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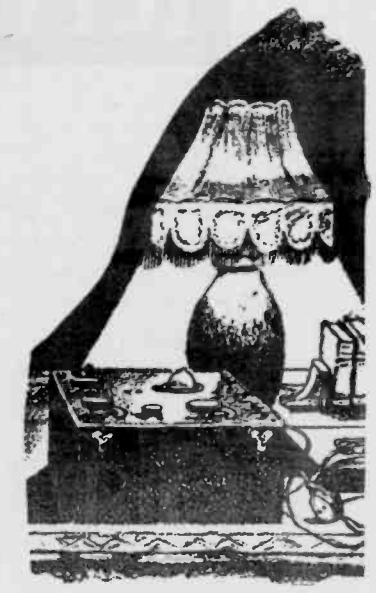
THE NEWSPAPER FOR
THE HOBBYIST OF VINTAGE
ELECTRONICS AND SOUND

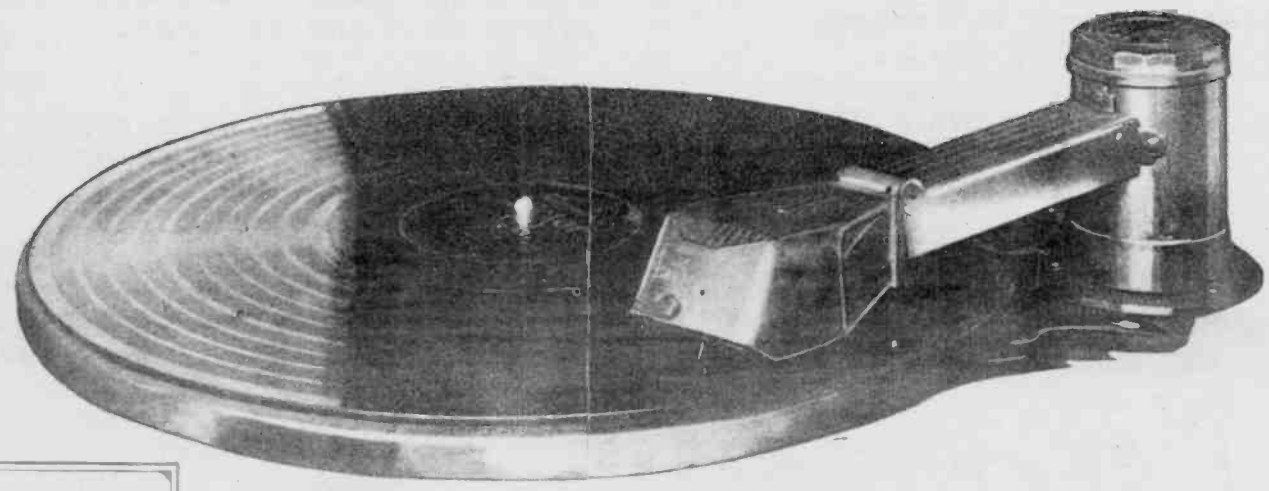
THE HORN SPEAKER



RADIO NEWS FOR MARCH, 1931

ELECTROMAGNETIC PICKUPS

In this simple analysis of the electromagnetic pickup and its characteristics the author reviews the historical development of the pickup and outlines a few easy methods for determining pickup characteristics.



By S. McClatchie

AWAY back in 1890 a man by the name of Capps got a patent on a telephone receiver. There is something startlingly modern about this invention. For it embodies the essentials of nearly all our present-day magnetic loud speakers and pickups. The man was a generation ahead of his time. Pickup history starts with Capps Patent No. 441,396 of Nov. 25, 1890. See Fig. 1.

Thirty-five years later engineers took the four-pole system of Capps, pivoted the armature in rubber bearings, provided the free end of the armature with rubber buffers, and inserted a needle setscrew. This was the first widely used commercial phonograph pickup, and about all that has been done since has been to somewhat refine the design. The type of structure which was introduced on the G.E.-designed Panatrope has been copied from California to Moscow. It is true that other types of pickup have been designed and put to commercial use, but probably nine-tenths of the pickups in use today are based on the one original idea. It will be the main purpose of this article to discuss the merits, limitations and characteristics of this design.

As will be evident from a glance at the illustration, Fig. 2, this type of phonograph pickup is a remarkably simple device. Its moving system is in effect nothing but a simple reed arranged to be vibrated by a needle-point. A loud speaker involves, by comparison, a labyrinth of complications, due to the special characteristics of cones and diaphragms, and the problems of coupling the armature to these parts, and these in turn to the air, which is the transmitting medium.

Frequency Characteristics

The frequency characteristics of the pickup are almost wholly dependent on the character of the reed or armature, which makes up, with the needle, its simple vibrating system. Now a reed set in motion manifests a certain resonance frequency. In the best modern pickups, this resonance point usually lies between frequencies of 3000 and 4000. In order to prevent an excessive response at these frequencies, it is necessary to damp the system. This is usually accomplished by means of rubber buffers applied to the free end of the armature. These buffers serve also to center the armature in the magnetic air-gap.

Now the damping does not affect merely the resonance frequencies. It tends to cut down the entire level of the upper musical range. Its effect is progressive. It is most effective for the highest frequencies reproduced and least effective for the lowest. This tends to give the response curve a downward slope. The volume control which is almost always connected across the pickup emphasizes this tendency. With a properly designed pickup, the output values are at a maximum at the lower end of the frequency scale. From here they fall off gradually until a frequency of about 2000 is reached. From this point on there is a sharp rise, due to armature resonance, the extent of which is determined by the amount of damping applied. After the resonance peak, the curve falls off steeply. The upper limit of frequency response is determined strictly by the location of the resonance point. Just beyond resonance there is always a cut-off. This cut-off falls almost always between 4000 and 6000, as commercial pickups generally resonate at about 3500. The effective range of the best modern pickups is from 100 to 5000,

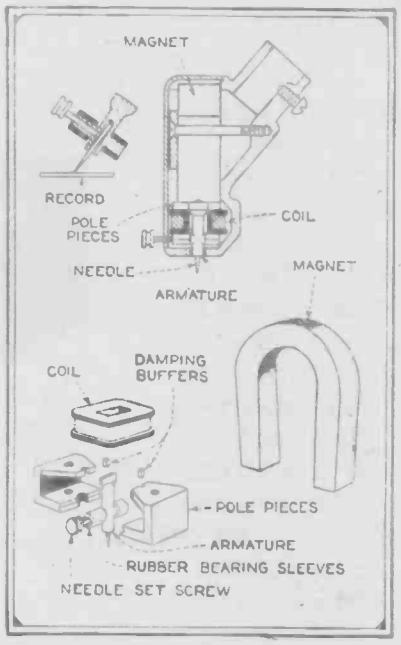


Fig. 2. (Above) The pickup designed by the G. E. Co. in 1925, which was first used on the "Panatrope." This construction has been closely followed by many succeeding pickup manufacturers. The armature is pivoted in rubber sleeves held between the lower pole-pieces. Rubber buffers, held by the upper pole-pieces, serve to center the armature and damp its tendency to resonance. Upper views show device in cross section; below, the parts "exploded"

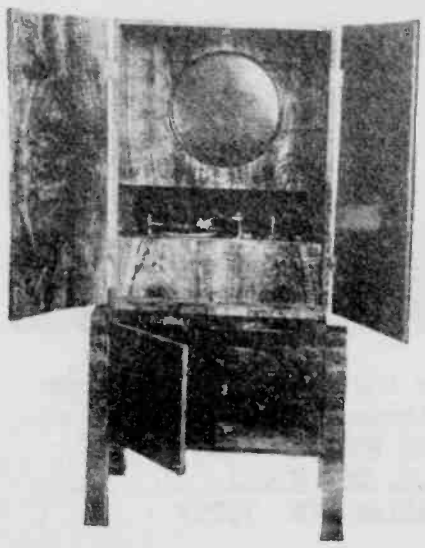


Fig. 3. (Left) An elaborate German radio-phonograph combination, embodying a Vogt electro-static loud-speaker. The pickup and turntable are just under the speaker. German taste in cabinetry runs to simple lines and highly finished woods

MR. McCLATCHIE started with "wireless" away back in the days of spark gaps and cat-whisker detectors. Out in California at the age of 14 he built a transmitting and receiving station with a 175-foot aerial stretched between two 90-foot poles. By 1911 he was already manufacturing and selling wireless apparatus.

In 1914 Mr. McClatchie abandoned the then not so very promising "wireless" field for other pursuits, among them university work and extensive travel in Europe. He did engineering work on electrical equipment in Germany for many years. In 1923 he again entered the radio field. He carried out the first rebroadcasting of American radio programs to be accomplished on the Continent. The same year he built a magnetic recording machine, which was used to record a program of Christmas greetings from the German to the American people. Stresemann, the President of the Reichstag, and Dr. Eckener, of Zeppelin fame, contributed speeches.

For a year and a half Mr. McClatchie has been devoting himself to the improvement of electrical phonograph pickups. He has written two articles especially for RADIO NEWS *which embody some of the fruits of his study of the pickup art, of which the accompanying article is the first.*

(Continued on page 3)

letters

Where can I buy the pot metal housing around the coils for an AK horn speaker? Do you know of anyone who might make one in brass for $75.00?

Thank you.

Edw. G. Tilton
2414 Southview Drive
Alamo, CA 94507

EDITOR...I hope this letter encourages a supply of this part.

Dear Jim -

Every month, I look forward to receiving THE HORN SPEAKER. It's a great publication and a definite asset to the hobby. It's interesting, informative and is a good means of communication among collectors.

Ken Zander
P. O. Box 2652
Sunnyvale CA 94087

FIND

I have been reading THE HORN SPEAKER for several years now and have often read with envy as someone described his "find." I had always believed that this only happened to others and never dreamed that it could ever happen to me. Well, it finally did.

A friend of a friend told me about a lady who had some old tubes to sell. I assumed that they were tubes from the 40's or 50's and wasn't too interested but decided I'd better go look just in case. I wasn't too excited when I arrived at the house and saw that the tubes were mostly old television tubes. Anyway, she said that she wanted me to look in the garage and see if there was anything there that I might be interested in.

The excitement began when we opened the garage door. Against one wall was stacked several large wooden crates. On top of these crates I could see some horn speakers. As I scrambled across stacks of old magazines and boxes to get a closer look. I saw that there were two Atwater Kent horn speakers, two Magnavox horn speakers, a Magnavox amp/reproducer, a Western Electric amplifier, some old variocoupler and covered with dirt and dirt-dobber nests, there before my eyes was an Atwater Kent "breadboard" model 12.

We then opened the crates and among other things they contained a Radiola III, IIIA, Crosley 50A, Aeriola Sr. without cabinet, Zenith R4, three RADA's, several VT1's, 215A's, 201A's, WD-11's and 199's and others and many old radio magazines from the twenties.

In addition to the above I also got a large Nipper dog and best of all an Atwater Kent "breadboard" model 10.

So, readers keep looking for those old radios, there are still lots of them in attics and garages, just waiting for you.

Regards,
Willis A. Rudolph
5008 Elmhurst
Memphis, TN 38115

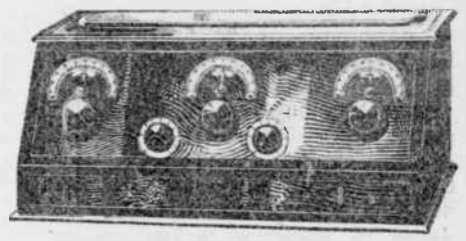
Was happy to find two nice goodies last month, one was a Federal 59 in wnat I would consider to be in Fair to Good condition - all there but been around, will be like new when I get finished with it. The other is a Radiola Senior with a WD-11 this set was manufactured by Westinghouse Electric Manufacturing Co. for Radio Corporation of America. This set is in Mint condition and shows little or no use. The Federal 59 and the Radiola Senior are both going into a Museum in N.J. which I'm helping to build up. Jim keep up the good work, needless to say your paper is the biggest and best published for the Antique Radio hobby.

Cordially yours,
Ralph Maddox
Purgitsville, WV

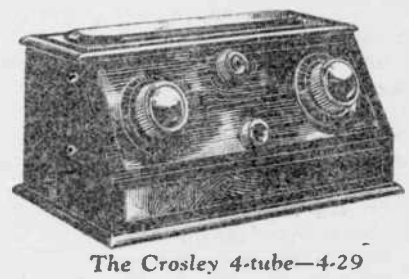
Picked up a very unusual Zenith similar to Deluxe Model 6SP. It is a very early AC set having 5 RF stages using 26's, and a 27 detector, 3 audio stages using 2 27's and a 26 with a 10 output tube and a 81 retifier. It has 2 bands covering from around 500 KC to around 2500 or so.

Tuning band is changed by throwing six separate knife switches, one on each coil. Volume is controlled by a filament rheostat on the RF detector tubes. I didn't get the cabinet this went in but it must've been something. Everything is original except the socket for the 10, which was wired backwards. The power supply is model ZE7 and filter unit ZE8P. I took some pictures and will send them later.

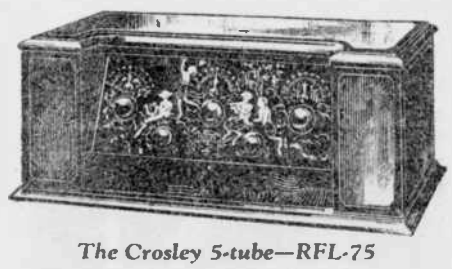
Best wishes,
Frank Heathcote



The Crosley 5-tube—5-38



The Crosley 4-tube—4-29



The Crosley 5-tube—RFL-75

April, 1926

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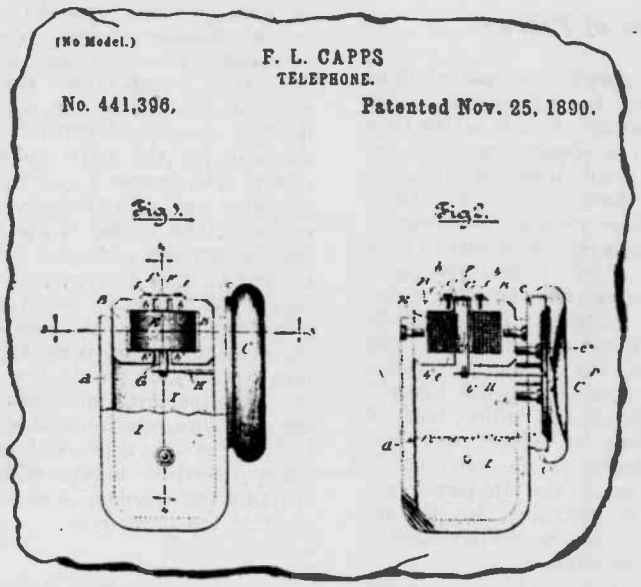
(No Model.)

F. L. CAPPS

TELEPHONE.

No. 441,396. Patented Nov. 25, 1890.

Fig. 1. Fig. 2.

Fig. 1. The granddaddy of them all. The Capps patent of 40 years ago, which shows the four-pole electro-magnetic system which is the basis of nearly all present-day pickups (and magnetic loudspeakers as well). All you have to do to this design to have a very passable pickup is to add a needle set-screw

which corresponds to the usual range of the phonograph record.

It is evident from the foregoing that the frequency characteristic of the commercial pickup is fixed basically by the simple natural laws governing damped vibrating reeds. There are dozens of brands of pickups on the market which resemble one another in tone characteristic so closely that only a very lively imagination can tell the difference between them. This means simply that the dimensions of the armature and the amount of damping applied have been standardized in commercial practice. It is indeed very simple by poor dimensioning to make a worse pickup, but it is with present designs and requirements next to impossible to make a materially better one. That is, so far as tone quality is concerned.

Measuring Pickup Characteristics

Frequency records are available to the public, and it would at first sight seem a simple matter to take pickup curves. One need but measure the response of the pickup at various frequencies with a tube voltmeter and plot the results. In practice this is not such a simple matter. The phonograph companies are not in the habit of releasing the frequency records which they use in their own laboratories, and those that they do release require a lot of correction on the part of the user, if even approximately correct results are to be attained. Here a warning: Even if the records are allegedly calibrated, don't accept the makers' calibrations for any purpose, no matter how reputable the name of the maker may be. Do your own calibrating! The most imposing calibrations in TU or Db are of little value unless they happen to be right. The most commonly available frequency records have calibration errors up to 20 per cent.

It is fortunately a comparatively simple matter to calibrate the records oneself. Hold any frequency record at such an angle to a source of light that a band of reflected light beams is seen running radially across the grooves. The width of the band at any point indicates the relative velocity of the cut. For instance, if at one frequency the width of the band is one inch and at another one and one-half inches, then the velocity of the cut at the second frequency is 50 per cent greater than at the first. This may sound to some readers like a "believe it or not," but it is nevertheless a fact capable of exact demonstration. The explanation of the fact would take up too much space here. All we have to do then is to measure as accurately as possible the relative width of the reflected light beams at all of the frequencis to be used, and multiply the voltmeter readings by corresponding factors.

Our readings will be very greatly facilitated if "sliding frequency" records are used; that is, records which vary constantly in frequency from the top to the bottom of the scale, or vice versa. Such records include the entire frequency band in a single recording, and a set of readings may be taken in about three minutes. The frequency may be kept track of by counting off the revolutions of the record. A certain number of revolutions from the start will always bring one to a certain frequency. Such records may be obtained from the Carl Lindström A.G. of Berlin, Germany, which is a branch of the Columbia concern. A set of three records costs about $7.50. I have not heard of such records being sold in this country. They are, however, available in England under the name "Parlophone."

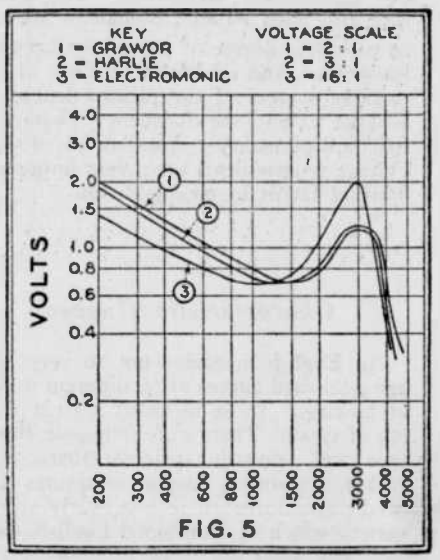

Fig. 5. A group of frequency response curves of foreign and domestic electromagnetic pickups

The voltmeter readings should either be reduced to Db or plotted on a logarithmic scale. For comparison of characteristics it is convenient to reduce the various curves to a common base line. For instance reduce the value at 600 in all cases to 1, and plot the remaining values up or down from this level. The actual voltage output at 600 may be noted separately. The frequency value 600 is suggested because this falls about in the middle of the possible frequency scale of commercial records or pickups.

As the output of the pickup at the lower frequencies is usually very much diluted with overtones due to the failure of the armature to properly follow the groove at these frequencies, it is necessary to distinguish between indicated values and real values. To arrive at the true relative response at the lowest frequencies, it is necessary to apply a filter to the measuring circuit which will cut off all frequencies above the one to be measured. The losses of the filtering device for the desired frequency must also be known, and accounted for in the resulting curve. The difference between the filtered and the unfiltered response at the lower end of the scale is a measure of the production of unwanted overtones by the pickup.

While we may thus correct for the weaknesses of the pick-up at the low frequencies, it is much more difficult to allow for the imperfections of the available frequency records. The above mentioned German records are not satisfactory below 200. The Victor records available to the public have abnormal amplitudes below 250. The maximum swing allowable in commercial records is only about 0.002" in each direction. The lower frequencies on the Victor records have amplitudes several times as great as this. It is quite unreasonable to expect a pick-up to perform properly at such amplitudes. So far as the writer is aware, no frequency records have as yet been issued which are satisfactory at the lower end of the scale. The best way to get around this difficulty is to take a record cut at say around 250 and run it at a slower rate to get the lower frequencies.

Stiffness Measurements

The earlier pickups were designed with a view to showing a nice frequency curve. Lots of damping was applied to iron out the resonance point as completely as possible. The result was a very stiff armature system. The rigidly held needle acted on the record about like the cutting tool of a lathe. To save the records, the amount of damping has of late been greatly reduced in almost all commercial pickups. The stiffness of the armature system is a very important factor in pick-up design.

While the stiff pickup had a fairly nice characteristic on paper, there was a grave defect in the method of taking the curves which formerly led engineers to believe that lots of stiffness, with the attendant high damping, was just the thing. These curves did not take into account the amount of overtones present in the output at the lower frequencies. The stiff armature system caused the whole body of the pickup to be vibrated unduly on the low notes. The present tendency is to save the low notes and the records, and let the resonance peak climb.

There are a number of very complicated devices for measuring the stiffness of pickups, but the writer has devised a very simple set-up which does all that is required in practice. As above mentioned, the maximum swing or needle displacement with commercial records amounts to about 0.002 of an inch. All that is required is to find the pressure required at the needle-point to cause this

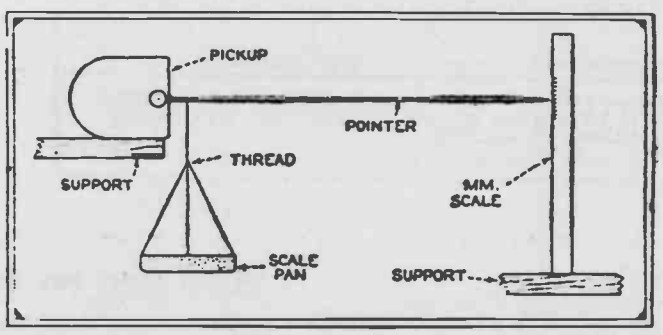

Fig. 4. The author's setup for measuring the "stiffness" of pickups. A light pointer is fixed in the needle holder of the pickup. At a point corresponding to the position of the needle-point is attached a thread which supports a light pan for holding weights. The stiffness is measured in terms of the weight required to cause a deflection of 0.002" at the needle-point

much displacement. The writer's arrangement (See Fig. 4) consists of nothing more than a pointer 8 or 10 inches long, which is provided with a pan for small weights suspended about ⅝" from the pivot end. The pivot end of the pointer is inserted in the needle holder of the pickup. The latter is held on its side, as indicated in the accompanying sketch. A scale is held next to the pointer end, as shown. The specified ⅝" represents approximately the length of the average phonograph needle.

The pointer should preferably be made of 1/16" aluminum rod or hard wire. It should have a length which is a large enough multiple of the needle length to give a legible movement at its outer end, say 1 mm. for a movement of 0.002" at the position of the needle-point (0.002" corresponds to 0.05 mm.). Weights are added to the pan until the required deflection is obtained. The total weight suspended from the needle-point position to obtain this deflection is taken as a measure of the stiffness of the armature system.

Measured by this system, the older pickups showed a stiffness of 6 ounces or more. Small wonder that the records and the reproduction of bass notes suffered! The best modern pickups have a stiffness of about 2 ounces. In any case, the stiffness must be set off against the frequency characteristic in judging the merits of any pickup device.

Voltage Output

Pickups are most commonly connected directly to the grid of the first amplifier tube. The device must deliver sufficient e.m.f. to adequately actuate the amplifier, even when soft records are played. An average maximum of about 1 volt is demanded of pickups for present-day radio sets. This fact is mentioned in connection with the discussion of pickup measurements, because the voltage output plays an important role in forming an overall judgment of the device.

This output depends, of course, for one thing, on the impedance of the pickup winding. It is practicable to surround the armature with as much as 10,000 or 20,000 ohms of wire, which would yield an impedance quite nearly matching the grid impedance for th ehighest frequencies reproduced. But such windings tend to pick up hum from the lighting circuit and to cause regeneration in the amplifier. With careful shielding such difficulties may be overcome, but most manufacturers prefer to avoid them in advance by putting not more than 2000 ohms of wire on the coil.

We may say, then, that general practice demands a pickup with an average maximum output of 1 volt from a coil of 2000 ohms d.c. resistance, or less. To obtain this, a considerable magnetic field strength is required, and the armature must be thick enough to handle this without approaching saturation. The armature also must be long enough to provide an adequate degree of movement between the poles. And on the dimensions of the working system of the pickup depend to a large extent the frequency characteristic and necessary stiffness of the device. Voltage requirements are a very important limiting factor in pickup design.

Characteristic Curves

An English magazine not so very long ago published curves of 30 different makes of pickups. These included a great variety of types. There were four-pole, three-pole and two-pole systems, there were rocker armatures, tongue armatures and needle armatures, there was nearly all the variety which the combined English, German and American markets afford in the way of pickup designs. But in spite of all this variety in construction, there was a surprising uniformity in the curves. Of course, many of the pickups were of distinctly poor design, so that they would be in any case ruled out of consideration, but as for the remainder, there was not one which stood out enough from the others to be worth bragging about.

Types of Pickups

In Fig. 5 is shown a sample of three of these curves. Each represents a distinct type of pickup. One is of the two-pole type, with a tongue armature, another is of the usual American type, and the third has a three-pole system. These three devices differ radically in construction, yet the frequency characteristics are nearly identical. One of the three shows a marked resonance peak, but this is due simply to light damping. As the damping buffers are usually adjustable in some way, it is possible for the user to regulate the amount of resonance to suit himself, so that one could, in fact, adjust most of the better pickups in such a way that there would actually be no material difference whatever in the frequency response. That is, assuming that the resonance points in all the devices used is located in the same region.

This fact emphasizes the point made above, that a pickup is essentially nothing but a damped vibrating reed operating in an electromagnetic system. There is no opportunity for the innumerable hills and dales which characterize loudspeaker curves. The pickup response may be analyzed into slope, trough, peak and cut-off. As it is difficult, for reasons above suggested, to obtain uniformly accurate pickup readings below a frequency of about 200, we may take this as a starting point. The ratio of the value at 200 to the value at the bottom of the trough is for pickups resonating between 3000 and 4000 usually about 2.5 to 1. The ratio of peak to trough is a matter of damping adjustment. This ratio should preferably be less than 2 to 1. This is the only factor which is subject to material variation. The cut-off point can be influenced only by changing the point of resonance.

Owing to the high output and low stiffness generally required in this country, it has become the usual practice here to allow a very high resonance peak. American pickups generally have a characteristic about like curve 3 on the curve sheet we have just been considering. One effect of allowing considerable resonance is to broaden out the trough and to lower the 200 to trough ratio. The curve does not look very pretty, but it is considered the best compromise between stiffness and damping for the given voltage requirements. The trouble is that "stiffness" and damping are with present designs correlated. This is due to the use of rubber for damping purposes, which must be applied in quite heavy doses in order to obtain full damping. That is, when applied with sufficient pressure to eliminate the resonance peak, it renders the armature system stiff for the low frequencies. What is needed is a more selective damping substance, which would absorb the vibrations at the upper end of the scale, where resonance occurs, without greatly affecting the freedom of armature movement at the lower end.

Design Possibilities

It is of course obvious that the possibilities in pickup design have not been exhausted by the instances here cited. It is possible to design pickups with a single mountainous peak in the middle of the scale. Or one can make electrostatic pickups which have a drop in their characteristic almost directly proportional to the rise in frequency. But such possibilities are not desirable.

TABLE VII

TYPE NUMBERS OF SIMILAR TUBES MADE BY DIFFERENT MANUFACTURERS

RADIO NEWS TYPE NUMBERS	-00A	-01A	-12A	-22	-24	-24A	-27	-30	-32	-36	-37	-40	-99	401
ARCTURUS	–	101 A	012 A	122		124	127	130	132	136 A	137 A	32 *	099	–
CECO	200 A	201 A	112 A	222	224	–	227	230	232	236	237	240	199	–
CUNNINGHAM	CX-300A	CX-301A	CX-112A	CX-322	C-324	C-324A	C-327	CX-330	CX-332	C-336	C-337	CX-340	CX-299	
DeFOREST	–	401 A	412 A	422	–	424	427	430	432	–		440	499	–
GOLD SEAL	GSX-200A	GSX-201A	GSX-112A	GSX-222	GSY-224	–	GSX-227	GSX-230	GSX-232	GSY-236	GSY-237	GSX-240	GSX-199	–
KELLOGG	–	–	–	–	–	–	–	–	–	–	–	–	–	401
KEN-RAD	UX-200A	UX-201A	UX-112A	UX-222	UY-224	–	UY-227	UX-230	UX-232	UY-236	UY-237	–	UX-199	–
NATIONAL UNION	–	NX-201A	NX-112A	NX-222	NY-224	–	NY-227	NX-230	NX-232	NY-64	NY-67	–	NX-199	–
PILOT	–	P-201A	P-112A	–	P-224	–	P-227	–	–	P-236	P-237	–	–	–
RAYTHEON	ER-200A	ER-201A	ER-112A	ER-222	ER-224	–	ER-227	ER-230	ER-232	ER-236	ER-237	ER-240	ERX-199	–
RCA RADIOTRON	UX-200A	UX-201A	UX-112A	UX-222	UY-224	UY-224A	UY-227	RCA-230	RCA-232	RCA-236	RCA-237	UX-240	UX-199	–
SPEED	200 AA	201 A	112 A	222	224	–	227	230	232	236	237	X-140	199	–
SYLVANIA	SX-200A	SX-201A	SX-112A	SX-222	–	SY-224	SY-227	SX-230	SX-232	SY-236	SY-237	SX-240	SX-199	–
TRIAD	–	T-01A	T-12A	T-22	T-24	T-24	T-27	T-30	T-32	T-36	T-37	–	–	–
WUNDERLICH·····	THIS NEW DETECTOR TUBE IS BEING MADE BY ARCTURUS. BUT AT THIS WRITING NO TYPE NUMBER HAS BEEN ASSIGNED TO IT.													

NOTE: THE ABOVE CHART SHOWS TYPE NUMBERS OF DIFFERENT MANUFACTURERS FOR SIMILAR TYPES OF TUBES. TUBES OF DIFFERENT MANUFACTURERS SOMETIMES DIFFER SOMEWHAT FROM GENERALLY ACCEPTED CHARACTERISTICS OF A GIVEN TYPE OF TUBE. FOR ACCURATE DATA ON TUBE CHARACTERISTICS OF ANY GIVEN MANUFACTURER, CONSULT HIS TUBE CHARACTERISTIC CHARTS OR BULLETINS.

NOTE *: DIFFERS CONSIDERABLY IN SOME OF ITS CHARACTERISTICS FROM TUBES OF OTHER MANUFACTURERS IN ITS CLASS.

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(3) You receive a 15% discount on all orders which total $25.00 or more!

(4) You receive a 20% discount on all orders which total $50.00 or more!

(5) You receive a free copy of our latest Catalog No. 19 with orders which total $10.00 or more!

THE DISCOUNTS DESCRIBED IN ITEMS (1) THROUGH (4) ABOVE ARE APPLICABLE TO TUBES, BOOKS, BOOKLETS, APPRAISALS, OR ANYTHING IN OUR LATEST CATALOG No. 19 WHICH WE DO NOT HAVE TO SPECIAL ORDER FROM ONE OF OUR SUPPLIERS AND WHICH WE HAVE IN STOCK AT THE TIME YOUR ORDER IS RECEIVED.

****

NO ADVERTISED DISCOUNTS STATED IN THIS ADVERTISEMENT OR ANY OTHER ADVERTISEMENT AND NO DISCOUNT COUPONS ARE APPLICABLE TO THE FOLLOWING SPECIAL OFFERS:

(6) If you initiate or renew your subscription to ANTIQUE RADIO TOPICS & THE CLASSIC RADIO NEWSLETTER before 30 April 1981, the subscription fee is only $8.00 ($2.00 off - regularly $10.00). Subscribers in countries other than Canada and Mexico add $10.00 for air mail service, otherwise issues are mailed by surface mail.

(7) Order six schematic diagrams and get one free! If we can not furnish one of the seven (six plus one free) we will only charge for one less than what we can supply. We can usually supply anything you request, but there were thousands of obscure manufacturers and many simply were never documented.

(8) TYPE 12A TUBES! --- We have a limited quantity (less than fifty) of type CX112A, UX112A (old style) and 12A (new style) tubes which we consider "excess stock." Our regular price for type 12A is $8.00 postpaid (see List No. 19). If your order is postmarked on or before 30 April 1981, you may purchase these type 12A tubes - old style or new style - at only $5.00 each! Some collectors have successfully substituted type 12A for UX201A, 01A, etc.

(9) We have a limited quantity (only about twenty) of porcelain antenna lightning arresters in original orange and blue printed cartons. These Model No. 1000 porcelain RADIO LIGHTNING ARRESTERS are manufactured by the Knox Porcelain Corp. They make a nice addition to any collection at only $5.00 each postpaid. ORDER TODAY - THEY WON'T LAST LONG!

(10) Purchase 10 old-time-radio program cassettes at our regular price ($2.25 each or ten for $22.50) and get three (3) more free cassettes! Regularly, you receive only one free with each ten purchased.

(11) We have only 4 ANTIQUE RADIO T-SHIRTS (same as we offered in our catalog about two years ago). Three are size MEDIUM in a gold color, one is size SMALL in white. --- $4.95 each while they last!

HOW MANY OF OUR CUSTOMERS WOULD LIKE TO BE ABLE TO PURCHASE THESE T-SHIRTS AGAIN? WE COULD OFFER ANY COLORS YOU DESIRE AND SEVERAL NEW DESIGNS. PLEASE LET US KNOW IF YOU HAVE AN INTEREST IN T-SHIRTS AGAIN.

(12) If your order totals $10.00 or more, you may order a copy of our DIRECTORY OF ANTIQUE RADIO SERVICES at only $1.00 postpaid! This is a two dollar saving - regular price is $3.00!

****

A NEW METHOD FOR APPRAISAL

WHEN WE APPRAISE AN ENTIRE COLLECTION, WITH INDIVIDUAL CERTIFICATES OF APPRAISAL FOR EACH RECEIVER OR ITEM, THE EXPENSE FOR THE PHOTOGRAPHS CAN BE PROHIBITATIVE. FOR THIS REASON, WE NOW OFFER A NEW METHOD OF APPRAISAL WHICH IS ACCEPTABLE WITH MOST INSURANCE COMPANIES. WE WILL WORK FROM A LIST OF THE SETS AND COLLECTABLES IN YOUR COLLECTION. THE LIST CAN BE HAND WRITTEN - WE WILL TYPE THE LIST ON OUR STATIONARY. WE MUST HAVE THE NAME OF THE MANUFACTURER, MODEL NUMBER OR NAME, SERIAL NUMBER, AND YOUR STATEMENT OF THE PHYSICAL AND ELECTRICAL CONDITION OF THE RADIO. IF THE INSURANCE COMPANY DOES NOT REQUIRE PHOTOGRAPHS, WE WILL ONLY WORK UP A LIST. IF PHOTOGRAPHS ARE REQUIRED, YOU MAY FIND THAT GROUP PHOTOS DEPICTING MANY SETS ON EACH PHOTO ARE ACCEPTABLE. OUR FEE FOR THIS TYPE OF APPRAISAL IS ONLY ONE DOLLAR PER RADIO OR ITEM. LARGE GROUPS OF TUBES OR LITERATURE ARE CONSIDERED ONE ITEM WHEN A LIST OF THE TUBES OR LITERATURE IS PROVIDED. PLEASE LET US KNOW IF WE CAN BE OF HELP FOR APPRAISALS.

VINTAGE RADIO HAS GREAT BOOKS FOR YOU!

VINTAGE RADIO 1887-1929

You'll enjoy this fascinating pictorial story of pioneer days in wireless and radio. Relive the days of Marconi, old spark transmitters, and the struggles of early radio broadcasting. It's the radio collector's reference, with over 1,000 pictures on 263 pages.

HARD-COVER $12.95
HANDBOOK $9.95

A FLICK OF THE SWITCH 1930-1950

Here's your time trip through the great days of radio broadcasting and the dawn of television. Revisit the Lone Ranger, Philco "cathedral" radios, old "Ham" days and many more. You'll revel in 312 pages of story, old ads and over 1,000 pictures.

HARD-COVER $12.95 HANDBOOK $9.95

1927 RADIO ENCYCLOPEDIA

Own this authentic reproduction of Gernsback's classic. Browse through radio's heroes (who's Marconi?) and hardware (what's a coherer?) of the old days. 175 fascinating pages. Our hard-cover version is a serialized limited edition, an ideal gift.

WHILE THEY LAST!
DELUXE HARD COVER $14.95 SOF[SOLD OUT]R $10.95

1921-1932 RADIO COLLECTOR'S GUIDE

This book makes you an "instant expert" as you go prospecting for those fine old radios. It eliminates guesswork in determining a set's age and "pedigree." There are 264 pages loaded with over 50,000 facts on 9,000 radio models made by 1,100 manufacturers.

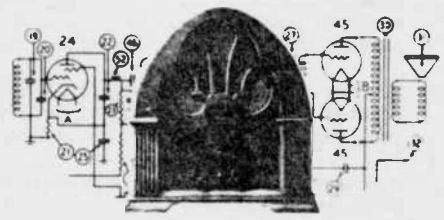
HANDBOOK $9.95

MOST-OFTEN-NEEDED 1926-1938 DIAGRAMS

This reprint of Morris Beitman's Supreme Publications book shows circuit diagrams for 600 radio models. Its 240 pages are valuable for historical circuit information, and are great aids in restoring those old sets. Made from Supreme's original artwork, it is clear and readable.

HANDBOOK $9.95

CIRCUIT DIAGRAMS



We will research any pre-1951 radio model and send you the circuit diagram and any other available repair information. We'll also tell you the year in which that model was introduced. Your money back if we don't come up with at least a circuit diagram!

We now have Canadian diagrams, too!

ANY RADIO MODEL $3.50

DISCOVER THE EXCITING RADIO COLLECTOR'S HOBBY!

RELAX WITH A TIME TRIP TO YESTERDAY!

GREAT BOOKS FOR YOU!

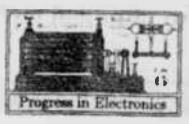
GOOD NEWS GOOD NEWS GOOD NEWS

As our old customers know, we had decided to let the Vintage Radio family of books go out of print. Many friends have urged us to keep publishing these books, so we have decided to keep them coming to you. We will start with a reprint of the RADIO COLLECTOR'S GUIDE, which has not been available for some time. So order up, and tell your friends that the GUIDE is available again!

The other books in this ad are all available, although the handbook edition of VINTAGE RADIO 1887-1929 is in very short supply. Other editions will also be in short supply from time to time, but we'll do our best to keep them coming to you without interruption.

There's a little bit of bad news, too. We've had to raise prices for the second time in Vintage Radio's ten-year history. We've kept the increase as small as we can, but we've got to keep the "guzinta" ahead of the "guzouta", as we're sure you'll understand.

Morgan McMahon Gayle McMahon Rowland Betty McMahon Gladie McMahon



MAGNIFICENT COLOR PRINTS FROM ORIGINAL ART

These fine "Progress in Electronics" prints are the most striking artwork we've seen in years. Made from the original painting, each print is 8" x 10" with its own coordinated matte background. Prints are on beautiful heavy stock with high-quality inks. It takes nine passes through the printing press to make each of these four masterpieces!

Originally conceived as executive gifts by Hall-Mark Electronics, these fine pictures are made by special arrangement with the U.S. Postal Service. Now a limited edition, by Government decree. Here's the ideal gift for you, your relatives and friends!

FOUR BEAUTIFUL PRINTS FOR FRAMING, ~~$7.50~~ now $3.75

DON'T WAIT; ORDER NOW FOR QUICK DELIVERY!

Send check or money order to McMahon's Vintage Radio, Box 1331, North Highlands, CA 95660

_____	$ _____	_____	$ _____
_____	$ _____	_____	$ _____
_____	$ _____	_____	$ _____
_____	$ _____	_____	$ _____

PLEASE ADD 50¢ PER BOOK SHIPPING.
CALIF. RESIDENTS ADD 6% SALES TAX.

Total $ _____

VintageRadio

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

PRICES EFFECTIVE UNTIL DECEMBER 31, 1981

VintageRadio

SHOP TALK

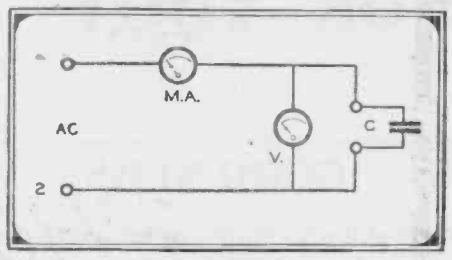
Radio News for March, 1931

RADIO NEWS INFORMATION SHEETS

Measuring Large Capacities (Part 1)

THE experimenter or serviceman lacking a capacity bridge has a need for a simple means of measuring large capacities such as filter condensers.

The method given here, while not without error, is sufficiently accurate for most purposes. The accuracy of the measured values is dependent on the accuracy of the instruments, and the accuracy by which the readings are taken.



The test apparatus required are an a.c. milliammeter, an a.c. voltmeter (the scale of which is determined by the voltage source) and an a.c. supply of known frequency.

Connecting the condenser to be measured in the position shown in the diagram, C, the reading of the a.c. milliammeter is taken, and then the reading of the voltmeter. Knowing the frequency of the source, a simple calculation will give the capacity within 5 per cent., if one is careful.

The formula:

$$C = \frac{1{,}000 \times I}{6.28 \times f \times E}$$

where C is capacity in microfarads, f is frequency of a.c. source, I is current in milliamperes, and E is voltage.

Having a large condenser of unknown capacity on hand and wishing to know its capacity, we connect the condenser in a circuit with the meters as shown in the diagram. Apply 60 cycles a.c. across 1 and 2, a reading is taken from the meters. The milliamperes are found to be 150 and the voltage 110.

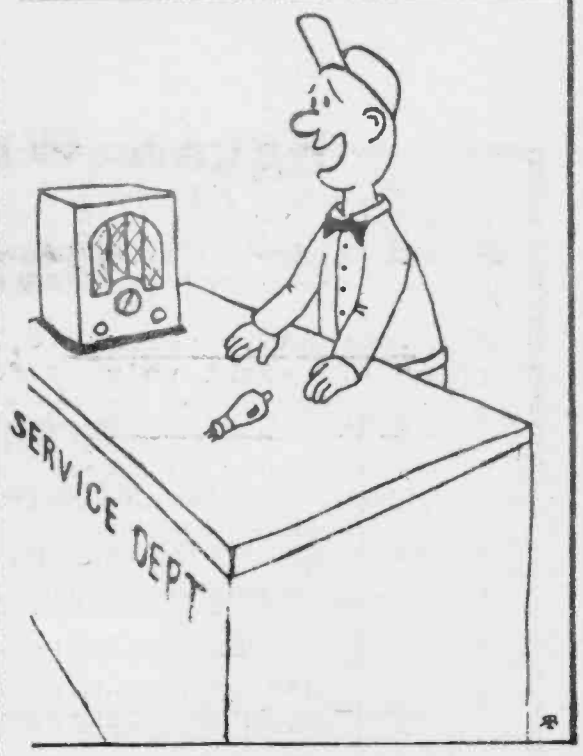
Thus: $C = \frac{1{,}000 \times 150}{6.28 \times 60 \times 110} = \frac{150{,}000}{41{,}388} = 3.57$ microfarads.

In measuring condensers of large capacity of the low-voltage electrolytic type, such as the condensers used in "A" eliminators, the voltage of the a.c. source must not exceed a value of three volts. Should the voltage exceed this value it is apt to damage the condenser. For the purpose it is best to use a low-voltage transformer with a rheostat inserted in the primary winding circuit. This rheostat should have a value of from 0 to 1,500 or 2,000 ohms. The measuring instruments are an a.c. voltmeter of low-scale reading, and the a.c. ammeter should have a maximum scale range of 10 amperes.

The formula to be used is:

$$C = \frac{I \text{ (amperes)} \times 1{,}000{,}000}{6.28 \times f \times E}$$

where the terms remain the same as the formula above with the exception of I, which is in amperes.



1922 ad

CLASSIFIED

Classified ad rate: 6¢ per word
Photo ads: $2.00 extra
Deadline: 20th of the preceding month.

PHOTO ADS ONLY $2.00 EXTRA

List ads - 35¢ per line

AD SPACE:
full page.....$50.00
half page.....$25.00
quarter page..$12.50
multiple runs.....
20% discount

MISCELLANEOUS

REPAIR: I restore vintage radios quickly and provide a meaningful warranty. Home or car type made to play like new. Maury Zivitz, Ph.D; 11503 Atwell Drive; Houston, TX 77035; (713) 723-4254.

"JERRY'S MUSICAL NEWS" (OVER 500 subscribers) phonographs, radios etc. ads. Subscription $6. year. Sample 50 cents. 4624 Woodland, Edina, MN 55424.

FOR SALE OR TRADE

FOR SALE: AUTHENTIC REPLICAS: FRONT PLATES FOR AK VARIO COUPLERS, VARIOMETERS, TYPE 11 TUNER, DIALS, KNOBS, POINTERS, BINDING POST NUTS, PUSH BUTTONS, BELT DRIVE PULLEYS FOR AK AND MUCH MORE. SASE FOR LISTINGS. K. PARRY, 17557 Horace, Granada Hills, CA 91344.

FOR SALE OR TRADE: OLD RADIO BOOKS, next 5 sales lists for a $1.00. RADIOGRAPHICS BOOKS, Box 18492, Cleveland Heights, OH.... 44118.

FOR SALE OR TRADE

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2 SIDED METAL ENAMELED SIGN 4 color 23 1/2 X 21 $250
TUBES- OVER 700 TUBES (220-01As, 65-71A, 78-80s, 70-26s,30-27s, 30-45s,30-47s, 75-24s) plus others, all $550 Speakers- AKE, E2 $30 ea., RCA 100,100A $30 ea. Utah "U" shaped horn $30 Radios - all working excellent or mint cases AK 37 W/spkr $120,AK44 w/spkr $140, Stromberg 635A w/ stand $140, Majestic 200 gothic cathedral $90, Keil table AK60 $75, RCA coinop $40, AK Radiodyne 10 $600.00, Some AK cathedrals mint not cheap 10 headsets and spares all $35 Ryder Manuals 1-21 w/index $300 AK spark coil $35 Plus many accessories in original boxes. D. Dexter, 151 Hudson St. NY NY 10013 (212) 226-4885.

****

SALE: THREE WD11'S. two that meet original specs exactly and one dud. All vacuum tipped and two with brass base. Sold as group only. Best offer over $80 Maury Zivitz, Ph.D; 11503 Atwell Drive; Houston, TX 77035; (713) 723-4254.

****

BRITISH SCIENCE MUSEUM BOOK, "Thomas Edison, Professional Inventor," $4.35 postpaid. J. Denny, 2929 N. Westmoreland, Arlington, Virginia 22213.

****

AK PARTS, AK SETS, OLD RADIOS, TUBES, TEST EQUIPMENT, RIDERS, RCA, ZENITH, PHILCO SERVICE DATA PLUS MORE. MAGAZINES, LIST 3-81 SEND 50 CENTS PLUS LARGE SASE WITH 30 CENTS IN STAMPS. KRANTZ, 100 OSAGE AVE., SOMERDALE, NJ 08083.

****

FOR SALE OR TRADE

****

376 CILLEY RD.
MANCHESTER, N.H.
03103

RESTORATION
REPAIR

VRS
VINTAGE RADIO
SERVICING

(603)
669-1698

-BUY-
SELL - TRADE

****

TOWER HORN SPEAKER, AK 40, RADIOLA R.C., PHILCO 84. MANY OTHER BATTERY AND A.C. SETS AND PRINTED MATERIAL. SEND SASE FOR LIST 4-81. DAVID McKENZIE, 170 WEST 53 RD STREET, HIALEAH, FL 33012.

****

TRADE OLD RADIOS-CATALOGS-LITERATURE-PARTS-TUBES FOR OLD STRINGED MUSICAL INSTRUMENTS-FIDDLES-GUITARS-MANDOLINS-BANJOS-ETC. REGARDLESS OF CONDITION. PLEASE DESCRIBE. CECIL BOUNDS, PINE SPRINGS RTE., CARLSBAD, NM 88220.

****

HI-FI, TAPE, AUDIO, and radio retail magazines and brochures: 1930-1935; Regency FM; early 1950's transistor sets. Have trade items. H. Layer, AV-SFSU, 1600 Holloway, San Francisco, CA 94132. .

****

SELL:- Collection of over 7000 modern and semi-modern radio tubes, some carbon lamps, and some antique radio sets and parts. Send SASE for list of tubes, and SASE for list of sets and parts. Bill Laverty, R.D. 1 Box 62K, Egg Harbor, NJ 08215.

****

NEWLY PRINTED TUBE MANUALS. TUBE characteristics baising diagrams VT numbers and commercial equivalents and substitution guide $4.50. Radio diagrams $1.25. Willis Housel, 3311 S. 54, Lincoln NE 68506.

****

I MIGHT HAVE THAT HARD TO FIND tube. Send needs and SASE. Sorry no WD-11s. Cecil Bounds, Star Rte. 1, Box 420, Carlsbad, NM 88220.

****

NEWLY PRINTED TUBE MANUALS FOR antique and obsolete tubes $5.00 Radio diagrams $1.25. Willis Housel, 3311 S. 54, Lincoln, NE 68506.

****

FOR SALE: CATHEDERAL, BATTERY and AC RADIOS from 1920's and 1930's. Please send self address stamped envelope. J. Albert Warren, Box 279, Church St., Waverly, PA 18471.

****

FOR SALE OR TRADE

****

ANTIQUES - Tuska Superdyne Junior. Rare. Beautiful. $295 W/T; Westinghouse (Radiola) RADA Receiver. Works. Nice. $180.00; Radiola 100A Speaker $25.00; Both 195; "Works for same speaker $7.50; National HRO 5TA, WWII Communications receiver, four sets of coils, matching speaker and power supply. Absolutely immaculate. $150; Mozart Grand horn speaker. Good. $45; Instructraph, 10 tapes. $30; Edison "Standard" morning glory graphophone horn. Good. $75.00. Want, or will take in trade on above: Early antiques, especially spark equipment: gaps, Transformers, condensers, Helix, Oscillation transformers, Kick back preventers, very old books, QSTs. Write SASE. All plus UPS. Paul C. Crum, 6272 N. Cicero Avenue, Chicago, IL 60646.

****

SASE FOR 2 PAGE LIST OF RADIOS FOR SALE. WANT TO BUY HAM GEAR. SO ALL MUST GO. D. A. SWINDAL, 1112 SAN JOSE LANE, HANAHAN, SC 29406.

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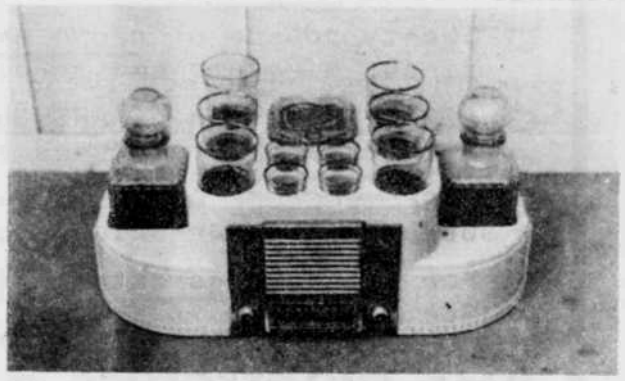

RADIO BAR BY STEWART WARNER NO. 9008A $575.00 or trade for outside horn phonograph. (503) 476-1078.

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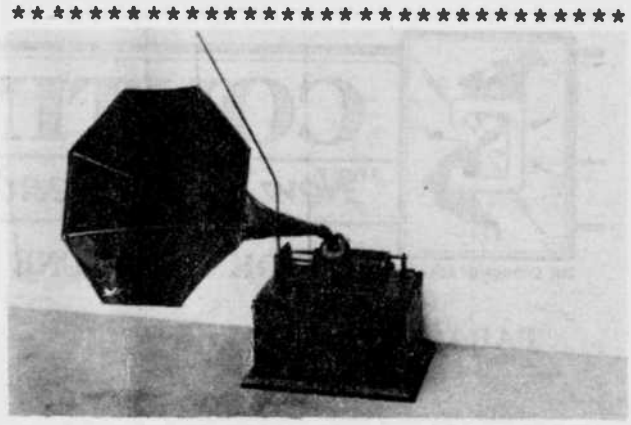

EDISON FIRESIDE incomplete $195. More phonographs. battery radios cathedral radios. test equipment horns. pictorial lists $2.00. Seidel, 925 Starlite, Grants Pass, OR 97526.

****

FOR SALE: NOW AVAILABLE -- COMPLETE PLANS FOR BUILDING YOUR OWN RCS-728 "A", "B", & "C" POWER SUPPLY. $4.50 TO GARY SCHNEIDER, 6848 COMMONWEALTH BLVD., PARMA HGTS., OH 44130.

****

FOR SALE OR TRADE

****

OLD TUBES - 20'S, 30'S, 40'S. Lots of 100 or more, $1 per tube Unused, original boxes, John Greeley, 1201 S. Fifth, La Crosse, WI 54601 (608) 784-24535.

****

WANTED

MICROPHONES for broadcast archive. Early carbon, dynamic or ribbon types. Purchase or trade. James Steele, National Association of Broadcasters, 477 Madison Avenue, New York, NY 10022.

WANT: BOTH AUDIO TRANSFORMERS FOR CROSLEY TRIRDYN, Maury Zivitz, Ph.D; 11503 Atwell Dr.; Houston TX 77035; (713) 723-4254.

WANTED : CORRESPONDENCE WITH anyone having English or French make of radios, 1920-1931 era. Also information on source for various diameter resistance wire as used in older bleeder rheostats, etc. DARCY BROWNRIGG, CHELSEA, QUEBEC, J0X 1N0 CANADA.

WANTED: "SEALED CATACOMB" FOR RADIOLA 25. Good mechanical and electrical condition necessary for radio restoration. Also need loop antenna for Radiola 25. James Briscoe, 119 Jan Lynn Lane, Hillsboro, OH 45133.

WANTED Cabinets for following radios: Federal 135, panel is 17-3/8" H, 11" wide. Cabinet for Grebe Synchrophase, its panel is 7 inches high and 19-3/8 wide. Cabinet for Kolster model D-6. Need Federal #35 R.F. transformer. Ralph G. Maddox, Purgitsville, WV 26852. Tel. (304) 289-3069.

WANTED: VICTOR RADIO RECEIVER and Electrola model 9-18, 9-25, or 9-55 and also AK cathedrals. Ken Zander, P. O. Box 2652, Sunnyvale, CA 94087. (408) 248-3555

WANTED --- COCKADAY 4 CIRCUIT TUNER RADIO. THIS IS A KIT RADIO. J. ALBERT WARREN, BOX 279, WAVERLY, PA 18471.

HAPPY COLLECTING

****

WANTED

WANTED: BREADBOARDS -- 4 TUBES or less. Anything pre 1922. What have you got?? Postage refunded. Ray Garner, Rt. 10, Box 645M-1, Ft. Worth, TX 76135.

WANTED: GENERAL ELECTRIC NE-18 2 watt bulbs. Also scanning discs. 3 - stage resistance coulped amplifiers. Darcy Brownrigg, Chelsea, Quebec, J0X 1N0, Canada.

CASH FOR DECEMBER 1915 TO DECEMBER 1921 QST's for personal collection. Ken Miller, K6IR; 16904 George Washington, Rockville, Maryland, 20853. (301) 774-7709

WANTED: VICTOR RADIO RECEIVER and Electrola model 9-18, 9-25, or 9-55 and also AK cathedrals. Ken Zander, P. O. Box 2652, Sunnyvale, CA 94087. (408) 248-3555

WANT CONE FOR SAILBOAT SPEAKER 3 1/8 inches deep in middle, 17 inches in diameter. E. P. Remski 920 Walnut Avenue, Bohemia, NY 11716.

WANTED: SCOTT RADIO IN NAPIER CONSOLE (radio in open on top of console); any original Scott literature; Scott FM tuner; Scott FM converter (old band to new band). Steve Chapman, 419 Bird Lane, Waxahachie, TX 75165. tel. (214) 937-2726 (evenings).

WANTED: 1940 R.C.A. VICTOR RADIO -PHONOGRAPH combination no. V-201, 1926 R.C.A. Victor Radiola - Automatic Electrola no. V.E.9-55, Brunswick Radio with automatic Panatrope and others. David Galanek, 111 Eastwood Rd. Bridgeport, CT 06606.

WANTED: SCOTT RADIO IN NAPIER CONSOLE (radio in open on top of console); any original Scott literature; Scott FM tuner; Scott FM converter (old band to new band). Steve Chapman, 419 Bird Lane, Waxahachie, TX 75165. tel. (214) 937-2726 (evenings).

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RADIOS OF THE '30S AND EARLY '40S (working) especially Scott, Arvin, A.K., Crosley and Majestic. One or more or entire collection. Particulars to Arthur Axelman, 20627 Clark St., Woodland Hills, CA 91367 "

****

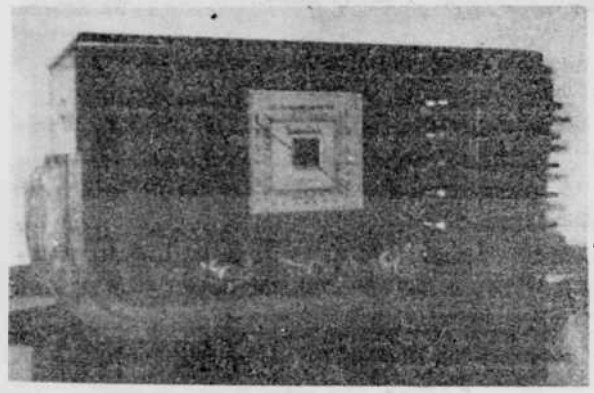
WANTED

WANTED -- COCKADAY 4 CIRCUIT tuner radio. This is a kit radio. J. Albert Warren, Box 279, Waverly, PA 18471.

WANTED: SCOTT 30 TUBE PHILHARMONIC. Must be in original cabinet and in mint to good restorsble condition. Will travel anywhere to purchase. Dave Pierson, 635 E. Buchtel Ave., Akron, OH 44304. (216) 762-5978.

WANT CONE FOR SAILBOAT SPEAKER 3 1/8 inches deep in middle, 17 inches in diameter. E. P. Remski 920 Walnut Avenue, Bohemia, Ny 11716.

AUTOMOTIVE RADIO ITEMS: VIBRATORS, original radios, cable heads, power tuner types, misc. cash paid. trade 1927 QST's. Marvin Roth, 14500 LaBelle, Oak Park, MI 48237.



PLEASE HELP. I love mirrored glass radios. If you have one, or know where there is one, please let me know. I'm also interested in any "wild looking" radios from the 1930's like colored celluloid radios (Fada, Emerson, etc.) and chrome radios. Barbara Gorton, Box 1252, Dayton, OH 45401. (513) 253-5073.

WANTED: 1928-1940 THEATER Horns and Drivers, particularly W-E and RCA. Shearer Two-Way Theater Speaker. Cinaudagraph PE-27 and others. W-E 26A Multi-cell. Rayleigh Disc. Rola Horn Speaker. Rola "Pedestal" Cone Speaker. W-E 713-A H.F. Driver. Call (501) 777-6751. Jim Hunter, % Klipsch and Assoc., P. O. Box 688, Hope, AR 71801.

WANTED FOR DISPLAY: Scanning disc television, Patsy Hicken, WCSC Broadcast Museum, 80 Alexander Street, Charleston, S.C. 29402. (803) 723-8371.

RAYTHEON TELEVISOR LAMP FOR JENKINS Scanning Disc TV. Top price paid for scanners. Bill Russell, 6463 1/2 Fulton Ave. Van Nuys. CA 91401 (213) 989-4086.

****

APRIL

THE HORN SPEAKER

1981

S

**5382*73*
R O HILL
3729 37TH ST EXT
BEAVER FALLS PA-15010