**ELEVEN ARTICLES FOR NOVICES**

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**DE LUXE COILS FOR SHORT WAVES**

At last experiments become more and more interesting in short waves and learn more about their potentialities. Many more amateurs have actually accomplished the best of the set of a number of sets, build the best of the set of a number of sets, build the best of the set of a number of sets. To those who will accept this as the Euro Delux Coils.

The Euro Delux Coils are of two types—the standard ironized wave coils, and the non-magnetic coils wound with fiber ribbon. Such types are expected to have the same specifications as in the English and German sets. These coils are in sets of four for the entire short wave band, and can be bought at the usual price of $6.00 each.

**SOLD**

145 W. 45th St., New York, N. Y.
Television Misdirected. New Tack Suggested
Scanning Systems Introduce Problems Impossible of Solution Consistent with
Good Picture—New Method Needed, Imitating Nature, Says Scientist,
Giving Hint on Course

By Arthur C. Lingelbach
Scientific Research Engineer

Radio and television engineers have
given the public every reason to ex-
pect commercial television within a
correspondingly short period and there
is no doubt that the engineers themselves con-
fidently expect to obtain it.

Consequently, John Public believes that
he will soon be able to go to his favorite
radio store and purchase a television re-
ceiver that will give him the same sat-
isfaction as his radio receiving set. By the
use of the television set he expects to see
performances given in the studio as well as
possibly public spectacles and enter-
tainments. Why should he not be able
to do this? Have not television engineers
now on the market a television set by
which he can see the face of the an-
nouncer or performer?

This enormous stride has been made, according
to John Public's understanding,
within a very short span of years since
the development of commercialization
of radio. He believes it is but a step from
this point to that of viewing complete
studio shows and public events. There is
no question this is a true picture of the
average lay mind, and in fact, represents
the confident belief of the majority of tele-
vision engineers. This view has become
so embedded in the public's mind that at
present it is becoming increasingly diffi-
cult to sell radio sets because of the belief
that television will be incorporated in the
more modern receiving sets about to be
marketed in the near future.

A Closer Examination

Under these circumstances, it will be
well to examine the subject of television
a little more closely to determine whether
the sincere belief of radio engineers and
the faith of John Public in them is jus-
tified.

The problem of television is inextrica-
antly interwoven with that of a kindred art,
telephotography, or the transmission of
still pictures between distant points. The
historical development of the art of tele-
photography is very illuminating. We find
that as far back as the year 1942, it was
proposed by Bain to transmit pictures be-
 tween distant points and an apparatus was
developed at that time which comprised a
stationary cylinder in the transmitting and
receiving stations and synchronously ro-
tating brushes adapted to scan the cylin-
der. A separate circuit connected corre-
sponding brushes at the transmitting and
receiving stations. The picture to be trans-
m itted was specially prepared into con-
centrating and non-conducting segments and
specially prepared photographic paper was
wrapped around the cylinder at the re-
ceiving station. The flow of current in the
circuit brought about a photographic im-
pression on the cylinder.

Bakewell in 1847 improved this system
by employing a single circuit and a single
brush at the transmitting and receiving
stations and synchronously rotating cylin-
ders whereby the brush was caused to
traverse the cylinders spirally. Thus we
find at the very inception of the art the
fundamental concept of the scanning of a
picture, or point by point, at the trans-
m itting station and employing a syn-
chronously operating scanning device at
the receiving station with but a single ele-
tric circuit connecting the stations.

Casselli improved the Bakewell process
by employing rocking plates instead of
synchronously moving cylinders.

Photo-Cell Introduced

Carbonelle next developed a system of
telephotography, using the same general
principle as that of Bakewell. Carbonelle's
improvement consisted of employing an
ordinary silver nitrate film. The brush in
moving over the negative would encounter
varying resistance according to the depth
of the silver deposit and reproduce similar
conditions at the receiving stations. An
attempt was made to install this system
commercially in Paris, France. However,
the installation was unsuccessful because
of the comparatively small variation in
the resistance in the circuit as the brush
scanned the film and because the electric
current had a tendency to follow the path
of least resistance and distort the trans-
m itting image.

Bidwell was the first to introduce into the
telephotographic art a photo-electric cell which he constructed of selenium. By
this development long prior to the begin-
ing of the twentieth century, we find all
the elements present in our television sys-
tem. It was employed for the transmission
of photographs or images from point to
point. That is, Bidwell employed synchro-
nously operating cylinders or scanning de-
 vices at the transmitting and receiving sta-
tions, a photo-electric cell in the trans-mitting station and a varying light in the
receiving station.

The next development was the invention
of the telautograph, by which drawings or
writings could be transmitted at a distance
as they were made. The system of tel-
autography or distant writing is used quite
extensively commercially.

The next advances in the art of picture
transmission occurred about the year 1900
when Amstutz employed synchronously
revolving cylinders at the transmitting and
receiving stations. These cylinders had
been employed as a rotary one and a stationary brush or stylus was em-
ployed. The picture to be transmitted
was specially treated to bring out raised
and lowered portions in the received picture.

Dunlay, Palmer and Mills in 1906 changed
the receiver of the Amstutz system so as
to etch a reproduction of the picture at the
receiving station.

Mirror Scanning

Picture transmission was brought to a
high state of perfection by Korn from 1903 to 1906 when it finally became com-
mercial and this system has been employed
in Europe since that time with consider-
able success. Korn first employed synchro-
nously moving scanning devices in the
transmitting and receiving station and a
photo-electric cell made up of selenium,
without a light at the transmitting station
in circuit with the photo-electric cell. In
Korn's system a beam of light was fixed on
a point of the film which was revolving

(Continued on next page)
(Continued from preceding page)

on a cylinder and moved slowly laterally so that the whole picture was scanned by means of a small light beam. The beam passed through the negative and was reflected into the photo-electric cell. The photo-electric cell was connected in a circuit that was being used at the receiving station which was forced to flow a current and caused to scan a photographic film in the same manner and synchronously with the beam of light from the transmitting station.

Korn encountered considerable difficulty in the time lag of a photo-electric cell but succeeded in developing a cell from selenium at a point where this was avoided. Korn improved the receiver in his later developments by employing a mirror that was driven at the same rate as the variations in current received from the photo-electric cell to vary the amount of light reaching the receiving station. In this manner he obtained a more accurate and responsive light at the receiving station. Another well-known name in the development of picture transmission is that of a Frenchman, Belin, whose system is now being used extensively in France. Belin's system differs from methods heretofore discussed in that it employs a plurality of selenium, and synchronously with them into the circuit one after another to get away from the time lag of selenium. At the receiving station he employs a revolving mirror of spark and gas. The light from the electric discharge of the gaps varies in accordance with the current through the selenium cells and affects the paper being used to depict the picture at the receiving station. By applying to both of his selenium cell and light at the transmitting and receiving stations respectively.

The Bank of Photo-Cells

In 1914 Schmierer in Germany developed a system consisting of a bank of photo-electric cells upon which the picture was projected by means of a lens at the transmitting station and a bank of seleniums at the receiving station corresponding in number to the number of photo-electric cells. High-speed selectors were used at the transmitting station in synchronism to connect to corresponding lamps and photo-electric cells together in series. The effect of the apparatus on the receiver was to pass through the seleniums by means of light projected upon a screen. This was a television arrangement requiring that the light to be transmitted had to be less than one-sixteenth of a second. This is the persistence of vision interval of the human eye. The method was partly anticipated by Trott, used substantially the same apparatus except that he employed a single Geissler tube in place of the bank of seleniums. The successive variations of light of the Geissler tube were properly positioned on the screen by means of a high-speed selective scanning device.

All the foregoing developments occurred long before the popularity of radio also.

An examination of these developments shows that at the very inception of the complete television number, there were, nearly 100 years ago, the use of two synchronously-operating scanning devices at the transmitting and receiving stations was used in synchronism with photo-electric cell or light-responsive element at the transmitting station and variable light-emitting element at the receiving station. These are the essential elements of the present-day television system and also all of which have been proposed.

We now come to the more modern developments of television by Jenkins and Sarnoff in the United States, Baird in England, and Mihay in Germany.

The development of television by these engineers has occurred since the advent of radio as a public entertainment although, of course, there has been a large number of workers or experimenters in the field during this period whose efforts have reached practically no publicity. We are all more or less familiar with television, success and failure. Will it suffice to say that each of these experimenters has developed the essential features of television discovered independently 100 years ago with no major advances in the last 50 years, and synchronously, each system has involved a scanning device at the transmitting and light-emitting means at the receiver, responsive to the control of photo-electric means of the transmitter.

Many Scanning Devices

The field of television and picture transmission has been thoroughly canvassed and there are many scanning devices ranging from rotary cylinders, vibrating mirrors, electron beams and prismatic and slotted discs. However, each and every one has for every great advantage has for every primary object that of scanning a picture point by point until the whole is transmitted.

Many of these devices were developed by the Bell Telephone system now in operation in the United States by various telegraph companies.

Essentially the same scheme is similar to the systems employed by Korn, previously outlined, involving a pair of photo-electric cells or rotating cylinders for scanning devices, together with the responsive and light-emitting elements at the transmitting and receiving stations. Such a system of picture transmission is moderately successful because it is not necessary that the whole picture is scanned in a very short time or as it is required in television systems. In fact, the transmission is so slow that it requires in certain instances several hours. The system gives the quality of reproduction as is obtained in the newspaper half-tone engravings 65 screen, which of course is quite crude.

The Scanning Process

The small experimental successes that are being obtained by modern television experimenters can be easily accounted for by the development of other arts. Namely, radio has come into being, amplifying apparatus has been developed to a high degree of efficiency, as well as have photo-electric cells or light-responsive elements, the development of synchronous motors and the tying of alternating-current power systems together which make a variation and phase shifting is largely eliminated and enables a synchronism between the transmitter and receiver in the same power area. The substitution of improved apparatus in the systems of the experimenters long since dead would have created the essential success in the television held as being attained today. However the inherent and fundamental limitations of a system of television employing scanning which is an essential element of each and every one discussed or proposed to date, will now be discussed briefly.

Scanning means that the picture must be analyzed into a large number of small dots.

A French scientist, Brillouin, states that his investigations have led him to the conclusion that a picture or view can be transmitted with sufficient distinctness only if the dots or elements constitute squares having one-thousandth millimeter sides. In this way, a small picture of 4 by 4 centimeter picture, 640,000 different points on a 4 by 4 centimeter picture, 16 times a second (Continued on next page)
Idle Hours May Be Spent on Reflex Experiments
By William A. Bidwell

WHEN tubes were expensive but most a decade ago, there was some excuse for attempting simple circuits, but there does not seem to be any need for that now, because tubes are cheap. Moreover, any reflexing introduces inevitably a certain amount of distortion. Reflexed tubes never were highly cured. The infamous audio howl could be understood some years after the question became academic. It was found to be due to feedback through a common impedance, a form of regeneration, the same sort of thing that now presents itself in some short-wave sets and is called fringe-howl.

Today persons are assumed to be better tone and that should rule out the reflex, for it is certainly true that the tone from the reflex can not be any better than that from the non-reflexed circuit. Nobody can deny that.

Of course, reflexing has a few adherents, but fortunately not any particular manufacturers. There are troubles possible enough in the simplest reflexed circuits, without producing any throwbacks such as reflexed sets.

Here are two diagrams, with values, of reflecting with a late tube, the 217 or 6B7. This is a duplex diode pentode, and it may be recalled that the information was released to the public some time ago by tube manufacturers when this tube was announced were such that some persons could not get a peep of the set when the tube was used in straight fashion. The reason was, as pointed out promptly in these columns, that the screen voltage was too high. The tube is critical as to that, around 50 volts being plenty for a 250-volt plate supply, with plate load resistor 20,000 ohms and RC around 1,500 to 1,600 ohms.

Some experimenters, who had a great deal of fun working over reflexes in the old days, may want to try the circuits with new tubes, and there is no denying the production of signals, but there is a likelihood there will be enough trouble to tax the ingenuity even of old-timers. The reflexes always were that way, constant cause of trouble.

Two Outstanding Valuable Pieces of Real Information

There isn’t anything that can be said about construction of a short-wave set that is more important than the fact that proper selection of series antenna capacity will reduce the dangers of dead spots, hence adjustable capacity for this purpose, even front-panel knob, is of extreme value.

And in the stopping of undesired oscillation in a radio-frequency or intermediate-frequency amplifier, no device is more important than that the bypass capacity across the biasing resistors in the cathode legs should be 2 mfd.

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Why All Measurements Depend on the Current

By Ayel W. Larsen

Volt-current-ohmmeter circuit, used as basis of explanation of just what takes place when the measurements are made. Also, the factors concerning accuracy are expounded.

Probably all testing equipment diagrams look complicated, because the reader is not as familiar with them as the designer, hence the connections seem mysterious or esoteric. Besides, some diagrams have hundreds of connections. Here the diagram is a rather simple one, and yet even that is not without its points that may not be quite clear at a glance. At least it is a good diagram to use as a basis of getting an insight into the operation of a current-voltage-resistance meter.

The first thing to realize is that the current through the meter is the only thing that is read ever. If current readings are what we are interested in, then that current flow is calibrated as part of the manufacturer's scale. Ordinarily full-scale deflection current would be 1 milliampere in a good instrument. That enables reading small currents, also later will enable accurate voltage determinations, within certain limits, and also will enable reading high resistances, besides medium resistances and very low resistances, so a fraction of an ohm.

Minimum Change Desired

When the current readings alone are of interest the meter and its incidentals have a low resistance, looking at the source. That is, a low resistance circuit is presented, which is desirable, because all current readings are taken, or measurements made, with the meter in series with the current supply. If the resistance were high the current would be reduced, therefore the reading taken with meter in circuit would not reflect the actual conditions when the meter is out of circuit. Always in current measurements the meter and its incidentals, such as shunts to enable reading larger currents, do reduce the current a bit, but when this reduction is very, very small it may be neglected, particularly as the effect is small compared to the accuracy rating of the meter. That is, the reduction is negligible, and is therefore properly ignored.

For the minimum current range, 0-1 milliampere, the meter is used as found, with one exception that one type of meter, the rectifier type, a 4-c instrument which also reads a-c values in terms of rectification current, usually has a shunting resistor across the d-c part of the instrument for all d-c uses. If an 0-1 milliammeter is to read higher currents, since the full-scale deflection current of the meter itself is not alterable, shunts, or parallel resistors, are used across the meter. Then more current flows through the shunt than through the meter, but the shunt is so selected that, for use in the intended range, always the current through the meter is 1 ma or less. The shunt takes up the excess of the meter cannot. It would burn out if too much current were passed through it.

Series Resistor for Voltage

For voltage readings, always there is a series resistor. The total meter circuit, consisting of the meter and its limiting resistor, is put across, that is, in parallel with, the circuit to be measured. So though current measurements require the meter to be in series, voltage measurements require the meter to be in parallel.

The meter draws current from the voltage source measured, which means that the reading obtained will be of a voltage a bit less than the actual voltage in the circuit when the meter is not connected. This difference is small for most purposes, and a 0-1 milliammeter, constituting a voltmeter of 1,000 ohms per volt, is satisfactory for most purposes; save those wherein the current flow in the measured circuit is less than that through the meter.

Always the amount of current through the meter can be determined, even when voltages are being measured, for the current scale is on the meter. True, the voltage scale is there also, and we are interested in reading the voltage, yet need not ignore the fact that we can see what the current is through the meter when the voltage measurement is being made. So, too, if the current is read as current, by series connection, and the voltage is read as voltage, by parallel connection, the current through the circuit can be compared to the current through the meter for the voltage-reading condition. It is necessary, for accuracy, that the current through the meter for voltage-reading purposes, be small compared to that through the circuit with voltmeter removed, or with the current meter alone present. On this ratio depends greatly the accuracy of the voltage determination, where voltage means the voltage in the circuit when the meter is not being used. Always the meter, when in circuit, reads the true voltage then existing, but removal of meter would change the voltage. The smaller the change, the greater the accuracy.

The problem, as often stated, is to ascertain what the voltage is when the meter is not in circuit, on the basis of a reading obtained when the meter is in circuit as a voltmeter, and since this is a contradiction, the condition can be satisfied only when the meter current is small compared to the current through the measured potential circuit.

Resistance Measurement

With resistance measurement, again we depend on current. All current indication is used, though the calibration may be in terms of current, voltage and resistance. Take a look. That is obviously direct and clear—so much current, calibration of scale on the basis of that current, and usually the scale is linear for current. For voltage there is a series resistor, therefore the scale, if linear for current, is linear for voltage, or the voltage calibration is on the basis of the current quantities that flow through a certain resistance.

Resistance measurement can use current and voltage calibrations and convert them to resistance terms. This is part of the calibration of the current-voltage-resistance meter.

First, we select a voltage source of fixed and accurate value. This may be a dry cell. We know that the meter draws 1 ma at full-scale deflection. Therefore we can compute the value of the limiting resistor that has to be put in series with the meter and the cell to enable full-scale deflection when the open terminals are shorted. The open terminals may be taken as those at upper left in the diagram.

The resistance, by Ohm's law, equals the voltage in volts times the current in amperes, or 1.5 divided by 0.001, or 1,500 ohms. So the limiting resistor of 1,500 ohms will do two things: (1) It will in series with the meter and an un-
Tuning Deemed Necessary for All-Wave Antenna
By L. C. Ramford

The antenna is connected to primary marked ANT. The associated secondary is connected to a transmission line. Terminals 3 and 4 go to the receiver.

The transmission line is illustrated with antenna connected to 1 and 2. T1 being a step-down transformer and the receiver connections made to 3 and 4, the secondary of a stepup transformer. These conditions are for a current-fed line. The other type of line, comprising the transformers reversed from what has been suggested, is the voltage-fed line. The idea behind each is that either the voltage is made high or the current is made high for the feed designation to apply.

The Best Line
There are advantages and disadvantages in both types. The current-fed line suffers less loss by far due to the capacity to ground represented by C. Because of this, the drop through these capacities is negligible at high frequencies. The loss appears to be next to nothing, and provided that the resistance is almost nothing. But with high current, small resistance becomes very serious, and the loss might be as great as 1/2 ohm for the voltage-fed line through the capacities C. If the resistance were kept well below 1 ohm. A doublet antenna is assumed, and connected to Ant. of the transformer at left. The transmission line may consist of a twisted pair, or transposed leadin, or concentric hollow tubing, which is the best transmission line there is, because from such a device there is zero radiation. The device is made of heavy copper tubing, inside of which is another hollow copper tubing, one of these, usually the outer one, being grounded, the other serving as the high-potential conductor. The transformation ratios take care of the theoretical requirements as to safeguarding against reflections, that is, accomplishing transfer of practically all the current or voltage in the first secondary to the second primary. In actual transmission lines as used with short-wave and all-wave receivers this condition is not achieved.

Another point worth considering is that it is hard to conceive of an all-wave antenna system being effectively such where there is no tuning. The transformation ratio is one thing and may be settled to the best practical approximation, but it is not known to the science that any coil system will handle with equal effectiveness an enormously-wide range of frequencies, that is, both aperiodic and periodic. The fact is that all-wave systems that omit tuning do so for practical reasons of convenience, good reasons no doubt, but offer a compromise.

The more technical-minded folk would do well to resort to systems that introduce tuning as a part of the all-wave antenna system, that is, actual control of the input coupling at least. Such might be accomplished by a condenser in series with terminal 3. Or by making the coupling between the 3 and 4 system and its associated primary adjustable within 45 degrees or so, the transformation ratio may be related effectively to the frequencies.

Power Practice
In power line practice the voltage-fed system is used, for example, for 25, 40, 60, and not more than 200 cycles under any conditions, the loss through the capacity to ground is negligible. In house installations where the current to ground was measured it was found to be of the order of several microfarads, definitely negligible at power frequencies. Hence the argument that because power-line practice is confined to voltage-fed transmission, therefore radio practice is wrong (one which power company engineers naturally don’t know much) should follow suit, does not hold.

In fact, the specialized antenna systems, while better understood than formerly, have not reached the state of complete attainment of the desired end. For short-wave work, the only field in which this is of considerable importance, the fact needs acknowledgment that more gadgets have to be tuned and retuned, to get the desired results. Only results count. More controls must be included as consistent with better effectiveness. The old argument of two controls, one for tuning, other for switch-volume, does not apply as a limiting factor when one is groping in the short-wave spectrum, concerning which on the whole not so much is known, and where there are numerous mysterious antecedents. Give a person those antecedents that make for the repeated and practically instantaneous perception of the sensations, and the argument in favor of short-wave and all-wave sets is completely won. As a result it is being widely demanded, but the result is in the lap of the goals.
A WIDE education in radio can be obtained from the analysis of a single receiver. No false hopes need be nourished, for that wide education is not to be imparted within the short limits of this article, yet we can confine ourselves to the definite aspects, for instance, the simplest considerations as applying to inductance, resistance and capacity. Those three constants are all there is to radio.

The circuit is a superheterodyne for reception of broadcasts. There are two stages of tuned-radio-frequency amplification, a local oscillator (middle left), two stages of intermediate-frequency amplification, a double-diode 56 detecting circuit, a 56 diode a-c-e tube, a 56 triode audio amplifier, a push-pull 56 triode driver stage, and a 45 Class B output, and a rectifier. All Class B systems are a form of push-pull as integral circuits.

Now for the inductances.

There are two radio-frequency transformers, consisting of primary and secondary. They are in shielded containers (shielding not identified). There is an oscillation transformer of the same type, but with smaller secondary inductance. The relationship of the capacity across each secondary to the inductance of that secondary determines the resonant frequency of the r-f circuits, and the oscillation frequency of the oscillator. The higher the adjustable capacity, the lower the frequency, or the lower the capacity the higher the frequency. Also, the lower the inductance the higher the frequency or the higher the inductance the lower the frequency.

Oscillator Frequency Higher

Since the oscillator secondary has lower inductance the oscillator frequency is higher than the carrier oscillation frequency. This is standard practice. The difference between the oscillator frequency and the carrier frequency must equal the intermediate frequency. Thus when the two frequencies, station carrier and local oscillator, are mixed in the first detector, as they are, due to the inductive coupling of the oscillator pickup winding which is in the cathode leg of the first detector, an output is obtained from the first detector which is equal to the frequency to which the i-f chain is tuned. Hence a new carrier is created, at the intermediate frequency, and since this new frequency is lower than the original carrier, and is higher than audio frequencies, it is between the two remaining limits of frequencies, hence is called intermediate.

Winding Coils

The secondary inductances therefore are selected on the basis of the capacity used and the frequencies desired. For the station carrier frequencies this is a very easy problem. The cut-and-try method works well. The computations may be made closely. In general, for 0.00035 mfd, capacity, an inductance around 220 microhenries or so would be used. Standard commercial coils of this value are obtainable, or coils may be wound on i-inch diameter tubing, having secondaries, closely wound, of 125 turns of No. 32 enamel wire. What the primaries shall be is a matter of design, but a common method is to use for primary about one-quarter the number of turns that were used for secondary, winding the primary over the secondary, with insulating fabric between. The primary wire is not so important, and may be fine, except perhaps in the antenna circuit, where it may be of larger diameter, but even if all primaries are of the same diameter wire it is all right.

The oscillation transformer, with its three windings, is of the same general type, though the secondary inductance is less, and there is a pickup winding. Ordinarily pickup windings consist of only a few turns of wire. But cathode pickup is at a point where the potential drop is small, and more turns would be expected.

The Tickler

The tickler for the oscillation transformer also is a matter of choice. It must be large enough for oscillation at all settings of the condenser, and for high-mu and screen grid tubes would require more turns than for triodes. The oscillator is a 56 triode, and therefore one-quarter the number of secondary turns would suffice. The tickler could be connected adjacent to the secondary on the same plane, or wound over it. When wound over it the coupling is also sensibly capacitative, besides being predominantly inductive, for the small capacity between windings is effective at the high-potential condition existing.

The oscillation voltage (peak value) is usually much higher than most persons imagine, therefore grid leak and condenser are used, so that the negative bias will go up as the amplitude goes up, and thus limit the plate current, or prevent saturation.

The d-c resistance values of tickler and pickup coil suggest that if the wire is of the same diameter the pickup winding has about twice as many turns as the plate winding in this instance. Large pickup windings for cathode connection are common, and besides contribute large distributed capacity, useful as a constant value of fixed capacity across an oscillator that requires some more fixed capacity than does the r-f circuits, due to the required shape of the oscillator tuning curve.

Oscillator Inductance

The selection of the r-f inductance has been mentioned, but nothing said about the oscillator inductance. There are some highly accurate theoretical formulas for such determinations, data concerning which were printed in the July 14th issue, page 7. The variation should not exceed 4 kc under those conditions. The method is beyond the scope of most experimenters. Another method may be used, and is more practical, with limited knowledge. A minimum capacity is assigned. This would consist of condenser minimum, wiring ca-

Elementary Analysis of Inductance Effects Studied in a 14-Tube Circuit, With Cutoffs for Secondary winds, Consisting of Primary and Secondary. They Are in Shielded Containers (Shielding Not Identified). There Is an Oscillation Transformer of the Same Type, But With Smaller Secondary Inductance. The Relationship of the Capacity Across Each Secondary to the Inductance of That Secondary Determines the Resonant Frequency of the R-F Circuits, and the Oscillation Frequency of the Oscillator. The Higher the Adjustable Capacity, the Lower the Frequency, or the Lower the Capacity the Higher the Frequency. Also, the Lower the Inductance the Higher the Frequency or the Higher the Inductance the Lower the Frequency.

Winding Coils

The Secondary Inductances Therefore Are Selected on the Basis of the Capacity Used and the Frequencies Desired. For the Station Carrier Frequencies This Is a Very Easy Problem. The Cut-and-Try Method Works Well. The Computations May Be Made Closely. In General, for 0.00035 Mfd, Capacity, an Inductance Around 220 Microhenries or So Would Be Used. Standard Commercial Coils of This Value Are Obtainable, or Coils May Be Wound on 1-Inch Diameter Tubing, Having Secondaries, Closely Wound, of 125 Turns of No. 32 Enamel Wire. What the Primaries Shall Be Is a Matter of Design, But a Common Method Is to Use for Primary About One-Quarter the Number of Turns That Were Used for Secondary, Winding the Primary Over the Secondary, with Insulating Fabric Between. The Primary Wire Is Not So Important, and May Be Fine, Except Perhaps in the Antenna Circuit, Where It May Be of Larger Diameter, But Even If All Primaries Are of the Same Diameter Wire It Is All Right.


The Tickler

The Tickler for the Oscillation Transformer Also Is a Matter of Choice. It Must Be Large Enough for Oscillation at All Settings of the Condenser, and for High-Mu and Screen Grid Tubes Would Require More Turns than for Triodes. The Oscillator Is a 56 Triode, and Therefore One-Quarter the Number of Secondary Turns Would Suffice. The Tickler Could Be Connected Adjacent to the Secondary on the Same Plane, or Wound Over It. When Wound Over It the Coupling Is Also Sensibly Capacitative, Besides Being Predominantly Inductive, for the Small Capacity Between Windings Is Effective at the High-Potential Condition Existing.

The Oscillation Voltage (Peak Value) Is Usually Much Higher than Most Persons Imagine, Therefore Grid Leak and Condenser Are Used, So That the Negative Bias Will Go Up as the Amplitude Goes Up, and Thus Limit the Plate Current, or Prevent Saturation.

The D-C Resistance Values of Tickler and Pickup Coil Suggest That If the Wire Is of the Same Diameter the Pickup Winding Has About Twice as Many Turns as the Plate Winding in This Instance. Large Pickup Windings for Cathode Connection Are Common, and Besides Contribute Large Distributed Capacity, Useful as a Constant Value of Fixed Capacity Across an Oscillator that Requires Some More Fixed Capacity Than Does the R-F Circuits, Due to the Required Shape of the Oscillator Tuning Curve.

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A power transformer. For choke input the high voltage afforded should be about 15 per cent. higher than for condenser input of rectifier, to afford the same d-c voltage.

Ground, which, though portrayed as fixed, because not molested after first adjustment, is nevertheless adjusted at 1,065 kc to give strongest output when the r-f level is at 600 kc. The value for 465 kc is 350-450 millid. When the inductance is 110 microh., 83 turns of No. 32 enamel on 1 inch outside diameter.

The radio-frequency and oscillator coils are solenoids. They are wound on insulation tubing of circular cross-section, turns adjacent, as such construction makes for the best coils at the frequencies concerned. For lower frequencies honeycomb coils suffice. Hence these are used in the intermediate transformers, usually both primary and secondary being tuned, though in the diagram one primary (of the last coil) is not tuned. Honeycombs are also used as r-f chokes.

Use of Signal Generator

The coupling between the coils determines to a considerable extent the selectivity, assuming circuits peaked properly. To peak them a service oscillator or signal generator is used, and the condensers across the coils are adjusted when the input is made to the plate of the modulator, with the arc generator supplying the feed. It is favorable to best lining up that the aerial be disconnected. Then no spurious responses will be excited.

The coils discussed are those under "radio frequencies," among which intermediate frequencies are included as a general grouping. The other coils relate to audio frequencies. These are the power transformer, the choke, the push-pull input transformer, the double push-pull interstage transformer, and the output transformer. Two speakers are shown, parallel-connected, one to accentuate the high notes, other the low notes, and the combination to yield a non-discriminating effect.

The d-c resistance of the primary may be small, but the impedance must be large. Otherwise the line would be short-circuited. Rating chokes manufacturers take care of the capacitance for high-voltage circuits. For high-voltage sets the d-c resistance of the primary will be low, e.g., 4 ohms, the reason being that the current is high in the primary.

Choke Input

The primary voltage, of course, is whatever is put out by the push-pull output transformer, called this stage Class B. The 46 tubes are operated at zero bias, the signal drives the grids positive, hence the input secondary is of low resistance, to avoid large grid-current power loss.

The Condensers

The capacities in the circuit include those used for tuning in signals, peaking intermediates, bypassing undesired frequencies in other ranges, for instance the hum frequencies arising from the line (60 cycles) and more particularly from the rectifier output, where the frequency, due to full-wave rectification, hence doubling, is 120 cycles, hence easier to filter. The 6 and 8 mfd. condensers are the B filter capacities and these are augmented by resistor-capacitor filters, as in the resistance legs. A resistor-coil-condenser filter is associated with the second detector output, for stabilization.

The resistors are used for dropping higher voltages to lower values required, for enabling such drops for purposes of interposing condensers across for filtration, for volume control, tone control and tone and hum compensation, for biasing, limiting and loading. There is no non-resistance-loaded circuit except the twin diode 56 detector and the a-c tube.

Non-Inductive Resistors

The resistances in general are non-inductive, that is, those resistors carrying small current readily may be carbon, metalized, etc. instead of wire-wound. All of them in the circuit are of low wattage. There are fourteen tubes in the circuit, and numerous precautions have been taken to insure high tone fidelity, as well as sufficient selectivity and sensitivity. The adjustable tone control is to the upper right of the a-f 56, the manual volume control to the grid input of this tube, the filters across the audio line being tone and hum correctors.

Bias for Output

The usual biasing arrangement is absent from the push-pull output stage, this will be called this stage Class B. The 46 tubes are operated at zero bias, the signal drives the grids positive, hence the input secondary is of low resistance, to avoid large grid-current power loss.
Neon Tube as Modulator
Made to Give Big Wallop
By Jack Tully

Great increase in the intensity of the audio oscillation will result if the 0.00025 mfd. condenser at right is put across the 8.0-meg. limiting resistor instead of across the audio-oscillating neon lamp. The switch may cut the condenser in and out to provide modulated-unmodulated service on d.c. Other methods and uses pertaining to the neon tube are detailed in the text.

The neon tube serves nicely as an audio oscillator for modulating a radio-frequency oscillator. The tube may be used when the voltage is high enough, and even 90 volts would be sufficient, so batteries are not necessary excluded.

In general, however, for signal generators the B supply is not more than 22.5 volts, or at most 45 volts, and neither voltage is high enough to cause the tube to strike. Therefore audio transformers are used in battery-operated devices to produce the modulating voltage. This means either a regular tube is used for audio oscillator, with transformer, or one of the new combination tubes. If a combination tube is used the type filament that takes twice as much current as the standard filament for the series is greatly desired. As the 2-volt series would be concerned, the 19 and the 1C6 would be used.

Oscillates on A.C. Too

Of course the 2-volt series tubes are useful in signal generators for universal application (a.c., d.c. and batteries), as a.c. on the plate is satisfactory, besides providing modulation. For introduction of the tone on d.c., the neon tube could be used, as, it will be noticed, the voltage is high enough, the line never being under 80 volts (let us hope), and only 62 volts being needed for "striking." Even on a.c. the neon tube oscillates at its own audio frequency, but this is drowned by hum.

The neon tube consists of two elements disposed in an evacuated space in which some neon gas has been left. When enough voltage is applied across the two plates, the gas breaks down, and the tube lights. Practically all lamps light with what passes for white light but the glow-discharge tubes, so neon, argon and similar tubes have distinctive colors. The very presence of these colors, each color distinctive to the gas used, the difference in capacity between lamps of the same class being unnoticeable to the human eye, at once suggests the presence of oscillation.

It may be said, without experimental confirmation, that the neon tube is oscillating at a frequency equal to that of the frequency of the orange color of the light if it is excited. This is not a form of oscillation that can be well communicated, except visually, but it is well to understand it as oscillation. The rapidity with which the gas is breaking down under the pressure of the voltage, that is, the rate of detachment of electrons from the gas, or rate of ionization, is the frequency of oscillation. It is one of the lowest light frequencies.

Condenser Across Resistor

If we connect a resistor in series with the lamp and put a condenser across the lamp, besides the light-frequency oscillation, which is useful only for illumination, there will be another frequency of oscillation, determined by the time constant of the circuit. The condenser across the lamp is well placed for a small amount of oscillation at this new frequency, for the conditions imposed require a relatively large capacity in this position, and naturally much of the oscillating current is bypassed around the lamp, and the total intensity of the audio oscillation is low. This in general may be desired, for avoidance of over-modulating a signal generator. The gain some may prefer greater —far greater—intensity of audio oscillation and wonder how it may be achieved without making any fundamental changes.

The solution is very, very simple. Instead of putting the condenser across the lamp, put it across the limiting resistor. In the diagram this limiting resistor is 8 meg., so that the condenser could be kept low (0.00025 mfd.), but if the condenser is put across the resistor, the resistor may be as low as 2 meg. and the frequency will be about 1,000 cycles.

Two extremes have been cited, that of weak intensity of audio oscillation in the neon tube, and that of strong intensity. Perhaps one desires to get between the two extremes. How would this be done?

One way is to connect the lamp and its limiting resistor in series, with the condenser across the limiting resistor (2 meg.), and put this series circuit across the filament limiting resistor of the 2-volt tube. For the 30 tube this resistor, unidentified in the positive leg in diagram, is 1,700 to 1,750 ohms, 10 watts. Practically the whole percentage of line voltage is dropped across this limiting resistor, all voltage but 2 volts—so there is plenty of voltage to energize the circuit.

Voltage and Frequency

The neon tube should be tried for audio purposes of this kind. It is also practical, in general, to vary the frequency either by changing the resistance or the capacity. For resistance values it is perhaps best to consider fixed ones, for rather accurate work, and wire-wound fixed resistors at that. Capacity can be accurately varied, not a simple task with variable condenser. With 20 meg., across which was a variable condenser 6 to 80 mfd., frequencies from 10,000 to 4,000 cycles were generated, and by using greater capacity, the range could be extended to the lower desirable limit, say 50 cycles or so. The variable condenser, the same as always, if any calibration is to be repeated, for the neon tube is unstable, in the sense that terminal voltage changes the frequency.

Any neon tube may be used, even the smallest obtainable giving a strong amplitude when the condenser is put across the limiting resistor, rather than across the lamp. Also, the range of oscillation frequencies is practically without limit. It is generally stated that the tube stops oscillating somewhere around 100 kc., but the circuits shown always have the condenser across the lamp, whereas if the condenser detours practically all of the oscillation voltage at that frequency. Due to instability, higher frequencies are not so desirable, there being better tubes for such purposes, and besides there is difficulty in taking off the neon due to the diode operation into total supply voltage, but frequencies well above 100 kc. are feasible, of course, so are frequencies to an extremely low limit—practically to almost d.c.

Frequencies were generated equal to 1-4, using a 80 mfd. condenser across 20 meg. The frequency of 1-4 means that there were one pulse every four seconds. At 10 volts the factor was 12 microseconds per minute per 1 mfd., proportionately fewer beats for higher capacities.

Capacity Measurement

Therefore it will occur to many that here is a method of measuring high capacities, by relating them to the frequency of audio oscillations, which may be seen, for such high capacities, or may be heard. As they may be varied from one to a thousand, the unknown capacity may be measured either by comparing the resultant periodicity with that of a watch, that is, actually counting the pulses in any time, or by selecting some unit time such as 1 second, and having the adjustable resistor calibrated in terms of capacity. Or the voltage could be varied and the meter calibrated in capacity for truly current values.
It's a Microphone Age That We're Living In

By Larry Hudson

A double-button carbon microphone at left, and a French-type arm with microphone, at right.

The invention of the microphone, or earphone in reverse, was one of the really important contributions to radio. It comes under the present general classification of translucer, because of the change effectuated in the energy. The input to the microphone may be caused electromechanically, as descriptive of the rarefactions and condensations of air created by sound, while the output is electrical, because consisting of variations of current. An energizing battery is used to augment the effect, to give the current larger magnitude, and thus improve the sensitivity, although some forms of microphone do not have this type of auxiliary, but may have an amplifier before or after the microphone.

The most popular and most sensitive microphone is the carbon-gramule type. The audio frequencies impressed on the diaphragm cause change in resistance of the carbon and therefore change in the current through the dielectric. The carbon microphone is of the single-button or double-button type. A double-button microphone is illustrated as the circular one.

The microphone itself, or 'phone type arm, for hand work, others to be put on stands or suspended from springs or from pulleyed lines, and others (as one illustrated) on a sort of tone arm.

The microphone technique has been developed considerably since the first crude microphone was used. The quest always has been for better and better tonal response. The factor of sensitivity is, in general, not so important, for in high-quality pickup, as for studios and high-class public address work, low fields may be compensated for much more readily than poor tone, or unreasonably restricted cutoff frequency limits.

Along the lines of tonal improvement the condenser microphone was developed. This is not a sensitive device by any means, and some say it is the least sensitive. Nevertheless it has been a great success, because of its faithful reproduction. Its success has been a fitting contrast to the failures of condenser type speakers, though the theory applying to both devices is the same. Probably the microphone engineers were a little more alert and resourceful than the speaker engineers.

Then came the ribbon microphone, or so-called velocity microphone. This is the one on which the big play is being made at present for quality work. It is an expensive device, as usually made, and it serves exactly purposes, but even the smaller stations, and perhaps medium-sized ones, too, don't seem to be able to afford one, even or condenser microphone, and manage during a depression to get along with whatever they have.

The microphone is essential to broadcast, not in the same class as the tube, nevertheless one of the items in the indispensible class.

Home Uses

Radio set users first became acquainted with the microphone as a sort of toy. It was considered by some great fun to connect the microphone to the receiver so that one could cut out the program and cut in the microphone, making facetious or alarming announcements, and amusing orconsternating one's guests, until the joke was finally revealed. It was a sport to the advocates of practical jokes, but as our juvenile academy teachers always told us that the jokes never were in good taste, probably the public knew that and therefore the sales of microphones for these kid-trick purposes did not thrive for that reason.

However, there are serious uses for the microphone at home. If baby is asleep in a dining room, a microphone connected to a transmission line and amplifier lets the whole house know if baby cries. This use is on the assumption that some babies when they awake crying do not make enough noise to be heard all over the house, although mothers have originated that idea. Particularly bachelors far removed from familiarity or even early association with baby-dominated households.

The microphone may be used in French-phone type, as shown, for interroom communication in a house. Then it is used for hotel and office work. The inter-office communication systems provide a considerable outlet for this type of microphone, but in the home the accessibility of the instrument should be elevated above the reach of young hands, as it is surprising how much five-year-olds have to say to each other over the home inter-room phone, while the batteries are being depleted with no regrets on the part of the families.

Not So Polite

The microphone also may be used by the heavy-sleeping wife as an aid to determination when her husband is putting the key into the door after that trying meeting, or tiring crossword-solving on neighbors, when the microphone is concealed, as in police work, and listening from comfort in the next door or house. This is not strictly polite but is practical.

Of course, all amateurs using phone need microphones, as they are in the same class as broadcasting stations in that respect, besides the whole sound-recording field, and a microphone on this field as well, constitutes a prolific source of microphone sale and use. In fact, we are living in the microphone age.
Fixed Bias is the Best; “C” Rectifier is Lauded
By Al Branch

The biasing method has a great deal to do with the tone quality of a receiver. This method applies to the audio tubes, particularly to the output stage. The methods usually employed are:

1. Interposing a resistor in the cathode leg of a-c tubes, or d-c tubes of the heater type, so that the plate current of a tube is determined by the bias. This produces negative feedback. A large condenser across the biasing resistor is necessary, except where there is a common resistor for two push-pull tubes, when no condenser is necessary. This cathode resistor method is called self-bias, and, where a condenser is needed, unless the capacity is enormous, the method is not good. At best, the power output is limited.

2. Semi-fixed bias is a combination of the cathode-resistor method of self-bias, with auxiliary bias from some stabilizer source, that is, where the audio signal amplitude does not affect the bias so much. A choke in the negative leg of the rectifier represents this. Instead of a push-pull output circuit, a resistor may be used. In general, the method is excellent, because the higher the signal amplitude the greater the current and the greater the bias, without the signal being a large contributor to the amount of bias. There is some positive feedback.

Semiconductor bias consists of using batteries or having a separate small rectifier tube that supplies the bias. Fixed bias is best, of course.

Say! Use 100 Mfd!
The self-bias method is the easiest way, and in small receivers, or installations where no much demand as to tone is imposed, may be used. But if the condenser is very large, as stated, the tone becomes good enough. Practically, the condenser never can be too large. A capacity of 100 Mfd should be quite acceptable.

Semi-fixed bias works best with tubes that require relatively small bias, because then the amount of bias voltage is a small percentage of the total voltage across the condenser, which is the field of the speaker. Usually, a simple field is used, and then, if the bias is obtained from 300 ohms, the rest of the d-c resistance of the field may be around 1500 ohms. Such a condition would prevail for the pentode tubes, 2A3, 47, etc. The d-c resistance of the biasing section is only one-sixth of the total d-c resistance of 1500 ohms, therefore, no hum trouble. Taking off the bias from a part of the circuit where filtration is not complete, is not serious.

Where tubes are used that require much more bias voltage, the drop should be in about the same proportion, for the same small hum, and that is not so practical.

Splitting the Chokes
However, the biasing part of the choke system may be in the negative leg, from the output. The main filtering part in the positive leg, as in the upper diagram, and then the same condition is approached, a low hum, as obtained in the cited example of the biased pentode.

The tube is the rectifier for the separate C supply in the lower diagram. This is an excellent method. A tube must be used that starts working at once, particularly with power tubes of the filament type, which also start at once. A heater type tube for the biasing, and especially with filament type power tubes, would not be acceptable, because for from 6 to 12 seconds the immediately-starting high-emission filament type tubes, such as the 2A3's, would be left with practically no bias and high plate voltage. Thus the power tubes might be seriously injured, if unhampered.

It is surprising that so little popularity has been won by the separate C supply, for it represents possibilities (to highest power output, comparable to battery bias, and besides, there is no common impedance to obstruct the performance, since no signal current flows through the rectifier or biasing circuit. When there is no signal through the biasing adjustment, there is little difference in the general performance.

Opinion Divided on Value of Push-Pull for R.F.
By L. Carter Wood

There is disagreement about the advantages of push-pull radio-frequency amplifiers. The problem of thought points out that high-frequency reception is favored, because of the halving of the effective capacities of the tubes in the tuned circuits. This fact is of course true. Where frequencies are very high, with ultra frequencies, the tube capacities may be a sizeable fraction of the total capacity in the tuned circuit, and halving the tube capacity counts. But even without the extra tube the capacity could be halved by a small condenser.

Tone is another point. In general, there is an impression, not without basis, that push-pull favors excellent tone. This is applied usually to audio. But some experimenters find that tone on short waves is better with push-pull radio-frequency reception. However, very little construction is done in the push-pull line for radio frequencies, especially as the cost per stage is practically doubled. The plain type of push-pull method is scarcely suitable for reception, rather for wave-meter work, as the sensitivity is too low. No regeneration is included, as it would have to be, to make it usable for general reception. But there is no doubt that, if regenerative results to around 5 meters are attainable.

About the only ones who devote some time to push-pull radio-frequency circuits are the amateurs, and they have developed excellent cross-neutralized ones.
If the current is small a resistor may be used instead of a B supply choke in a short-wave set, and filtration may be sufficient, due to the large capacity of the filter condensers. In this instance the current would not exceed 8 milliamperes under conditions of feedless feedback.

Plate Voltage Control for Screen Grid Regenerators

By Charles Foller

Radio has been subjected to the severest forms of economicizing since the very beginning. Some manufacturers and experimenters have striven for the best results and have not counted the expense as an important item. But enough others have tried to cut every conceivable corner. It is surprising how well the economizers have succeeded, measuring success by the attainment of the ends which they sought. They have succeeded in endowing radio with the universal broadcast receiver that sells for $10 or so, complete with tubes, or inflicting this specimen on the public, whichever way you look at it, and they have minimized the number of coils, tuned circuits, filter circuits, tubes and the like, and reduced some chasses to little more than the cadmium-plated iron of which they are made. The radio part has seemed not much more than the mere supporting metal of the framework.

Some one found that a resistor could be used to replace a choice coil in the B supply of a universal short-wave set, a good set by the way. The resistor is satisfactory only if the current is very small. A capacity is more effective in series with such a resistor than in series with a semi-conductor, so with 25,000 ohms and two 8 mfd. condensers passable filtration is achieved.

Screen Voltage Control

The plate current in the short-wave universal circuit diagrammed herewith is less than 2 milliamperes, therefore the resistor replacing the choke is permissible.

The suppressor is grounded and the screen voltage is varied for control of regeneration. This is an effective method of control, as in screen grid tubes the mutual conduction, or transconductance, to give it the preferred name, depends largely on the screen voltage. In fact, the plate current is practically independent of the plate voltage and depends on the screen voltage. If the screen voltage is zero, the plate current is practically zero, though the plate voltage is the maximum available.

Some experiments would be worth while, in the line of stabilization of a tube circuit, so that regeneration control would have minimum detuning effect, by altering the plate voltage. The point may be raised that since the plate current does not depend on the plate voltage so much as it does on the screen voltage that the control would be insufficient. That would be true if the tickler were just taken at random, but where the tickler is made small, and the variation of current, hence control, is small, a working range can be found for each band.

Then the frequency stability of the system may be improved, that is, regeneration has a minimum detuning effect, and frequency calibration even of a regenerative receiver becomes more practical.

Antenna Condenser

Of course a series antenna condenser, if adjustable, as it should be, would work against the calibration, but for purposes of finding particular frequencies, the circuit could be used and calibrated in its oscillating condition, as with control set for maximum oscillation, and then the station could be followed through by tuning realignment to compensate for the detuning caused by recession to just below the oscillation point.

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Radio World, 145 W. 45th St., New York, N. Y.
Auto Sets Vie for First Place with All-Waves

By Lyon Morchauer

Automobile sets have become vastly important in radio. With all-wave receivers, they lead in sales. That is, most radio sales have to do with nothing else than auto sets and all-wave sets.

Fashions are changing. Methods are improving. Naturally, one of the first considerations is the elimination of the use of B batteries. No heed need be given to eliminating the storage battery, because there is a battery in every car, and there is a generator in the car. There is the experience of many autoists is that such battery is more than they discharge it, hence some car owners will be found who run in the daytime with their cars. There is a lot on what the manufacturer puts in to the device that he sells.

Remote Control Tuning

The generators are rated usually for voltage, because for given voltages there is a pretty much standardized. There are 90-volt, 125-volt and 180-volt generators. On what is the rating of such a generator? It is not important, so long as it is consistent with the rating. Actually, the power is what counts, but when the current is pretty nearly standard, expression of the voltage is approximate expression of the power. Power is the time rate of electric energy, or rate at which work is done by electricity.

Most auto sets have remote control tuning. That means there is a cable connected to the receiver, and that the tuning unit, volume control and switch may be on a single piece clamped to the steering column. Other auto sets are self-contained, even unto speaker, and a cable is provided for connection to the power supply, which is the storage battery. It is the battery that runs generator or vibrator.

Some auto sets are universal, in the sense they may be used both in the home, and are made of such appearance as to be attractive in the home, as well as electrically suitable for home use. In some instances a special connector permits coupling to the a-c or d-c line in the house, whereas in the car the connection to another outlet for the 6-volt storage battery.

If the car has a 12-volt storage battery, which is unusual these days, either a special vibrator or motor generator should be obtained, or a limiting resistor used in connection with a 6-volt type. The limiting resistor type wastes a lot of power—half of that supplied.

Desirability of Set

Every car owner should consider having a radio in his automobile. Especially when one gets used to listening in to certain programs does he feel disappointed if he is required to be driving his car at the time a favorite program is on the air. The auto set saves the day—or night.

Also, when one is interested in special events broadcast, such as results of sports, the auto set renders an important service. The old saw about danger to driving resulting because of the set in the car being turned on does not amount to anything. Practically no accidents occur when a set is turned on.
Dead Spots a Live Issue; Restoratives Are Prescribed

By Leon H. Husband

Dead spots are due to only one cause—absorption. They may arise because the antenna system is an absorbing circuit for a particular frequency range, which is not unusual. If the circuit is regenerative, there is a temptation to assume that the frequencies for which regeneration must be supplied are denied that usually occur. This process is known as the regenerative process, and the frequency may be changed by employing the regenerative process. The absorption cut-off frequency is proportional to the frequency, and this, however, is not unusual. If a coil is used in a circuit the oscillation becomes weaker and the absorption cut-off frequency increases. Therefore, a coil is used when the absorption cut-off frequency is too high.

Not Too Much Capacity

It is wise to put a large condenser across it, because the circuit is used on a.c. The large condenser has the effect of reducing the effective resistance of the circuit. The second has a lower effective resistance, but that is true of the circuit. For all circuits in which there is a high frequency the resistors preferably be low. The values of carbon or metallized, an easy attainment for low wattages, 1 watt or less. Whereas, if the current is high, and a series resistor is used, then the second should be a circuit to a certain circuit. The large capacity may be put with much better results. A reducing resistor for limiting B voltages, and as a special precaution a small microcondenser is put to cut across the large paper condenser, hence the result is unexpected.

The B Supply

Electrolytic condensers don't have much inductance, but they may have a high impedance to short-wave frequencies. Carbons, for example, are sensitive to inductance. Hence if a biasing resistor is used, then the second should be a circuit to a certain circuit. The large capacity may be put with much better results. A reducing resistor for limiting B voltages, and as a special precaution a small microcondenser is put to cut across the large paper condenser, hence the result is unexpected.

Set Gives Real Use

(Continued from preceding page)

In an Automobile

In operation in the car. Accidents are due to other cars, but that does not mean the current is such. The voltage is so low, practically zero, because of the low resistance or short. In fact, a short circuit is defined as zero potential difference. But if there is current it may rise to enormous heights just because the resistance is so low, for it is high resistance that limits current, and high resistance that allows current to flow. This assumption for the absorption cut-off frequency is proportional to the frequency, and this, however, is not unusual. If a coil is used in a circuit the oscillation becomes weaker and the absorption cut-off frequency increases. Therefore, a coil is used when the absorption cut-off frequency is too high.

Ultra-Frequency Effect

At ultra frequencies, as is well known, a limiting factor on the continuation of oscillation is the time of transit of electrons in the space stream. When this time approaches or equals the frequency of the tuned circuit the oscillation becomes practically nil. The most serious is as follows. This is another form of absorption, because all the effect is concentrated on the gas stream, the tuned circuit, the frequency, and the voltages of the supply, and there may be no feedback because the current is used to determine the frequency which may be used for absorption, which does not depend on the gas stream. Poor brakes contribute their share. Blowouts are not to be ignored. The radio set as a cause of accidents may be ignored. No driver is so distracted by radio listening that he is not alive to the necessity of the road. He is driving first, listening next.
Station Sparks

By Alice Remsen

three weeks; the truth is, Frank has gone on a vacation—and he doesn't want to be disturbed, and who can blame him!...

Ford Bond, popular NBC announcer, whose broadcasts are heard daily over NBC networks, has been in radio for twelve years as singer, announcer and program director. Before coming to the air, Ford was a choral conductor and played in Gilbert and Sullivan operettas.

An international short wave broadcast from Bayreuth, Germany, on August 5th, will bring to listeners an ABC-WJZ network the first act of Wagner's opera, "Das Rheingold." The performance of this opera will mark the beginning of the famous "King" cycle at the Bayreuth Festival, which will be conducted this year by Karl Elmendorf, director of the Munich Staatsoper.

The Revelers, NBC quartet, who are Hollywood's leading opera stars, will celebrate their thirteenth anniversary on the air this October. They began broadcasting from the Loew's Washington studio in Newark, when it was a veritable triumph if their program was picked up by a workman stationed on the roof with a crystal set.

Irene Bordoni has a new series on WEAF these days. Each Wednesday, Thursday, and Friday, the scintillating French songstress is heard in the interests of the J. J. Fox Co.

Donovan, selected by the Empire Gold Company for their "Voice of Gold" broadcasts over WEAF each Sunday at 1-45 p.m.

Everett Marshall lives in a walk-up apartment to keep his waist line down. Everett has nothing on me—I do the same thing—only I have to keep my weight down but to keep the rent line down, too.

Producers of the "True Story Court of Human Relations," among the first to broadcast a program over the NBC network, have renewed the current series, becoming effective Friday, August 3rd. It will be heard on a new schedule at 8:30 p.m. EDT, each Friday.

Percy Hemus continues as the judge; the cast includes, Elsie Hitz, Neel Weaver, Anne Elson, Ulysses, Allyn Joslyn and Paul Stewart.

Fred Waring's Pennsylvanians have started their annual stage show and dance tour through the middle western and northeastern sections of the country. They will continue their salesman's dealers broadcast over the WABC-Columbia network, and after the road, will return to the Radio Playhouse stand in New York early in September.

"Between the Book Ends," a quarter-hour of restful reading, a popular feature in the West and Ninth Street, can now be heard in the East over a WABC-Columbia network each Thursday afternoon at 5:15 p.m. EDT. Tel Malone reads poems and light philosophy, and Edy provides organ accompaniment. Program originates in Kansas City.

Al Lasker, chief announcer of WMCA, key station of the new American Broadcasting System, is taking his first vacation in ten years of broadcasting, he and Mrs. Alexander are at the White Mountains.

"Smiling" Jerry Baker, popular tenor of the "Radio Party" on WMCA, each week Wednesday afternoon in EDS, is entertaining his in-laws from Columbus, Ohio.