stock cabinets for those who build their own sets, we have developed a line of cabinets that are neat in design, attractive in appearance and finish, and of the best workmanship.

The Crosley Radio Cabinets are made of hard wood, Adam brown mahogany finish.

CROSLEY VARIOMETER PARTS



These Variometer parts are made in our own large wood working plant on special automatic machinery, which enables us to not only offer them to you at a price reduction, but to make each part accurately.

Each Variometer set consists of two stators, one rotor and the necessary hardware, shown in the illustration.

Made of poplar wood, well shellaced	$1.50
Made of Mahogany	1.75
Winding form extra	.30

CROSLEY SHELTRAN

Incorporated in the design of the Crosley Sheltran, are all the characteristics, so essential and necessary to obtain the maximum amplification from the modern vacuum tubes used in radio work. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The Crosley Sheltran is designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. Completely shielded—9 to 1 ratio.

Better—Costs Less—$4.00

CROSLEY VARIO-COUPLER PARTS

The Crosley Vario-Coupler is made with the same accuracy as the Crosley Variometer, and is designed to function perfectly with it. Each Vario-Coupler set consists of a formica tube, rotor and the necessary hardware for complete assembly.

Complete as shown in illustration, ready for assembly—$1.50. Also furnished completely wound and assembled complete with knob and dial "Better—Costs Less"—$3.00.

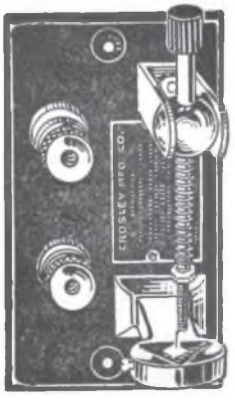
CROSLEY BINDING POSTS

These are made in three sizes—⅜" diameter, ⅞" diameter and ½" diameter. They are all of the same design, however, as shown in the illustration.

No. 1	5c each
No. 2	7½c each
No. 3	10c each

CROSLEY CRYSTAL DETECTOR STAND

This unit is especially well constructed, neatly mounted on black base covered on the bottom with green felt. All parts are bright nickel finish, complete with mounted crystal, binding posts, etc., manufactured under the following patents: "Patented January 21, 1908; November 17, 1908; June 15, 1909; September 7, 1909; July 21, 1914; September 8, 1914; November 24, 1914; April 27, 1915; January 28, 1917. Licensed for amateur, experimental or entertainment purposes only. Any other use will constitute an infringement.—$2.50.



CROSLEY MAGFON

No Radio station is complete without this Magfon. A built-in horn amplifies signals, voice or music. With it head phones are unnecessary except on weak signals. Any make of watch case receiver can be used with the Crosley Magfon by simply inserting it in the back of the cabinet.

Mahogany finish—$10.00.

WRITE FOR CATALOGUE

Dealers and Jobbers Who Handle Crosley Apparatus, handle the best

CROSLEY MANUFACTURING CO.

DEPT. Q.S.T.1 **CINCINNATI, OHIO**

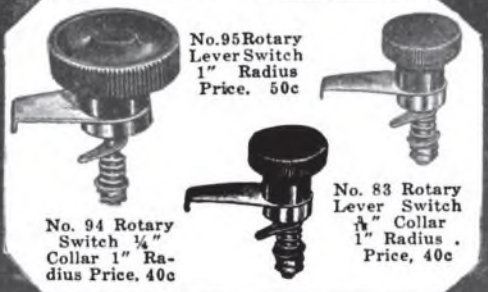
REMLER Cunningham

APPARATUS THAT RADIATES QUALITY

No. 82 Rotary Switch 1½" Radius Price, 50c

No. 90 Bearing Type, Rotary Lever Switch 1½" Radius Price, 75c

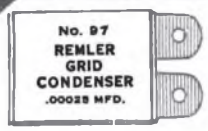
No. 91 Bearing Type Rotary Lever Switch 1" Radius Lever. Price 60c



No. 95 Rotary Lever Switch 1" Radius Price, 50c

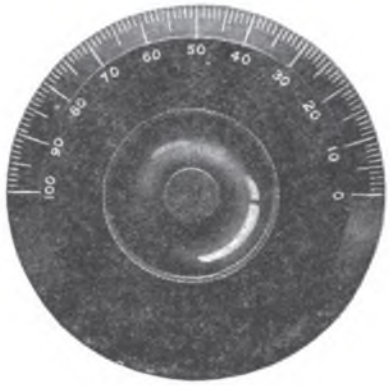
No. 94 Rotary Switch ¼" Collar 1" Radius Price, 40c

No. 83 Rotary Lever Switch ¼" Collar 1" Radius . Price, 40c



No. 97 Fixed Grid Condenser Price, 20c

No. 96 Variable Grid Leak Price, 40c



Type No. 100
3-inch Bakelite Dial with Knob and Bushing 75c

Remler Parts for Your Set

On this page are shown the popular line of Remler switches, the Remler Fixed Grid Condenser, the Remler Variable Grid Leak and the famous Remler Dial.

This represents but a small fraction of the Quality Radio Apparatus that has put Remler in the leading position it holds today. This small fraction, however, is built with the same care, accuracy and precision that has made the entire Remler line universally known as Quality Radio Apparatus.

It is becoming more and more apparent that Remler Apparatus is preferred in the building of sets because of its uniformity of construction—the well balanced proportion of each item giving an accurate and a pleasing appearance to the finished set.

Insist on Remler parts. If your dealer cannot supply you, write us direct for the name of a Radio dealer who can.

REMLER RADIO MFG. CO.

E.T. CUNNINGHAM GENERAL MGR.

248 FIRST ST. SAN FRANCISCO, CAL. 154 W. LAKE ST. CHICAGO, ILL.

CLASSIFIED ADVERTISEMENTS

Six cents per word per insertion, in advance. Name and address must be counted. Each intial counts as one word. Copy must be received by the 10th of month for succeeding month's issue.

WEST COAST signals all over the room with 4GL radio frequency transformers. Range 200-600. Price $3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

BARGAIN—Regenerative receiver with two stage tube equipment $48—Carl Anderson, 1126 Gibbs Ave., St. Paul, Minnesota.

JR. SCIENTISTS: Our magnet wire stock is complete. Depend on "ARCO" to supply your needs. Low prices. Quick Service. Send 6c for Bulletins Listing Hundreds of good products. American Radio Co., Box 133, Baltimore, Md.

LOUD SPEAKER UNIT:—For horn or phenograph attachment. Clarion type 3-C. Five dollars. Few Brandes TransAtlantic Head Sets from bankrupt stock. List twelve dollars. Our price Six-fifty per set. Enclose money order and address: Citizen Wireless Service, Hornell, New York.

FOR SALE—One station type Voca-Loud in good condition. $24. August Bauer, Chesaning, Mich.

BESTO' ALL RADIO FREQUENCY TRANSFORMERS: two hundred to six hundred meters; mounted for use in standard socket also has binding posts, Two Dollars each; unmounted for cabinet sets One Dollar each, postpaid in U. S. Guaranteed on money-back basis. Sold direct, eliminating middleman's profit. BESTO' ALL RADIO SHOP, Ballston, Va.

SELL—Thordarson ½ kilowatt transformer, new, $18 Thad Bryan, Ocean Springs, Miss.

RUBBER STAMP with large call letters 50c; Radiogram and Relay Radiogram blanks 25c per hundred Post cards 60c hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

SELL: Amrad Basketball Variometer, $5.00; Western Electric fones, $10.00; Thordarson Amplifying Transformers, $3.50 Anti-capacity switches, $1.50; Following at 25% off list: DL-50, L-100, DL-100, L-250, L-400, L-500, L-750, DL-1250, L-1500; Murdock OT $3.00; Mesco 1" spark coil, $3.50; Kilbourne Clark Quenched Gap, $4.00. Write, Howard Chinn, 210 West 102 Street, New York City.

FOR SALE COMPLETE only one kilowatt spark transmitter, Marconi forty thousand volt secondary "Coffin." Thordarson OT, Special OT, Robbins and Meyers thirty four thousand revolution gap, Boston key, Marconi loading inductance, one hundred forty cash fob Cuero R. A. Fulk, Cuero, Texas.

BARGAINS—Regenerative, $36; 15 dial Omnigraph, $24; Navy Coupler, $12; Small Spark Set, $20. All in excellent condition. Robert Fairchild, Portville, N. Y.

SELL—Practically new Emerson 220 volt motor. Makes excellent 600 volt generator. $23—E. C. Espy, Vandergrift, Pa.

PRINTED CARDS—Description of your station with QRA. 500 $4.00; 1000, $6.00, delivered. Samples on request. Donald Detwiler, 3BSB, 1120 Virginia Ave., Washington, D. C.

FOR SALE: Z-nith regenerator & Amplifigon AGN-31 Benwood 15 watt C.W. and fone set. All apparatus latest type and used but a short time. Address Herbert L. Gordon-Radio 8-BAS, Antwerp, Ohio.

BARGAIN: 3 three circuit regeneratives with Detector and two step in same cabinet, $80 absolutely new. ½ KW spark with enclosed gap and Thor. trans., $35. Myron Gould, 12542 Clifton Boulevard, Lakewood, Ohio, Ex 8GE.

BARGAINS: As Long As They Last. DeForest DT-800 two-stage Amplifiers, $22.75 each; Cabinet Type Vacuum Tube Detectors with Condenser and Variocoupler Tuning, $20 each; approved 100-ampere 600-volt 5-inch break Ground Switches, $2.25 each. Sent postpaid on receipt of price, or parcel post collect on receipt of order. Ludwig Hommel & Company, 530 Fernando St., Pittsburgh, Pa.

SELL: Ten watt C.W. set, tubes and transformer, complete $45. Arthur Houlihan, Woodlawn Ave., Ansonia, Conn.

A REAL radio frequency transformer for amateur use; beats anything on the market; range 200-600 meters; designed by 4GL; price $3.15 each postpaid anywhere in U.S. Circuit with each transformer. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

FOR SALE: Navy Type Coupler 3500 meter, $15 excellent condition. 2 Old double filament Audiotrons never used equipped with standard adapter $10 each. Radio Corporation Amplifier Transformer $5. Two back of panel rheostats $1 each. Geo. B. Kaiser, Wharton, Texas.

SELL: Regenerative Receiver 150-600 meters bakelite panel; oak case, cost $45, make me an offer. Clarence Kelley, Saco, Maine.

FOR SALE: 8SP SPARK: 1KW Acme Transformer, 220 Volt $28.00. Aluminum type Benwood gap, complete with 110 volt motor, new glass bushings, oilless bearing and coupling $28.00. Both as good as new. A. G. Kisner, Fairmont, W. Va.

FOR SALE: Practically new Clapp-Eastham H.R. receiver $25. Wanted, Paragon RA10, write Raymond Mathison, Gladstone, Michigan.

EDISON B BATTERY ELEMENTS. Make your own. Can be recharged and lasts for years. 200 ampere hour A batteries, guaranteed $35.00. Harry Morrell, 52 Goffe St., New Haven, Conn.

ODDS AND ENDS—Storage Battery, Eveready 6v. 110 amp. new $15, cost $20; 1 UV 200 $4; 2 UV 201 $5; 1 Electron Relay tube $4; Pair 3000 ohms $12. Dictograph headset $9; Faradon UC 1820 variable condenser $5; Boston Key $5; Homecharger, good condition $12; alcohol blow torch and iron $1; Hydrometer $1. Forty lessons of electrical course sacrifice $10. Navy radio air craft course $3. All answered. 3BTD, c/o Wm. Wailes, Jr., 3118 Fourteenth St., N. W., Washington, D. C.

9JD 20 WATT CW and Fone set for sale: Mounted on ¼ inch hard rubber panel, in oak cabinet. Radiation 1-2 amps. 350v.-750v. A.C. R.A.C. or M.G. 50-150 MA. VT'2. DX: Miami, Fla. & Pittsburgh on fone. Calif., Conn., Vt. & La. on CW. Complete for $150. First M.O. or draft takes it. 9DVL, P.O. Box 77, Naperville, Ill.

FOR SALE: Regenerative Single Circuit Receiver with V.T. 1 tube $25. Also Crystal Set with 3,000 ohm phones $15. Excellent condition all instruments guaranteed. A. Nowell, Dublin, N. H.

FOR SALE: One regenerative receiver, (2 variometers, variocoupler, variable condenser) and detector, 2 step amp. to match—cost $140 used 2 months. First check $95 takes it. 2 Tuska variometers—used, $5.00. Donald H. C. O'Neil, 5602 Etzel Ave., St. Louis, Mo.

TESTED GALENA CRYSTALS From our own Mines shaped and tested at the mine in best standard bookup—direct to user. A real crystal—not a pinhead. Twenty-five cents postpaid, five for $1.00 to group buyers. Ozark Crystal Co., Box 1, Morrellton, Mo.

MAKE YOUR OWN Head Phones. Complete parts including Headband, Cases, Magnets, coils completely wound 2000 ohms, all ready for assembling with instructions $3.50. South Hills Radio Co., 411 Charles Street, Knoxville, Pittsburgh, Pa.

NEW WESTINGHOUSE RC for Grebe CR 9 or Sell. 8 South Ohio, Atlantic City, N. J.

AMRAD TUNER and detector two step, ninety dollars. Clapp-Eastham H.R. receiver with H.Z. amplifier, mahogany, sixty-five dollars. Magnavox R3, forty dollars. All new, perfect condition. Send money-order. Ridgewood Orchard, Winchester, Virginia.

JENKINS VERNIER RHEOSTAT
Indispensable for adjustment on Radio Frequency and Detector Tubes. Patent instant cut-off switch. Write for folder.
Liberal discounts to dealers and jobbers.
Manufactured & Guaranteed by
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SPECIALTY SERVICE COMPANY
Distributors for
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We have a complete line of C.W. transmitting apparatus for the coming season.
Write for prices
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BUILD YOUR OWN

Complete 50c instruction book for 20c only on radio reception and how to make eight classes of crystal and vacuum tube receiving sets. Wonderful information makes you understand radio. With every order we send free our price list of **20c** parts prepared especially for the several sets described. Buy direct from factory and save many dollars. Both instruction book and price list sent on receipt of 20c only. Money back if not satisfied.
RADIO PARTS MNFG. CO.
Dept. 13, Park Place W., Detroit, Mich.

WHILE THEY LAST: Fada Rheostats, $0.85; 43 plate variable condensers, panel mounting, $3.30; 23 plate, $2.70; DeForest Everyman Sets, $21; Brach Lightning Arresters, $1.85; 100 ampere lightning switches $2.50; Murdock 3000 phones, $5.30; Fixed condensers, $0.60. Radio Electric Service Station, 151 Main St., Tottenville, S. I., N. Y.

EDGEWISE COPPER .033x.295x3¾" diameter 50 turns $3.50 postpaid. Radio Specialties Co., Counellsville, Pa.

SPECIAL THIS MONTH: Westinghouse R. C. Receivers, R.A. Tuners, D.A. Detector-Amplifiers. 10% off list prices. Prompt shipments or money refunded. Wesley Robinson, Jr., St. Marys, Georgia.

FIRST $100 takes complete Regenerative Set. Honeycombs. New. Fred H. Reichert, Hawley, Pennsylvania.

FOR SALE: Meteor .01 Condenser, Thor OT, Franklin Gap, Thor Type R Transformer, Marble base changeover switch. All good. Make offer. Allen Strete, West Mansfield, Ohio.

LIBERTY C.W. TRANSMITTING and Receiving products. We manufacture "Liberty" C.W. power and Filament transformers. Choke Coils. "Liberty" Catalog ready September 15. Amateurs, use "Liberty" equipment for your relays. DEALERS write. Snyder Radio Manufacturing Company, Ashland, Ohio.

INVENTORS: Protect your invention through A. M. Wilson, Inc., Washington, D. C. Over 20 years of efficient, expert, confidential service. Skilled in Radio-Electrical, Chemical, and Mechanical fields. Our 1922 illustrated Booklet, giving much necessary and very useful information which every inventor should know, will be sent free upon request. Prompt and careful attention. Highest references. Moderate fees. Send sketch or model for our careful opinion and preliminary advice. Write today to A. M. Wilson, Inc., 310-16 Victor Building, Washington, D. C. (Successor to business established in 1891 by A. M. Wilson.)

GREBE CR3 $45.00. Grebe Detector and two step amplifier $40.00. Both fine condition, Wesley Robinson, Jr., St. Marys, Georgia.

4GL RADIO frequency transformers; DX, fones and 600 meters; $3.15 each with circuit. Savannah Radio Shop, 1223 East Duffy St., Savannah, Ga.

The Standard Idea

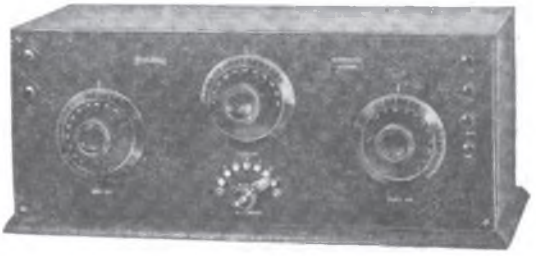
Assembled But Not Wired

THE STANDARD IDEA permits you to purchase radio equipment in a new way—**a cheaper way.** We manufacture a full line of instruments—including a Detector and Two-Stage Amplifier and a Multiple Wave Tuner—that embody the latest and most successful developments in radio. These instruments are shipped to you—complete assembled—**but not wired.** You do the wiring yourself with the diagrams and instructions furnished with each machine or using your own ideas if you prefer.

The STANDARD IDEA enables you to effect a saving of **20% or more** when you buy your instrument, for the wiring, being hand-work exclusively, is the most expensive operation in radio manufacture. By eliminating this costly item you save money and have the fun of doing all your own wiring.

Write today for literature descriptive of the STANDARD IDEA and prices and descriptions of the various machines we make. You will be interested in our offer to ship any machine for inspection on receipt of 1/3 the purchase price **which is cheerfully refunded if you are not satisfied.**

STANDARD ASSEMBLING COMPANY
6 Stone St. New York, N. Y.



—FOR YOUR CONVENIENCE—

QST'S INDEX OF ADVERTISERS

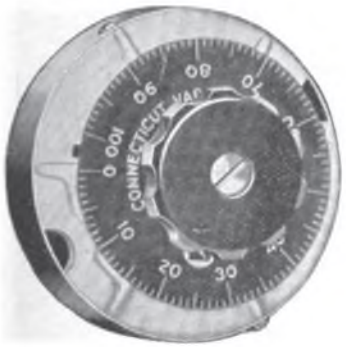
IN THIS ISSUE

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

CONNECTICUT RADIO

Ask some amateur who is using a CONNECTICUT Variable Condenser about his results. You'll find him our best advertisement.

When one has used multi-plate condensers, then found the CONNECTICUT two-plate type would give better results, sharper tuning, clearer signals, he naturally feels, as one amateur wrote us, that CONNECTICUT is "cheaper in the long run."



The new panel type, requiring but four small holes for mounting. Designed for panel thickness from ⅛" to ¼".

If you measure the value of an instrument by what it does rather than by what it costs, you'll use the CONNECTICUT Variable Condenser. We have an interesting booklet describing the theory and performance of the instrument in full. We'll gladly send it on request.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden Connecticut

83

AMRAD

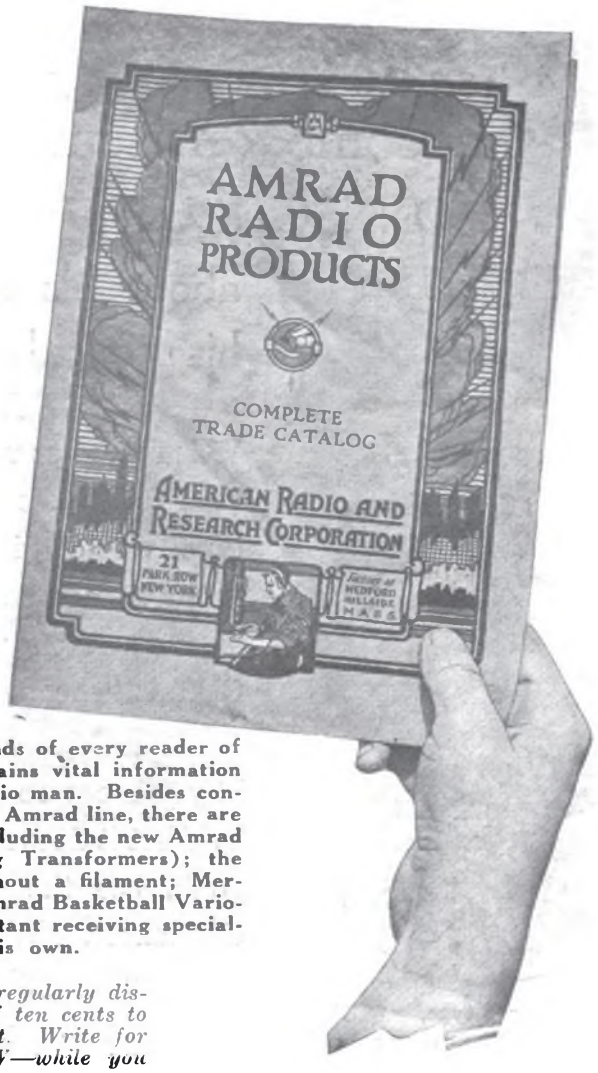
The Recognized Symbol of Superior Performance

GET THE FACTS

The Amrad Catalog gives you the latest information about the newest, TESTED developments in Radio

Its loose-leaf make-up assures up-to-the-minute facts while they ARE facts.

It will be sent FREE to QST readers until October 15th.



We want this Catalog in the hands of every reader of QST because we believe it contains vital information useful to the more advanced radio man. Besides containing descriptions of the entire Amrad line, there are Bulletins on Radio Frequency including the new Amrad Radiformers (R. F. Amplifying Transformers); the S-Tube Rectifier—the tube without a filament; Mershon Electrolytic Condensers; Amrad Basketball Variometers and Couplers; and important receiving specialties for the man who builds his own.

The Amrad Catalog is regularly distributed upon receipt of ten cents to defray partially its cost. Write for your FREE copy NOW—while you have it in mind.

AMERICAN RADIO AND RESEARCH CORPORATION

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(4 Miles North of Boston)

New York District Office
13 Park Row

Chicago District Office
218 State St.