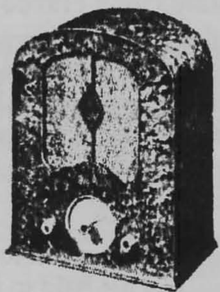
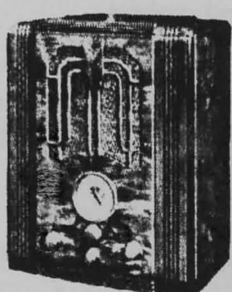
The

Call Letter

of the Northwest Vintage Radio Society

Vol. 24 | September 1998 | No. 9






Bring your favorite tombstone set to the meeting on September 12!

In print since 1974

The Northwest Vintage Radio Society

The Northwest Vintage Radio Society is a non-profit historical society incorporated in the State of Oregon. Since 1974 the Society has been dedicated to the preservation and enjoyment of "Vintage radio" and wireless equipment.

Membership in the Society is open to all who are actively interested in historic preservation. The dues are $15.00 for domestic membership, due on January 1st of each year (prorated quarterly).

The *Call Letter* has been a monthly publication since 1974. It was originated with the founder, Bob Bilbie, and our first president, Harley Perkins. Through several editors and with the assistance of numerous members of the *Call Letter* has continued to be a publication that both informs members of the society's business and that has supported the hobby of collecting, preserving, and restoring vintage radios.

Society meetings are held the second Saturday of each month (except July and August) at the Buena Vista Club House at 16th & Jackson Streets in Oregon City, Oregon. They convene at or about 10 AM for the purpose of displaying radios, conducting Society business, and exchanging information. Guests are welcome at all Society meetings and functions (except board meetings).

Other Society functions include guest speakers, auctions, radio show, and radio sales which are advertised in the *Call Letter* and are held in and around Portland.

Society Officers:

President	David Rutland	(541) 929-4498
Vice-President	George Kirkwood	(503) 648-4809
Treasurer	Ed Charman	(503) 654-7387
Secretary	Liles Garcia	(503) 649-9288
Board member at large	Jerry Talbott	(503) 649-6717
Call Letter Editor	Rick Walton	(503) 284-5648
Librarian	Tony Hauser	(503) 629-4836

The Society's address is:

The Northwest Vintage Radio Society
Post Office Box 82379
Portland, Oregon 97282-0379

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On the cover: Four Grunow tombstones serve as reminders to members to bring their favorite tombstones to the next meeting. Depicted are: Model 460 (upper left), Model 570 (upper right), Model 660 (lower left), and Model 750 (lower right). These pictures were taken from an ad in the November 17, 1934, issue of *The Saturday Evening Post.*

Call Letter Deadline
25th of the month
prior to publication.

Rouse yourself from the Summer doldrums! Don't miss the meeting on September 12 in the Buena Vista Club House. We'll be looking for you!

Visit the NWVRS web site at:
http://www.peak.org/~wren/nvrs.html.

From the Editor

by *Call Letter* Editor, Rick Walton

School is starting up, Labor Day has marked the unofficial "end of Summer," and the Society resumes its monthly meetings. I look forward to seeing many of your faces again.

The first order of business for your editor is to apologize to Pat Kagi for failing to list his change in e-mail address. I listed Pat's name, copying all the information from the entry in the Roster, but I forgot to finish the job by listing the new e-mail address. So Pat is listed in the Roster Corrections again, this time with the correct e-mail address.

This month my predecessor, Dick Karman, has contributed an excellent article by Kim Smith dealing with variacs (or variable autotransformers) and their uses as test equipment and power supplies. The article is full of useful information that goes well beyond bringing up a set for the first time. The article is bound in this issue as the "centerfold" so you can take it out and save it separately for reference.

Mike Parker is taking a breather for the Summer but he'll be back "In the Shack" this Fall.

1998 NWVRS Calendar of Events

September 12	Regular meeting. Monthly feature: Tombstones.
October 10	Regular meeting.
October 31	Fall Swap Meet. National Guard Armory, Washington Co. Fairgrounds, Hillsboro, Oregon.

Variacs

for Use as Test Equipment and Power Supplies

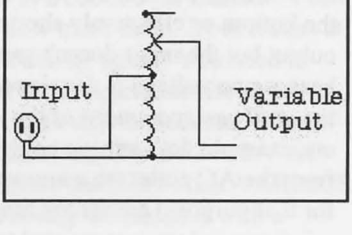
• By Kim Smith

This is a "primer" on Variacs for the neophyte bench technician.

Nearly everyone has heard of a *VARIAC* or *autotransformer* but nearly everyone also asks; *"What can you DO with it?"* Why should you use a variac to begin with? To answer both questions, you have to consider the ancient antique radio you just bought - your prize! You are so proud of it after just bringing it home and now you want to plug it in. You feel giddy - will it work or not? You flick the switch and **POW!** something inside blows faster than you can say; "Quick - turn it off". As often happens with antique radios, their ancient capacitors are either wax paper or old electrolytics. The foiled, wax paper is "leaky" and now drawing a load as a resistor - building up heat - melting the wax - and eventually creating a short. The old electrolytic cap is dried out and may just be "open" (no capacitance) or shorted. These are common ailments in capacitors in antique radios along with shorted vacuum tube elements, all of which will create problems instantly with the inrush of a full operating electric current during turn-on. Given the general situation that MOST vintage radios were manufactured without FUSES, something else within the radio set will usually become the "fuse".....which is why so many electrodynamic speaker field coils, for example, are opened-up. They were usually in the Plate B+ circuit somewhere and when there was a shorted tube, they were the first thing to go - *often with a "whimper" instead of a "bang"!.*

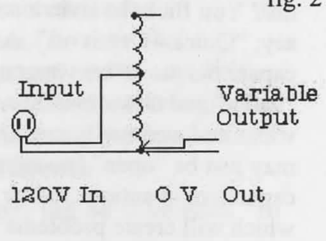
Now - Why should you use one? Answer - to help protect your electronic antique during it's initial "power-up" and servicing. Ancient electronic circuits need to be brought up **SLOWLY** especially after you initially acquire them! The idea is to limit the *rapid and sudden* inrush of current into fragile and aged components. That is, to bring them up to operating voltages - very slowly, using a variable AC source. This is where the Variac comes into play. Actually, the term "variac" is almost a slang contraction of "variable AC" and they are also known as "autotransformers" and "variable transformers" which is really the more correct term.

fig. 1



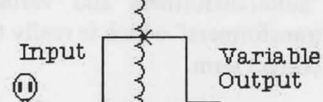
Now - What can you do with them? That is what the remainder of this article will hope to do. First, let's look at the symbol for the variacs (see figure 1). Unlike most transformers which have separate windings for primary and secondary windings, this *variable transformer* has only 1 winding which is common to **both** input and output. Also, there is an arrow in the symbol which indicates that it is variable. What else? There should be something that should be throwing red flags at you - ***there is no* electrical isolation** from the input and output which means that unless you are careful, you stand to get a good shock because you are connected directly to that AC outlet in the wall! This is irrespective of the actual voltage indicated at the output terminals!!! So be careful at the outset OK? Yes, you can work on energized equipment with a variac but be mindful not to touch your equipment chassis and anything else which might make a ground (and complete the circuit through you). Notice also that there are usually 4 terminal connections: 1). A "common" terminal to both input and output on one end of the single winding - the "bottom" of the winding in our diagram, 2). A tap up "most of the way" on the winding for the input, 3). A tap at the "top" end of the winding in our diagram which we generally won't use and finally 4). A variable "slider" that connects across the open windings with a graphite contactor, tapping the voltages developed at various points. The cost of a brand new open-framed variac with the specs of 0-185 VAC @ 1.75-2A is about $100-180 (Newark) (without knobs or mounting hardware) and the fully enclosed, deluxe versions going for about $300! Now, we have a local surplus junk store here called "Grande Junquetion" which can sell you an open-framed variac for $25-35 at the same specs - sound better? Only, they sell it "as is" - no documentation or directions etc. etc. This is where this article hopes to be a help on how to make this junk work as a useful piece of test equipment or even a variable DC power supply.

fig. 2



How do variacs work with only 1 winding? Well, simply, a voltage is developed across the winding and you "tap-off" whatever voltages you want. In figure 2 we are tapping off at the "bottom" of the winding. Notice the "arrow" or slider is at the bottom or effectively shorting out the output but the input doesn't seem to care because no voltage is developed at the sliding tap *until you span more of the windings*. In our example, let's say we apply 120V AC from the AC outlet (to a known proper variac for that purpose) across the major part of the windings and we just wanted to go from 0 to 120V AC, SLOWLY. We'd start with the slider at the bottom and move it up to

fig.3



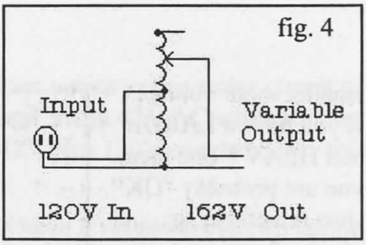
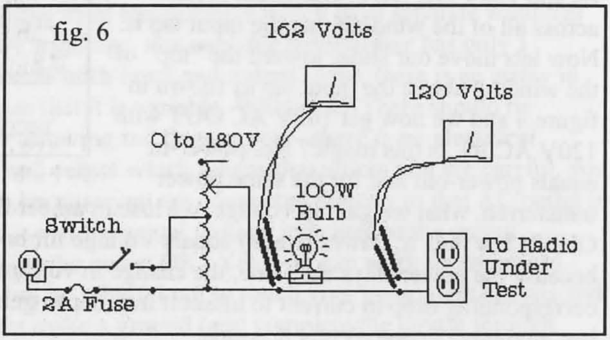


fig. 4

the position indicated in figure 3 - 120V AC IN and 120V AC OUT. Our slider is now across all of the winding that the input tap is. Now lets move our slider toward the "top" of the winding above the input tap as shown in figure 4 and we now get 162V AC OUT with 120V AC IN. Is this magic? No, power-in equals power-out and for the same power transferred, what we gain in voltage, we lose in amperes (current). That is, as OHM's law puts it; Power (watts) equals Voltage times Current (Amperes) so because the power stays the same, the change in voltage will show a corresponding drop in current to offset it in order to get the same power. Have I lost anybody? Power=Volts X Amps.

Now, you just bought something that looked like a variac from a flea market and want to try it out. How do you do this without making a blinding, white light and tripping a circuit breaker (and again, definitely diminishing the faith your spouse has in you for this stuff)? If the terminals on the suspected variac are not marked then you will need to apply power to it through some "Alligator Clip-Leads" and check it's response with a voltmeter or multitester. How to do it safely? Many of us already have the item in the house, perhaps more than one that aren't used - it's sometimes called a "wall wart" or a little block AC adaptor - make sure the output is AC not DC as DC won't work. Look at the block and it usually says what it's output is (e.g. 12V AC). Since this is a surplus wall wart, (nobody knows why we keep old AC adapters but we always do) we will now clip-off the end and strip the insulation on the 2 wires to expose them for our clip-leads (why not, after all, it wasn't doing anything useful in your sock drawer anyway). Now look at your variac and try an find 1 tap at one end and then try an find a tap more than halfway towards the other end - these are where we will clip-lead from the wall-wart to the alleged variac input. Since AC is non-polarized, it doesn't care which wire goes where - just don't short them together. If you are reasonably lucky - you should have a voltage on the variac with which now to measure at the "output" with your AC voltmeter. If you don't, you popped a useless wall-wart. Now, remember that one of the input terminals will be common to the output. Clip-lead one of your voltmeter probes there. With the free probe, try checking around the other taps and rotate the variac shaft (try putting electrical tape on it first for both insulation and better grip) while observing the voltmeter. Does it go up and down in a continuous manner? Yes - then those are probably the terminals we want - now mark them. Does it start at a certain voltage at one end then go to zero then back up again? You need to change the clip- leads on the input taps. It should be a continuous rise or fall from one end of the shaft rotation to the other with no dips in between. What you might see is, for an input of 12V AC, a variable range from 0 to 18 V AC from one end to the other. It's important to remember that NOT ALL VARIACS WILL TAKE 120 V AC ON THE INPUT. That is why we tested it with a smaller input voltage. If you have a LARGE and HEAVY one then, you are probably "OK" -just remember to place a fuse somewhere in the circuit between one of the wires going to the AC plug and the variac itself (2 AMP probably) and incorporating a switch from the AC plug line wouldn't be a bad idea either. If your variac isn't very big, it's probably a "control" type variac operating at a lower voltage, say 60V AC and 120V AC would pop it. But keep it anyway, we have other uses for lower voltage variacs later in this article (good junk must never be wasted!).



Now, supposing we have a viable variac with which to test our vintage radios. You might consider the circuit in figure 6 for your test set. Notice, you have a switch, a fuse, the variac, an outlet socket or line socket (for the radio to plug into) and something else - a 100 Watt light bulb. Why the light bulb? First notice that the light bulb is placed *in series* with the line to the radio in stead of in parallel. If there was a "short" in the line to the radio, the variac wouldn't care. All that would happen is that the 100W light bulb would continue to glow right away and increase in brightness as you increased the voltage because it is now the only "load". Try shorting out the socket to the radio and see for yourself - all that happens is that the 100W light bulb becomes the entire load - *that is, if it was intalled in series with the socket.* This is a good way to tell if you have a problem early on, before much power is applied. If the light bulb starts getting brighter as the radio is running (note we have the radio turned-on BEFORE we start bringing up the voltage on the variac), then you know that you have some component that is starting to go quickly - switch off! Now a quick word about WHY we wanted a variac which went ABOVE 120V AC on the output. This has to do with the light bulb in series. OHM's Law says that the sum of the voltage drops in a *series circuit* equals the total applied voltage. This is why all the filament voltages in an "All-American-5" radio add up to (approximately) 117V - they had no filament transformer so the filaments were all connected in series - some with odd filament voltages such as 25V or 35V and whatever was leftover may have been taken-up with a "ballast" tube (a wise Greek ship captain said;"All in Life Must Have *Ballast*"). Think about it. Add them up in your A-A-5 set. Now it's the same with the 100W light bulb *in series* with your radio. It has a voltage drop of it's own and if you have a variac which only maxes-out to 120V AC, then 30V or so will be dropped by that light bulb leaving only about 90V AC going to the radio which, will allow it to *barely* work, if at all!

Typically, you need about 162V from the variac output to this series circuit of 100W light bulb and radio - the bulb will "drop" about 42V AC while leaving 120V AC for the radio to operate normally. 42V plus 120V equals 162V - this is Ohm's law for series circuits in action.

Notice also in our circuit (figure 6), that I have 2 voltmeters shown taking readings - 1 for the variac total before the light bulb and one at the radio. I had some surplus AC meters which I had connected for this but you can use your voltmeter probes if you wish. I wanted to monitor both voltages. Why? Reason - if I was bringing up a radio and the *total* voltage showed 50V AC but the *radio* voltage showed 0 voltage then, I have a problem right away.

In actual operation, you might notice how the ratio of the voltages changes as both the light bulb and radio warm-up. Those tungsten filaments in both devices will *change resistance* as they warm-up, increasing resitance as they get hotter and thus changing the voltage-drops with the heat. Ohm's laws say that Voltage, Current and Resistance are inter- related.

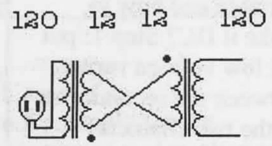


fig. 7

Voltage equals Current times Resistance. If the resistance of the filaments changes when they heat-up then there will be changes in the voltage drops (assuming a steady current is presented to the load). When the radio is fully brought up to 120V AC, slowly, in 25V intervals over a few minutes each interval, the light bulb should be glowing *softly* as if it were only a 25W bulb instead of a 100 watter. Some people recommend bringing up vintage radios gradually over a matter of hours. You will have to experiment with this. I have no advice except for this; IF all you wanted to do was see if it was working initially AND that you will probably replace ALL the capacitors anyway, why risk "heating-up" a leaky wax capacitor over a period of hours and popping something? This [photo not available] photo shows my variac test set mounted to a cutting board with connections made via terminal strips. This test set has also been used to test other variacs to determine their usefulness as well.

Now what about those other variacs? The ones using a max of 60V AC input. Can these be used? Answer - Yes, as in a variable **DC** battery eliminator power supply for your battery operated radio sets. Just how we use them involves placing them into an AC circuit at a later stage. Consider the circuit diagram (in figure 7) showing two filament transformers wired "back to back". We have 120V AC input on the primary winding with 12V AC output on the secondary winding on the first transformer. On the second transformer, we "turn-around" the 12V AC secondary and make it the "primary" or input winding and we get 120V AC on the output of the former primary, now used as secondary winding! The little "phasing" dots show that you should connect up the secondaries in a cross-over arrangement because some transformers will not transfer power unless this is done. This is effectively an *isolation* transformer but in order to be useful, it must be large enough to transfer sufficient current for us to use at the output. This circuit has a LOT of losses and will probably NOT be useful for high current applications but this has *more than enough current* for a B+ battery power supply. Most battery radios only used about 50 to 60 milliamps of B+ plate current. The trick now is - how do you make it variable and how to make it DC? Step 1: put the low voltage variac *between the secondaries* of the two filament transformers as shown in figure 8.

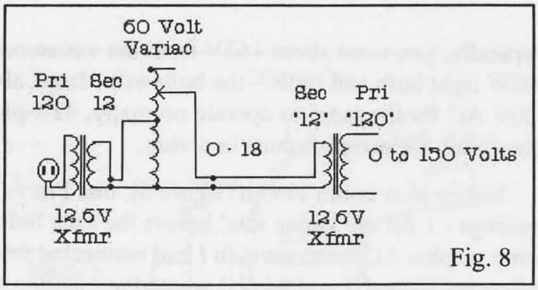
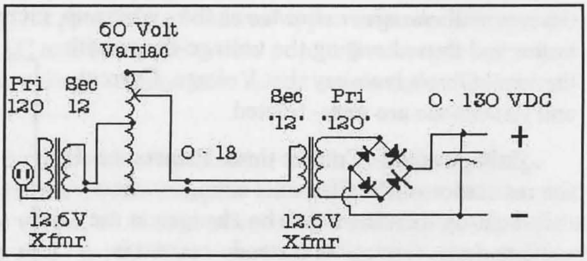
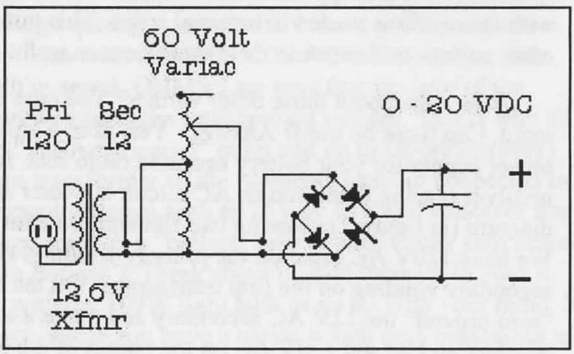


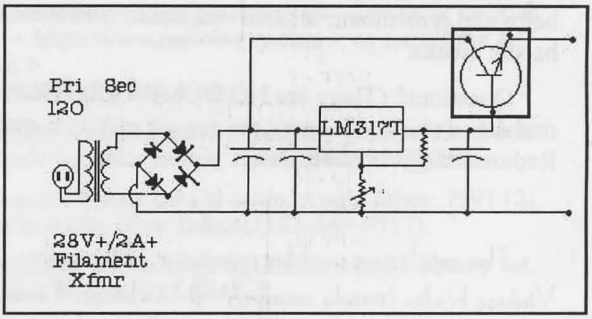
Fig. 8



Notice how you can control the final output of the second transformer by varying the input AC voltage. Step 2: now add a diode bridge and a large filter capacitor as in figure 8 and you now have a variable DC voltage B+ battery supply! What if you need two different *positive* B+ voltages (1 special B+ just for the "det" tube)? Put a large, tapped, 100W, power resistor across the output and set the tap along the resistor for the right secondary voltage while it is adjusted at the larger operating voltage. By the way, did you ever notice how battery voltages came in percentages related to 90V DC B+? That is, 50% of 90V is 45V, 75% of 90V is 67.5V and 25% of 90V is 22.5V - all *common* battery voltages! What if I need a C-, biasing voltage? You probably need an isolated *negative* voltage just to keep things simple and safe and you seldom need anything more than a couple of



volts anyway and it is little hard to do with a tapped resistor with any accuracy. Observe figure 8a with the curcuit using a low voltage variac direct to a diode bridge and large filter capacitor. To make it a negative supply, just connect the negative to the biasing and the positive to the ground reference. One note of caution - check between your various DC circuits for AC potentials because differing designs will be fine in and of themselves for isolated DC but may short out something via an AC route you hadn't anticipated and *never* rectify AC from a variac to a diode bridge *DIRECTLYA from the 120V AC line voltage - you need* **some isolation** from the 120V line source such as an input transformer like the one shown in figure 8b again Aotherwise, there'll...be..trouble.



OK, we have a B+ and C- supply - how about an A+ supply for the filament? Well, most variacs just won't supply enough current (unless they are big, heavy and expensive) and since we just told you not to rectify from them directly, then we have *probably* reached our useful limit of variacs. For A+, DC filament supplies, I recommend going to "Radio Shack" and buying the parts for a solid state, adjustable voltage regulator like the one in figure 9. Here we have a low voltage transformer from 120V to 28V AC to a diode bridge to a filter cap to a circuit for an adjustable voltage regulator, Radio Shack Catalog number: 276-1778. The circuit diagram with parts values is on the back of the blister pack of the voltage regulator. I did add one additional item because it is unlikely that this voltage regulator could handle as much current as the ratings say, even if properly heat-sinked, so I put a large pass transistor with a heat sink following the adjustable voltage regulator. The voltage regulator acts to turn-on the larger transistor in a common-base configuration (the little current controls the larger current here). The raw, high current, positive output from the filter capacitor is applied to the emitter of the large transistor and nothing will reach the output (collector) going to the tube filaments until the adjustable voltage regulator turns it "on" at the base of the large transistor.

The ideal large transistor type is a 2N3771 but they might be a little pricey so I used a slightly less current-carrying 2N3055 because they were very inexpensive and common. Here the voltage regulator acts like a valve to control the large current like a gate valve for water at a large dam. Both the voltage regulator and large transistor need considerable heatsinks for continued, safe operation. For more current carrying capacity, just *"parallel in"* another large transistor into the circuit across the 1st one (e.g. emitter to emitter and collector to collector) and place a 3 tap variable resistor pot in the base feed to both (100 - 500 ohms) with the control input (from the adjustible voltage regulator) to the center tap and output to the transistors at the outside terminals then adjust the pot so that both transistors, under a filament load, till they feel equally "warm" (a quick balancing for more or less equal conduction) - which will usually mean close to exactly 1/2 way on the pot. This design is basic to all large current handling, regulated DC power supplies with the exception that we are using a *variable* voltage reference from the adjustable voltage regulator. I hope this helps and remember; "a good technician is someone who fixes more things than he/she breaks."

Questions? (There are NO DUMB QUESTIONS, so don't be afraid to ask - that doesn't mean I'll know the answer either) E-mail me! Radiosmith@juno.com

This article was used by permission of the author and is provided to NW Vintage Radio Society members at no charge. Formatting errors can be attributed to Dick Karman, of the NW Vintage Radio Society, Portland, OR. The Author, Kim Smith, has some great technical knowledge and is a good writer. You can find his works and those of others at **http://connix.com/~harry/radio.htm** This site is known as Skywaves.

Swap Shop

FOR SALE: Thousands of tubes, hundreds of radio parts, panels, meters, surplus, etc. R5-D3 electronic surplus, Bob Lee, 6111 SE 82nd Ave., Portland, OR, (503) 774-6560.

BUY, SELL, & TRADE: Vintage Radio, Early Television and Hi-Fi.
Wanted: Tubes, Parts and whatever you might have related to early radio & TV. Visit my web-site at: < http://www.radiolaguy.com > or e-mail me at: < sonny @radiolaguy.com >
Thanks, Sonny Clutter, phone (360) 834-5741

WANTED: The Crystal Radio Guy wants crystal sets and toy germanium diode radios. Buy outright, or trade for other radios. Galen (503) 231-9708.

WANTED: **Ch. 9 and 17 plug-in crystals for CB radio. Audio tubes: 7591 (2) and EL34 (2). Have tubes to trade. Jerry Talbott,(503-649-6717).

WANTED: *Schematic and servicing information for Philco 46-131 battery set. Not in Rider's! Contact Rick Walton, 284-5648.

WANTED: *For RP-6, RS-6, etc., military CW transceiver: Power Supply (dead or alive); also, any parts, info, or a schematic for a NORCO (Northwestern Radio) 3-dial battery receiver, made here in Portland. Jim Barratt, (360) 834-4429.

WANTED: Philco 46-1201 radio/phono, the one with the slot to put the record in to play it. Ray Vanderzanden, 648-2287.

FOR SALE: *1948 Crosley 9-122W -$35 and novelty plastic train locomotive (Japan) with name "C.P. Huntington" on it-$35. Jerry Talbott 503-649-6717

FOR SALE: Silvertone console, R/P Model #9108. Good condition, $60. Silvertone console, Model #6335, $75. 1942 Zenith console Model #7S682, cabinet needs to be refinished, $50. Knight console, sloding doors, 1930?, $50. Howard Burgoyne, 650-3828, West Linn.

FOR SALE or TRADE: Over 400 78 records - Big Bands, Frankie Lane, Doris Day, etc. 50¢ each or trade for radios. Howard Burgoyne, 650-3828, West Linn.

FOR SALE: Old records. Contact Tom Johnson, 681-2320, Hillsboro.

Leads And Needs

Radio Theft. Stolen from a vehicle June 7,1998 at Medford, Ore. Scott Radio, consists of tuner and power supply chassis. Chrome plating very good. Has 14 selector buttons (7 down each side) on front panel of wood or simulated wood. Further description on request. Any leads would be greatly appreciated

Please contact: Russ Stone
6790 Hwy. 66
Ashland, Ore. 97520
541-482-8832

or: Rudy Zvarich
2227 NE 102 Ave.
Portland, Ore. 97220
503-255-2227
E-mail is: rhz1@juno.com

Roster Correction

*Kagi, Patrick A. R
6710 NE 65th Ave.
Vancouver, WA 98661
(360) 694-6149 kagi.pat@con-way.com
Plastic and wood table radios, phonographs, and coin operated devices (jukeboxes, pinball, amusement games, player pianos)

* E-mail address change


N.Y. VINTAGE RADIO SOC.