

MODERN RADIO

EDITED
BY
ROBERT
S.
KRUSE

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Number 2

August

20 cents

1931



Now Still

Short waves give a quality of daylight reception and a daylight distance that is amazing. Signals come in at mid-day from England so loud that they can be clearly heard all over a large house. Reception at night is just as good.

The THRILL-BOX Circuit is designed to employ a heretofore unknown and unused characteristic of the new 235 Variable-Mu Tube, so that the sensitivity is in inverse logarithmic relation to the control setting (instead of in straight-line relation). Thus a great smoothness of sensitivity control is available on all signals, regardless of frequency or the mechanical setting of the control elements,—and the operator can secure stable operation at a much higher level of sensitivity, because the control is not critical.

BETTER SIGNAL-TO-NOISE RATIO IN THRILL-BOX

In the NATIONAL SW-5 THRILL-BOX there is a definitely better signal-to-noise ratio than in any other commercially available short-wave receiver.

HUMLESS A. C. POWER UNIT

The power unit of the NATIONAL THRILL-BOX is specially designed for humless operation on the short waves. There is an electrostatic shield in the power transformer which isolates the secondary windings from disturbances and there is an over-size hum filter. Even the Rectifier Tube has an R.F. Filter which eliminates tunable hum. R. C. A. License.

SINGLE CONTROL, EASY TUNING

The THRILL-BOX has TRUE SINGLE-KNOB TUNING, with one knob only. Stations always come in at exactly the same place on the dial. The special 270 degree Tuning Condensers spread out the stations, and the genuine Velvet Vernier Drive makes tuning easy and accurate.

A NEW SPECIAL MODEL WITH 245's IN PUSH-PULL

We have just brought out a new model THRILL-BOX especially for short-wave broadcast reception with 245's in Push-Pull. This gives much more volume and even better quality than the standard model. Write us for full particulars.

NATIONAL PARTS USED ALL OVER THE WORLD—PROOF OF THRILL-BOX QUALITY

The THRILL-BOX is built with NATIONAL Precision-Made Radio Products. NATIONAL Precision-Made Radio Products are used by: General Electric Co.; Westinghouse Electric & Mfg. Co.; R. C. A.; Tropical Radio (United Fruit Co.); Federal Tel. & Tel. Co.; American Tel. & Tel. Co.; Canadian Marconi; U. S. Naval Research Laboratories; U. S. Navy; Signal Corps, U. S. Army; Jenkins Television Corp.; Press Wireless, Inc.; U. S. Dept. of Commerce (Lighthouse Service); Pan-American Airways; Curtiss-Wright; Boeing Airplane Co.; Western Air Express; Roosevelt Field, Inc.; Southern Air Transport, and by thousands of leading Amateurs, Experimenters, Colleges, Universities, Schools and Research Laboratories the world over.

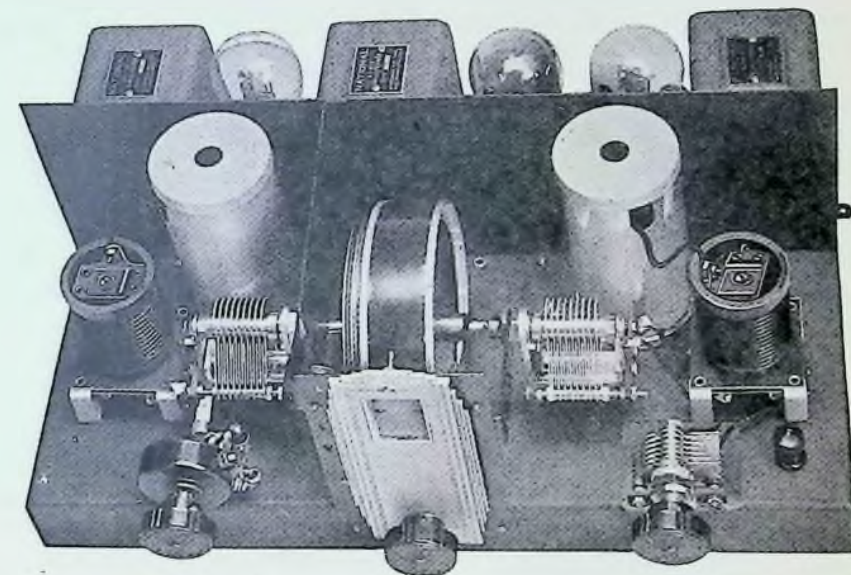


Further Improved!

The NATIONAL THRILL-BOX

A. C. SW .5 RECEIVER

With the new 235 Variable-Mu tubes



NO BAND-CHANGING SWITCHES

There are no band-changing switches or other additions likely to reduce the performance, in the THRILL-BOX.

R-39 COIL-FORMS

Coil forms are made of R-39, the special high-frequency coil-form material. Because R-39 is free from moisture and is non-hygroscopic, it gives results that cannot be secured with ordinary form materials. So superior that they can be noticed immediately by ear alone.

BATTERY MODEL

The THRILL-BOX is also made in a Low-Drain Battery Model, for those who prefer battery operation or who have not A.C. available.

Send in this Coupon TODAY

NATIONAL CO., Inc.
61 Sherman St., Malden, Mass.

Gentlemen:

(Check which)

- () Please send me complete information and prices on your new Improved THRILL-BOX, with 227 Push-Pull Output (Bulletin 147).
- () Please send me complete information about new Special Broadcast Receiving Model of THRILL-BOX, with 245 Push-Pull Output.
- () I enclose 50c (stamps or coin) for your 64-page Handbook of Short-Wave Radio, describing in full the latest and best short-wave receiving circuits, adapters, meters, etc.

Name

Address

MRS

The Service Gentleman—An Editorial

By Harold S. Johnson

Only in the past five years has any great amount of systematic, intelligent radio service work been done. Radio service deals with a product strictly a luxury, yet owned by every fourth family in the United States. Unlike service to such utilitarian products as refrigerators, oil burners, vacuum cleaners, washing machines, etc., radio service puts the repair man into definite, intimate contact with the family as a whole, all of whom use the radio receiver. The service man must be not only repairman but often salesman, frequently diplomat, collector sometimes, and always a gentleman. What a combination!

The routine of a service call runs smoothly enough if common sense is applied. Assuming that the service man knows his job (i. e. radio repairing) that part is simple. However, questions regarding guarantees, price changes and trade-in allowances will often arise. All information regarding these and allied subjects will be valuable tools for the service man. He should read local newspaper advertising to keep in touch with other service organizations; subscribe to a trade journal to keep one jump ahead of the technically minded customer; join the local radio dealers organization. All these will help make the job easier and the customer better satisfied.

Always a gentleman! This applies to everything written thus far; and requires further amplification as well. Be neatly dressed: clean linen, pressed trousers, clean shoes, and hair brushed and face shaved. These *must* be if the service man hopes for complete satisfaction and success. He must remember that his own future is directly dependent upon that of the concern for whom he works, and conversely. He represents the concern. A very good way to carry this out is to always greet the customer at the door with "Good morning Mrs. Smith, my name is Jones from Real Radio Repairs."

The service man should introduce himself at once; don't force the cus-

tomers to inquire your business.

Continuing along the same line, the mistake of talking too much on the job should be avoided. There are service men who never seem to improve because they either bore the customer with their garrulousness or create an unpleasant reaction by their know-it-all attitude. By all means he should explain what is necessary and be pleasant, and do the job thoroughly in a minimum of time.



Be
Neat

The service gentleman is cautioned against smoking on the job. Waiting for the customer to come to the door with a cigarette in one's mouth creates a most unfavorable impression. The service man should think twice before smoking in the customer's home. If a smoke is offered, that's a different story.

Neatness in working habits should be cultivated. The service man should never hesitate to ask for something to protect a highly polished floor or a valuable rug. After all any damage done may be taken from the service man's salary. Discretion must be used in putting down tools while working. All test equipment should be provided with rubber feet to avoid marring the

radio cabinet. Nevertheless don't slam or drop the test kit on the radio receiver or table, no harm may be done materially, yet the impression is bad. If extensive repairs must be done at the customer's home, at the completion of the work things should be left as they are found: chairs in place, loose wires tacked up, all scrap material removed.

Many customers will stand around while the service man is working. Here is an excellent chance to get acquainted with the customer's present set or with this idea about a new one. A small amount of conversation fits in nicely with the job for many times the set owner will lead you to the trouble in the set. Again he may be a prospect for a new radio set, the sale of which often means a commission to the service man. None the less the service man is primarily a service man, not a salesman. A very unfavorable reaction may occur through failure to observe this fact. Unless the customer mentions a trade-in, or unless repairs really warrant mention of a new radio set, a new radio

should be forgotten. The customer called for a service man—be one.

As for being a collector, that is usually quite easy. The procedure and terms are generally well outlined to the customer on his first contact with the office when the call is taken. The service man can make his lot an easier one if he sees that the office co-operates in the above practice. He will save much time and avoid the appearance of a professional collector. When a certain tolerance in the matter of charge accounts is allowed by the office, many unpleasant occasions may be avoided by consulting the credit manager before taking a call. The office will sometimes rely on the serviceman's judgment. He must make a decision at the job. Proficiency in this is usually acquired by experience.

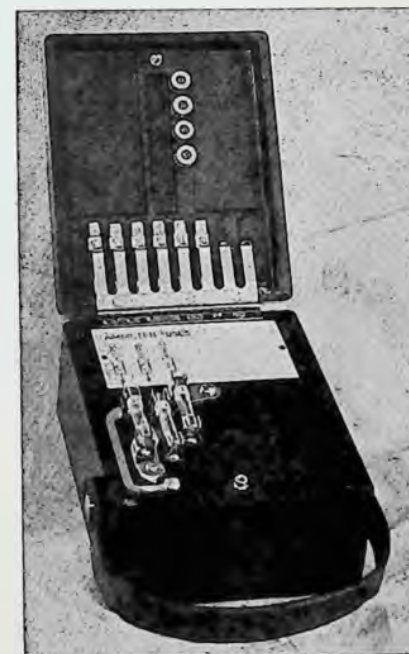
Finally, a gentleman keeps his word. If the service man makes an appointment, it should be kept. If, through some unforeseen circumstance an appointment must be broken, the customer must be notified at once.

AN ACCIDENT-PROOF METER AT LAST

Weston has done it! At last we have a volt-ammeter that lives through that bad minute when we unintentionally feed it 5 times rated current.

The New Model 540 volt-ammeter is equipped with both voltmeter and ammeter fuses, and spares are carried in a compartment at the back of the meter as shown in the photograph. The ammeter fuses are under the spring clips while the affairs which look like binding posts are actually spare voltmeter fuses. The main objection to a multiple-range meter has always been that one accident spoils the whole group of meters. The fully-fused Model 540 removes this objection and makes *real* the saving that has always been so tempting in the multiple-range volt-ammeter.

The Model 540 is a direct-current instrument with an accuracy of 1%, a mirror-scale for aiding correct readings, and a switch for permitting any one of the 6 ranges to be used instantly.



100% Modulation—? ?

By Robert S. Kruse

In the July issue of "Modern Radio", under the title of "Modulation Improvement" some shortcomings of the usual "single-sided" modulator system were spoken of, and a less troublesome system described. We will now go back to the ordinary single-sided system, shown again in Diagram A.

The usual assumption that one can set down on paper the conditions for 100% modulation in such a circuit is quite correct—provided one sets down a number of things that are usually not mentioned—and often forgotten. To get 100% of *real* modulation instead of *paper* modulation one must do all of the following—

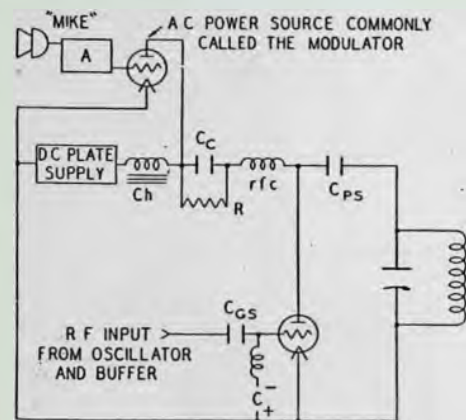


Diagram A. The ordinary single-sided modulation system shown again for further analysis.

- A—Provide enough modulator power.
- B—Provide this modulator with a correct load which means
 - 1—That the audio power really gets to the r.f. tube.
 - 2—That the r.f. tube is "linear" as to input and output.
- C—Make sure that the sidebands are not pruned off in the tuned circuit. Of these point A was sufficiently discussed in "Modulation Improvement" and may be left alone for the moment.

In Fig. 1 we have the diagram B simplified to the form in which the user ordinarily considers it. The one and only



???

excuse for Fig. 1 is to point out that the audio output can go two ways—not merely one. It may escape through the B supply, or it may go the proper route through the drop-resistor bypass into the r.f. tube's plate circuit. Like all electrical current it will take the easiest route, therefore the arrangement will not

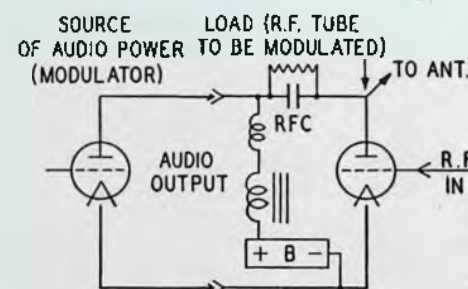


Fig. 1. Diagram B redrawn to make clearer the two paths through which the a.f. output of the audio (modulator) tube may travel. The path through the B supply should have a very high impedance, that through the r.f. tube should have no a.f. impedances except that of the r.f. tube.

fulfill expectations unless the audio impedance through the B supply is very high and the audio impedance of the drop-resistor bypass is very low.

If we go back to our former example of a '10 tube modulated by a '50 tube we will come out with a combination some-

what similar to that of Fig. 2—the particular dimensions shown being typical of a number of small transmitters which have been examined, possibly because 5,000 ohm resistors are in common use as grid leaks and hence easily available!

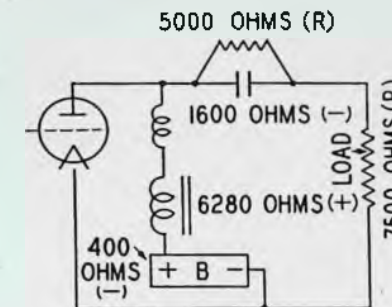


Fig. 2. Typical constants for a low-power transmitter with 500 volt supply to a '50 modulator and '10 r.f. tube. The drop resistor is 5000 ohms, the bypass 1 microfarad, the 7500 ohm load is the plate resistance of the '10 tube. The 6280 ohm impedance is a B-sub 30 henry choke reduced to 10 henrys by the 90 mil current of the two tubes. The 400 ohm minus reactance in the B supply is due to a 4 microfarad final filter condenser.

The 100 cycle modulation possible with this "100%" system is between 50 and 60% at the point of audio overload.

"On paper" the combination looks about like this—

'50 tube operating at 500 volts with 50 Ma. input and a bias of about 100 volts.

'10 tube operating at about 300 volts with about 40 Ma. plate current and a bias of about 90 to 95 volts.

With the '50 grid swung 95 volts—too much for good quality—the percentage modulation falls near to 95%—on paper.

A very casual examination of Fig. 2 shows that this set would never actually come within a rifle shot of 95% modulation.

In the first place the choke used is inadequate for the job. It was probably an alleged 30 henry choke (which is not enough) and when the 90 Ma. taken by the two tubes were sent through the windings saturation took place to such an extent that the inductance dropped to 10 hy.—exactly what will happen in most B-sub chokes put to such use. Thus the 100 cycle reactance of the choke was only 6280 ohms. The B supply had a final condenser of 4 microfarads, giving a "negative" reactance of 400 ohms—which must be subtracted from the 6280, giving us something like 5880 ohms through this "wasting path" which we so cheerfully assumed to take no audio power at all. On the other hand the drop-resistor bypass is only 1 microfarad, which gives a 100 cycle reactance of 1600 ohms for the audio to struggle through before it can reach the 7500 ohm load—wasting about 1/6 of the 100 cycle audio voltage at this point alone.

As a result we have this combination:

The audio tube is not working into 7500 ohms as it should but is instead working into about 4900 ohms. This spoils its efficiency so that only about three-quarters as much 100 cycle audio output power is available as before. The rest is wasted inside the '50 plate circuit.

Of the 100 cycle audio output that does emerge, roughly 60% is wasted through the B supply.

Thus the audio power actually entering the '10 is roughly 45% of what was anticipated—allowing for the drop in the bypass.

And at High Frequencies

Of course 100 cycles is a rather low pitch and things get better at higher

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frequencies—in some ways. Thus at 200 cycles the B sub will take only half as much current and the whole thing will be between one-half and one-quarter as far “down”—which isn’t such an awful lot worse than some cone speakers of a few years since and may do for a tenor voice. It is not good enough for a low-pitched voice and certainly not nearly good enough for musical transmission.

Now when the transmitter mentioned in Fig. 2 was examined at 3000 cycles the impedances were found to be as shown in Fig. 3. The bypass had become

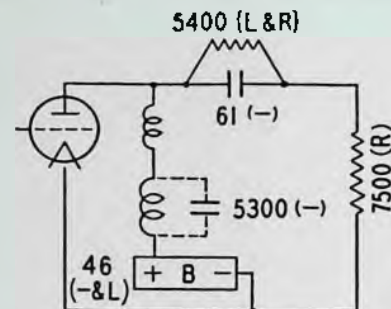


Fig. 3. The system of Fig. 2 as it looks at 3000 cycles. The choke is now ineffective because of its distributed capacity. The possible 3000 cycle modulation percentage is under 50% at audio overload.

harmless—though apparently it was a little inductive, as it should have measured only 53 ohms. The last condenser in the B supply was also harmless though it was apparently quite inductive—or possibly had some resistance, for its purely capacitive reactance should have been down to something like 13 ohms. But what has happened to the modulation choke? Instead of showing an impedance of 30×6280 ohms as we expect—which is so high up that it amounts to an open circuit—we find a mere 5300 ohms—worse than the thing was at 100 cycles! As suggested in the diagram the choke is now being bypassed by its own distributed capacity. That is easily possible in the enamel-wire close-wound choke we have been using.

And In Between

So there we are. At 100 cycles this “100% modulation” system may give us 50% modulation when the audio tube is being overloaded, at 3000 cycles it will produce even less. Somewhere in be-

tween, things will be better—but there is nothing to cheer about. Even if we can stand the low percentage the voice will sound queer, and any music going through the system will be short the alto, baritone and bass, not to speak of the upper soprano.

Figure 4 suggests some reorganization of the circuit to permit 100 cycle power to go through the system properly. The values may seem rather high but are in line with good practice. To prevent the accident of Fig. 3 one must evidently keep down the distributed capacity of the choke. This can be done in two ways, which are almost equally effective. One is to build a choke with sectionalized “pancake” windings. The other is simply to use a number of 20 henry chokes in series, preferably not grounding their cores or setting them too close to metal strips or plates. Naturally these chokes should individually have low capacity, for which reason it is a little better to make the winding in sections if one wishes to be particular.

Point 2—The “Linear” r.f. Tube

It is too bad that there has started up a practice of calling class B radio-frequency antenna-feeding amplifiers “lin-

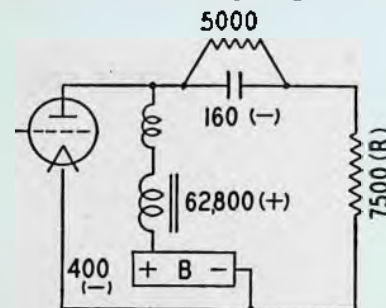


Fig. 4. The system with proper constants. Drop-resistor bypass 10 microfarads, modulation choke 100 henrys in 5 sections of 20 hy. each. Measured modulation at audio overload 90% at 100 cycles, 85% at 5000 cycles, 90% plus from 200 to 2500 cycles.

ear”, for almost every type of amplifier is “linear” in one way or another—even those used as frequency doublers. By this I mean that if we look at all the possible sorts of curves for the different classes of amplifiers, each class will be found to contain some “linear” curves—which is to say curves that are nearly straight lines.

In the case of a modulated r.f. tube the particular curve that should be “linear” is the one showing how plate voltage changes the current in the tuned tank circuit of the tube. Such a curve is shown in Fig. 5 for a grid-leak-biased

The tube was neutralized (not shown in diagram) by continuing the plate coil a few turns below the part shown and returning to grid through a high-insulation mica condenser and a 50 micro-microfarad neutralizing condenser.

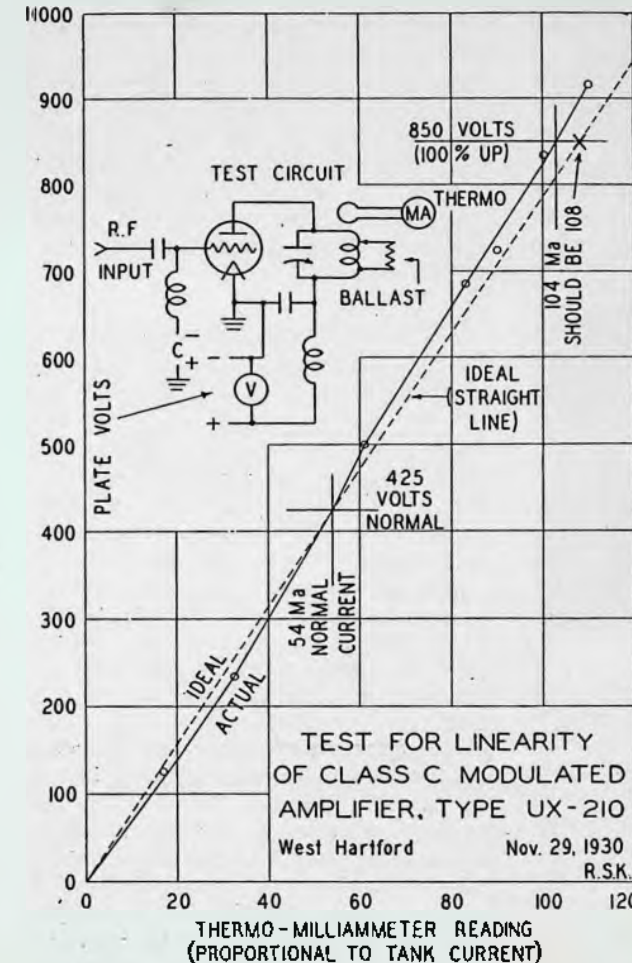


Fig. 5. A test-curve to show whether a modulated r.f. stage is working properly. Any considerable departure from such a curve shows that the transmitter cannot produce good fidelity. The r.f. input during the test is kept normal and constant, the plate voltage is changed by steps, using any convenient arrangement of generators, batteries or B subs. arranged in various bucking and boosting combinations, with or without series resistances. The points used in making the curve are shown by small circles. A thermogalvanometer may be used with the aid of the calibration curve supplied by the maker.

’10 tube. There is a good deal to be said for gridleak biasing as against C battery at this point. The leak-bias is self-adjusting and rises with the r.f. input, making proper adjustment semi-automatic. In this particular case a 25,000 ohm Electrad resistor with one contact moved about 1/3 of the way in was used. Neither this value nor that of the grid condenser was at all critical. The stage, when modulated by a good audio system produced high-quality modulated signals.

Whenever it is found that the top end of the curve is too far to the right the trouble is regeneration and calls for shielding, bypassing and filtering of leads with chokes or (if possible) resistors. If the top end of the curve is not far enough to the right the difficulty may be insufficient r.f. input to the tube (a very common disease), or “degeneration”—which will be explained in another paper which may appear in this or another issue. It is simply a reversed feedback, and cured in a manner similar to the usual sort of feedback.

The Making of Metallized Resistors

By Francis R. Ehle*

Shortly after the inauguration of organized broadcasting a professor of chemistry in one of our larger universities was experimenting with the rare element germanium, a by-product of zinc. At that time this metal sold at from \$8 to \$10 per gram, and its use was largely confined to medicine. The professor was bent on finding new uses for it. In the course of his experiments he discovered that thin, hard deposits of germanium could be formed on other



Color-coded Resistors

materials. These metallic films had very high electrical resistance and it was suggested that they might be used in the making of radio resistors of the order of 100,000 ohms or more, replacing the inked strips of paper which were then used.

The first resistors made up with the new coating consisted of glass tubes with the metallic deposit on the inside. This form did not prove satisfactory, since it was found practically impossible to control the resistance value when applying such an internal coating; and, furthermore, the resistance was not stable but changed gradually with time. Films of germanium on thin insulating rods or glass filaments were also found to be unstable. Since the general construction seemed sound further experiments were made with conducting substances of all types. Better resistance materials were found, which would coat the glass thread

with a dependable high-resistance film. Today two colloidal solutions are employed, which have been found satisfactory for both receiver and radio power resistors.

The manufacture of resistors based on such coated glass threads has grown rapidly. In 1929 about 2,500,000 feet, or about 470 miles, of metallized filament were produced and shipped to organizations here and abroad which mount the filament and produce completed resistors.

The Manufacture of the Filaments

In the present process the starting point is a thick glass rod, which is fed into an automatic glass-drawing and resistance-coating machine. An operator feeds the glass rods into this machine, checks the resistance per unit length while the process is under way and removes the finished two-foot lengths of filament. The glass rod is pressed against an electrically heated die, in passing through which it is reduced to about 1/15 of the original diameter, or to about the size of the leads used in an automatic pencil. This glass filament passes between cleaning pads, then through coating pads and a baking oven. In some forms of the resistance filaments a varnish is automatically applied at this point. The coated filament then passes through mercury contacts spaced the exact distance of the contacts in the ultimate resistance unit, so that the resistance value is continuously indicated on a direct-reading ohmmeter. Plus and minus tolerances are indicated on this meter so that the operator may, at need, adjust the coating device. The filament is finally cut into two-foot lengths and piled in a receiving tray.

Prior to assembly in the completed resistor the filaments are once more run through an ohmmeter in the same manner as in the original manufacture. They are then put into stock for shipment to licensees who manufacture the metal-

* President, International Resistance Company, Philadelphia.



The Size You Want
The Value You Want

The Type You Want
The Accuracy You Want

You'll find them all in the stock of any Wholesaler handling

TYPE "K" *Metallized* RESISTORS

The Metallized line is not only more accurate, more dependable—it is more complete. Say Metallized to your jobber or dealer and look for the I. R. C. trademark. Avoid the weaknesses common to ordinary carbon resistors. Leading radio set manufacturers and servicemen standardize on Metallized units made by the
INTERNATIONAL RESISTANCE COMPANY



Type MF 4 (1 Watt)



Type MF 4 1/2 (1/2 Watt)

To make capacity bridge meters, ohmmeters, volt-meters and high-reading milliammeters, use

I. R. C. PRECISION WIRE WOUND RESISTORS

They are more accurate and more dependable. Calibrated to an accuracy of 1% or better. Specified for laboratory standards by leading engineers. Write for free charts showing how to make the meters named above.



WW 1



WW 2

As Specialists in Resistance Units, we provide a complete service for every Resistor need. Consult us on your radio problems.

INTERNATIONAL RESISTANCE CO.

PHILADELPHIA

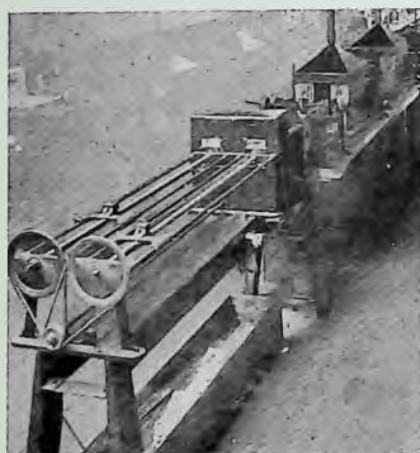
TORONTO

lized resistors. The shipping containers are large glass tubes, corked at both ends.

Making the Units.

In making the final resistance units the two-foot filaments are cut into short lengths, to fit the mounting, which may take the form of a glass tube with metal caps (the familiar visible-filament grid-leak type) or of a ceramic body with cast metal heads ("powerohm" type to dissipate 1/3 to 3 watts).

In making the visible-filament type an ingenious centering device holds the filament in position as the brass caps and glass tubing are assembled over it.



Glass-rod feed at front, next the drawing dies, the coating pads and last the baking oven.

In the case of the "powerohm" type the ceramic tubing contains one or more holes into which the metallized filament will fit closely, permitting rapid transfer of heat to the ceramic body from which it may be radiated. The filament or filaments having been inserted with the end projecting slightly the ceramic body is held in a moulding clamp under a spigot from which molten metal flows into the mould. The metal chills promptly so that the finished casting may be removed a moment later. Usually pigtail connecting wires, touching the ends of the filament, have been included in the cast end, making for good contacts. In the case of the heavier-current, or lower-resistance, units two or more filaments

may be threaded through the ceramic body, arranged in parallel.

For unusually high resistance values the metallized filament, which may then be quite long, is mounted in a heavy-walled glass tube with either brass caps or cast ends.

The ceramic body employed in the 1/3 to 3 watt resistors has been developed particularly for that purpose. The material has an exceptional degree of heat conductivity, is non-porous and can be fabricated with extreme accuracy.

Final Tests

The assembled resistors are measured on limit bridges. Tolerance limits are marked on the scale; the needle must come to rest between these limits, otherwise the resistor is rejected. An accuracy of 10% (plus or minus) is required by the Radio Standards of the N. E. M. A.† and the R. M. A.‡ but in production it is found possible to work to closer limits. Following test the resistors are labelled and placed in stock. When accuracies of 3 to 5% are required by an order resistors within the specified tolerance are selected from stock by re-test.

Color Coding

With the introduction of a color code for resistors it has become necessary to make provisions for rapid marking in this manner. This is done by placing groups of resistors in frames which leaving a strip at the center exposed. The frame is then set in a spray hood and the paint sprayed on.

All resistors are subjected to a load test. Mounted on contact boards they are run for 5 minutes under double rated load. The resistors are then measured for final resistance value.

† National Electrical Manufacturer's Association, Radio Division.
‡ Radio Manufacturer's Association.

A CONDENSER BOOKLET

A. M. Flechtheim & Co., 136 Liberty St., New York, supply on request a useful general-information booklet on fixed condensers for the range of 200-7000 volts.

FREE!

You can get one of these Without Cost

FLECHTHEIM, through Modern Radio, is presenting subscribers with transmitting filter condensers. These are given without cost. The condensers to be awarded are two 2 Mfd. 2000v., two 2 Mfd. 1500v., two 2 Mfd. 1000v.

CARDWELL is giving a Midway transmitting variable condenser of 150 MMfd. capacity.

INSULINE is giving several sets of test-leads and neutralizing tools.

READRITE is presenting an ohmmeter, 10,000 ohms maximum.

MODERN RADIO on its own behalf is going to allow some fortunate chap his choice of five well-known short-wave receivers, a gift worth having. The choice will be of a National A. C. SW-5 kit with power pack, ready to wire less tubes; a Pilot A. C. Super-Wasp kit and power-pack less tubes; an I. C. A. Conqueror five tube outfit, with power pack but wired and ready to use less tubes; an HY-7, 6 tube A. C. or battery operated super-heterodyne wired and ready for use less tubes, batteries (or power pack).

I want to obtain without cost one of the Short-Wave receivers, or other equipment, mentioned in this announcement. Please send information, my subscription is herewith (\$1.25 for 13 issues) enclosed. I assume no obligation by sending this coupon.

Signed

Address

City

Mail to
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127 Ann St.
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PERRYMAN

RADIO TUBES



A New Achievement

P. R. 588

Fil. v. 5

Plate v. 500

Fil. amp. 2

Plate ma. 300

A full-wave rectifier running on the filament requirements of a 280 tube, costing a few cents more than the 80 and capable of supplying 150 watts at 500 volts (300 ma.). Some tube! Ideal for the 210 transmitter with P. R. 210 oscillators, for the power-amplifier or for experimental power supplies required to have excellent reservoir capacity. Write now. Price and data on request.

PERRYMAN ELECTRIC CO., Inc.

North Bergen, N. J.

Keeping Out of the Red

I hope, in these plain-language stories, to pass on to the readers what I regard as vital precautions in a business which is overcrowded and highly competitive.

N. T. Young

PLANNING A RADIO BUSINESS SIMPLY AND SAFELY

By N. T. Young

The newcomer to radio retailing frequently fails to realize that he is a newcomer. As a rule he is a man with several years of experience in radio sales or service for some established organization. He is inclined to feel that he "knows the radio game"—including the running of a radio business.

Afterwards, when the "For Rent" sign is in the window, he realizes that more figuring ahead, would have saved him. Still, he probably doesn't know how it should have been done. For such beginners, and for the man whose small radio business is not prospering this first story of our series is being told.

Groundwork

A year is not much time in which to look ahead toward starting a retail radio store. We will assume that you are a sales-service man with some existing organization. You are making contacts with the service clientele and have appreciated that many of them could be sold new radio sets and that others are prospects for accessories and parts. Knowing that with a little capital and a small stock of parts and sets you can start out yourself this seems tempting. At this point there should be begun a serious attempt to make friendly contact with jobber's representatives whose good will you will absolutely require later on. Jobber's socials, radio shows and set showings should be attended whenever possible and a definite attempt made to learn everything possible about the equipment and about business practices. Do not be afraid to ask questions, but don't be a pest. Introduce yourself to the jobber's representative every time you meet him until he knows you.

Keep a card catalog of prospects for your future store. Needless to say this

should not be done at the expense of your employer who may be a future good friend.

\$\$\$\$\$\$\$\$\$\$

Finances are always the first thing to take stock of. Without some cash it is impossible to start any business. The amount of cash necessary depends on the size of the proposed business and usually it is safe to assume that there is not much cash and therefore the business must be small. It is to be hoped that the proprietor of the new business has a fairly good knowledge of servicing radio sets of all types so that he need not buy all of this information at the very first when he cannot afford such a thing, but must work harder than anyone else in the place—and longer hours!



The pencil work now begins. If we can first make the proposed business pay on paper we have gone a long ways! It is necessary for this new business to pay the proprietor's own wages, whatever salary or commission is to go to the service man (if there is one) and also to pay for such current expenses as rent, telephone and light, taxes, the operating costs of the service car or truck and the carrying of the stock. One

Build Your Own

SHORT-WAVE SET

PARTS FOR THE

NATIONAL A.C. SW-5—

Dial with condenser brackets....	\$ 3.54
SE90 tuning condensers.....	2.21
SE90 CC tuning condensers.....	2.21
(One clockwise and one CC for dial.)	
Trimmer, 50 Mmfd.....	1.33
Voltage divider	.74
5101 screen-grid detector A.F. coupler, \$6.50 list.....	3.83
Tube-shields	.24
Coil-sockets, 6 prong.....	.36
Coils, 15-115 meters, four pair required, \$5.00 list.....	2.94
Coils, 9-15, 115-200, 200-350, 350-550, 550-850, \$5.50 list, pair	3.24
Band-spread, 20-40 or 80, \$6.00 list	3.53
R.F. chokes for SW5.....	.42
6 prong coil forms, R-39.....	.89
5 prong coil forms, R-39.....	.89
4 prong coil forms, R-39.....	.89
.01 condensers, Pilot.....	.42
.01 condensers, Polymet.....	.49
.01 condensers, Sangamo.....	.68
551 variable mu. tubes.....	1.32
235 variable mu. tubes.....	1.32
227 tubes	.74
224 tubes	1.18
280 tubes	.83

All National parts in stock or promptly gotten. Reliable, honest service. Biggest stock in Connecticut of short-wave or repair parts for service or set-building. One-fourth cost as deposit required on all C. O. D. orders. We ship day order arrives.

Include Postage

NATIONAL A.C. SW-5

A.C. Kit	\$46.74
D.C. Kit	44.10
Wiring by factory.....	5.89
Power pack	20.30
Extra coils in left column.	

PILOT SUPER-WASP

A.C. Kit	\$33.95
D.C. Kit	28.97
K-111 pack	16.20

BAIRD-SW AND TELEVISION RECEIVER

2 tuned R.F. stages, plug-in coils, 16-550 meters, 7 tubes, screen-grid R.F. det., Kit.....	\$55.13
Wired set	73.73
Cabinet	7.36
Televisor Kit	58.80
Televisor, wired, in cabinet.....	73.49

Electrad, Tobe, Flechtheim, Pilot, Sprague, Cardwell, Jewell, Weston, Readrite, Beede, Insuline, Aerovox, Hammarlund, Gavitt, I. R. C., National, Polymet, Thoradson, Wright-DeCoster, Elkon, Frost, Universal, Amertran, Ward-Leonard, Birnbach, public address parts, replacement condensers, resistors, chokes, transformers, coil-forms, copper tubing, A. F. T.'s, tubes, wire, solder, soldering irons.

Hatry & Young

119 Ann St.



Hartford, Conn.

can easily give a few simple rules to show what is needed. Thus the store should have a show window, should not be more than a block from some good retail business street and should have enough space so that it is possible to arrange it in the manner suggested by Figure 1 and Figure 2. The exact arrangement is unimportant. The main idea is to keep the service department out of sight and the sets in front where they must be seen.

Your rent should not amount to more than 5% of your annual sales. Of course your sales are only intelligent guesswork so far, therefore be careful. There is no shame in starting in a "hole-in-the-wall".

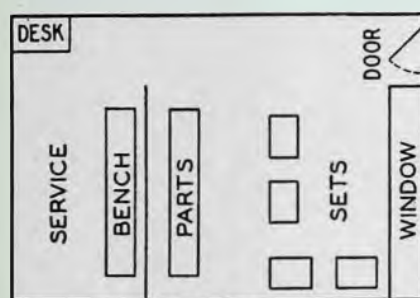


Figure 1

If money must be borrowed, attempt to get it on long time notes, for instance a 6% personal loan to run six months. This, of course, means that among the expenses to be looked forward to is that of creating a "sinking fund". By this is meant that one must each month put aside a definite amount toward the payment of the note when it comes due. It is frequently better to start more conservatively and with little or no borrowed money.

A service car has been mentioned. A light truck or a coach is most convenient and I recommend buying a used one for cash rather than a new one on time. The operating costs will be from 6 to 8 cents per mile and an average service call may represent about four miles of driving. If the same car is used as a personal car make sure that the proper proportion of the costs is paid out of the proprietor's salary. The proper way of charging for service calls will be mentioned later.

A telephone is a necessity and a small advertisement in the telephone directory is worth while. In your preliminary figuring allow for these things, and for newspaper advertising.

Stock for the store must be purchased, possibly also some service equipment. Details on this are given somewhat later but they must be counted in on the present calculation.

Find out all you can, check your guesses by getting actual prices. Possibly your present employer will not like this and tell you so—even discharge you. Be careful—but ready for such a jolt.

The 120 Day Rule

Having added up all of the foregoing prospective operating expenses your

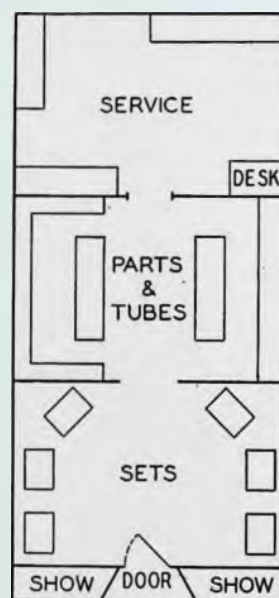
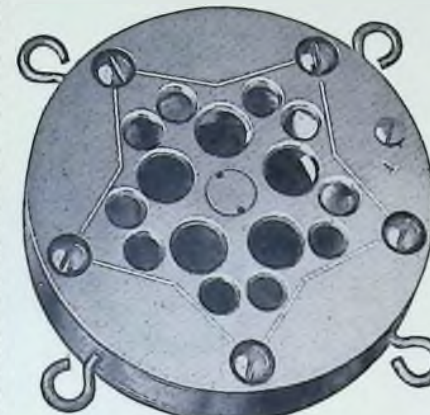


Figure 2

question now is, "Have I enough money on hand now to keep up such a place for four months without depending on my income during that time?" If the answer is not satisfactory the whole thing had better be refigured with a more modest store, less allowance for stock, a cheaper service car, etc. *Failing that, one is taking chances.* I know of one store which started with \$300 in cash and lived, but this was under most unusual circumstances and is a dangerous example.

MODEL "C"



LIST PRICE—\$35.00

"STAR"

Improved Double Button Microphone

Accepted as Standard
from Coast to Coast

Special Price to Amateurs
\$19.50

A Super-Quality Instrument—Priced Right
Satisfaction Assured, Sold on Money-Back Guarantee

THE GAVITT MICROPHONE has the following features:

1. Non-metallic diaphragm, not under tension.
2. Output level 12 to 20 D. B.'s higher than average microphone.
3. Flat output curve within voice frequencies.
4. Minimum carbon hiss due to non-metallic diaphragm.
5. Requires only 8 mils per button.
6. 200 Ohms per button impedance.
7. Solid brass construction, chromium plated.
8. Sufficient weight to damp out microphonics.
9. Diameter 3 1/4; 3/4 thick.
10. Packed in attractive plush-lined, steel pocket-carrying case.
11. Shipping weight four pounds.

Matched microphone transformer	\$6.00
Six foot three conductor moisture-proof shielded microphone cord	1.50
Table type stand with springs	8.00

GAVITT MFG. CO., Inc.
BROOKFIELD, MASS.

Answering Some Questions

Before the figuring has gone very far the beginner's head will be buzzing with questions.

1—"How shall I choose and buy my stock?"

2—"Shall I carry parts?"

3—"What service equipment must there be?"

4—"What must I allow for the set department?"

5—"How much do I need to allow for cost of demonstrations, free service, antennas, trade ins and carrying time-payment set-sales?"

6—"How will I tell when I am going wrong?"

7—"How do I keep books?"

8—"What is the right way to figure margins and discounts?"

9—"What are a lot of these business terms that I hear?"

10—"Ought I to incorporate this firm?"

11—"What do I pay the service-salesman? What and how do I collect for service calls?"

12—"What are my Ads. to be like?"

Well—there we have a dozen questions. Let us answer them in order.

When that has been done it will be possible to do our prophetic pencil-and-paper work with much more speed and sureness—and a far better chance that the result of the figuring will be reliable.

1—Choosing Your Set Stock

As will be seen later, the writer does not believe in a radio store which relies on set-sales alone. None the less set-sales are very important and therefore the choice of a proper line of sets is a serious business for the beginner. Perhaps the most important thing of all is to keep away from those sets whose manufacturers make it needlessly hard for the dealer, by failing to warn him of price and model changes, or by putting sets into the hands of garages, grocery stores and others who will probably dump them later.

A big mistake is too many lines of radio sets. The advantages gained in carrying one line only are many. It allows the dealer to concentrate all his effort. He can gain more out of his advertising by concentration. By playing with one jobber he can get more

benefits and privileges in credits and co-operation. His prospects will not be confused. The dealer will be better able to memorize prices, down payments, model numbers, circuit specifications, tube equipments and other data necessary to convey the thought of competent knowledge of the merchandise being offered for sale.



Keep away from "orphans" and distress merchandise. There is no profit in this type of merchandising. You can never be sure of the price from one day to the next. Stick closely to the nationally known brands. Select one of the leaders, one that has the reputation in your community of not dumping near the end of the season. Nothing is more irritating to your customer than to find that the set he bought for \$150 has been cut to half that price only a few weeks after his purchase. If he bought on the "easy payment plan" you will find this disastrous to you for the set will come back, with much of its value gone because it is now a used set. Many radio dealers have gone to the wall because of carelessness in choosing lines which brought them into such situations.

Buying the Stock

With few exceptions discounts to dealers are uniform and standard so that no uncertainty need exist. The typical arrangement is 40% discount from the retail price with a further 2% discount if paid within 30 days. Be most cautious as to the number of sets taken on, for if you do not sell a set within 30 days it must be paid for out of your own pocket. Possibly the jobber can be made to wait but that is poor business for a new firm trying to establish credit. Better have only one or two sets and "discount your bill" (pay it early

BIRNBACH AERIAL EQUIPMENT HOOKUP WIRE

WIRE —

Birnbach specializes in wire for aeriels, stranded, stranded enameled, stranded tinned, or solid and solid enameled wires. All the way from the husky, strong cable using seven strands of No. 20 wire to the light one using 7/26, an aerial wire to suit any requirement of strength or economy.

Birnbach has hookup wire for all purposes: No. 12 flexible, rubber covered, tinned for heater hookup, or No. 18 for ordinary hookup uses. Sizes in between or larger if you want.

Birnbach complete aerial kits are sold by thousands of dealers, find out about them. Birnbach arresters, leadin strips, ground clamps, or insulators can be gotten separately. Use the coupon now.



STANDARD AERIAL WIRES

100 ft. 7/22 Tinned Copper	List .80
1,000 ft. 7/22 Tinned Copper	List \$7.00
100 ft. 7/22 Enameled...	.95
1,000 ft. 7/22 Enameled...	9.50
100 ft. 7/20 Tinned...	1.40
100 ft. 7/20 Enameled...	1.50



617—A new Leadin Strip with screw, self-locking terminal, copper strip, weather-proof. List, each... .09



615—Ground Clamp. Sturdy, good-looking, screw-point, makes positive connection through scale or paint, cadmium finish.

Each12



Shielded Leadin and Ground Wire, closely wound braid, generous rubber covering, a real wire.

25 feet No. 14.....	.90
50 feet No. 14.....	1.80
100 feet No. 14.....	3.60
250 feet No. 14.....	9.00



Flexible, heavy, rubber-covered hookup wire for ground, a.c. heater, and similar uses. Rubber has bright finish, comes in several colors.

25 feet	.45
50 feet	.85
Rubber covered hook-up wire in colors.	
25 feet rolls.....	.30

BIRNBACH RADIO CO.
145 Hudson St., New York, N. Y.

BIRNBACH RADIO CO.,
145 Hudson St., New York, N. Y.

Please send me your 1931 Catalog of Birnbach aerial kits and accessories, and hookup wire.

Name

Address

City

Quote on

enough to be granted the 2% discount). Nothing helps future credit like prompt payment of early bills.

2—The Parts Stock

It is usually well to carry parts, with the following precautions. A part that cannot be used in service or repair work may easily become a "shelf warmer" and should be ordered in the smallest possible quantity unless a definite demand persists for some time. Dials are an example of the kind of part which may die on one's hands.

Set maker's parts should be carried as little as possible for nothing can be deader than repair parts for a set that was handled a year ago. Most repairs can be made without resorting to set manufacturer's parts. You will have to carry a fair stock of good, medium-priced parts for your service work. Why not carry a line which can also be sold over the counter and let people know about it? A show case will help immensely to display parts and to speed their sale. Shelves around the parts department will take care of tubes, batteries and such parts as are best kept in their boxes. Carefully handled the parts department will be found profitable in these days of short wave enthusiasm.

3—Service Equipment

A complete stock of service instruments is highly desirable, but do not feel that \$500 to \$1,000 must be spent by the beginner. It is really surprising how little money need be spent if a little ingenuity is used. After you have some surplus on hand you will be in shape to purchase time saving conveniences.

Coming—Part 2

PROFIT IN SET SALES

A NEW SET ANALYZER

The Pattern 444 Set Analyzer just announced by the Jewell Electrical Instrument Company of 1642-U Walnut Street, Chicago, Illinois, makes socket current and voltage tests, on all types of sets, including those having variable-mu and pentode tubes. In addition to direct socket testing, 24 measuring ranges are available at pin-jacks for use with test leads. Included are three resistance ranges, 0-1,000—10,000—100,

000 ohms, three rectifier type output meter ranges, and 0-4-8 ampere A. C. ranges for servicing electric refrigerators, vacuum cleaners, and other electrical appliances. The meters have non-shatterable glass scale covers. The test



cable instantly detachable at the analyzer panel, and a test selecting switch is provided. List Price, complete with test leads and prods, A. C. line test plug and cord, speaker voice coil clips, battery for ohmmeter and tube test circuit—\$112.00. Dealer and Servicemen's price—\$84.00.

A LOW-DRAIN BATTERY SET

The Pilot Radio & Tube Corporation of Lawrence, Mass., has released a battery-operated superheterodyne receiver, called the S-150 and characterized by unusually low filament demand. The set uses three 236 type screen-grid tubes, two 237 type tubes and a pair of 238 type output pentodes. The filaments are connected in parallel which permits the use of a standard 6 volt storage battery, or operation from a car battery when in camp. The total filament drain is 2.1, the "B" demanded 135 volts.

"Modern Radio's" readers will observe that the extremely rugged "automobile type" tubes and the modest B voltage required makes the set very attractive for camp and other "portable" use.

The set is of the "midget" type; when in its cabinet it measures 18½ inches high, 16½ inches wide and 9½ inches front-to-back. Phonograph connections are provided. The retail price is \$65.

USE THE CARDWELL

MIDWAY

FEATHERWEIGHT

For tuning receivers and transmitters, as neutralizing capacities in intermediate stages of transmitters—in any position where a small, compact variable condenser is needed. Not a midget but a smaller CARDWELL, identical in design to the larger CARDWELLS, not skimmed and not cheapened—a real job.

For receivers and low power transmitters using '10 type tubes—

7 sizes—26 to 365 mmfds.

* For transmitters using up to 75 watt tube—

6 sizes—22 to 150 mmfds.

* Plates have well rounded edges and are highly polished overall.

Send for literature describing these and other CARDWELL condensers. The range covers condensers suitable for Broadcasting down to midget balancing capacities.

THE ALLEN D. CARDWELL MFG. CORP.

80 PROSPECT STREET, BROOKLYN, N. Y.

"THE STANDARD OF COMPARISON"

MODERN RADIO

EDITED BY
ROBERT S.
KRUSE

ASSOCIATE EDITOR
L. W. HATRY

LAST CHANCE!

Don't use the coupon if you can do without practical radio dope of a reliable engineering nature in "Modern Radio" for September, Number 3. Tear it out now if you want to read up-to-date, informative, technical data, accurate and reliable, to help you in design, repair, and improvement work on all radio receivers and radio-fone and C. W. sets.

YOU HAVE SEEN NUMBERS 1 AND 2 OF RADIO'S NEWEST MAGAZINE. Its highly practical and useful nature must be obvious to you. Subscribe now to get Numbers 3-15.

I enclose \$1.25, introductory price, for which please send me Numbers 3-15, inclusive, of "Modern Radio". I am—am not—commenting in a letter on your new magazine.

Signed
Address
Town

Successful Metal-chassis Receivers—Part 2

By Robert S. Kruse

There are some cases in which it is difficult to decide whether one should use a .01 mufd. mica bypass or a paper bypass of larger capacity. A few general rules can be laid down with the warning that these, like all other rules, are most unsafe unless the final result is carefully checked up by measurements. (If measuring equipment is not available one is pretty badly crippled at the start; a matter of which we hope to say more in this publication.) It is not safe to use the little mica condenser for r-f bypassing and the paper one for a-f bypassing. It is even less safe to assume that a large capacity is always a better bypass. In general one must do this:

1. Make the condenser large enough to provide low impedance at the lowest frequency to be used.
2. Do not make it of a size which is resonant in the working range when connected in the circuit.
3. Keep the resistance and inductance down.

These simple conditions are surprisingly hard to meet. Rule 1, of course, means that the impedance must be low compared to the impedance of the thing which is being bypassed. For example, at 60-cycles a 1 microfarad condenser has an impedance of 2,650 ohms and is a thoroughly good bypass around a high resistance of 500,000 ohms. However, when we try to use it to bypass the cathode resistor of a first audio 227 the results are poor enough, for the 60-cycle finds it no more convenient to go through a 2,650 ohm condenser than through the 2,500 ohm cathode resistor. To get much bypassing effect one should have a 10 microfarad condenser! The proper bypassing of cathode resistors is most important, since both the grid circuit and plate circuit must return to the cathode and unfortunately do it in such manner that any resistance at this point is "anti-regenerative" and tends to spoil the amplification at any frequency for which the bypass is not effective. A splendid example

of this can be had by using an undersized cathode bypass on the first audio tube of a good audio system, or by disconnecting this bypass altogether. The low audio pitches disappear immediately. The same thing goes on at radio frequencies when the r-f bypass is ineffective. Perhaps the most troublesome of all stray r-f voltages are those which wander into the power supply. The bypassing of power supply leads is therefore of the first importance in preventing nearly all of the bad effects mentioned heretofore and also hand capacity effects in receivers with controllable regeneration.

De-Coupling Resistors

If the precautions suggested before do not suffice it becomes necessary to provide r-f obstructions in the

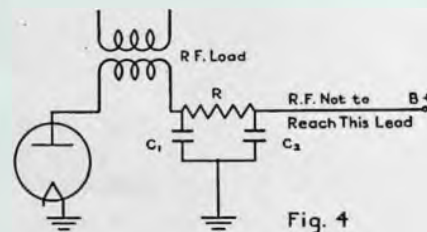
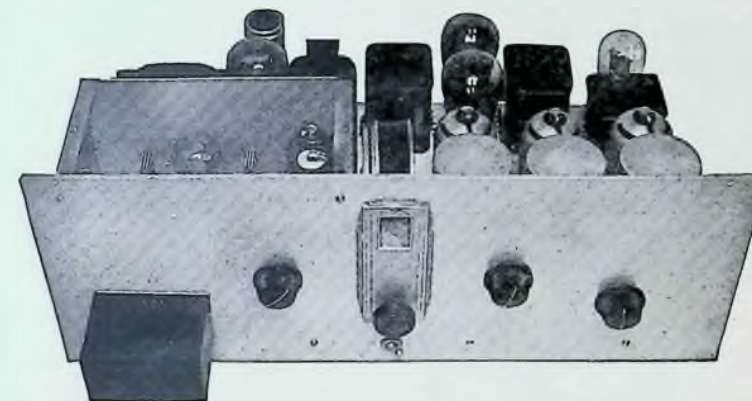


Fig. 4.—Plate circuit filtering probably 100 times better than that shown in Fig. 1. Details of this sort make or break receiver performance.

supply leads in addition to merely providing a bypass. R-f chokes are exceedingly unsatisfactory and make far more trouble than they cure. A much more satisfactory arrangement is that of Figure 4 in which the resistance R may be anything from 500 to 2,000 ohms (for B circuits and screen circuits only; about 10,000 to 100,000 ohms in grid-bias leads) and the condensers are chosen for the frequency to be used. Ordinarily 1 microfarad paper condensers are satisfactory in audio work, 0.1 mufd. non-inductive paper condensers for broadcast work, .01 mufd. for work down to about 20 meters and slightly smaller mica condensers below that.

A Real Amateur Phone Receiver

We have designed coils for our new S W S 9 to give full dial spreads on all amateur bands. Here is a receiver which not only pulls in your stations but separates them.



Employs a 227 oscillator, 224 first detector, 2-224 intermediates and a 224 second detector, and has a regeneration control. The set is entirely free from hum. The interchangeable coils are arranged on the front of the receiver

For more information send for our FREE catalogue "A" describing this receiver along with a standard line of monitors, relays, oscillators and other calibration equipment.

WIRELESS EGERT ENGINEERING, Inc.

179 Greenwich St., New York City

An application of the same general idea to a multistage amplifier is shown in Figure 5A where everything non-essential has been omitted, the plate circuits only being shown. If the amplifier is any good at all it will certainly oscillate when the plate supply is brought in as shown, for the r-f plate current will not follow the dashed lines only but will wander back into the common plate lead. The most obvious way of preventing this is shown in Figure 5B but it is just as effective to use the connection of Figure 5C which permits slightly simpler wiring.

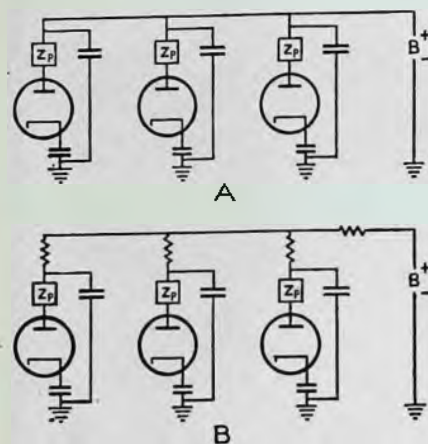


Fig. 5. The Z_p s are the plate-loads of the tubes, in this case R.F.T. primaries. A shows ordinary filtering, B shows circuits in which the effectiveness of the by-passes is increased by many times.

The One-Point Principle

It will have been noticed that this discussion has frequently reverted to the necessity of keeping r-f currents in their proper circuits. Another way of putting this is that trouble arises wherever there is a "common reactance". This simply means that there is coupling between circuits whenever they use some wire, or piece of the chassis in common. It is comparatively easy to use branched wiring but as we have seen, it is quite difficult to prevent "common reactances" when currents wander about in the chassis or the shield walls. All this suggests that there should be as few points as possible where r-f circuits are attached to the chassis. Some instances have been given. Another one is sug-

gested by Figure 6 in which the rectangle represents a stage shield to which are grounded a tuning condenser and a pair of bypass condensers. If this is done as in A the currents are flowing around the shield itself and that shield becomes a single turn loop coupled to

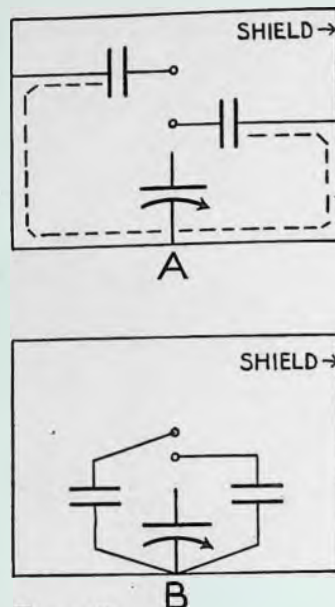


Fig. 6

As explained in the text, A is a case of wiring that has rendered a good shield useless. This sort of wiring is frequently present in monitors, shop oscillators and similar devices whose radiation or pickup is irritatingly excessive. Correct rewiring as in B usually improves shielding performance amazingly.

everything in the neighborhood. At B this is avoided, particularly if the point Y is at the bottom of the shield and grounded to the chassis. For exactly the same reason very poor shielding is obtained if a coil is merely enclosed in a box or can of which one side is also used

PILOT TO RESUME TELEVISION BROADCASTS

Pilot Radio & Tube Corporation has applied for a construction permit for a 60-line television transmitter.

As far as we know the first regular television broadcast schedules in this country were sent from WRNY in the summer of 1928 with Pilot equipment.

New Readrite Test-kits

Set-Testing Reduced to Simplicity

These new test-kits are equipped with a practical selector-switch simplifying testing operations and speeding the work of circuit analysis. The scale readings are 0-60-300-600 volts D. C., 0-10-140-700 A. C. and 0-20-100 d-c. ma. Both A. C. and D. C. filament voltages are measured on one meter. Tube-tests by grid-shift. $4\frac{1}{2}$ v. battery provided for continuity tests. Capacity and resistance charts are provided for capacity checks on condensers and ohmmeter checks on fixed resistors. The eight scales of the meters may be used separately by plugging into the proper jacks. Housed in a strong case with leatherette covering. Attractive, compact and complete. Fills the needs of either the expert serviceman or the beginner at a price that makes not owning a test-kit an absurdity.

NO. 700—\$25 LIST

The No. 600 tester contains the same equipment as the 700. The carrying case is larger, has a lock and room is provided for carrying tubes, tools and supplies. The test equipment and panel is in a removable tray at the top of the case; it may be removed for separate use in the shop as a test panel.

NO. 600—\$30 LIST

READRITE METER WORKS

18 COLLEGE AVENUE
BLUFFTON, OHIO



No. 700



No. 600

FIRST — REMAINING FIRST

- FIRST—To use an intermediate frequency high enough to eliminate repeats by making them 3000 kc. apart.
- FIRST—To use space-charge first detector to remove interlocking tuning troubles.
- FIRST—With the pentode, 551 variable mu. with 100% short-wave design.
- FIRST—With band-spread tuning and two-band oscillator coils.
- FIRST—Commercial SW super-heterodyne, with regenerative first detector.

The A.C. or D.C. HY-7

Is first again—with automatic volume control on all regular models if you want it. A. V. C. is good only for fone, not useful on telegraphy.

The HY-7, strictly SW super-heterodyne has band-spread coils for 20, 40 or 80 meters. It may be purchased with only one pair of coils, the three pair or for over-lapping ranges.

Hatry & Young
119 Ann St.  **Hartford Conn.**

"Short-Circuits" at W2BP

As we understand the advertisements, all the tube manufacturers just happened to invent the variable-mu tube at the same time.

Anyone with a fair imagination can get all the benefits of a ride on the rollercoaster from simply listening to G5SW fade.

At one radio store customer's tubes that test "sick" are marked with a tuberculosis stamp.

Now if we had an automatic gadget to shut off the loudspeaker while the announcer brushes his teeth, gulps his yeast, gargles his ginger ale, and champs on his corned beef hash we would be able to endure his chatter about cigarettes.

In our estimation this thing of working transatlantic or transpacific with a 5 watt tube is in the same class with crossing in a rowboat—an interesting stunt, but what of it? Just try to get either adventurer to take traffic on a penalty-bonus basis.

It would ease our minds considerably to know what city man hatched the idea that farm folks want a different sort of radio performance.

The midget broadcast receivers are rapidly catching up with the 1925 designs.

Powerpacks of unknown makes may be tested with ordinary spring scales reading up to about 25 pounds.

Several authentic cases have been heard of recently in which high-grade broadcast receivers have been left tuned to a local station for a year or more, using nothing but the off-on switch. This may seem just a little like buying a high grade car and running it back and forth in the driveway. Servicemen should take care to avoid leaving sets tuned to stations which sound like a defective receiver.

As LWH says, the finest thing about radio is the switch; a click and one may have silence in any quantity.

One also wonders if we are carrying modern design too far. Why worry over high sensitivity, great selectivity, or automatic volume control when one can cure anything with the switch?

At the same time we mustn't knock too much, for who knows where our next job is coming from?

Understand that a shotgun squad is hunting for the California correspondent who let out the story of the baby earthquake in L. A.

Well, we can't brag either, times are so hard here that one man was seen cutting grass with the right half of a lawnmower.

Amos, of the Amos and Andy team went to wartime radio school at Harvard, pounded brass on a destroyer and maybe sent some of us traffic. We don't know about Andy but have seen messages that look as if he must have handled them.

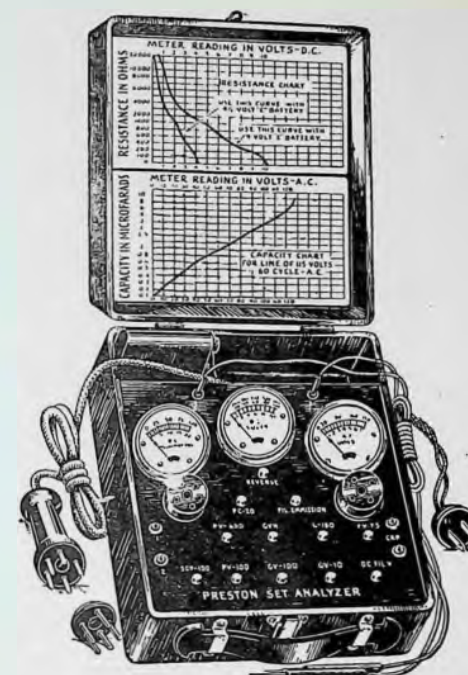
Coming in Modern Radio

ERASING TRANSMITTING ANTENNA WORRIES
MAKING YOUR OUTPUT METER—CHEAPLY
THE LOUGHREN SYSTEM OF MODULATION
THE PAINLESS MATHEMATICIAN

(Continued on Page 28)

The Preston Set Analyzer New and Complete

**\$25.00 List
\$15.00 to
Servicemen**



Designed for quick and simple operation so that circuit tests or tube tests can be made instantly. No rotary switches are used, as each particular test has its own individual push button.

Three meters are used with scale readings of 0-10-100-600 DC, 0-10-150 AC, and 0-20-100 milliamperes.

Ideal for testing voltages of plate, grid, screen grid and cathode, as well as plate current, filament voltages and line voltage. Has continuity test for set circuits, choke and transformer windings, etc.

Resistance measurements and capacity measurements can be quickly taken. Calibrated chart is provided.

Panel is engraved bakelite. Case is sturdy and leatherette covered. All in all, a modern up to the minute radio set tester and tube checker, one that any service man would be proud to own.

Beede Electrical Instrument Corp.

136 LIBERTY STREET, NEW YORK, N. Y.

THE STAFF OF "MODERN RADIO"

Collectively the staff of "Modern Radio" has:

- Designed five successful receivers.
- Designed and built 22 transmitting stations.
- Contributed to every major American radio magazine.
- The articles have been reprinted in all principal countries of the world.
- Has operated 29 commercial, broadcast, amateur and experimental stations.
- Had 12 years' experience in radio retailing and jobbing.
- Had over 14 years' experience in radio service work.
- Has participated in many sorts of radio experimental work.
- Has had 42 years of experience in radio transmission.

Coming in Modern Radio

CURE FOR INTERLOCKING
SIMPLE COIL MATCHING
A ONE-UNIT LABORATORY
WHERE THE PENTODE FAILS
WHEN NOT TO USE VARIABLE-MU
EDGE-NOISE—HOW TO USE IT
THE PENTODE MINUS DEGENERATION
SAVING C BATS. IN 'PHONE STATIONS
A HIGH-GRADE CONVERTER POWER-PACK—\$5.00
(Also see Page 26)

Aerovox 100 mfd. 25 v. conds.

Sprague 8 mfd. — 75c
Jewell's new test-kit — \$2.38
or on easy terms if you want.

Aerovox 100 mfd. 100 v. conds. — \$3.39

8 Mfd. electrolytic special — 60c

8 Mfd. Aerovox electrolytic — \$1.18

3-8's Aerovox — \$3.15

2-8's Aerovox — \$1.95

5 prong SW coil forms and 4 prong — 23c

Pilot coil forms — 35c

Magnet wire, all sizes, dials, sockets, condensers, resistors, transformers, etc.

National R-39 plug-in coil-forms, 4 prong, 5 or 6 — 89c

KEEPING UP!

H. & Y. are proud of their growth as a supply house for radio parts. Only prompt (shipment same day) service, fair prices, high-grade merchandise and a friendly policy could have made this possible.

That H. & Y. keeps up with newest parts, circuits, engineering information and advances of the art is but part of the constant effort to give the best and most reliable radio supply service in New England. All types of amateurs can get at H. & Y. everything from a coil to a complete S-W or broadcast receiver. Try H. & Y.—order it, we do the rest.

Hatry & Young
119 Ann St.  Hartford Conn.

and for Parts!

YAXLEY

If you are doing any kind of radio work, you will probably find excellent use for many Yaxley parts, made in particular for the service man.

two gang plate for aerial and ground connections and AC connections (illustrated—\$2.00) meets every modern demand.



Take the little cable markers. They are most useful in identifying wires. (Per set of eighteen most widely used designations, as illustrated—25c.)



Many service men regularly install Yaxley Radio Outlets at a sweet profit to themselves and satisfaction to their customers.



Then, the terminal clip with screw, is mighty useful and convenient. It is substantial and, of course, hot tin dipped. (Clip and screw as illustrated—5c each, or, if you prefer, furnished on bakelite blocks of from two to twelve terminals.)



And screw shell assemblies—Yaxley makes several dozen varieties from the socket assembly (illustrated—10c) to the clip-on bracket type.



The tip jacks (as illustrated—25c per pair) have dozens of uses around the shop and in receiving sets. Their companion piece, the solderless plug (as illustrated—10c) comes in handy for use with the jacks.



Now, Yaxley volume controls are available with special staffs and practically any resistance value, straight or tapered from 1 ohm to 40,000 ohms.

In radio outlets, Yaxley regularly supplies special plates with selector switches, volume controls and the like for the very largest installations. For the home, the

If you should like a copy of the Yaxley catalog, one will be mailed on request.

Yaxley Manufacturing Co.

1528 West Adams Street
CHICAGO, ILLINOIS

HY-7 I.F.T.s \$3⁹⁵ ea.

All HY-7 intermediate couplers have hitherto cost \$20.50 for 3, \$6.95 individually.

This special offer to "Modern Radio" readers is made on the latest type built into current HY-7's.

Features—R-39 form for R.F.T. windings; National Trimmer (Midget) 50 Mmfd. tuning condensers; I. F. range with 224 or 551 tubes 1510-1590 kc.; R.F.T., not impedances, ratio correct for '24's and '51's, each individually shielded and contains by-pass condenser and R.F. choke. Offer good only while supply lasts.

Have you our circular on variable mu-pentode ready made HY-7's? Get it!

National ST50 tuning condensers—\$2.06

HY-7 tube shields—39c

HY-7 leak mounts—19c

A.C. switch—34c

H. & Y. power pack—\$21.75

HY-7 band-spread coils, each—\$2.97

Complete HY-7 A.C. Kits suitable for making set of circuit in H. & Y. catalog only \$49.50, regularly \$64.50. Only a few at this price. Pilot K-112 OK Power Pack—\$19.50.

HY-7 wound coils, plug-in, 01-02-03, A1, A2, A3, A4, A5, A6, set of 9, previously \$18, now \$11.00, wound in National coil forms.

HY-7 A.C. base with 5 UY sockets riveted in place—\$4.35, formerly \$5.95.

Sprague .25 Midget by-pass condensers—34c, regularly 80c list.

2,000 ohm flexible resistors for R.F. filtering, regularly 24c each—15c.

HY-7 drum dial—\$3.53

Drilled bakelite panel, engraved with Hatry and Young, as used on the HY-7— $\frac{3}{16}$ x 7 x 1—\$1.97

Frost potentiometers for screen volume control—\$1.47

Hammarlund R.F. chokes—89c

These prices will not be offered again on the latest new HY-7 parts—Order to-day.

INCLUDE POSTAGE

Hatry & Young

119 Ann St.



Hartford, Conn.

ICA Presents "THE ENVOY"



Aristocrat of Radio Receivers A.C. and D.C. MODELS

The "ICA Envoy"—a set that's fit for a King! A powerful midget receiver featuring Radio's latest improvements—the Pentode Tube and the Variable Mu-Screen Grid Tubes, affording added tone fidelity and sharper tuning.

There is no cross-talk between stations at or near the same wave length—you will enjoy volume unknown till now and WITHOUT DISTORTION! The Envoy has a wave length range of 200 to 600 meters! Models also available ranging from 200 to 2000 meters. The "ICA Envoy" embodies every latest improvement that Radio has developed. "The famous ICA Tone Control"—A phonograph switch and jack for any phonograph pick up are standard equipment. "The Envoy" is built into a beautiful American Walnut Cabinet 18" high by 15" by 9" and its compactness and lightness (net weight only 28 lbs.) make it as handy as a portable set.

The "ICA Envoy" is not "just another midget." We staked our reputation on this job. We have devoted a great deal of time and money perfecting laboratory models so that you might have a really better Radio. By all means hear the "Envoy" before you buy ANY radio receiver. After hearing them all—judge for yourself. We feel confident of your choice.

The "ICA Envoy" is available in models for both AC and DC operation.

AC MODEL

100-125v and 220v—50-60 cycles
1 Pentode Tube Power Amplifier
1 224 Screen Grid Power Detector
2 Variable-Mu Screen Grid
1 280 Full Wave Rectifier
List Price 110-125v 50-60 cycles—
56.00 less tubes
220-240v 50-60 cycles—\$57.50, less tubes
List Price of Tubes for AC "Envoy"—\$9.70

DC MODEL

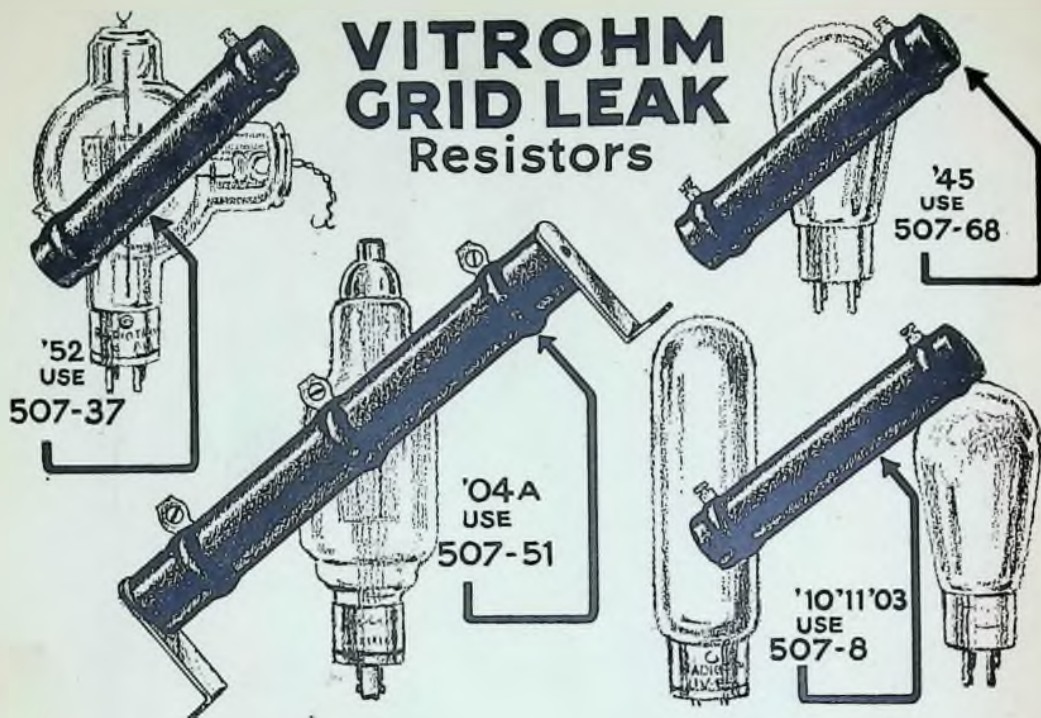
105-130v and 205-240v
3 new type 236 Screen Grid Tubes
2 two volt No. 233 Pentode Tubes
List Price 105-130v—\$56.00, less tubes
205-240v—\$57.50, less tubes
List Price of Tubes for DC
"Envoy"—\$13.75

>>>>> INSULINE <<<<<

CORPORATION OF AMERICA

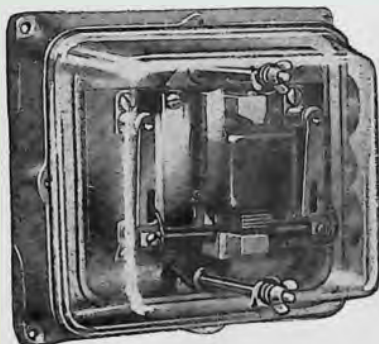
23-25 Park Place, New York City, U. S. A.

VITROHM GRID LEAK Resistors



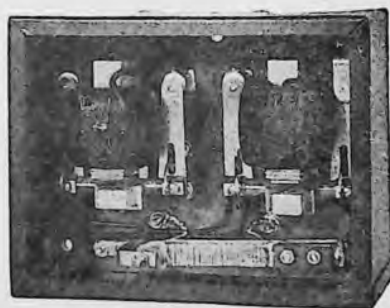
A.C. Keying Relay

1. Keys directly from 110 volt A.C. Lines.
2. A two pole relay, one pole for plate circuit, one for the grid circuit.
3. It follows a key up to 40 words a minute.
4. Totally shielded by cast aluminum case.



Time Delay Relay

1. Protection to Mercury Vapor Rectifier tubes by a definite time delay between filament and plate voltages.
2. 15 to 60 seconds' time delay setting.
3. Dimensions 4-7/8" x 6-1/8" x 3-1/16" (enclosed).
4. Arranged with back connection for panel mounting.



WARD LEONARD ELECTRIC CO.

MOUNT VERNON, N.Y.

Send for the revised Circular 507