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THE HOBBYIST OF VINTAGE
ELECTRONICS AND SOUND
THE HORN SPEAKER

RADIO NEWS FOR APRIL, 1930

# TELEVISION *Through a* CRYSTAL GLOBE

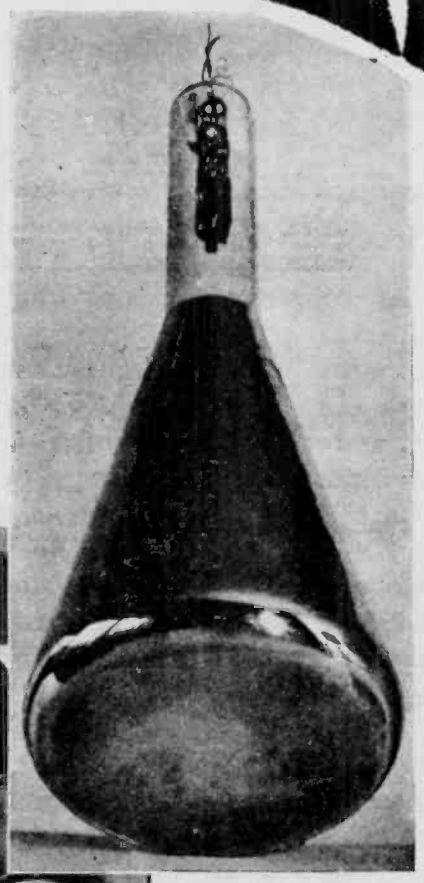
## New Cone-shaped Tube Reproduces 4 x 5-Inch Picture, Is Quiet in Operation and Does Away With Need of Mechanical Parts in Home Receiver

*By* V. Zworykin

*Reprinted by courtesy of the Institute of Radio Engineers*

THE problem of television has interested humanity since early times. One of the first pioneers in this field, P. Nipkow, disclosed a patent application in 1884 describing a scanning of the object and picture, for which purpose the familiar perforated disk was employed and at present the rotating disk is giving excellent results within the mechanical possibilities of our time. The cathode-ray tube, however, presents a number of distinct advantages over all other receiving devices. There is, for example, an absence of moving mechanical parts with consequent noiseless operation, a simplification of synchronization permitting operation even over a single carrier channel, an ample amount of light for plain visibility of the image, and indeed quite a number of other advantages of lesser importance. One very valuable feature of the cathode-ray tube in its application to television is the persistence of fluorescence of the screen, which acts together with persistence of vision of the eye and permits reduction of the number of pictures per second without noticeable flickering. This optical phenomenon allows a greater number of lines and consequently better details of the picture without increasing the width of the frequency band.

This paper will be limited to a description of an apparatus developed in Westinghouse Research Laboratories for transmission by radio of moving pictures using the cathode-ray tube for reception.



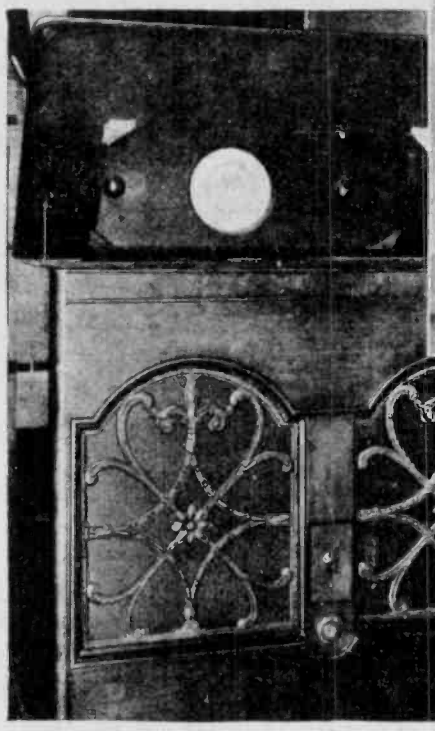


Fig. 1 (above)—A cathode-ray tube — the heart of the Zworykin receiver. Fig. 2 (left) —One type of cabinet receiver housing the Zworykin apparatus

In the author's opinion, if a receiver is to be developed for practical use in private homes, it should be designed without any mechanically moving parts. The operation of such a receiver should not require great mechanical skill. This does not apply to the transmitter, since there is no commercial difficulty in providing a highly trained operator for handling the transmitter, which consists of a modified standard moving (*Continued on page* 949)

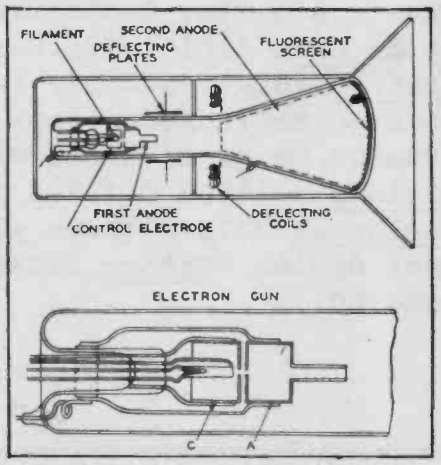
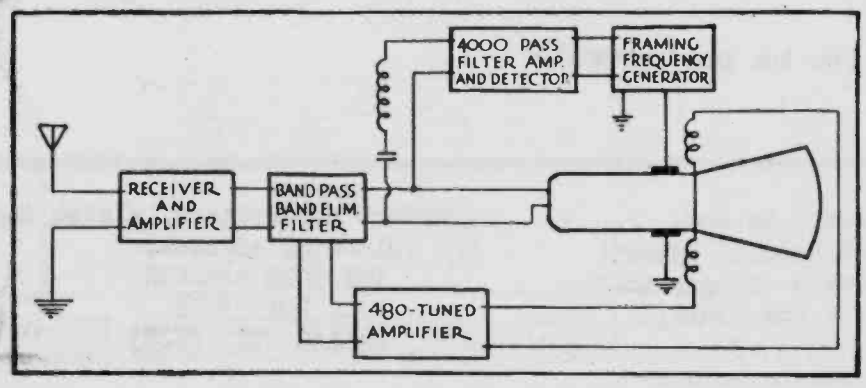



Fig. 3 (above)—Cross-sectional view of cathode-ray tube, including an enlarged drawing of the electron gun. Fig. 4 (left) —Diagram of the band-pass filter which divides the local receiver output into the picture and synchronizing frequencies




picture projector, at the broadcasting station.

The receiver consists of a cathode-ray tube especially designed for this purpose. The principles of the cathode-ray tube are well known from their application for oscillographs. The low-potential type of cathode-ray oscillographs is of the sealed-off type, but the amount of light available from the screen is far too small. In order to give sufficient brilliancy for the picture of 5-inch size, the tube should operate at least at 3,000 volts. For larger pictures still higher voltage is required, since the brightness increases with the accelerating voltage. According to these requirements, a new type of cathode-ray tube was developed. This is shown in Figs. 1 and 3. An oxide-coated filament is mounted within a controlling electrode, C. The cathode beam passes through a small hole in the front part of the controlling element and then again through a hole in the first anode, A. The first anode accelerates the electrons to a velocity of 300 to 400 volts. There is also a second anode consisting of a metallic coating on the inside of the glass bulb. This second anode gives to the elyectrons a further acceleration up to 3,000 or 4,000 volts. The velocity of the electrons at this is about one-tenth that of light. An important function of this second anode is also to focus electrostatically the beam into a sharp spot on the screen. The target wall of the bulb is about 7 inches in diameter and is covered with a fluorescent material such as willemite prepared by a special process so as to make it slightly conductive. Conductivity is required to remove the electrical charges from the screen supplied by the electron beam. This tube will be referred to hereafter in this paper as the kinescope.

The beam of electrons can easily be moved across the screen either by an electrostatic or an electromagnetic field, leaving a bright fluorescent line as it passes. For this purpose a set of deflecting plates and a set of deflecting coils are mounted on the neck of the kinescope, outside the tube. The plates and coils are adjusted in the same plane, so as to give vertical and horizontal deflection at right angles to each other. As a result of the location of the deflecting elements between first and second anode, the deflecting field is acting on comparatively slowly moving electrons. Hence the field strength required is much less than that which would ordinarily be used to deflect the beam under the full acceleration of the second anode voltage.

The brightness of the line can be controlled to any desired extent by a negative bias on the controlling element. The bias controls the mean intensity of the picture whose lights and shadows are superimposed upon this mean intensity. It is evident that if we apply to this controlling electrode the amplified impulses from

the transmitter and at the same time deflect the beam in synchronism with the motion of the light beam across the picture on the film, the picture will be reproduced on the fluorescent screen. Fig. 2 shows a general view of one type of receiver.

If separate channels are available for each of the synchronizing signals, the problem of synchronization of the receiver with the transmitter is very simple. For horizontal scanning, it is necessary only to transmit the scanning frequency operating the mirror as a sinusoidal voltage and to impress it on the deflecting coils of the kinescope. The cathode beam will follow exactly the movement of the light beam across the film.

For the framing or picture frequency, a voltage is generated at the receiving end and merely controlled by signals from the transmitter. A condenser is charged at constant current through a current limiting device, such as a two-electrode tube, so that the voltage at the condenser rises linearly. The deflecting plates of the kinescope are connected in parallel to this condenser, and therefore, when the condenser is charging, this cathode beam is deflected gradually from the bottom to the top of the fluorescent screen at constant speed. This speed is regulated by the temperature of the filament of the charging tube to duplicate the downward movement of the film. An impulse is sent from the transmitter between pictures, which discharges the condenser, quickly returning the beam to the bottom position, ready to start upward and reproduce the next picture.

For transmission of the complete picture, three sets of signals are therefore required: picture signals, horizontal scanning frequency, and impulses for framing. It was found that it is possible to combine all of these sets of signals into one channel. In this case the photo-cell voltage of the transmitter is first amplified to a level sufficiently high for transmission. There is then superimposed upon this a series of high audio-frequency impulses lasting a few cycles only and occurring when the light beam passes the interval between the pictures.

The picture frequencies together with the framing frequencies are then passed through a band eliminating filter, which removes the picture component of the same frequency as that of horizontal scanning. Following this, a portion of the voltage which drives the transmitter vibrator is impressed upon the signals, passed through the filter, and the entire spectrum is used to modulate the radio-frequency carrier.

At the receiving station the output of the local radio receiver is amplified and divided by a band-pass band-elimination filter into two parts; one the synchronizing frequency, and the second the picture frequency plus the framing frequency. The synchronizing frequency is amplified by a tuned amplifier which supplies current to the deflecting coils of the kinescope, Fig. 3.

The picture and framing frequencies are applied directly to the control electrode of the kinescope.

The same voltage which modulates the light is impressed upon a band-pass filter, which is tuned to the frequency of the a.c. voltage used for the framing impulses. The output of this filter is amplified, rectified, and used to unbias a discharging triode which is normally biased to zero plate current, and which takes its plate voltage from the condenser which provides the vertical scanning voltage. Thus, the picture signals and both synchronizing and framing frequencies are transmitted on one channel, and fully automatic synchronization is obtained.

Those who are accustomed to the conventional scanning disk type of television notice a number of differences in the appearance of the picture as viewed on the end of the cathode-ray tube. The picture is green, rather than red (as when a neon glow tube is used). It is visible to a large number of people at once, for an enlargement by means of lenses is unnecessary. The framing of the picture is automatic, and it is brilliant enough to be seen in a moderately lighted room.

Technically, the kinescope type of receiver presents added advantages. The high-frequency motor for synchronization, together with its power amplifier, is not required. The power required to operate the grid of a kinescope is no more than that for an ordinary vacuum tube.

# off the record

Re: RESULTS OF RECENT MAIL AUCTION OF COLLECTIBLE PHONOGRAPH RECORDS.

L. R. "Les" Docks, of San Antonio, Texas, reports that supplying record collectors' wants remains a "sound business." Docks' assessment is based upon the results of his largest record auction to date, which consisted of several sections: 78 rpm hillbilly, country-western, western swing, and cajun; 78 rpm jazz, dance bands, swing, "sweet" bands, personalities and popular vocalists; 78 rpm blues, rhythm & blues, gospel and other "race" records; 78 rpm rock 'n' roll, rhythm & blues, rockabilly, and popular hits of the late 1950s (usually found in 45 rpm form); 45 rpm rock 'n' roll, rhythm & blues, blues, rockabilly, novelty. Most of the 6,000+ records offered were sold (although there are some left-overs). Intense interest was apparent in each category offered, but the highest prices, as expected, were brought by 78 rpm blues and 45 rpm rockabilly discs. Some highlights of the auction- records receiving the most spirited bidding, but not necessarily the highest prices, follow (presented by artist, label, and number).

In the hillbilly section; Gene Autry, Victor 23630, $111.11; Herschel Brown, Okeh 45337, $41.11; Fiddlin' John Carson, Okeh 45379, $46.88; Darby & Tarlton, Columbia 15624-D, $44.77; Ft. Worth Doughboys, Bluebird 5257, $52.57; Lulu Belle & Scotty, Voque R-718, $32.11; Narmour & Smith, Okeh 45377, $32.80; Pine Mountain Boys, Victor 23582, $41.65; Asher Sizemore, Bluebird 5717, $51.65; Ernest Tubb, Bluebird 8966, $41.65; Joe Werner, Bluebird 2076, $23.70. The last disc is a cajun item, and is representative of a number of cajun records in the auction, most of which attracted several or more bids.

Most popular in the jazz, dance band section were: Don Clark & His Los Angeles Biltmore Hotel Orchestra, Columbia 824-D (Bing Crosby's first recording), $20.77; Eddie & Sugar Lou's Hotel Tyler Orchestra, Vocalion 1514, $67.14; Elgar's Creole Orchestra, Vocalion 15477, $78.92; Five Musical Blackbirds, Perfect 14585, $40.06; Henny Hendrickson's Louisville Serenaders, Victor 22749, $30.00; Eddie Lang - Joe Venuti & Their All Star Orchestra, Vocalion 15864, $47.50; Jack Linx & His Orchestra, Okeh 41014, $35.00; Guy Lombardo & His Royal Canadians, Personal Record 140-P, $22.50; Ferd (Jelly Roll) Morton, Silvertone 4038, $103.17; George McClennon's Jazz Devils, Okeh 8143, $31.51; Jimmy O'Bryant's Famous Original Washboard Band, Paramount 12312, $31.11; Red Devils, Columbia 14586-D (blue shellac), $23.17; Frank Trumbauer & His Orchestra, Columbia 2729-D (blue shellac), $22.16; Thomas Waller with Tom Morris' Hot Babies, Victor 21358, $90.02; The Washingtonians, Triangle 11437, $80.60.

**(To be continued)**

**POSTAL IDENTIFICATION STATEMENT**
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# Horn Contour

continued

*by* BRUCE C. EDGAR

SB: What did your first designs of loudspeakers look like?

Voigt: I designed for high flux density on the electro-magnetic moving coil drive. The company blacksmith provided a U-shaped soft iron core, bent, (from memory) out of 2 inch diameter bar. Onto its straight portions went 4 separate coils, each with a carbon lamp across it to take care of the "splash" when switching off, and so, for my earliest high power magnet experiments, I had a 1/4 KW excited field U magnet to experiment with. In due time, I arranged for a pole-tip system suitable for a cylindrical coil. (NOTE, in my school text book at Dulwich, such coils were called Solenoids. Nowadays that word is used to describe such a coil plus iron cores to operate switches, etc.)

In my case the coil actuated a lightweight saucer-shaped aluminum diaphragm, driven via aluminum spokes and supported so as to be able to move very freely. It was surrounded by strips of mother's old carpets to act as a non-resonant baffle.

You will notice that the diaphragms (see Figure2) I show, are based on the "cap of a sphere" shape, with "spokes" which are tangential to the surface. This arrangement I used on the moving coil mikes I experimented with during the development of the recording system and on the early moving coil loudspeaker drives. It never went into production, as I had no satisfactory method of making the spokes adhere the spun aluminum diaphragm.

When the adhesive between the spokes and the al diaphragm gave way, it would rattle under working conditions. When I had overhauled it carefully and had my moving coil system working, I would "turn up the wick", and, alas, within 5 minutes it would be rattling again!

By the time my complete specification of my loudspeaker was under study by the patent examiners, they were aware of the work of Rice & Kellogg, and that anticipated my concept so completely that I removed from the complete spec. and the claims mentioning the moving coil system.

Such removal meant that manufacture for sale was out, but not that I had to give up my "hole in the wall" concept or that I had to give up making experiments with moving coil systems.

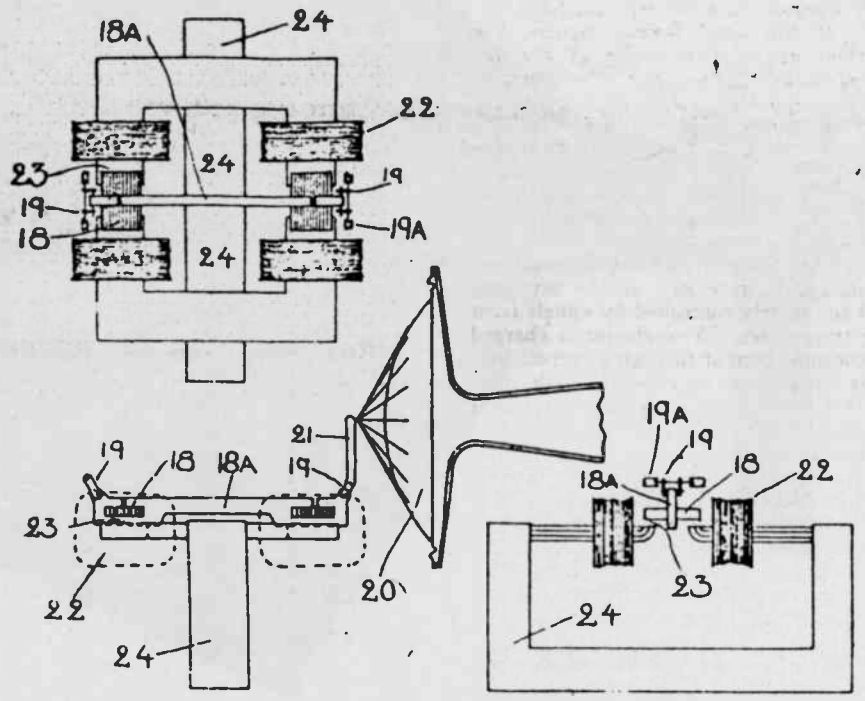
SB: Was this your first patent application?

Voigt: No, I had 6 previous patents granted to me, all on wireless devices. I was eventually granted British Patent # 238, 310 for "Improvements to Sound Reproducers". That is the one which would have anticipated Rice-Kellogg if it had been 2 months earlier. As you will see my application date May 20, 1924, so the Rice-Kellogg application should be in March of that year. I was quite unaware of the work of Rice-Kellogg at that time. The news had had not reached Britain.

(Editor's note: Rice and Kellogg were two American engineers, working for General Electric, who developed the first good electromagnetic moving coil loudspeaker.[2])

FIGURE 2

238,310 COMPLETE SPECIFICATION




Early Voigt moving coil loudspeaker portrayed in a patent drawing. ( British Patent # 238, 310)

SB: How did your first loudspeaker perform?

Voigt: When it was all ready for test, I was looking forward to hearing something vastly better than any previous loudspeaker. I was, upon switching on, very very disappointed. I had never had anything sounding so "tinny". The highs were strong and the lows very poor.

Upon thinking out why such an unexpected result was occurring, I realised that when calculating the load which the square inches of diaphragm area (piston equivalent) were assumed to be working into, I had used the mechanical ohms figure for a plane audio wavefront.

The disappointing result I was getting, I realised, was due to to that assumption being approximately right for frequencies so high that the wavelength was SMALL relative to the dimensions of the diaphragm, but totally wrong when the diaphragm dimensions were small relative to the wavelength. Under those conditions the air, when exposed to the peak pressure of low frequency sound instead of reacting with back pressure, simply ESCAPED sideways out of the compression region, and ditto all that in reverse during the suction half of the sound cycle.

Evidently, some means of PREVENTING those lateral component motions must be provided, and that is how I came to design my horn. Close to the diaphragm, the obvious way to prevent lateral motion, is to fit a large diameter pipe, but analysis of that obvious way shows that while the to and from flow of the air propagating the sound is prevented from lateral motion, it will propagate with a plane wavefront (ar right angles to the inner surface of the pipe) until it reaches the end of the pipe at which the prevention of the lateral component ceases abruptly. That allows the transverse escape there and thus a coupling into an air resistance totally different to the mechanical ohms resistance at the diaphragm.

The parallel pipe thus, basically, only transfers the discontinuity which permits the lateral "escape" near the diaphragm, to a more distant location. IT DOES NOT ELIMINATE THE DISCONTINUITY.

What is worse, is that at the discontinuity, there is a reflection (analogous to that in a transmission line) which travels back to the diaphragm and tends to make the pipe behave rather like an organ pipe!

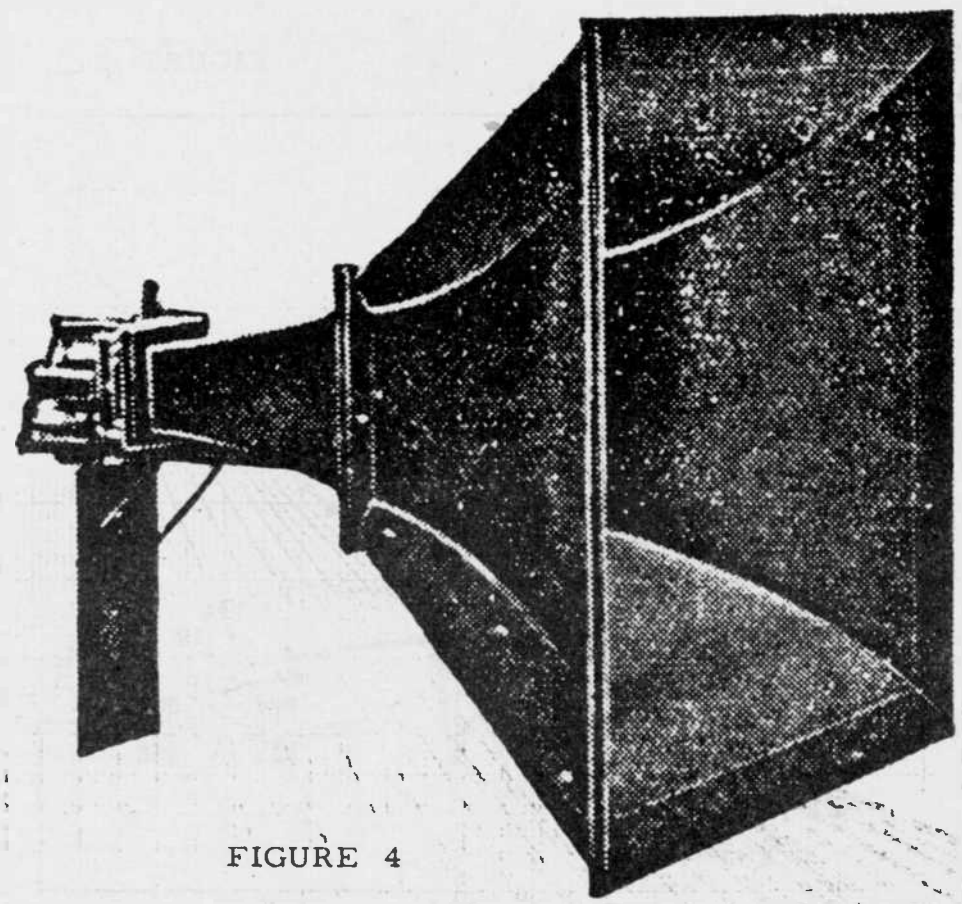


FIGURE 4

angle was reached quite soon, so that it seemed shorter. Later, I learned from our draftsman, that the curve was known in the mechanical world, and that its name was a Tractrix.

SB: How did you come to the conclusion that the wavefronts in a horn must be curved instead of flat?

Voigt: My background was that I was familiar with basic engineering principles. It follows from the most elementary of these, that where the edge of the wavefront rubs on the inside surface of the horn, the wave surface has NO ALTERNATIVE but to orient itself at right angles, i.e., normal to that surface.

Try and imagine the pressure face of a wavefront endeavouring to propagate parallel to the axis, then it will have to leave a gap between its own circumference and the expanding inner surface of the horn. The further forward that wavefront goes, the bigger will the gap become.

AUTOMATICALLY, the pressure wavefront will spread sideways to fill that gap. With such a sideway spread, the volume moving forwards is reduced and thereby slowed down. Such slowing down slows down the wavefront, the effect being greatest where the gap is being filled and least at the furthest distance from the gap. With a circular horn, the expanding gap exists all around the circle, and the furthest distance available to the wavefront is IN THE MIDDLE, i.e., on the axis. Thus, inevitably there is a forwardly bulging wavefront. With a circular horn, will that bulge be 100.000% Spherical? The answer is NO. This will be surprising to most readers, but it is not a serious matter.

So, to sum up, the difference between the tractrix and the exponential with its flat wavefront (theory) is that one was designed by a 24 year old engineer familiar with the elementary mechanics of nature, the other by a skilled mathematician, take your choice!

(Editor's note: On July 5, 1926 Voigt applied for a patent, and he was granted British Patent # 278,098 for the Tractrix Horn in 1927.)

SB: What was the size of your first tractrix horn?

Voigt: The first horn I had made for my lab had a 4 foot square mouth and a 4 inch square throat and was about 5 feet long with a monster magnet. When the 4 foot mouth tractrix was eventually finished, the speaker's frequency range (with the low frequency cut off very gentle) peaked a little before its gradual cutoff but now it was no longer "tinny" in sound, its response went down to below 100 cycles per sec (Hz!) and was still useful at 50 Hz.

My lab had a "cathederal" ceiling, and, from the previous users, (Radio set repair), an erection on to which my monsterous loudspeaker could be raised. It provided the most perfect reproduced sound I had yet heard up to that time. In those days, I did a lot of late work. So, in the evenings up to midnight when the B.B.C. dance music closed down, I had the pleasure of listening to reproduced LIVE music (with NO commercials) from London's leading hotels via the B.B.C.

What the above proved, was that my belief that IF a high average energy efficiency electricity-to-audio transducer could be produced, then the energy response curve would not only be smooth, but that the audio effect would be very satisfying ------- assuming of course, that the polar distribution diagram of the energy did not concentrate parts of the energy into compact beams with the listener located in an area of major concentration.

In my case, the erection on which my 4 foot mouth horn speaker was located ran transverse to the room. The horn's axis was about 9 foot above the floor, and, as I am only about 5 foot, 11 inches tall, my ears will have been about 3-1/2 foot BELOW the level of the axis. About 4 foot from the horn's mouth, along the axis was the wall above the entrance door. So any normal listening to which I was exposed was reflected off that wall, OR it may have come off the back of the diaphragm and been reflected in different ways.

SB: When did your tractrix horns reach public notice?

Voigt: As regards the word tractrix in connections with horns, that did not reach readers of the Gramophone till their November 1933 number when it described a visit to the inventor's exhibition at which Voigt Patents Ltd had a stand (see Figure 4).

SB: How did you construct your cinema horns?

VOIGT: In the drawings I made for the carpenter, the forward flare part was in 4 pieces bolted together, plywood on frames cut to the correct shape. The front was square, and so the sections joined at an angle which from the front was 45° off the vertical. The front opening was 4 foot square while the rear opening of that assembly was 1 foot square. To that could be bolted neck pieces of the length required for their input sources. Now the angle of the ply's relative to each other was not 45°. In fact the angle varied along the length. So I figured out a jig to hold the wood at the appropriate shape and then by sawing vertically, the varying angle would come out automatically. Well, the carpenter could not see the need for that at all. Obviously the angle was 45°, and he had been in the business for many years.

Well, when people know all the answers I do not waste time arguing with them. When I have alerted them I have done my bit. He learned the hard way that horns can look like 45° joints, but they are not. He had an awful job making it fit together.

The curves of those horns were based on the tractrix across the center section. This meant that across the diagonal the tangent would

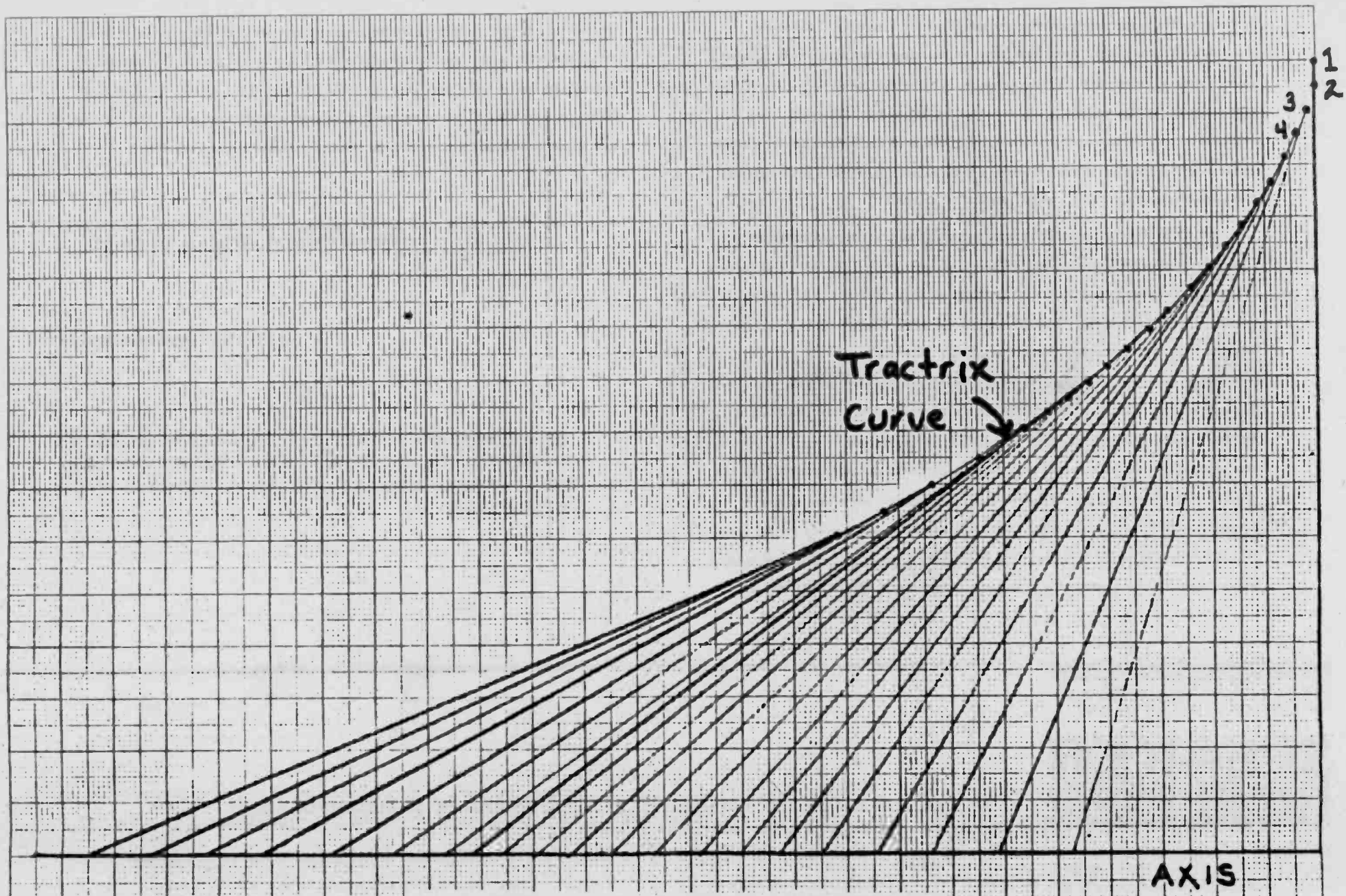



Figure 3 Drawing of the Tractrix curve from instructions of Voigt.

**SB: How did you make the transition from a pipe to a horn?**

**Voigt: Part of the "trick" which is necessary to improve the situation at the output end of the straight pipe is to scrap that shape and put a slight, expanding taper at the diaphragm end. If that taper is "gentle" enough the lateral motion can be reduced so much that it is so slight as not to introduce any major loss of reaction pressure.**

The sound wave will, when in a slightly (outward) tapering pipe, no longer travel with a perfectly flat wavefront. Where the wavefront travels along the surface of the taper, it will, quite naturally travel parallel to that tapered surface. On the opposite side, the tapered surface ALSO causes the wave to travel parallel to it. Thus, the wavefront edges will diverge as necessary to fit the gentle divergence of the expanding taper which encloses it. AND, the beginnings of the normal spherical expansion of a sound wave have commenced.

As the area increases, its relation to the lower frequency wavelengths improves, and, while this is beneficial from their point of view when reaching the end of the horn, they have already suffered a little because of the poorer relationship near the smaller diaphragm. AND, if the taper remains gentle, the wavefront in the horn will only expand very slowly making the horn inconveniently long if that benefit is to be preserved.

What is practical, is to increase the outward taper as the distance from the diaphragm increases. This too is desirable; for by the time the wavefront reaches the opening, ESPECIALLY if there is a flat baffle around the opening, the taper should have increased gradually to a 90 degree angle to the axis. The abrupt discontinuity is then reduced to a rounded surface leading to the baffle, and the ill effects are greatly diminished.

**SB: How did you draw the horn curve?**

**Voigt: The curve (see Figure 3) is easily drawn on drawing board paper by starting with the decision of the semi-mouth size at the 90° to the axis taper. Suppose that that size is to be near 30 cms. Place a rule at 90° to the axis and mark the approximate position of the mouth at 30 cms from the axis. (Point No. 1). Mark clearly the first cm from that point toward the axis. (Point No. 2). Keeping the lower end of the rule on the axis, move the lower end of the rule along the axis, keeping the 30 cm rule point near the clearly marked top cm. In fact, let the edge of the rule pass over point no. 2 (which will be 29 cms from the axis.). When point no. 2 is at 30-1/2 cms along the rule, step the motion along the axis and mark the next point, no. 3, at the 29-1/2 cm mark on the rule. Point no. 3 will be near 28 cms from the axis. Move the axis end of the rule along the axis again so that point no. 3 is at 30-1/2 cms along the rule and mark point 4 at 29-1/2 cms along the rule.**

**A curve will be seen to develop. Continue the above procedure. As the curve flattens out, the steps can be made longer. The wanted curve is the curved line through the points.**

**As I drew out this curve to make the smoothest possible transition from the nearly parallel taper near the diaphragm, to a 90° angle to the axis, I wondered if I had re-invented the standard logarithmic (exponential) curve mentioned in some advertisements, (this was in the mid twenties.). When I plotted the latter, I found that at the throat where the taper was very slight, the difference was negligible. As the mouth was approached, however, the taper increased faster than the logarithmic, and the 90°**

be longer, increasing toward the mouth where it would be 1.414 times the center line tangent. Consequently, on account of making them square as a matter of woodworking convenience, I may have been lucky for if the discontinuity at the mouth at the centerline caused a reflection, that reflectior would be ahead in time of the effect of the discontinuity at the corners of the mouth. With a circular mouth, all the effects of the mouth discontinuity get back a the same time.

I once did have a circular tractrix horn made. It was for outdoor use. The flare was an aluminum spinning 3 ft at the mouth. The unit was housed in an aluminum cast box with a side door. The spun flare was, I think, in two parts. It sounded awfully "horny" compared with what I was use to with my wood horns. But there may have been other reasons.

That throat was circular, my wood horns were square. With the latter you might get a vertical and horizontal "eigentone" affecting the the load on the speaker, but they would spread. With the circular casting (very strong) any eigentone would be radial with a concentration at the center. Since the casting was so strong the would have been negligible give and so the damping would have been small. With the wood horns, there was the rear frame ( 1" thick) and out forward that would be framed with plywood with lots of give and no doubt able to absorb energy. The question of "give" is important. Where a resonance builds up and a wall gives, energy is bound to be absorbed, and so the trouble will not get out of hand. The aluminum spun flare had not the give that the slightly curved ply on the wood had. In fact with some horns, I had so much give and vibration at some low resonance that I had to reinforce the sides to get the response up to standard.

2. Rice, C.W. and E. W. Kellogg, Notes on the Development of a New Type of Hornless Loudspeaker, Trans. A.I.E.E., 44, pp 461-480, 1925.

(To be continued.)





## WANTED

SCOTT RADIO IN NAPIER CONSOLE (pictured at bottom of page)

SCOTT FM TUNER (10 tube unit, with rectangular dial, chrome plated chassis)

SCOTT FM CONVERTER (converts old FM band to new---3 small tubes, 1 knob--has plate with 4 columns of figures & instructions)

Also interested in:

Scott communications receiver (26 tube, crackle finish on metal cabinet)

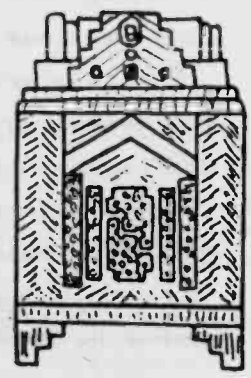
Scott original antenna systems.

Scott Philharmonic (30 or 33 tube)---complete unit, parts, even rough chassis, etc.

Original Scott literature---Scott News, manuals, console brochures, etc., for that matter any Scott memorabilia.

Zenith 25 tube Stratosphere.

These items are wanted for my personal collection, not for resale. I am very interested in Scott radio items and history; would appreciate very much any help or leads you can give. I will be pleased to share any information I have which would be of assistance to you.



Napier console
(tuner chassis in open)

Steve Chapman
419 Bird Lane
Waxahachie, Texas 75165
tel. 214-937-2726 (home, evenings & weekends)
214-937-2720 (office)

Radio News for April, 1930

# Amos 'n' Andy

## Being the Biographies of Two Bumptious Black-faced Broadcasters who Bring Bliss to Billions

By H. P. W. Dixon

AMOS 'n' Andy are two of the best known radio characters in America, and in the last six months—the time they have been on the National Broadcasting Company networks—they have made radio history in broadcasting at least 150 times, which is the equivalent of three years on the air for an ordinary weekly program.

The story of the program can be told in a paragraph. Amos 'n' Andy, two colored men, operate the Open Air Taxicab Company in Harlem. Each night a microphone picks up the highlights of their day as revealed in their discussions with their associates. Their business ventures, their amusements, even their affairs of the heart, are told in their conversations. The story goes on and on, and it has been asserted that if you listen in three nights in succession, you'll be an Amos 'n' Andy fan. The program is the first daily "comic strip" on the air.

Another paragraph will give all that is necessary of the history of the originators of Amos 'n' Andy. They are, in very private life, Freeman F. Gosden and Charles J. Correll. Gosden is Amos and Correll is Andy. Correll was born in Peoria, Illinois, and grew up with the ambition to become an actor. Gosden, a native of Virginia, was an actor when the two men met in North Carolina almost eight years ago. They became partners and for a while traveled about staging amateur revues for Junior Leagues and other organizations. Then they teamed together in a theatrical company. In 1925 they appeared for the first time before the microphone. In 1926 they introduced "Sam 'n' Henry" to the radio audience. Two years later they created "Amos 'n' Andy," popularizing them throughout the Middle West. In 1929, the N. B. C., on the lookout for outstanding radio talent, signed them up and subsequently put them on the air under the sponsorship of the makers of Pepsodent toothpaste.

Not even the sponsors realized how popular they were until a strange thing happened. When Amos 'n' Andy changed from the Columbia Broadcasting System to the N. B. C. network, their program was scheduled for 11:00 o'clock, Eastern Standard Time. Parents and children protested. It was too late for the youngsters, and the youngsters who were Amos 'n' Andy fans were numbered in hundreds of thousands.

It was then arranged to present the pair at 7:00 o'clock in the evening (Eastern Standard Time), in order that youngsters might listen in. Then the squall broke.

Seven o'clock, Eastern Time, means 6:00 o'clock Central Time, 5:00 o'clock in the mountains, and 4:00 o'clock on the Pacific Coast. Fans who had become interested in the adventures of Amos 'n' Andy found out that they would either have to give up their jobs or give up Amos 'n' Andy. The storm broke in Denver, where there was virtually a mass meeting of irate listeners. Thousands upon thousands of letters and telegrams of protest were received by the N. B. C. and the sponsors. Something had to be done. The result was that a precedent was established in radio. Amos 'n' Andy continued to go on the air at 7:00 o'clock Eastern Time, but only in the Eastern Time zone. The same evening they went on the air over a Central and Western network at 11:30 P. M. This proved to be the solution of the problem, and while it cost more money there seemed to be no other way out.

Only the President is considered to have right-of-way over Amos 'n' Andy. When it became necessary to eliminate the program for an evening in order to rebroadcast Big Ben in London on New Year's, there were protests. Any rumor that Amos 'n' Andy are going off the air is followed by a flood of letters. Once when the program failed to go on, it was necessary to have the continuity for that night printed in newspapers.

What is the fascination of the program?

Smart showmen declare it is the continuity of interest. They point to newspaper comic strips as an example of the same technique.

Correll and Gosden have ideas of their own.

"It isn't a wise-cracking program," Correll said in discussing their success. Incidentally, both men are somewhat amazed by it all. "People don't listen in because of the jokes that are told. In fact, the program at times has a decided touch of pathos. Amos 'n' Andy are very human. They have more than their share of faults, and they have many likable characteristics. They are always blundering into scrapes and getting out of them. In other words, they are doing what anyone is likely to do under the same circumstances. The comedy is human. The Negro characterization and dialect merely point it more."

Gosden is very proud of the fact that their sketches aren't considered objectionable burlesques by members of the Negro race. The program is as popular with Negroes as with persons of other races. In fact, the belief is current that they really are Negroes, for, it is pointed out, how else could they so thoroughly understand the characters they portray? Both men, however, are decided blonds.

They make public appearances throughout the country and pack the theaters. It is on record that a member of President Hoover's cabinet personally requested that they make an appearance in Washington. They are almost mobbed if by any chance their identity is discovered on the streets or in public places. They get thousands of letters each week, and—well, the boys are good!

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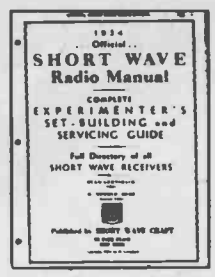


NEW --- WE OFFER IBM PHOTOCOPIES OF THE FOLLOWING BOOKS!!!

(1) HOW TO MAKE WIRELESS RECEIVING APPARATUS - construction details and directions, 1922, by twenty five different radio experts, The Experimenter Publishing Co. (97 pages - 2 pg per copy). . . . . $6.95

(2) THE SUPERHETRODYNE BOOK - a collection of articles covering - every known superhetrodyne circuit, 1926, Radio News, Experimenter Publishing Co. (100 pages 8½ x 11). . . . . $9.95

(3) HOW TO ELECTRIFY YOUR SET by V. Osgood, conversion of battery sets to AC power, 1927, (36 pages) . . . . $2.95

(4) HOW TO BUILD HAZELTINES NEUTRODYNE CIRCUIT RADIO RECEIVER, F.A.D. Andrea, 1923, (39 pages) . . . . . $2.95

(5) ATWATER KENT INSTRUCTION BOOK for MODELS 55 - 60 AC RADIO RECEIVERS, 1929, (18 pages). . . . . $1.95

(6) THE 1934 SHORT WAVE RADIO MANUAL, complete experimenter's set-building and servicing guide, with numerous schematics of short wave receivers of that time period, Hugo Gernsback, Editor, published by Short Wave Craft magazine (240 pages 8½ x 11) . . . . . $19.95

OLD TIME RADIO PROGRAMS!!! *We will soon offer over 200 NEW PROGRAMS!!! Amos & Andy, Fibber McGee & Molly, Charlie McCarthy, Jack Benny, Jimmie Durante, Baby Snooks, Ozzie & Harriet, I LOVE A MYSTERY, SUSPENSE, ESCAPE, QUIET PLEASE, NICK CARTER, The Bing Crosby Show, and many others. SEND ONE 18¢ STAMP FOR OUR NEW LIST OF RADIO SHOWS WHICH WILL BE AVAILABLE SOON!!!*

# SERVICE *Problems*

by Ron Boucher

ANOTHER TECHNIQUE

SEVERAL MONTHS AGO I wrote an article about using "O" rings as replacements drive belts for tuning mechanisms in some radios. Sometimes this method is not practical so I had to come up with another technique.

I sometimes make a replacement belt by using nylon string. Firstly, I thread the string around the pulleys in the drive mechanism and tie a knot leaving about 3 inches of string on the loose end. Do not cut off the remainder of the string; leave it on the spool. Now, operate the dial mechanism so that the knot goes around all the pulleys and takes string from the spool and carries it around the pulleys. Keep going until the knot has gone around the pulleys many times and the knot is in the starting position. You now have a belt consisting of several strands of string. Now, cut the string from the spool and tie that end to the 3" piece you left on the knot. Trim off the loose ends on the knot. As the string is being fed onto the pulleys, be careful not to put the string under too much tension or you could have a belt that is too tight.

Next, I usually brush some rubber cement on the belt to bind the strings together to give it traction. At first this makes a sticky mess but eventually it dries and adheres to the belt.

# club news

MORE VRPS CONVENTION CLUB NEWS

The Vintage Radio and Phonograph Society's 1981 Annual Convention, to be held October 23-25 at the Quality Inn on Highway 183 in Irving, is taking final shape. A Victrola VV IX will be this year's pre-registration prize. Just register before October 16 for your chance to win this example of the popular Victor instrument.

For more information write VRPS at Box 5345, Irving, Texas 75062.

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## FOR SALE OR TRADE

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FOR SALE: CATHEDRAL, BATTERY and AC RADIOS from 1920's and 1930's. Please send self addressed stamped envelope. J. Albert Warren, Box 279, Church St., Waverly, PA 18471.
**********
FIRST AD FREE when you subscribe. (24 issues, 1 year, $7.50). Most diversified swap sheet in America. ELECTRONICS TRADER, Box 73-HS, Folly Beach, SC 29439.
**********
FOR SALE - ATTENTION - SILVER MARSHALL COLLECTORS. 1924 McMurdo Silver's, Silver Six. extra set long wave coils, working, nice walnut case, no tubes .... $125.00. 1927-? S.M. Laboratory Super 8, 2 dial AC set, mahogany case, perfect, no tubes ... $95.00. 1929 AC S.m. 726 SW All Wave, 2 dial, 11 tube super 15-550 meters, 1st rotary band switch, excellent with tubes, no case, speaker not original ... $85.00 All plus shipping. Herb Balmer, 610 N-14th, Maryville, KS 66508. (913) 562-5414.
**********
**********
SELL 10 SIGNAL CORPS. RADIO MANUALS; SCR-54/54A, SCR-67/-67A, SCR-69, SCR-74/74A, SCR-79A/99, SCR-105, SCR-109A-/159, SCR-127/130, Wavemeters and Decremeters (phamphlet #28). Amplifiers and Heterodynes (Phamplet #9). $150 for the lot. W6ME, 4178 Chasin Street, Oceanside, CA 92054
**********
FOR SALE -- ATWATER KENT BREADBOARD, radio is in good condition, audio transformers open, Send SASE. for list of 20's and 30's radios. Also wanted to buy Federal, Grebe and Kennedy radios. Jerry Finamore, RD 2, Box 623, New Castle, PA 16101. (412) 656-0338.
**********
SEND LARGE 35 cent S.A.S.E. for list of radio magazines, catalogs and literature to: G. B. Schneider, 6848 Commonwealth Blvd., Parma Hgts., OH 44130.
**********
AERIOLA SR (EXC) $160. HALLICRAFTERS S20R (EXC - WORKING) $55. WESTERN ELECTRIC CANDLESTICK PHONE AND BELL BOX (WORKING - EXC) $ 75. TEMPLE "SHIP" SPEAKER (V.G. - WORKING (WEAK)) $50. PHILCO 84B $65. PILOT WASP MONARCH (SQUARE TOP MULTIBAND) $40. EMERSON 415 (1933 BAKELITE AC/DC) (MINT) $25. GREBE SYNCHROPHASE (AUDIO'S O.K.) $150. RADIOLA III $70. (AUDIO OK) $70. STEWART WARNER 300 $50. ZENITH 333 (EXC) $60. RON BOUCHER, 376 CILLEY RD., MANCHESTER, NH 03103 (603) 669-1698. PLEASE INCLUDE SHIPPING COSTS.
**********
RCA TELEVISION CONSOLE MODEL TRK-5, RCA TELEVISION TABLE MODEL SET TT-5, DAVEN TELEVISION AMPLIFIER TYPE T-4, PRESTO RECORDER MODEL J-5 WITH MIKE, A.K. BREADBOARD MODEL 10 WITH TUBES, WESTINGHOUSE RC WITH TUBES AND HEADPHONES, FEDERAL 61 WITH TUBES AND FEDERAL HEADPHONES, NATIONAL ELECTRIC SUPPLY CO. CN239, CLAPP-EASTHAM 1/2 KW SPARK TRANSMITTER, THORDARSON TYPE R - 1 KW SPARK TRANSFORMER, 2 WIRELESS SPECIALTY APPARATUS LEYDEN JARS, KENNEDY - 281 S.W. RECEIVER, NO AMP., CLAPP-EASTHAM LOOSE COUPLER 1914 - VINTAGE BOOK P-153. PHIL WEINGARTEN, 67-61 ALDERTON STREET, FOREST HILLS, NY 11374 (212) 896-3545.
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FOR SALE: COMPLETE PLANS for building your own "A", "B", and "C" power supply. Send $4.50 to: G. B. Schneider, 6848 Commonwealth Blvd., Parma Hgts., OH 44130.
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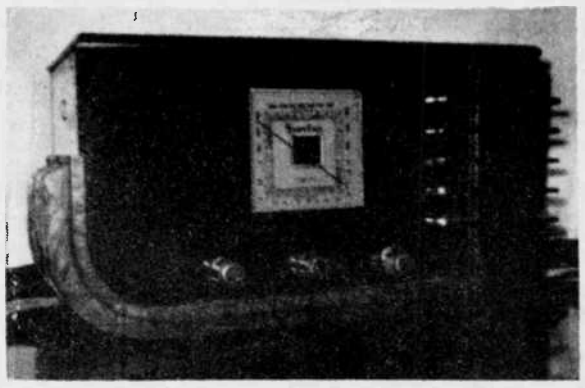
# Wanted



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.

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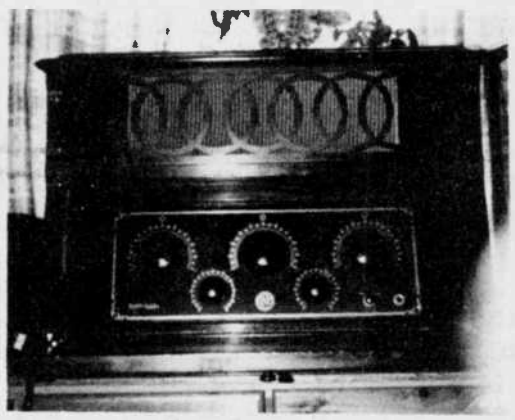

WANTED: NEED POT FOR BECKLEY RALSTON BATTERY RADIO. RUSSELL SCHOEN, R no. 1, BOX 35, CLENTONVILLE, WI 54929.

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CASH -- FOR RADIO RETAILING MAGAZINES, Radio Today, Radio T.V. Retailing, 1925 to 1955, for personal collection. Send your list and prices first letter. Also want Detrola Radio Corp. Advertising, yearly set phamphlets, factory literature, dealer signs, etc. Please no Rider or Supreme info. Or contact me and I will send you my want list. EDWARD BZOVY, 140 North Citrus Ave., Covina, CA 91723.

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WANTED "ELECTRIC CLOCK" for Philco Grandfather clock/radio model 570, Bob Westrick, 702 Broadmoor Dr., Annapolis, MD 21401. Call collect (301) 757-5661.

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WANTED: EARLY CEILING OR TABLE FANS. ESPECIALLY ODD OR UNUSUAL TYPES. RICHARD CANE, 8391 N.W. 21st ST., SUNRISE, FL 33322.

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WANTED: SCOTT radio in Napier console (radio in open on top of console), Scott FM tuner, Scott FM converter, Scott Communications receiver, original Scott literature, Zenith Stratosphere 25 tube receiver. Steve Chapman, 419 Bird Lane, Waxahachie, TX 75165. (214) 937-2726 (home).

---

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: SCOTT PHILHARMONIC. Prefer Napier console. Dick Howe, 9318 Wickford, Houston, TX 77024 or call (713) 680-9945 collect.

---

GLASS CASED RADIO (no home brews) have Federal 110, Kennedy V and other fine sets as trade items. Send S.A.S.E. to Leonard Prince, 25 Merrymeeting Drive, Topsham, ME 04086.

---

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

---

WANTED: AN IP-501 OR NAVY SE*1420. PLEASE GIVE CONDITION AND BEST PRICE. BOB W6ME, 4178 CHASIN STREET, OCEANSIDE, CA 92054.

---

WANTED: SCOTT PHILHARMONIC - SPECIAL COMMUNICATIONS RECEIVER - PHANTOM DELUXE. Also early All- Wave series in original cabinets. Zenith Stratosphere also wanted Highest cash price paid for any of these sets. Also have rare Federal 161 for trade. Dave Pierson, 635 E. Buchtel, Akron, OH 44304. (216) 762-5978.

---

WANTED: INDIVIDUAL RADIO REPAIR AND SERVICE MANUALS FROM 1930 TO 1950 FOR G.E., PHILCO, ZENITH, AIRLINE, CROSLEY, SILVERTONE, STEWART WARNER, EMERSON, AND R.C.A. INTERESTED IN ANY QUANITY. SEND PRICES. CHARLES TEAGUE, 330 SEMINOLE, BOULDER, CO 80303

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WANTED: WESTERN ELECTRIC catalogs and technical manuals on 1946-1981 telephones and accessories such as plugs and jacks. Also need WE plugs and jacks for residential use. Carleton Sarver, 256 West 88th Street, New York, NY 10024.

---

WANTED: SMALL SIZE COMMUNICATION TYPE SETS. (no junk). Please write and tell me what you have and the price. William Hemrick, Route 1, Terra Alta, WV 26764.

---

PHILCO MODEL 18 OR 118 chassis, speaker and knobs or whole things. Will buy other cathedrals. State condition and price. Joe Beach, 6515 SUNSET, GARDEN CITY, MI 48135. (313) 261-7965.

---

SERIOUS NEW COLLECTOR HAS LITTLE TO TRADE, WISHES TO PURCHASE: 1.) RIDERS MANUALS, INDEXES 2.) NEW TUBES IN BOXES; 24A, 26, 27, 45, 47, 71A, 2A6, 2A7. 3.) 30'S RADIO RETAILING MAGAZINES, CATALOGS, ETC. 4.) PRE 1937 A.C. WOOD CASE TABLE RADIOS; WANT MINT OR EXCELLENT CABINETS, WORKING OR NOT, MOST INTERESTED IN A.K., G.E., PHILCO, AND R.C.A. VINNY SHEA, 6 ROCKY RIDGE RD., EASTON, CT 06612.

---

WANTED: CAR RADIO VIBRATORS, NEW, CASH PAID. SIGNAL SEEK AUTO RADIOS; FORD CHEVROLET, ETC. MARVIN ROTH, 145 LABELLE, OAK PARK, MI 48237. PHONE (313) 399-5993.

---

WANTED -- KNOBS TO FIT PHILCO 20 and 60, Stromberg Carlson 642A. Also escutcheon plate for SC6424. Also need AK 60 and SC642A chassis. Jim Conaway, 709 Halstead Rd., Wilmington, DE 19803 (302) 478-5815.

---

RCA MODEL R-5 AC RADIOLETTE, 4 tube T.R.F. set. Vinny Shea, 6 Rocky Ridge Rd., Easton, CT 06612.

---

WANTED: AK 80 CATHEDRAL, Charles Green, 1303 W. 42nd south, No. 3, Wichita, KS 67217 (316) 524-7306.

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A-K MODEL 5, RCA VZ1320 or 1325 speaker, dial light hoods for Radiola 17 and 18. Foot for Radiola 60 cabinet. Wilson, 1475 Mossline Drive, Jackson, MS 39211.

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WANTED CROSLEY 1932 8 tube chassis with speaker. Model 124. Phone (206) 783-6151. Art Corbus, 5704 11th Ave. NW, Seattle, WA 98107.

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WANTED - COILS OR ENTIRE DRIVER to fit AK model L horn speaker, Jim Conaway, 709 Halstead Rd., Wilmington, DE 19803. (302) 478-5815.

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OLDE TYME RADIO COMPANY
ANTIQUE TUBES AND PARTS
********* 1981 SUMMER - FALL ********* *
ANTIQUE HEADPHONES, USED TESTED, ONLY $5.00 A PAIR.
* NEED NAME PLATE OR ESCUTCHEON SCREWS? WE HAVE THEM. BRASS ROUND HEAD. GUAGE AND LENGTH 0 - 1/4", 2 - 1/4", 2 - 3/8", 1 - 1/4", 1 - 3/8", 0 - 3/8". ANY 10 FOR 50 CENTS.
* NEW ITEMS -- CRYSTAL SETS PARTS --GALENA CRYSTALS .. $1.45 EA. CAT'S WHISKERS, PACKAGE OF 2 ..$1.10 EA. CRYSTAL DETECTOR ASSEMBLY WITH CRYSTAL .. $3.35 EA.
* RF, OSC, IF TRANSFORMERS 175KC AND OTHER POPULAR FREQUENCIES .. $2.50 EA. HIGHER FOR SPECIAL UNITS (WRITE).
* NEW ITEMS -- OLDE TYME HEADPHONE AND LOUDSPEAKER REPLACEMENT CORDS. 5 FT. HEADPHONES .BALDWIN TYPE .. $4.25 EA. .BRANDES TYPE .. $4.25 EA. .LOUDSPEAKER .. $3.00 EA.
* SPECIAL -- NEW MERIT POWER TRANSFORMERS, 300-0-300 V AC AT 90MA, 5V AT 3A, 6.3V AT 3.5A, $15.00 EA. OR 2/$25.00.
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* AUTO VIBRATORS -- NEW 4-PRONG 6V, 4-PRONG 12V, 3-PRONG 12V AT LOW PRICE OF $5.00 EA. USED UNITS AT $2.50 EA.
* EXACT REPLACEMENT RADIOLA II OR VIII LEATHER HANDLES .. ONLY $4.50 EA.
* SCHEMATICS FOR SETS MANUFACTURE FROM 1920 THRU 1940 .. $1.50 EA.
* OLDE TYME BAKELITE BINDING POSTS - SINGLES .50 EA., 3/$1.00; TRIPLES $1.00 EA., 3/$2.50.
* RESISTOR LINE CORD REPLACEMENT KITS: 4-TUBE .. $3.50, 5-TUBE .. 4.50.
* TUBES FROM THE 20'S, 30'S, 40'S AND 50'S. MOST TYPES. BOTH USED AND UNUSED. ALL TUBES GUARANTEED- 30 DAYS. (USED- UNUSED) WRITE FOR A QUOTE.
* OLDE TYME RADIO BATTERY CABLE - 5 CONDUCTOR, ALL CLOTH, AK STYLE .. .75/FT. - 6 CONDUCTOR, ALL CLOTH, AK STYLE .. $1.00/FT., - BROWN SILK TYPE POWER CORD .. .30/FT. - SINGLE CONDUCTOR HOOKUP WIRE (CLOTH) .. .12/FT.
* HEADPHONE REPLACEMENT PIN JACK TIPS .. 25 CENTS EA. OR 5 FOR $1.00.
* OLDE TYME AC PLUGS, NEW .. $1.10 EA. OR 3 FOR $2.95.
* CAN'T PROVIDE WD-11'S BUT CAN PROVIDE WD-11A MADE WITH 864 IN WD-11 BASE. WORKS JUST AS WELL .. $15.00 EA.
* SPECIAL - 10-10uf/ 450 V. SMALL FP TYPE ELECTROLYTIC CAPACITORS (MALLORY) .. $1.00. EA. OR 12 FOR $10.00.
* PLEASE SEND SUFFICIENT FUNDS TO COVER SHIPPING COSTS. OVERAGES IF UNDER $1.00 WILL BE CREDITED TO FUTURE ORDERS- OR REFUNDED IF REQUESTED. OVERAGES OVER $1.00 WILL BE REFUNDED AND RETURNED WITH YOUR ORDER WHEN IT IS SHIPPED.

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# CONVENTION
## AND AUCTION

OCTOBER 23-25, 1981

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# PUETT ELECTRONICS

PUBLISHERS OF P.O. BOX 28572 DALLAS TEXAS 75228

ANTIQUE RADIO TOPICS & THE CLASSIC RADIO NEWSLETTER

LIST N/19

HOW TO ORDER - (1) MAKE ALL CHECKS OR MONEY ORDERS PAYABLE TO PUETT ELECTRONICS. ALL PAYMENTS MUST BE IN U.S. FUNDS AND NEGOTIABLE WITHOUT PAYMENT OF A BANK COLLECTION FEE. MONEY ORDERS ISSUED BY POST OFFICES IN CERTAIN COUNTRIES (CANADA FOR EXAMPLE) ARE ACCEPTABLE IF THEY CAN BE CASHED IN A U.S. POST OFFICE.

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| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0A2 | $3 | 1N4 | $6 | 2A4 | $8 | 6A5 | $6 | 6B6 | $6 | 6J8 | $6 | 6SR7 | $5 | 7B5 | $6 | 12AH7 | $5 | 12SH7 | $4 | 25A6 | $6 | 36 | $8 | 59 | $9 | 1201 | $6 |
| 0A3 | $3 | 1N5 | $6 | 2A5 | $7 | 6A6 | $5 | 6B7 | $7 | 6K5 | $5 | 6SS7 | $5 | 7B6 | $6 | 12AT6 | $4 | 12SQ7 | $5 | 25A7 | $6 | 37 | $6 | 70A7 | $7 | 1203 | $6 |
| 0A4 | $3 | 1N6 | $6 | 2A6 | $7 | 6A7 | $9 | 6B8 | $7 | 6K6 | $5 | 6ST7 | $5 | 7B7 | $7 | 12AT7 | $4 | 12SR7 | $5 | 25AC5 | $6 | 38 | $6 | 70L7 | $8 | 1231 | $6 |
| 0B3 | $4 | 1J5 | $6 | 2A7 | $6 | 6A8 | $7 | 6BA6 | $3 | 6K7 | $6 | 6SU7 | $5 | 7B8 | $6 | 12AU6 | $3 | 12SW7 | $5 | 25B6 | $6 | 39 | $6 | 71A | $9 | 1232 | $7 |
| 0C3 | $4 | 1J6 | $6 | 2B7 | $6 | 6AB4 | $4 | 6BE6 | $4 | 6K8 | $6 | 6SV7 | $5 | 7C5 | $5 | 12AU7 | $3 | 12V6 | $4 | 25C6 | $6 | 40 | $9 | 75 | $8 | 1273 | $6 |
| 0D3 | $4 | 1L4 | $6 | 2E5 | $10 | 6AB5 | $18 | 6B36 | $4 | 6L5 | $6 | 6S27 | $5 | 7C6 | $8 | 12AV6 | $4 | 12Z3 | $4 | 25L6 | $6 | 40Z5 | $5 | 76 | $5 | 1274 | $6 |
| 0V4 | $4 | 1L6 | $12 | 2W3 | $4 | 6AB7 | $6 | 6C4 | $4 | 6L6 | $5 | 6T7 | $6 | 7C7 | $6 | 12AX7 | $4 | 14A4 | $6 | 25S | $8 | 41 | $6 | 77 | $7 | 1282 | $6 |
| 0Z4 | $5 | 1LA4 | $7 | 2X2 | $5 | 6AC5 | $4 | 6C5 | $4 | 6L7 | $6 | 6T8 | $3 | 7E6 | $6 | 12AY7 | $4 | 14A5 | $6 | 25Z5 | $6 | 42 | $6 | 78 | $8 | 1291 | $6 |
| 1A3 | $6 | 1LA6 | $6 | 3A4 | $5 | 6AC7 | $6 | 6C6 | $7 | 6N5 | $12 | 6U5 | $18 | 7E7 | $6 | 12B7 | $6 | 14A7 | $6 | 25Z6 | $6 | 43 | $7 | 79 | $6 | 1294 | $6 |
| 1A4 | $6 | 1LB4 | $7 | 3A5 | $5 | 6AD5 | $7 | 6C7 | $7 | 6N6 | $6 | 6U6 | $4 | 7F7 | $12 | 12B8 | $6 | 14AF7 | $6 | 26 | $7 | 44 | $6 | 80 | $5 | 1629 | $9 |
| 1A5 | $5 | 1LC5 | $6 | 3A8 | $6 | 6AD6 | $9 | 6C8 | $6 | 6N7 | $6 | 6U7 | $7 | 7F8 | $9 | 12BA6 | $4 | 14B5 | $6 | 26A6 | $6 | 45 | $10 | 81 | $9 | 1852 | $6 |
| 1A6 | $5 | 1LC6 | $6 | 3B5 | $5 | 6AD7 | $6 | 6CB6 | $3 | 6P5 | $5 | 6V6 | $3 | 7G7 | $7 | 12BE6 | $4 | 14B6 | $6 | 26A7 | $6 | 4523 | $5 | 82 | $7 | 1853 | $6 |
| 1A7 | $4 | 1LD5 | $6 | 3B7 | $5 | 6AE5 | $5 | 6D4 | $5 | 6P7 | $6 | 6W7 | $5 | 7H7 | $6 | 12C5 | $5 | 14B8 | $6 | 27 | $7 | 4525 | $4 | 83 | $7 | 5881 | $7 |
| 1B4 | $6 | 1LE3 | $6 | 3C6 | $6 | 6AE6 | $6 | 6D6 | $7 | 6Q7 | $6 | 6W6 | $4 | 7J7 | $7 | 12C8 | $6 | 14C5 | $5 | 28D7 | $4 | 46 | $6 | 83V | $7 | 6146 | $7 |
| 1B5 | $6 | 1LF3 | $6 | 3LF4 | $6 | 6AE7 | $6 | 6D7 | $7 | 6R7 | $6 | 6X4 | $4 | 7K7 | $8 | 12F5 | $5 | 14C7 | $6 | 30 | $7 | 47 | $9 | 84 | $6 | 9001 | $5 |
| 1B7 | $6 | 1LG5 | $6 | 3Q4 | $5 | 6AF5 | $6 | 6D8 | $7 | 6S4 | $5 | 6X5 | $4 | 7L7 | $7 | 12H6 | $6 | 14E6 | $6 | 31 | $6 | 48 | $8 | 85 | $6 | 9002 | $5 |
| 1C5 | $4 | 1LH4 | $6 | 3Q5 | $5 | 6AF6 | $9 | 6E5 | $12 | 6S7 | $6 | 6Y6 | $5 | 7N7 | $10 | 12J5 | $6 | 14E7 | $6 | 32 | $6 | 49 | $8 | 89 | $6 | 9003 | $5 |
| 1C6 | $5 | 1LH5 | $6 | 3S4 | $4 | 6AG5 | $4 | 6E6 | $5 | 6S8 | $7 | 6Z4 | $6 | 7Q7 | $6 | 12J7 | $5 | 14F7 | $7 | 32L6 | $4 | 50 | $9 | 117L7 | $9 | 9006 | $6 |
| 1C7 | $6 | 1N5 | $6 | 3V4 | $5 | 6AG7 | $5 | 6E7 | $7 | 6SA7 | $5 | 6Z9 | $6 | 7R7 | $6 | 12K7 | $6 | 14F8 | $8 | 32L7 | $4 | 50A5 | $6 | 117M7 | $9 | VR75 | $4 |
| 1D5 | $6 | 1N6 | $6 | 5AZ4 | $8 | 6AH5 | $5 | 6E8 | $7 | 6SB7 | $6 | 6Z7 | $6 | 7S7 | $7 | 12K8 | $6 | 14H7 | $6 | 33 | $6 | 50B5 | $4 | 117N7 | $8 | VR90 | $4 |
| 1D7 | $6 | 1P5 | $5 | 5R4 | $9 | 6AH7 | $5 | 6F5 | $6 | 6SC7 | $6 | 6ZY5 | $6 | 7V7 | $6 | 12L6 | $6 | 14J7 | $7 | 34 | $6 | 50C5 | $3 | 117P7 | $8 | VR105 | $4 |
| 1D8 | $6 | 1Q5 | $5 | 5T4 | $5 | 6AK5 | $3 | 6F6 | $6 | 6SD7 | $5 | 7A4 | $6 | 7W7 | $6 | 12Q7 | $6 | 14N7 | $6 | 35 | $7 | 50C6 | $7 | 117Z3 | $6 | VR150 | $4 |
| 1E4 | $5 | 1R4 | $6 | 5U4 | $4 | 6AL5 | $4 | 6F7 | $7 | 6SE7 | $5 | 7A5 | $5 | 7X6 | $7 | 12SA7 | $5 | 14Q7 | $6 | 35A5 | $6 | 50L6 | $5 | 11Z4 | $8 | VT 5C | $7 |
| 1E5 | $6 | 1R5 | $3 | 5V4 | $5 | 6AL7 | $9 | 6F8 | $5 | 6SF5 | $5 | 7A6 | $6 | 7X7 | $7 | 12SB7 | $6 | 14R7 | $6 | 35B5 | $5 | 50X6 | $6 | 11Z6 | $6 | FM1000 | $9 |
| 1E7 | $6 | 1S4 | $4 | 5W4 | $5 | 6AQ5 | $4 | 6G5 | $12 | 6SF7 | $5 | 7A7 | $6 | 7Y4 | $6 | 12SC7 | $6 | 14W7 | $6 | 35C5 | $4 | 50Y6 | $6 | 485 | $7 | XXB | $6 |
| 1F4 | $6 | 1S5 | $4 | 5X4 | $5 | 6AQ7 | $5 | 6G6 | $5 | 6SG7 | $6 | 7A8 | $6 | 7Z4 | $6 | 12SF5 | $5 | 14X7 | $7 | 35L6 | $5 | 50Y7 | $8 | 717A | $9 | XXD | $6 |
| 1F5 | $6 | 1T4 | $5 | 5Y3 | $4 | 6AT6 | $4 | 6H4 | $5 | 6SH7 | $5 | 7AD7 | $6 | 10 | $9 | 12SF7 | $5 | 15 | $9 | 35W4 | $5 | 51 | $7 | 879 | $5 | XXL | $6 |
| 1F6 | $6 | 1T5 | $5 | 5Y4 | $5 | 6AT8 | $5 | 6H6 | $3 | 6SJ7 | $5 | 7AE7 | $6 | 12 | $8 | 12SG7 | $6 | 19 | $7 | 35Y4 | $6 | 53 | $15 | 884 | $8 | XXFM | $7 |
| 1F7 | $6 | 1U4 | $5 | 523 | $5 | 6AU6 | $3 | 6J4 | $5 | 6SK7 | $5 | 7AF7 | $8 | 12A5 | $6 | 12SH7 | $5 | 19T8 | $3 | 35Z3 | $6 | 55 | $8 | 950 | $8 | | |
| 1G4 | $6 | 1U5 | $5 | 524 | $5 | 6AV6 | $4 | 6J5 | $6 | 6SL7 | $5 | 7AG7 | $6 | 12A6 | $6 | 12SJ7 | $5 | 20 | $9 | 35Z4 | $6 | 56 | $6 | 951 | $8 | | |
| 1Q5 | $6 | 1V | $6 | 6A3 | $6 | 6B4 | $6 | 6J6 | $3 | 6SN7 | $3 | 7AH7 | $6 | 12A7 | $7 | 12SK7 | $5 | 22 | $8 | 35Z5 | $5 | 57 | $7 | 955 | $7 | | |
| 1G6 | $6 | 2A5 | $10 | 6A4 | $7 | 6B5 | $7 | 6J7 | $6 | 6SQ7 | $5 | 7B4 | $6 | 12A8 | $6 | 12SL7 | $5 | 24A | $7 | 35Z6 | $6 | 58 | $8 | 958 | $7 | | |

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# OCTOBER

# THE HORN SPEAKER

1981

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AERIAL | | | PUSH-PUL AUDIO TR | | | SINGLE CIRCUIT JACK | DOUBLE CIRCUIT JACK |
| LOOP ANTE | | | | | | FILAMENT CONTROL JACK | HEAD PHONES |
| GROUND | | | VARIABLE RESISTOR | | | VOLTAGE REGULATOR TUBE | |
| COUNTER-POISE (CP) | | | VOLTAGE DIVIDER (POTENTIO-METER) | | | BINDING POST TIP JACK | |
| FIXED CONDENSERS | OR | | WIRES NOT CONNECTED<br>WIRES CONNECTED | | | LAMP SOCKET PLUG<br>PLUG RECEPTACLE | |
| VARIABLE CONDENSER | OR | | CRYSTAL DETECTOR<br>PIEZO-ELECTRIC CRYSTAL | | | METER (MAY BE VOLT METER, AMMETER, OHMMETER, MILLIAMMETER, ETC.) | |
| CONDENSERS OPERATED ON ONE SHAFT "GANGED" | | | SWITCH (POWER OR FILAMENT-SINGLE-POLE, SINGLE-THROW SW.) | | | THREE ELEMENT TUBE ("TRIODE") | |
| CONDENSER BLOCK | | | SINGLE-POLE MULTI-THROW SWITCH | | | TWO ELEMENT (DIODE") TUBE RECTIFIER FOR POWER SUPPLY OR DETECTION | |
| R.F. COIL (MAY BE R.F. CHOKE) | | | DOUBLE-POLE DOUBLE-THROW SWITCH | | | FULL-WAVE RECTIFIER TUBE | |
| R.F. COILS COUPLED (R.F. TRANSFORMER) | | OR | FUSE | | | THREE ELEMENT TUBE. A.C. HEATED CATHODE TYPE ("TRIODE") | |
| VARIOMETER (CONTINUOUSLY VARIABLE R.F. COIL) | | "A" "B" "C" | BATTERIES | | | SCREEN GRID TUBE ("TETRODE") | |
| TAPPED R.F. COIL | | | PHONOGRAPH PICK-UP | | | VARIABLE-MU SCREEN GRID TUBE | |
| AUDIO FREQUENCY COIL. (MAY BE A.F. CHOKE) | OR | | MAGNETIC SPEAKER<br>DYNAMIC SPEAKER | | | R.F. PENTODE TUBE | |
| | | | ONE TER) | | | POWER PENTODE TUBE | |