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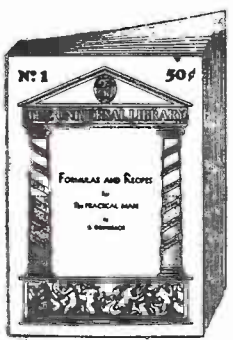
Occupation _____ *Age* _____

THREE NEW 50c BOOKS



FORMULAS AND RECIPES
For the PRACTICAL MAN

CONTENTS

1. Adhesives: Glues, Cements, Gums, Mucilages, Lubricants —2. Cleaning: Stain Removers, Bleaches, Cleaning Fluids —3. Metal Craft: Coloring, Oxydizing, Plating, Repairing, Welding, Polishes, Alloys, Solders—4. Paints: Colors, Stains, Varnishes, Enamels, Luminous Paint, Washable Paint, Paint-Removing, Waterproofing, Fireproofing—5. Glass-Working: Cutting, Drilling, Boring, Bending, Blowing, Etching, Engraving, Frosting, Silvering, etc.—6. Wood-Craft: Fillers, Fireproofing, Acid-proofing, Waterproofing, Furniture Polishes—7. Inks: Eradicators, Ink Stain Removers; Sympathetic, Invisible, Hectograph—8. Photography: Developers, Emulsions, Fixers, Sensitizing, Toning, Printing, Photographic Paper, Blueprint Paper—9. Antitodes for Poisons, Remedies for Burns and Scalds, Disinfectants, First-Aid in Accidents, Home Remedies — 10. Preparation, Manipulation, Handling, Mixing, Emulsifying; Use of Hydrometer, Use of Thermometer; Tables of Weights and Measures, Decimal System, Useful Tables.

FROM the table of contents, it will be seen that the book contains only such material as is constantly needed and can be practically applied by the man who is doing or making things.

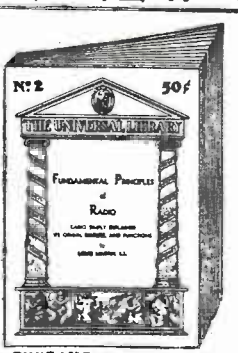
Every formula has been selected with a view to its usefulness to the experimenter and practical technical man.

Not only that.—This book is intended to serve directly for the use of the man who wishes to work out desirable preparations for practical home manufacture, as a means to earning spare-time money.

It is well known, in the case of innumerable preparations that have become household standbys and whose production now runs into millions of dollars of profit—and if the truth were known, this would be found to be the origin of nearly all such successful enterprises—that the biggest manufacturers, who have built up tremendous factories making all those things which you use in your own home, shop, and business, started on the road to success with just such a small beginning as you, perhaps have been dreaming about.

This book will be useful also in helping you to save money by showing you how to make in your own home at a fraction of their usual cost the hundred and one preparations which you now buy ready-made for use in your home or business.

This book has been compiled by S. Gernsback, a well-known author of practical instructional manuals in various scientific fields. You will find it a real help and an instrument for self advancement. It will serve you as a money-saver and a money-maker!



FUNDAMENTAL PRINCIPLES OF RADIO
Radio Simply Explained— Its Origin, Nature and Functions

CONTENTS

Chapter I—Fundamentals of Radio: Electricity, Resistance, Batteries, The Magnetic Circuit, The Magnetic Field, Inductance, Condensers, A.C. Circuits, Propagation of Radio Waves; Chapter II — The Simple Radio Set, Single, Two, and Three - Circuit Tuners, The Battery Set, Vacuum Tubes, Electric Sets, Loud Speakers; Chapter III —Diagrams, How to Read Them, Chapter IV — Amateur and Broadcast Stations, Talking Pictures, Television.

THIS BOOK is intended as a handy fundamental aid for "checking up" and systematizing your knowledge of radio, no matter what stage of the art you have thus far mastered by study or experience.

It is intended for those who may have had to get their first working knowledge of radio through experience in a haphazard fashion and now want to get a more solid grounding in its principles and theory.

It is intended for the practical man, the technician who wants to get a practical comprehensive knowledge of the principles underlying the HOW and WHY of Radio.

The book has been prepared with special consideration for the young members of the profession; and one of the main objects has been to state in plain English the few important elementary principles which the authors of most books on radio envelop in such a haze of technical mystery as to keep their explanations beyond the understanding of the ordinary man.

There is no more mystery about radio in the mind of the reader after he has read this book!

The author, being a former instructor in radio, knows how to go about explaining in simple language, the origin and nature of radio; he leads his reader through clear description and practical analogies, step by step, until he understands the working of the most complicated circuit.

You will find in Mr. Martin's book a really intelligible discussion of a lot of subjects in radio, for which you have never before been able to find an elementary explanation in such easy-to-grasp and understandable terms.

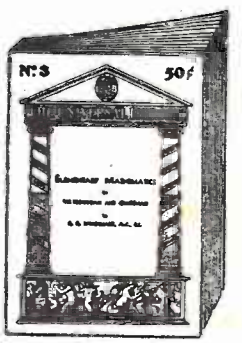
Even if you think that you know a very great deal about radio, you should get this book, even if only to see in what a charmingly easy way Mr. Martin has dealt with a difficult and abstract subject.

THIS MANUAL has been written especially for the man who wishes to acquire a working knowledge of the elementary principles of mathematics for his own every-day use. To provide a complete treatment, the author starts from the beginning of the subject, explaining the first principles of arithmetic in simple, clearly understandable language, and from these, takes the reader by easy steps through all the rules and processes of arithmetical calculation.

A good technician is not always a good mathematician, but the art of computation by figures is easy to acquire, if you are guided by some one who knows how to direct your way and make it easy.

That is the object of this book. Mr. Shainmark, who is an instructor in practical sciences, knows how to explain things in plain English, and his one purpose in this book is to make clear, in terms of daily application, the important basic principles of mathematics which everyone ought to know, whether he be a working man, a merchant, or a professional man.

Special attention is devoted in this book to showing the man who is employed in industry or in technical work, how to apply the working rules of mathematics in his profession or business.



ELEMENTARY MATHEMATICS
For the Technician and Craftsman

CONTENTS

I—Arithmetic: Addition, Multiplication, Subtraction, Division, How to Use Decimals: II—Fractions, Percentages, Ratio and Proportions; III Powers and Roots; IV—The Metric System; V—How to Measure Surfaces and Volumes; VI—Mathematics for the Manual and Technical Craftsman; VII —Special Mathematics for the Radio Technician; VIII—Commercial Calculations, Short-cut Arithmetic, Interest Calculation, Discounts; IX — Weights and Measures; X —Useful Tables.

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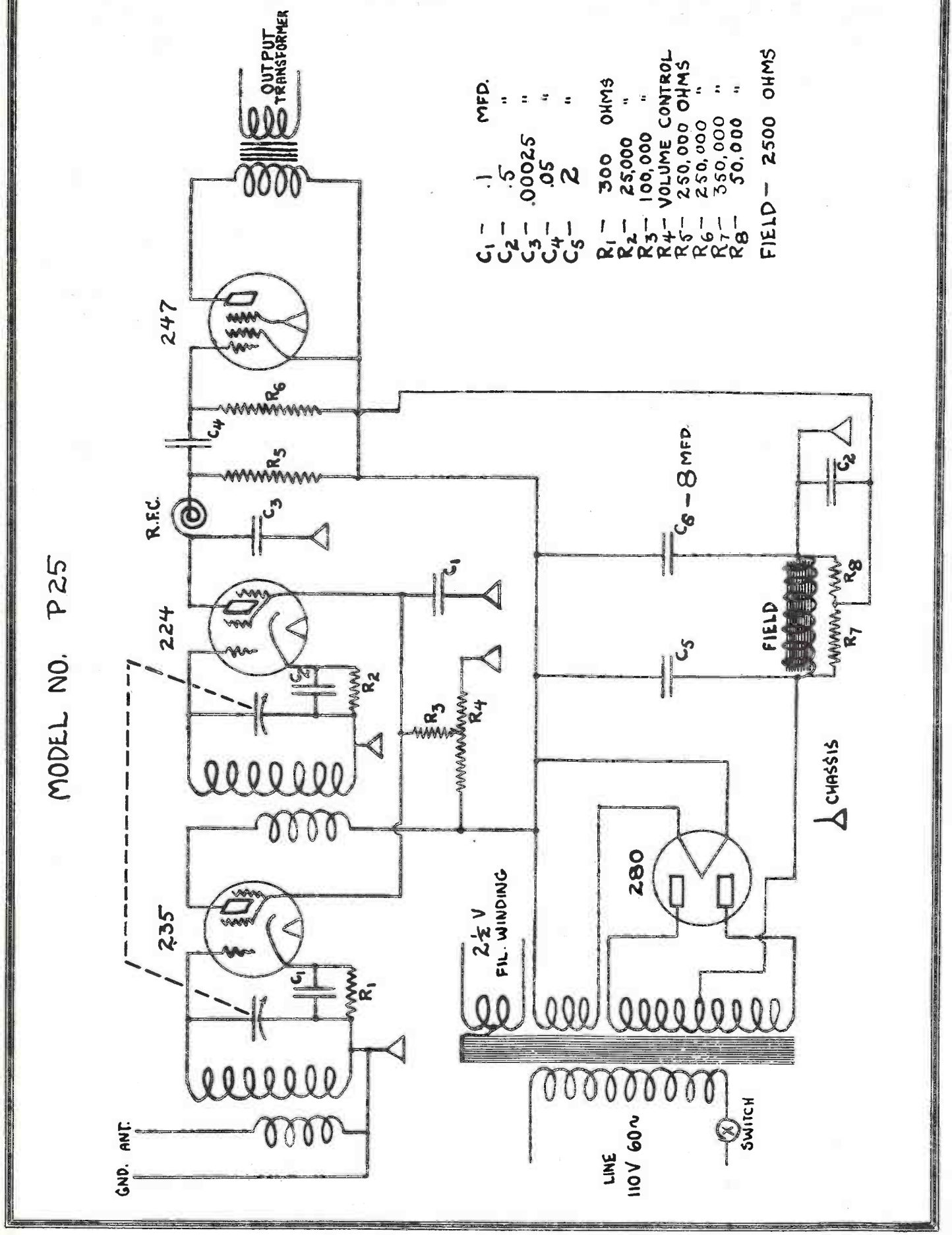
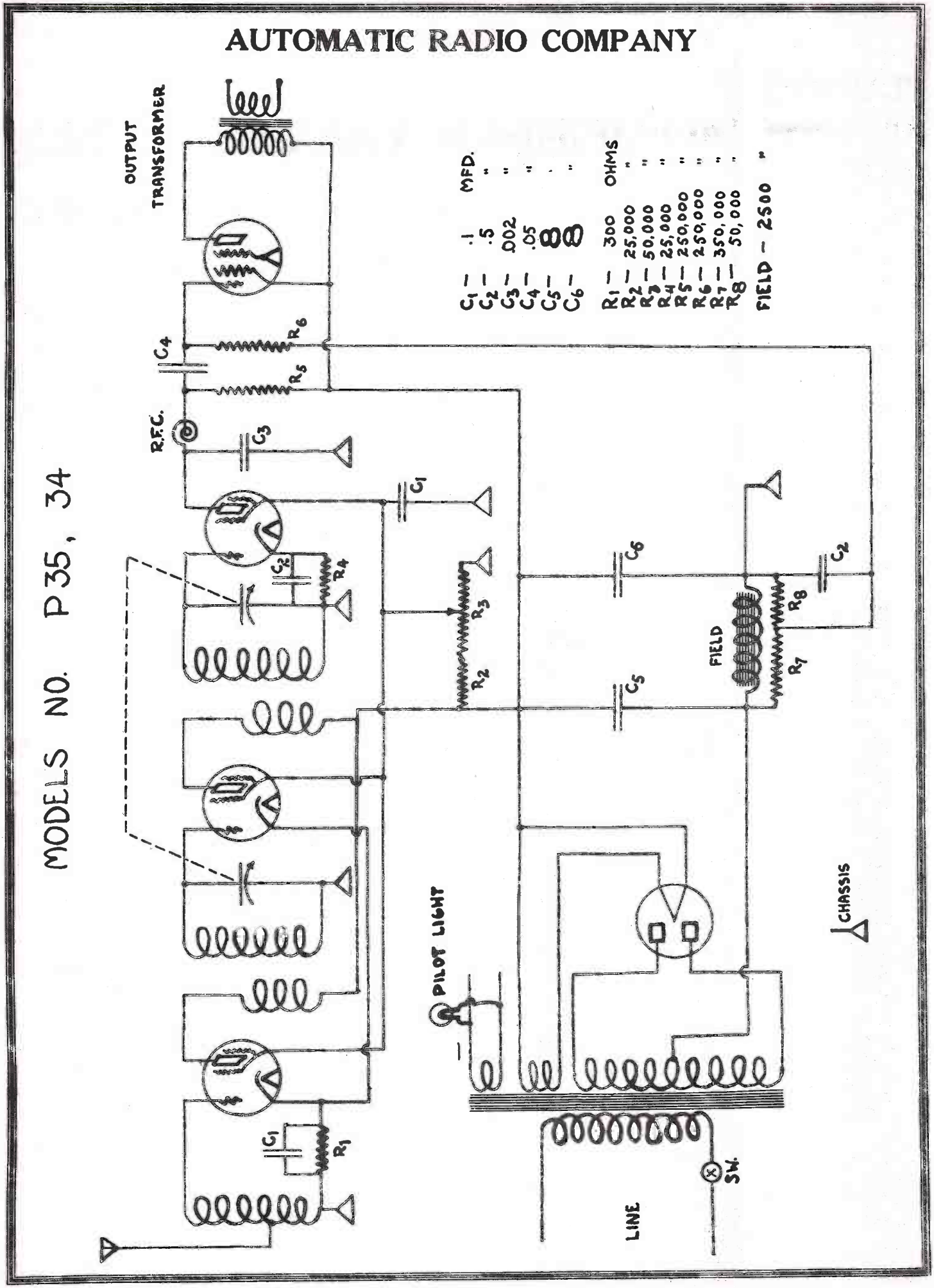
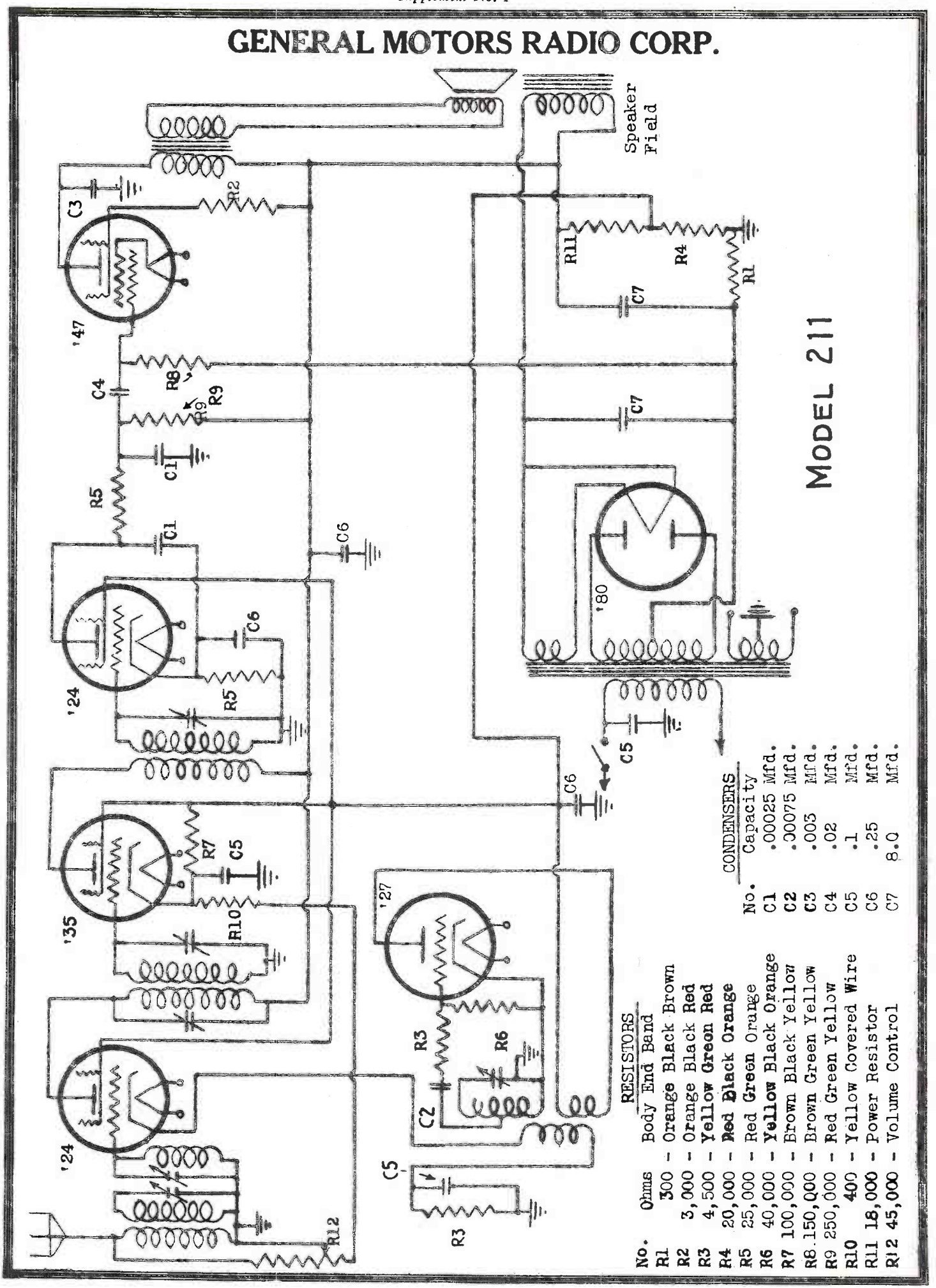


AUTOMATIC RADIO COMPANY



GENERAL MOTORS RADIO CORP.



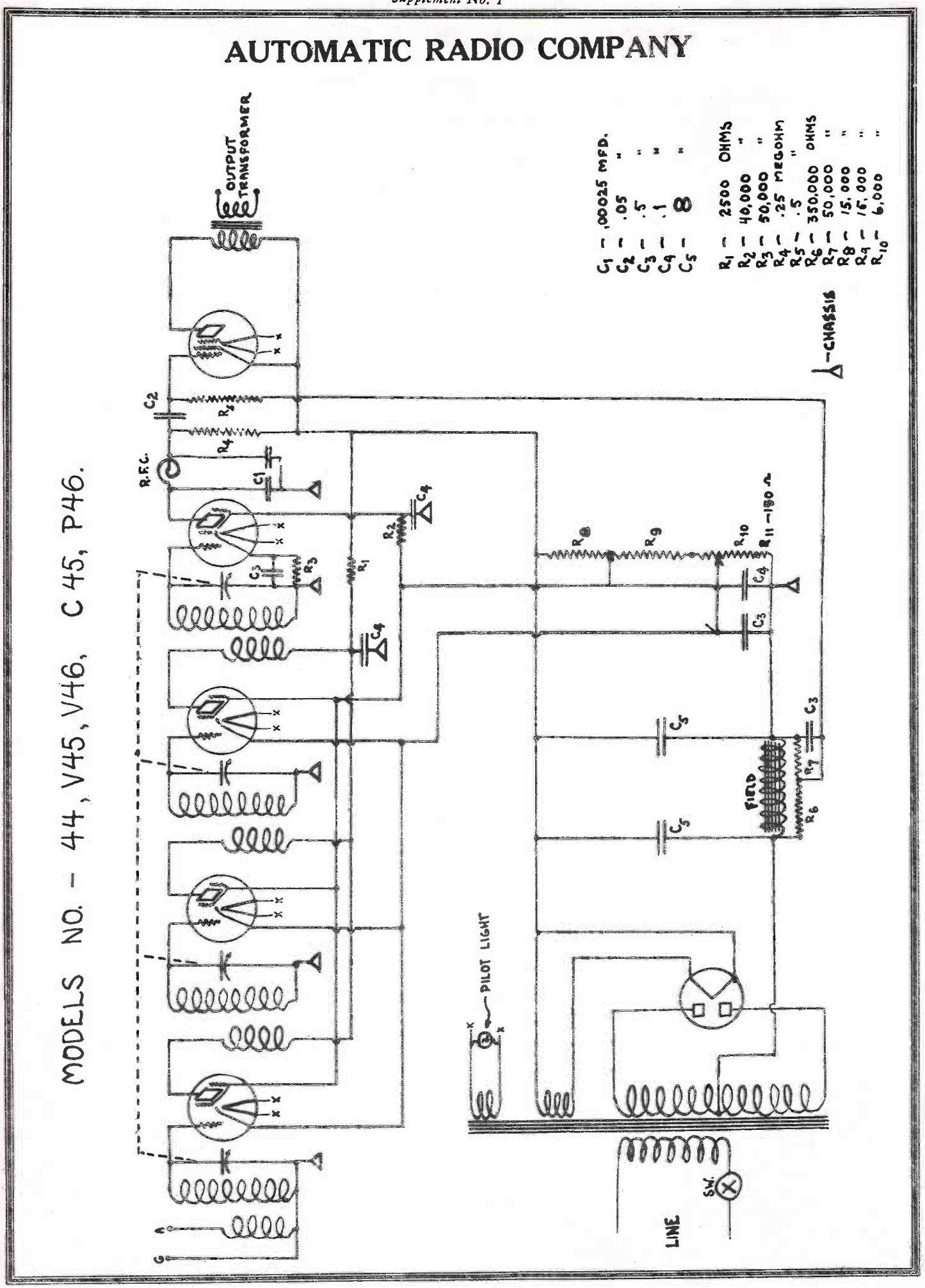
RESISTORS

No.	Ohms	Body End Band
R1	300	- Orange Black Brown
R2	3,000	- Orange Black Red
R3	4,500	- Yellow Green Red
R4	20,000	- Red Black Orange
R5	25,000	- Red Green Orange
R6	40,000	- Yellow Black Orange
R7	100,000	- Brown Black Yellow
R8	150,000	- Brown Green Yellow
R9	250,000	- Red Green Yellow
R10	400	- Yellow Covered Wire
R11	18,000	- Power Resistor
R12	45,000	- Volume Control

CONDENSERS

No.	Capacity
C1	.00025 Mfd.
C2	.00075 Mfd.
C3	.005 Mfd.
C4	.02 Mfd.
C5	.1 Mfd.
C6	.25 Mfd.
C7	8.0 Mfd.

AUTOMATIC RADIO COMPANY



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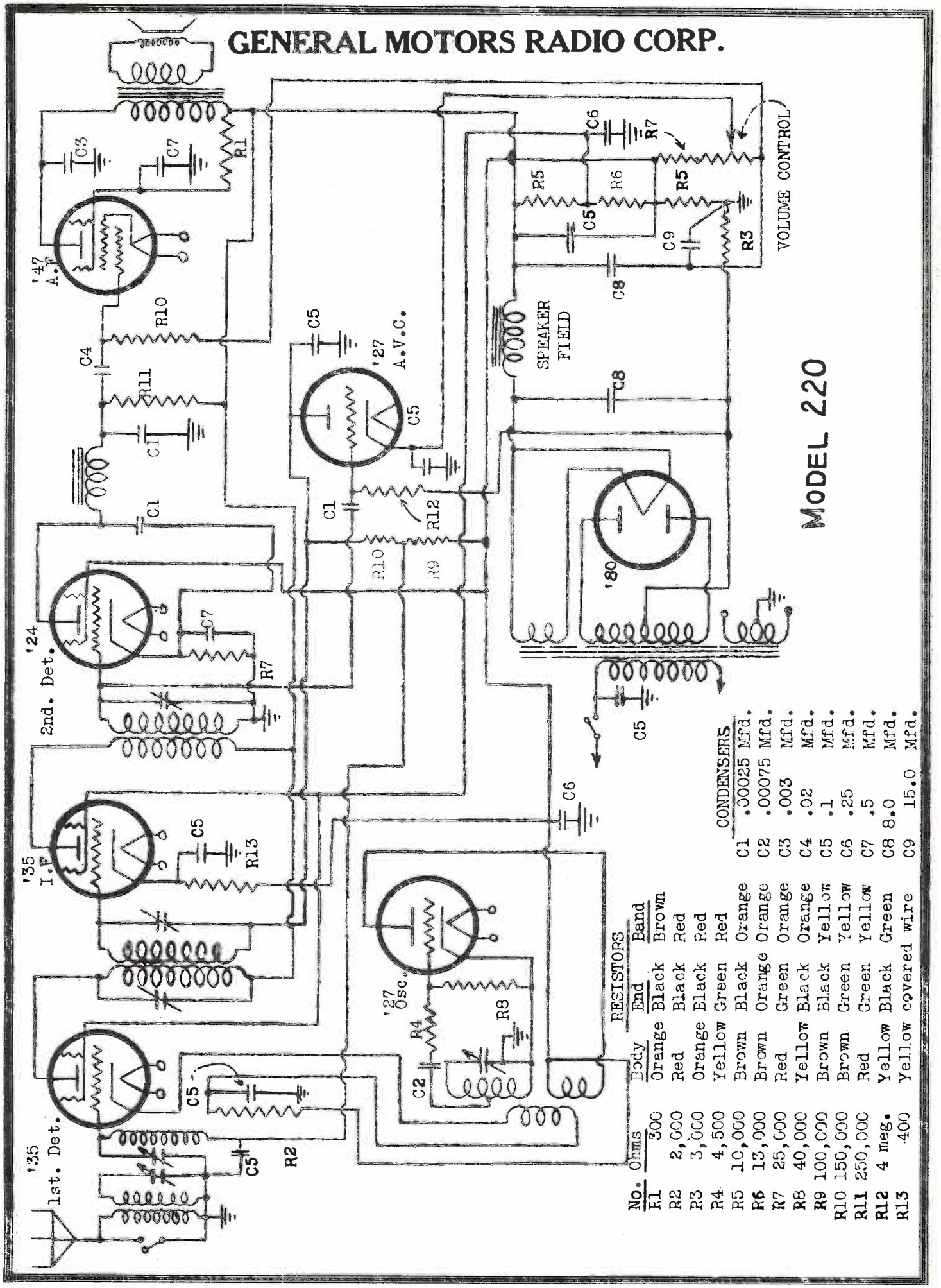


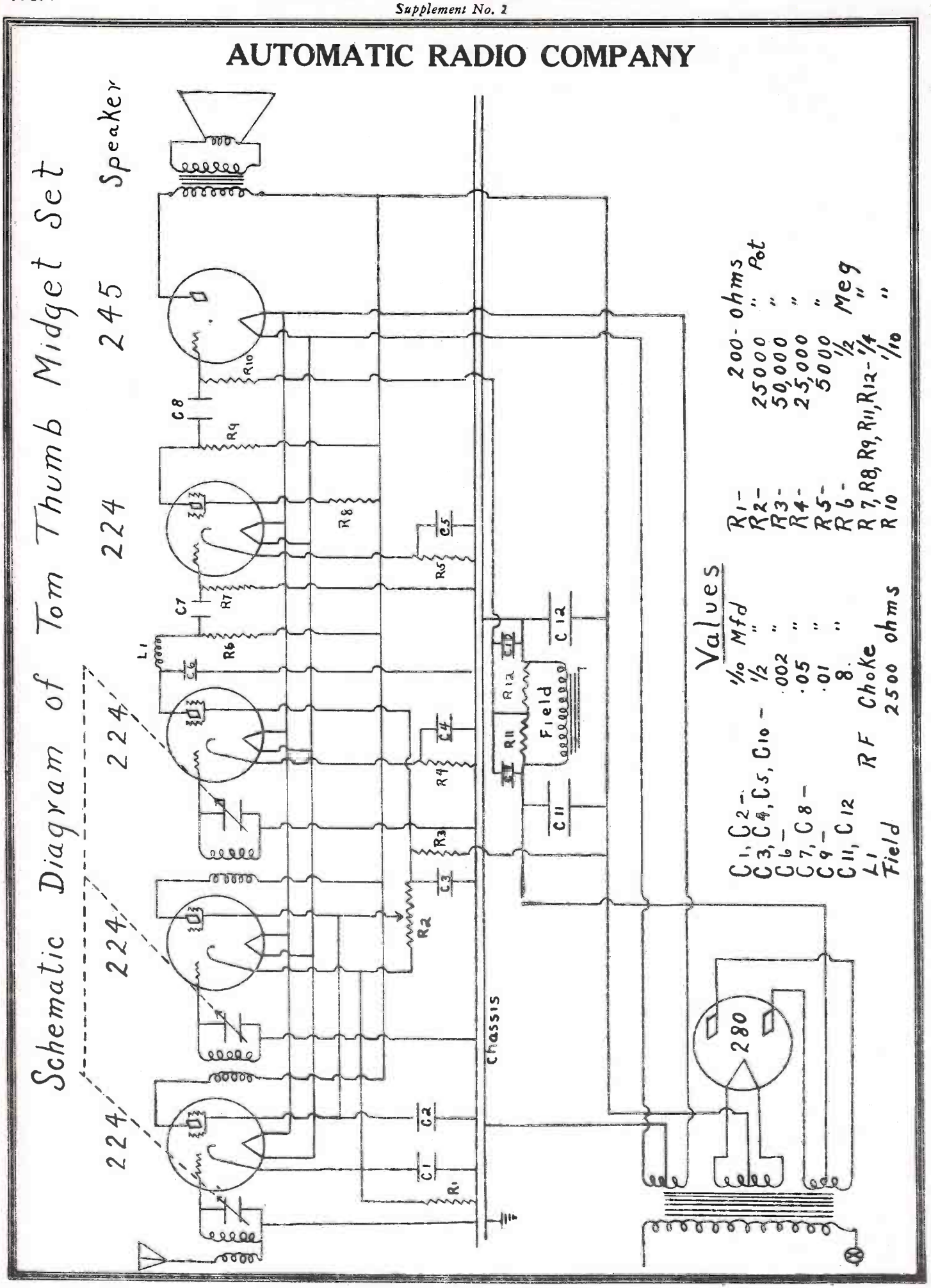
No.	Ohms	Body	End	Band
R1	300	Orange	Black	Brown
R2	2,000	Red	Black	Red
R3	3,000	Orange	Black	Red
R4	4,500	Yellow	Green	Red
R5	10,000	Brown	Black	Orange
R6	13,000	Brown	Orange	Orange
R7	25,000	Red	Green	Orange
R8	40,000	Yellow	Black	Orange
R9	100,000	Brown	Black	Yellow
R10	150,000	Brown	Green	Yellow
R11	250,000	Red	Green	Yellow
R12	4 meg.	Yellow	Black	Green
R13	400	Yellow	covered wire	

RESISTORS

C1	.00025	Mfd.
C2	.00075	Mfd.
C3	.003	Mfd.
C4	.02	Mfd.
C5	.1	Mfd.
C6	.25	Mfd.
C7	.5	Mfd.
C8	8.0	Mfd.
C9	15.0	Mfd.

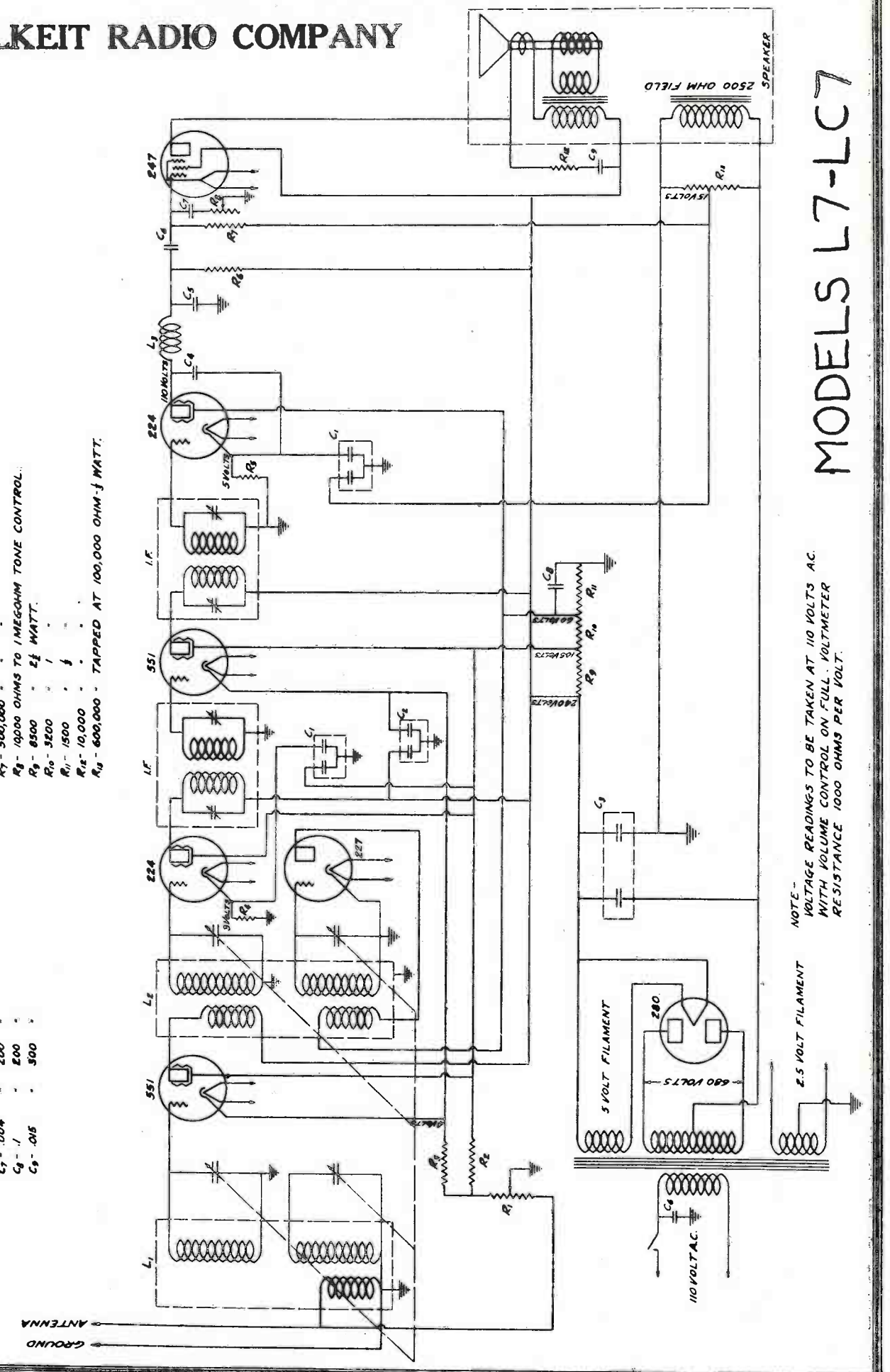
CONDENSERS

AUTOMATIC RADIO COMPANY



BALKEIT RADIO COMPANY

MODELS L7-LC7



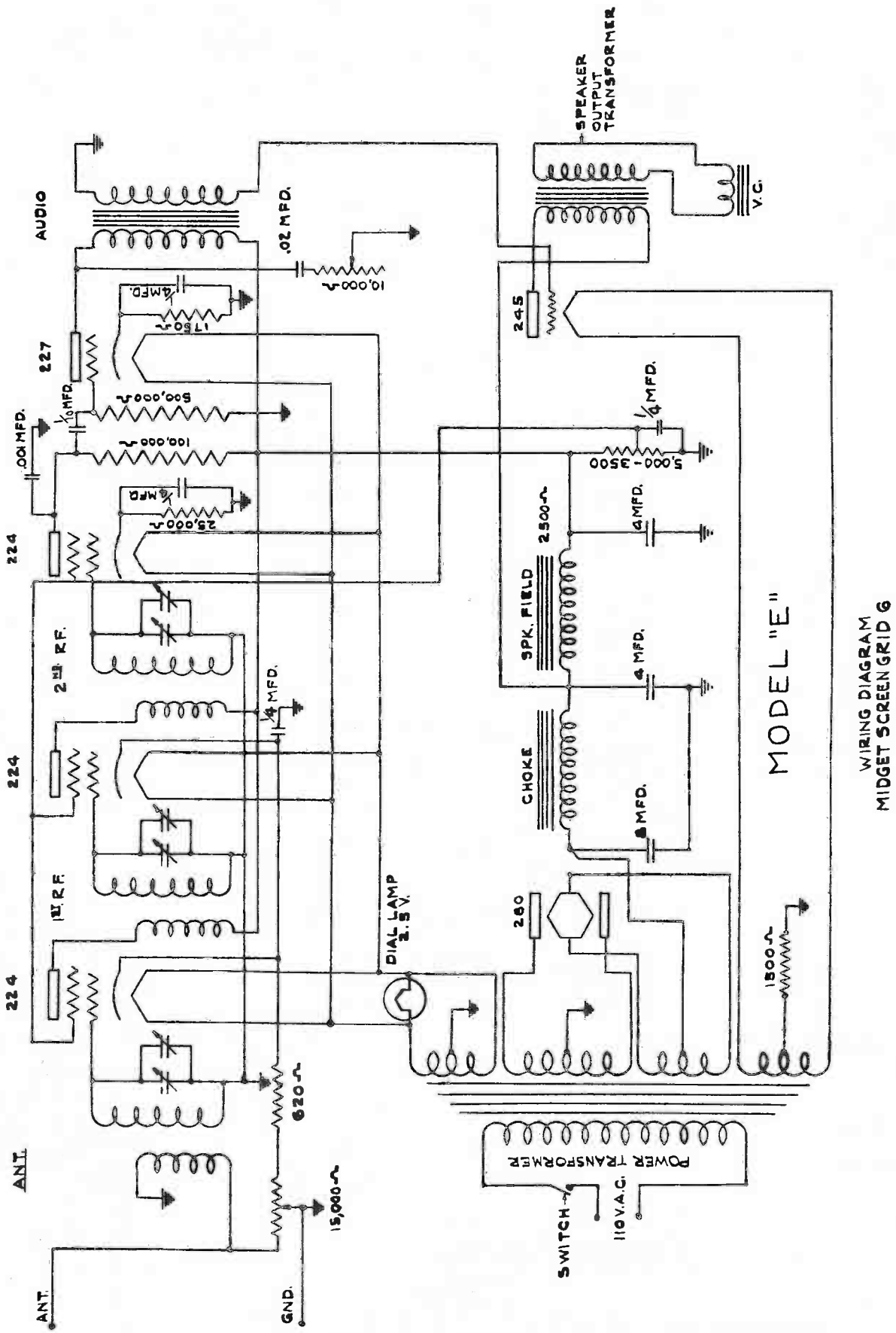
L_1 - ANTENNA AND R.F. COIL.
L_2 - DETECTOR AND OSC. COIL.
L_3 - R.F. CHOKE.
I.F.- INTERMEDIATE FREQUENCY TRANSFORMER ASSEMBLY.

C_1 - DUAL $\frac{1}{3}$ MFD. 200 VOLT.
C_2 - DUAL COND. $\frac{1}{3}$ MFD. SEC. 200 V. - $\frac{1}{3}$ MFD. SEC. 300 V.
C_3 - DUAL 8 MFD. COND. - 1 SEC. 350 V. - 1 SEC. 450 V.
C_4 - .0025 MFD.
C_5 - .0005 "
C_6 - .01 " 300 VOLTS.
C_7 - .004 " 200 "
C_8 - .1 " 200 "
C_9 - .015 " 300 "

R_1 - 15,000 OHM VOLUME CONTROL.
R_2 - 40,000 " $\frac{1}{2}$ WATT.
R_3 - 300 " "
R_4 - 800 " "
R_5 - 30,000 " "
R_6 - 200,000 " "
R_7 - 500,000 " "
R_8 - 10,000 OHMS TO 1 MEGOHM TONE CONTROL.
R_9 - 8500 " 1 WATT.
R_{10} - 3200 " $\frac{1}{2}$ "
R_{11} - 1500 " "
R_{12} - 10,000 " "
R_{13} - 600,000 - TAPPED AT 100,000 OHM - $\frac{1}{2}$ WATT.

NOTE -
VOLTAGE READINGS TO BE TAKEN AT 110 VOLTS A.C.
WITH VOLUME CONTROL ON FULL. VOLTMETER
RESISTANCE 1000 OHMS PER VOLT.

BALKEIT RADIO COMPANY



DELCO APPLIANCE CORP.

DELCO 32-VOLT RADIO RECEIVER CHASSES

Models RB-3 Console, RC-3 Jr. Console and RA-3 Compact

These three cabinet model receivers, designed for farm districts powered by 32-volt supply systems, are manufactured by the Delco Appliance Corp., Rochester, N. Y., and employ the same chassis, the schematic circuit of which is shown below. The 32-volt or "farm lighting" power line supplies only the filament potential, as shown; the plate potentials must be obtained from a block of "B" batteries or from a Delco Power Unit.

Before connecting the power unit, turn the power switch to the "off" position. The power switch is incorporated in the volume control and is turned off by turning the left-hand knob to the left or in a counter-clockwise direction as far as it will go. Connect the power unit to the chassis by means of the 3-lead cable according to the following color code: red, "Plus 135 V." connection on the Delco power unit; maroon, "Plus 67.5 V." tap; black, the negative lead. The "A" lead on the receiver chassis is plugged into the 32-volt power line; reversing the position of the plug in some instances may improve reception a little.

As indicated in the diagram, this 32-volt chassis employs four type '36 screen-grid tubes and two type '38 pentodes; these '38's are connected in parallel,—plate-to-plate, grid-to-grid, etc.

In shunt with each of the tuning condensers in the gang is a trimmer. The nuts of these small condensers are accessible for adjustment through four holes in the top of the condenser shield. A bakelite aligning tool must be used, in order to prevent injury to the inductances within their respective shield cans. The frequency at which it is recommended that this chassis be aligned is 1400 kc. Adjust the volume by means of the volume control until the station signals can be heard faintly but clearly.

If the pointers on the dial window do not correctly indicate the frequency of the stations, the dial may be rotated to the correct position. To do this, it will be necessary to remove the chassis from the cabinet.

After the chassis is removed from the cabinet, measure the vertical distance from the bottom of the cabinet to the indicating points on the dial window (inside the cabinet). Tune in a station of known frequency and loosen the two square-head set screws which hold the dial and hub assembly to the tuning condenser shaft. Hold the condenser rotor stationary and turn the selector dial on the condenser shaft until the frequency shown on the selector dial of that particular station is the same vertical distance from the bottom of the chassis as that previously measured from the bottom of the cabinet to the indicating points on the dial window inside the cabinet.

Lock the selector dial assembly on the shaft by tightening the two square-head screws and reassemble the chassis in the cabinet.

The dial light is rated at 6 volts and has a standard flash-light base. It can be removed or replaced easily by lifting the dial light, socket and bracket assembly up and off the dial light mounting bracket.

A good ground connection is necessary for best operation. Use an approved ground clamp to make a connection to a cold water pipe or a six-foot iron rod driven into moist ground. The antenna may be 100 to 150 feet long.

The knob at the left of the station selector dial window operates the combination volume control and off-on switch. The toggle switch located on the left-hand side of the cabinet is the local-distance switch shown in the schematic circuit as SW.1. The large knob at the right is the tuning control and the central one is the tone selector.

Note that when the local-distance switch is in the up or "distance" position, the receiver is adjusted for maximum sensitivity. However, when the switch is in the down or "local" position battery power is conserved, as described below. In this position the volume on distant stations is very greatly reduced, and satisfactory reception is possible only from local stations. Incidentally, this provides better control of volume on local stations and, as will be observed by reference to the schematic circuit, there is conservation of the battery current.

Tubes for these 32-volt receivers are available from the Delco company, and are somewhat special in their characteristics, although, in lieu of these, the more standard types may be used; they carry the designations D-236 for the screen-grid type, and D-238 for the pentode.

As will be evident by reference to the schematic circuit, the problem of operating on a 32-volt supply necessitates the use of a receiver design entirely different from other types. To meet this situation adequately it has been considered advisable, in the design of the Delco 32-volt radio set, to limit the line current demands to supplying only the filament current required by a number of heater- or cathode-type tubes, the '36's and '38's shown in the schematic circuit. This system of connection eliminates the need for heavy filter chokes in the "A" circuit.

There then remains the matter of supplying "B" and "C" potentials to the circuit. The most satisfactory solution to this problem, it was decided, would be the use of "B" batteries to supply "B" current; and the principle of voltage drop across a resistor in series with the "B" supply to furnish the required "C" potential. Of course, this voltage is subtracted from the total "B" voltage available, and the remainder constitutes the voltage which will be available for use at the plates of the tubes.

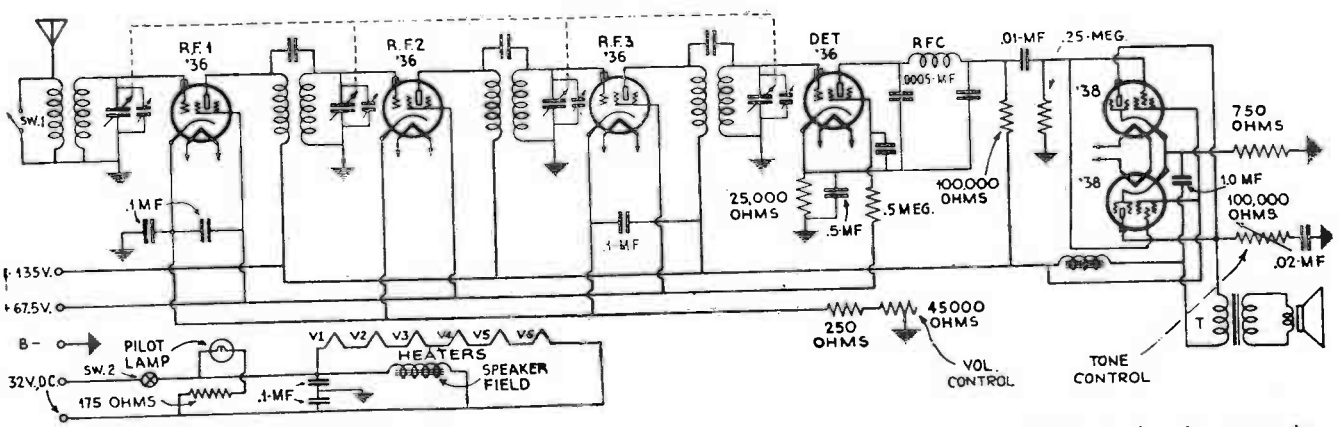
The "C" potential for tubes RF1, RF2 and RF3 is the drop across a fixed 250 ohm resistor and that portion of a variable 45,000 ohm resistor which may be in the circuit at the time; variation of this value constitutes the only volume control in this receiver,—except for the change which is effected when switch SW1 is operated, or the tone control is adjusted.

The detector is of the plate-rectification or power type, the high negative bias required for this form of circuit operation being obtained as the drop across a 25,000 ohm resistor in the screen-grid detector cathode lead. Bias for the pentode tubes is obtained from a 750 ohm cathode resistor. The power output circuit is not push-pull but is parallel, as previously stated.

The screen-grids of the pentodes are isolated from the plates, as far as A.C. is concerned, by means of an iron-core choke coil and 1. mf. fixed condenser in the high voltage lead common to both, as shown in the schematic circuit. The output of the pentodes is transformer-coupled to the dynamic reproducer voice coil by means of the usual output-type audio transformer; the field coil of which is connected directly across the 32-volt supply.

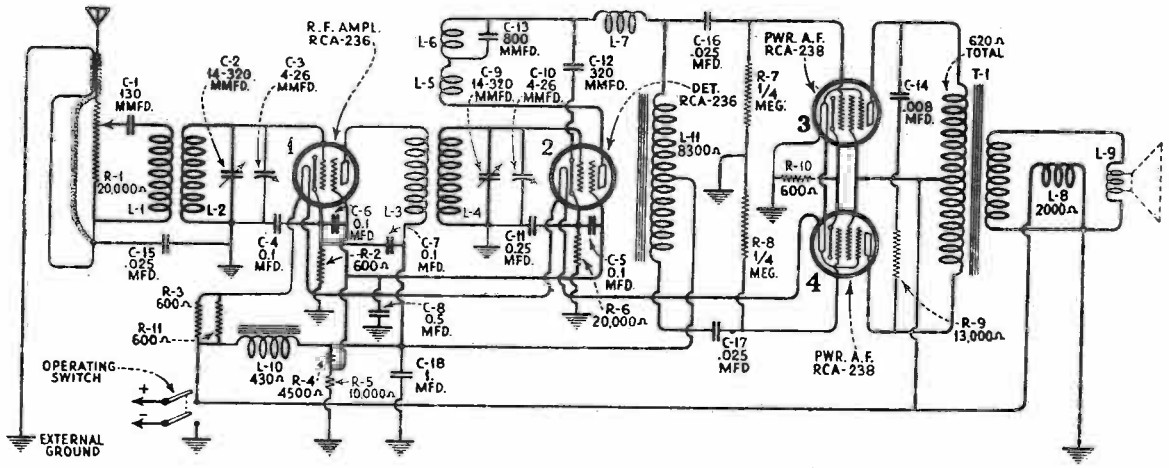
To improve the tuning characteristics, small coupling condensers are connected to the high potential ends of the R.F. tuning coils.

A line-filter, consisting of two, 0.1-mf. fixed condensers connected in series and the center-tap grounded, is connected across the 32-volt power line. Its use prevents surges from affecting the operation of the set.



Schematic circuit of the Delco 32-Volt Receivers, Models RB-3 Console, RC-3 Jr. Console, and RA-3 Compact. The detector is resistance-capacity coupled to the power output tubes through a fixed condenser of .01-mf. It is always well to check condensers in this position, for leakage; occasionally, an open circuit may develop, and the usual tests should be applied where such a condition is suspected.

GENERAL ELECTRIC CO.



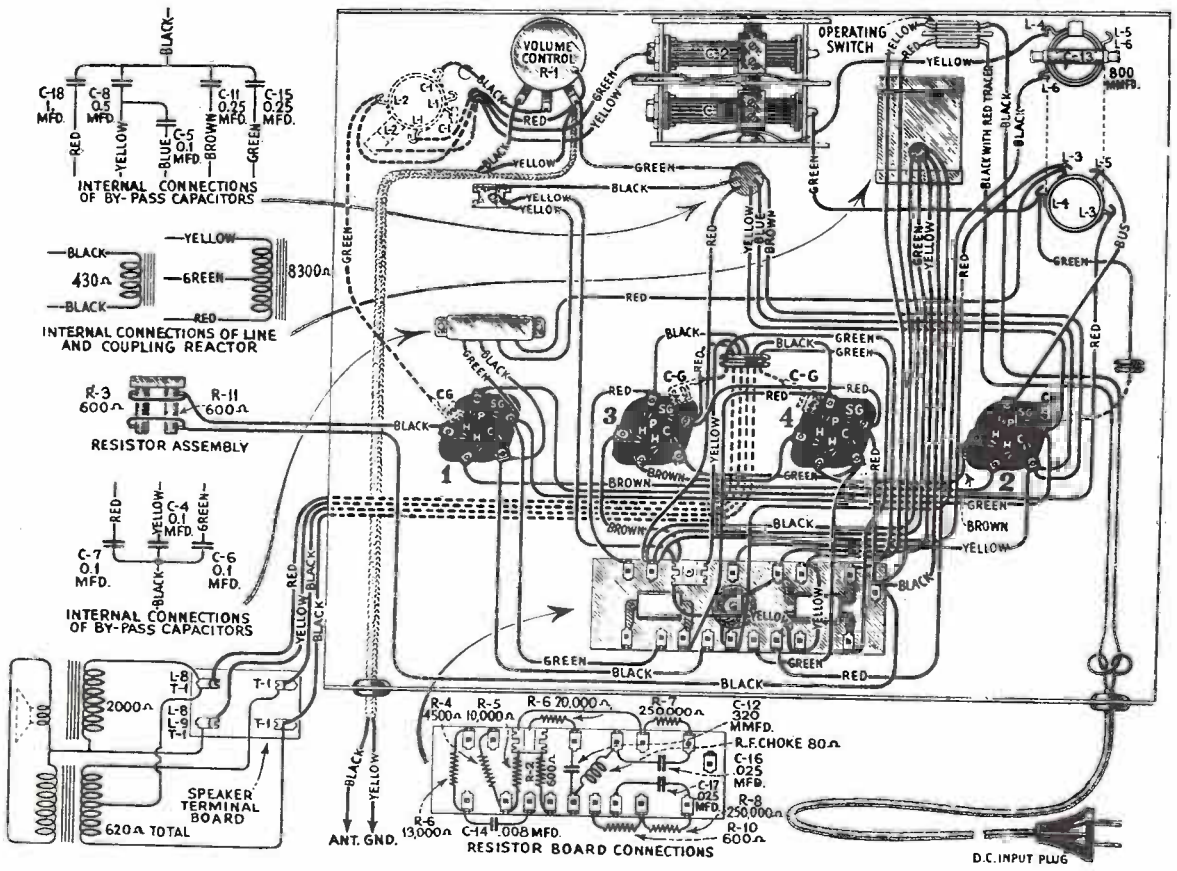
RADIOTRON SOCKET VOLTAGE

MODEL T-12-D

110 VOLT D. C. LINE

These readings are obtained with the usual set analyzers and are not true readings of the voltage at which the Radiotrons operate.

Radiotron No.	Cathode to to Control Grid Volts	Cathode to Screen Grid Volts	Cathode to Plate Volts	Plate Current M. A.	Heater Volts
1	1.5	62	98	2.0	6.0
2	3.2	54	92	0.2	6.0
3	0.3	99	95	5.5	6.0
4	0.3	99	95	5.5	6.0



GENERAL ELECTRIC CO

SERVICE NOTES

FOR

General Electric Radio Model J-70 and J-75

ELECTRICAL SPECIFICATIONS

Voltage Rating ..... 105–125 Volts
Frequency Rating ..... 50–60 cycles and 25–60 cycles
Power Consumption ..... 95 Watts
Type of Circuit ..... Super-Heterodyne
Type and number of Radiotrons ..... 2 RCA-235, 2 UY-227, 1 UY-224, 1 RCA-247 and 1 UX-280
Number of R.F. Stages ..... One
Number of I.F. Stages ..... One using one tuned input transformer and one untuned output transformer
Type of Second Detector ..... Power self biasing
Type of Tone Control ..... Variable resistance in series with condenser that tunes secondary of interstage transformer at "low" position
Number of Audio Stages ..... One—Single Pentode
Type of Rectifier ..... Full wave, UX-280
Undistorted output ..... 2.25 Watts

PHYSICAL SPECIFICATIONS—J-70

Height ..... $16\frac{27}{32}$ inches
Depth ..... $9\frac{3}{8}$ inches
Width ..... $14\frac{3}{4}$ inches
Weight alone ..... $30\frac{1}{2}$ lbs.
Weight Packed for Shipment ..... 37 lbs.

PHYSICAL SPECIFICATIONS—J-75

Height ..... $38\frac{1}{2}$ inches
Depth ..... 11 inches
Width ..... 23 inches
Weight alone ..... 58 lbs.
Weight Packed for Shipment ..... 77 lbs.

The General Electric Models J-70 and J-75 are seven tube Super-Heterodyne radio receivers incorporating such features as Super Control Screen Grid Radiotrons in the R.F. and I.F. stages, single Pentode output stage and the inherent sensitivity, selectivity and tone quality of the General Electric Super-Heterodyne. Model J-70 is a table model and J-75 is a small console. Except for the cabinet, speakers and output circuit, both models are identical.

Service work in conjunction with this receiver will be very similar to that of other table type receivers. However, there are several new features of this model which require some consideration.

The second I.F. transformer in this receiver is of the untuned variety, making the set slightly less sensitive and selective than the S-22. This decreased selectivity permits the omission of the 600 K.C. adjustable capacitor used on the S-22, S-132 and other Super-Heterodyne receivers. When aligning adjustments are necessary, it is therefore only necessary to tune one I.F. transformer and the three tuning capacitors. The I.F. transformer is adjusted at 175 K.C. and the tuning capacitors at 1400 K.C. In the case of the latter, the dial should be set at 1400 as well as the oscillator and the three screws adjusted for maximum output. This will permit the dial to read very accurately.

The schematic diagram, the wiring diagram, the voltage readings and the replacement parts are given in the following pages.

RADIOTRON SOCKET VOLTAGES

120 Volt A. C. Line

	VOLUME CONTROL AT MINIMUM								VOLUME CONTROL AT MAXIMUM							
Radiotron No.	Cathode to Heater Volts, D.C.	Cathode or Filament to Control Grid Volts, D.C.	Cathode or Filament to Screen Grid Volts, D.C.	Cathode or Filament to Plate Volts, D.C.	Plate Current M. A.	Screen Current M. A.	Heater or Filament Volts, A.C.	Radiotron No.	Cathode to Heater Volts, D.C.	Cathode or Filament to Control Grid Volts, D.C.	Cathode or Filament to Screen Grid Volts, D.C.	Cathode or Filament to Plate Volts, D.C.	Plate Current M. A.	Screen Current M. A.	Heater or Filament Volts, A.C.
1. R. F.	50	50	60	235	0	0	2.66	1. R. F.	3.0	3.0	65	260	3.0	0.5	2.66
2. Osc.	50	0	—	55	4.5	—	2.66	2. Osc.	3.0	0	—	60	5.0	—	2.66
3. 1st Det.	10	9	100	260	1.0	0.25	2.66	3. 1st Det.	6.0	5.5	60	260	0.75	0.25	2.66
4. I. F.	50	50	60	235	0	0	2.66	4. I. F.	3.0	3.0	65	260	3.0	0.5	2.66
5. 2d Det.	25	10	—	250	1.0	—	2.66	5. 2d Det.	25	10.0	—	250	1.0	—	2.66
6. Pwr.	—	10	290	280	35	—	2.66	6. Pwr.	—	10.0	290	280	35	—	2.66

GENERAL ELECTRIC CO

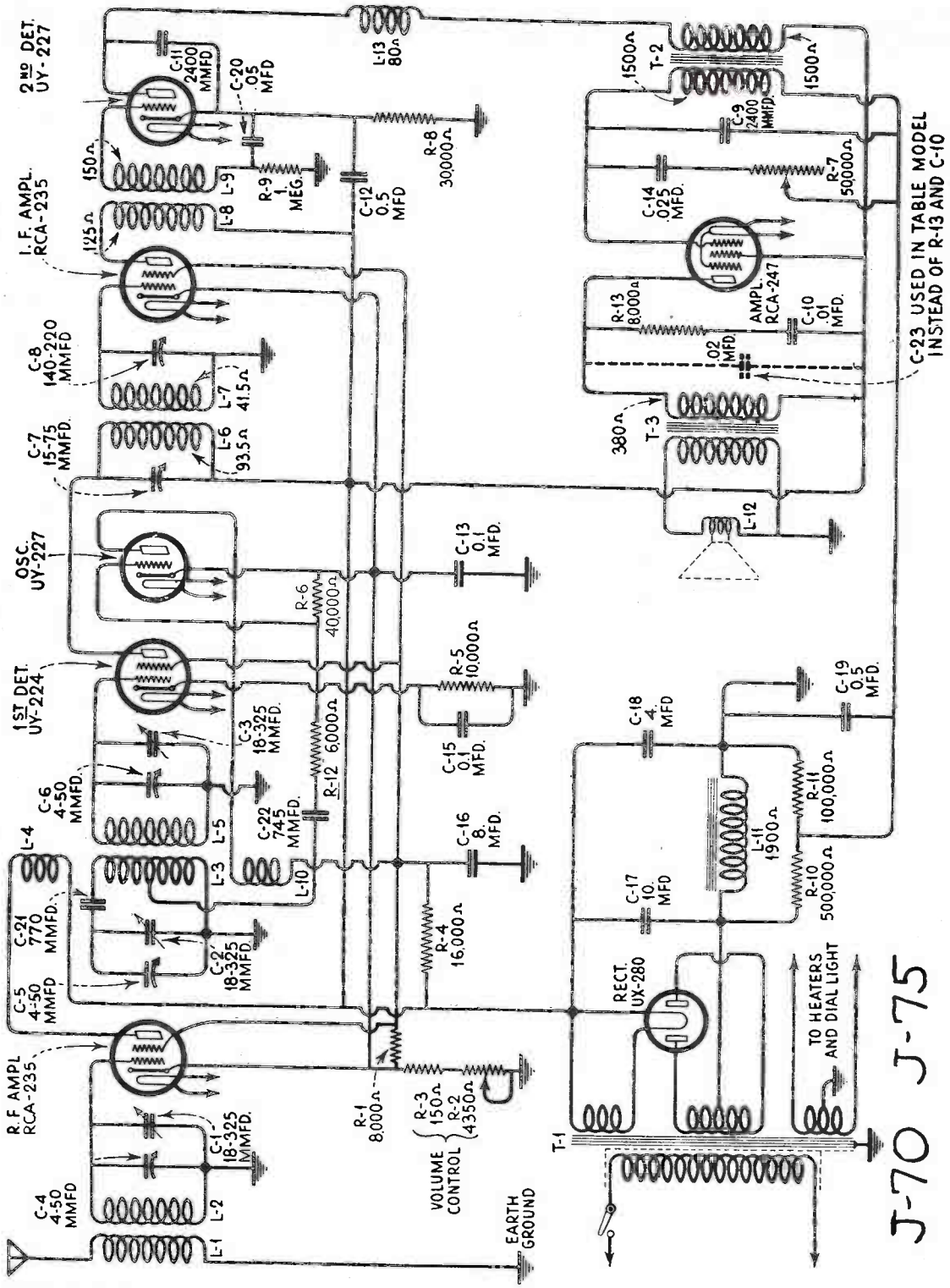
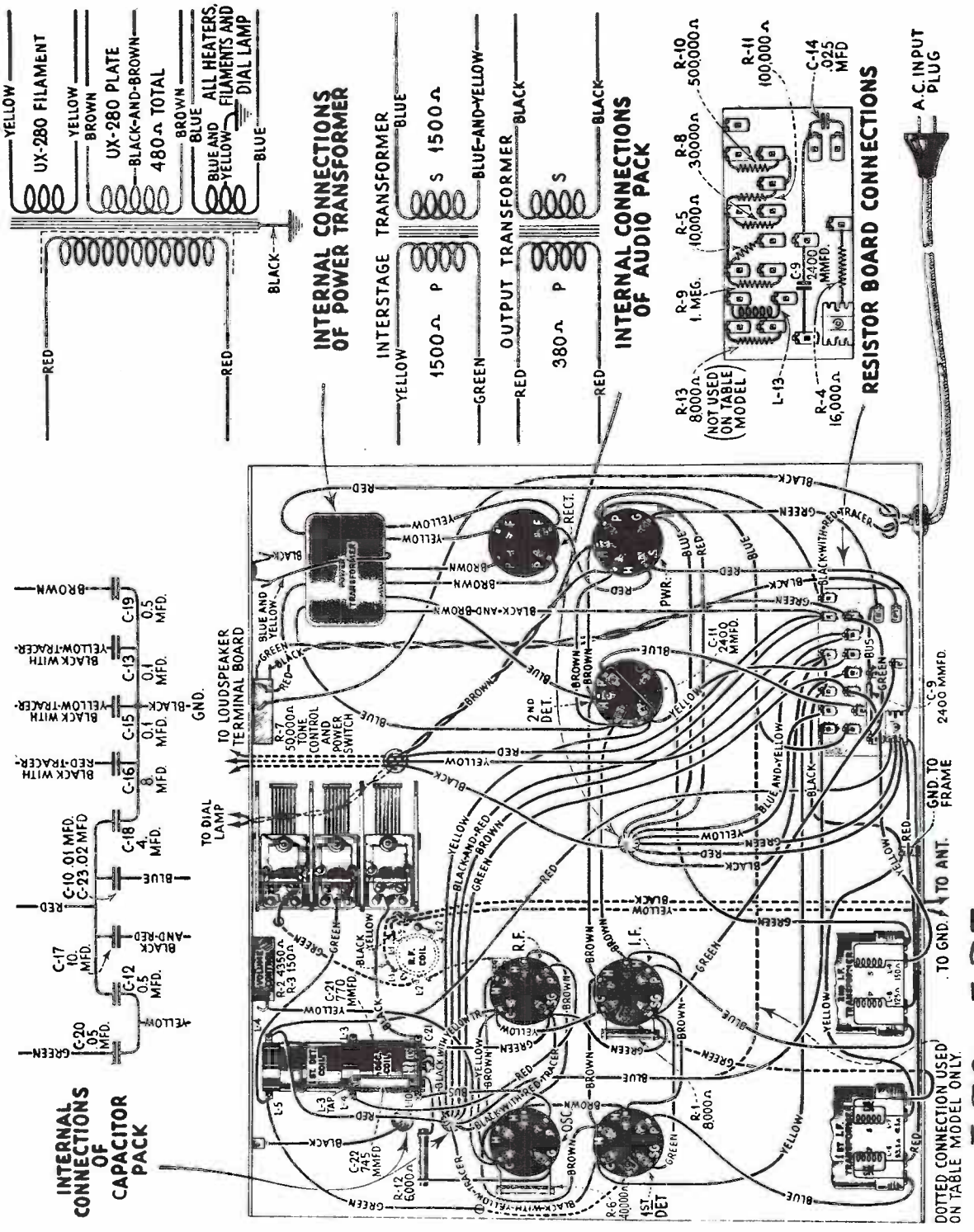
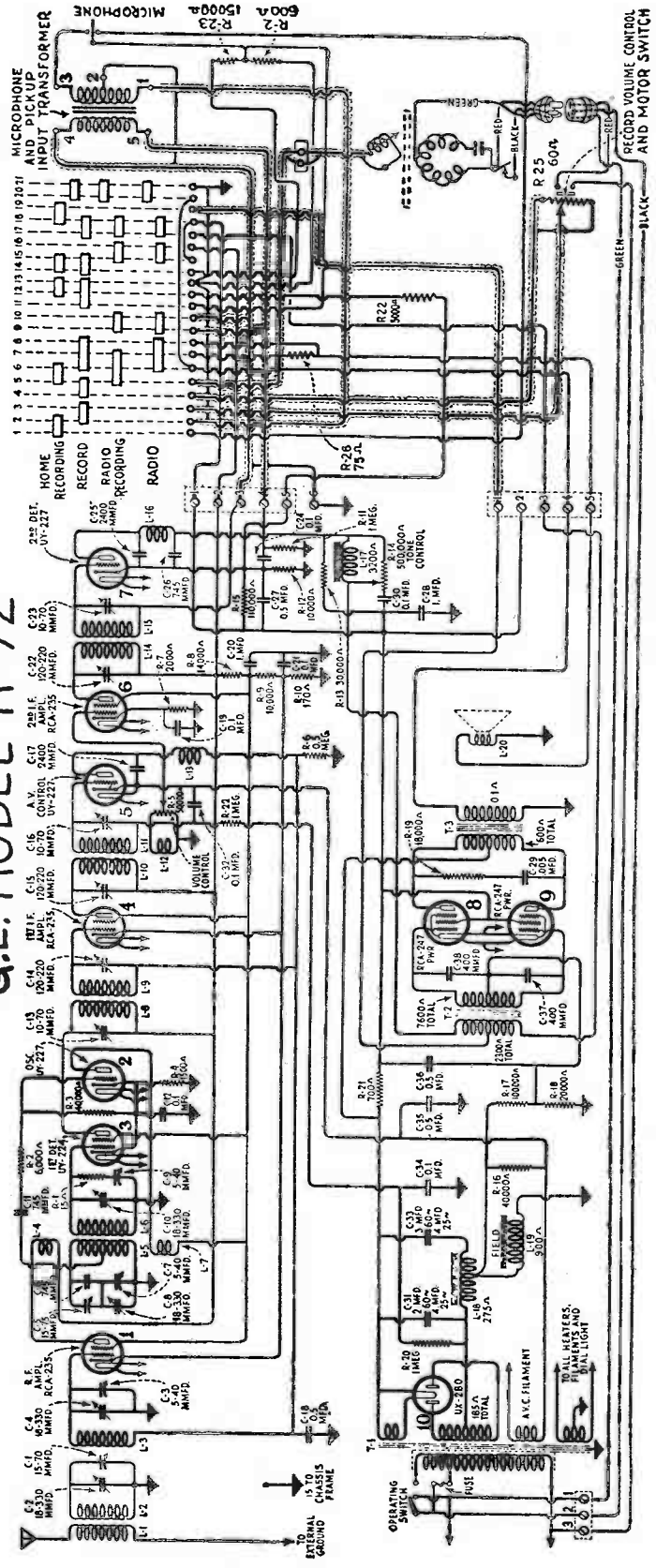


Fig. 1—Schematic Wiring Diagram

GENERAL ELECTRIC CO



GENERAL ELECTRIC CO.
F. A. D. ANDREA INC.



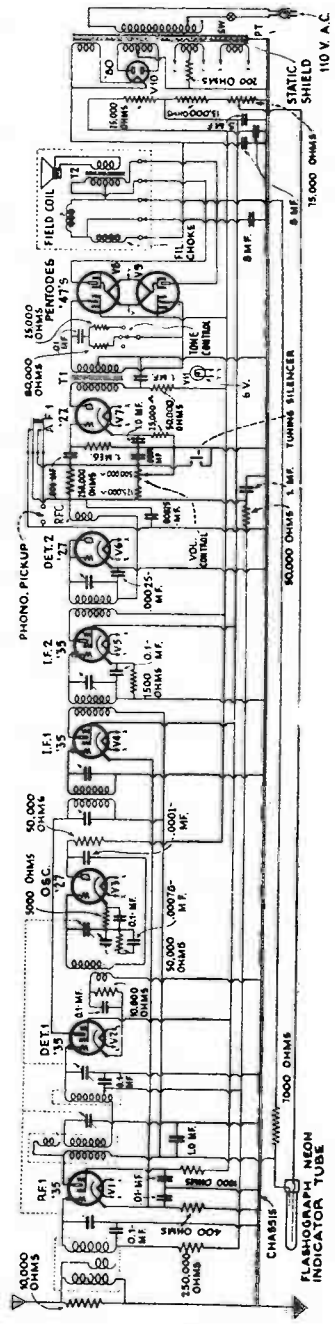
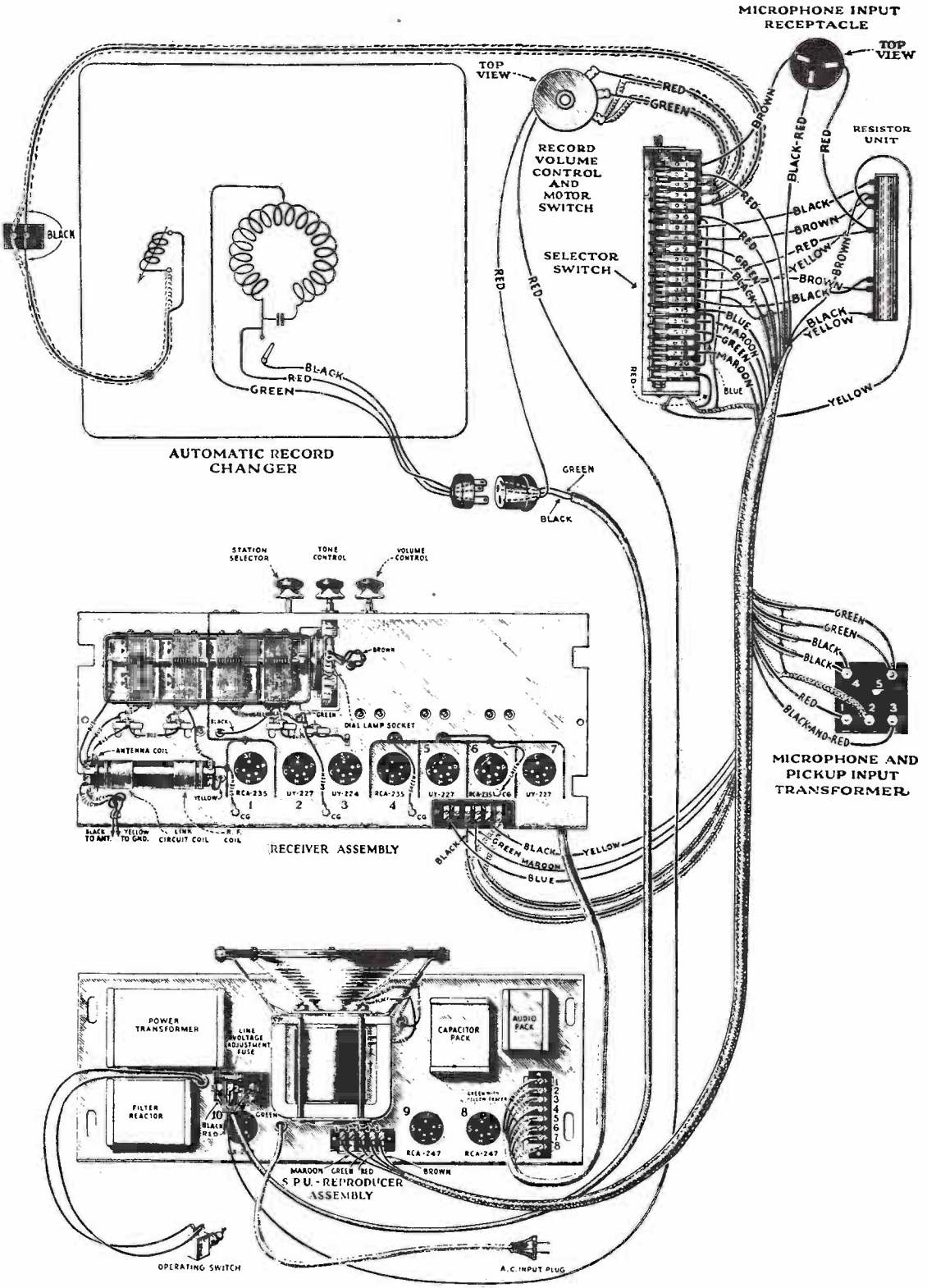


Diagram of the Fada models "48" and "49" receivers. This chassis is of the superheterodyne type employing a diode detector, a Tune-A-Lite for indicating maximum response; and is equipped with an automatic volume control and push-pull pentodes.

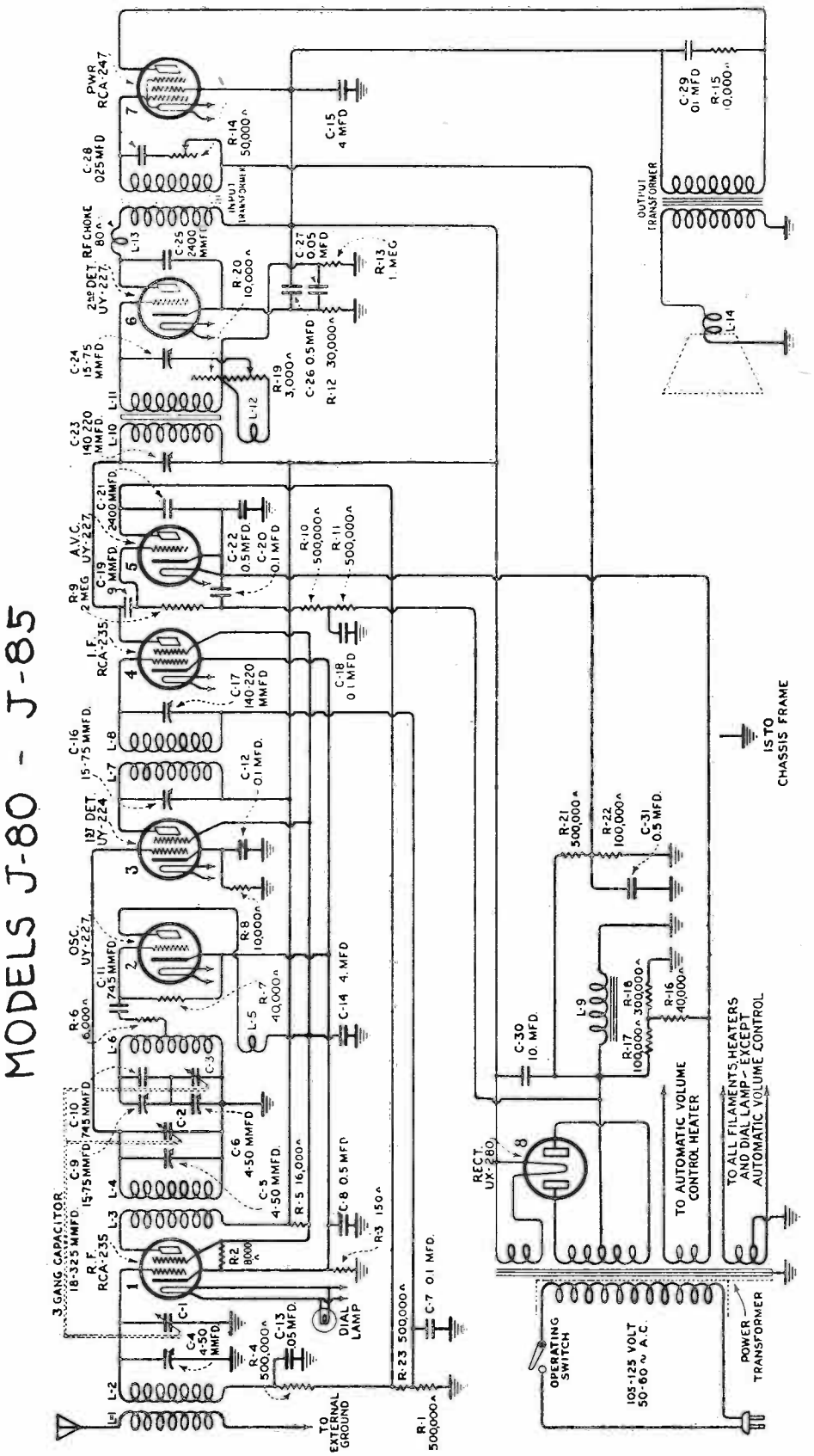
GENERAL ELECTRIC CO.

MODEL H-72

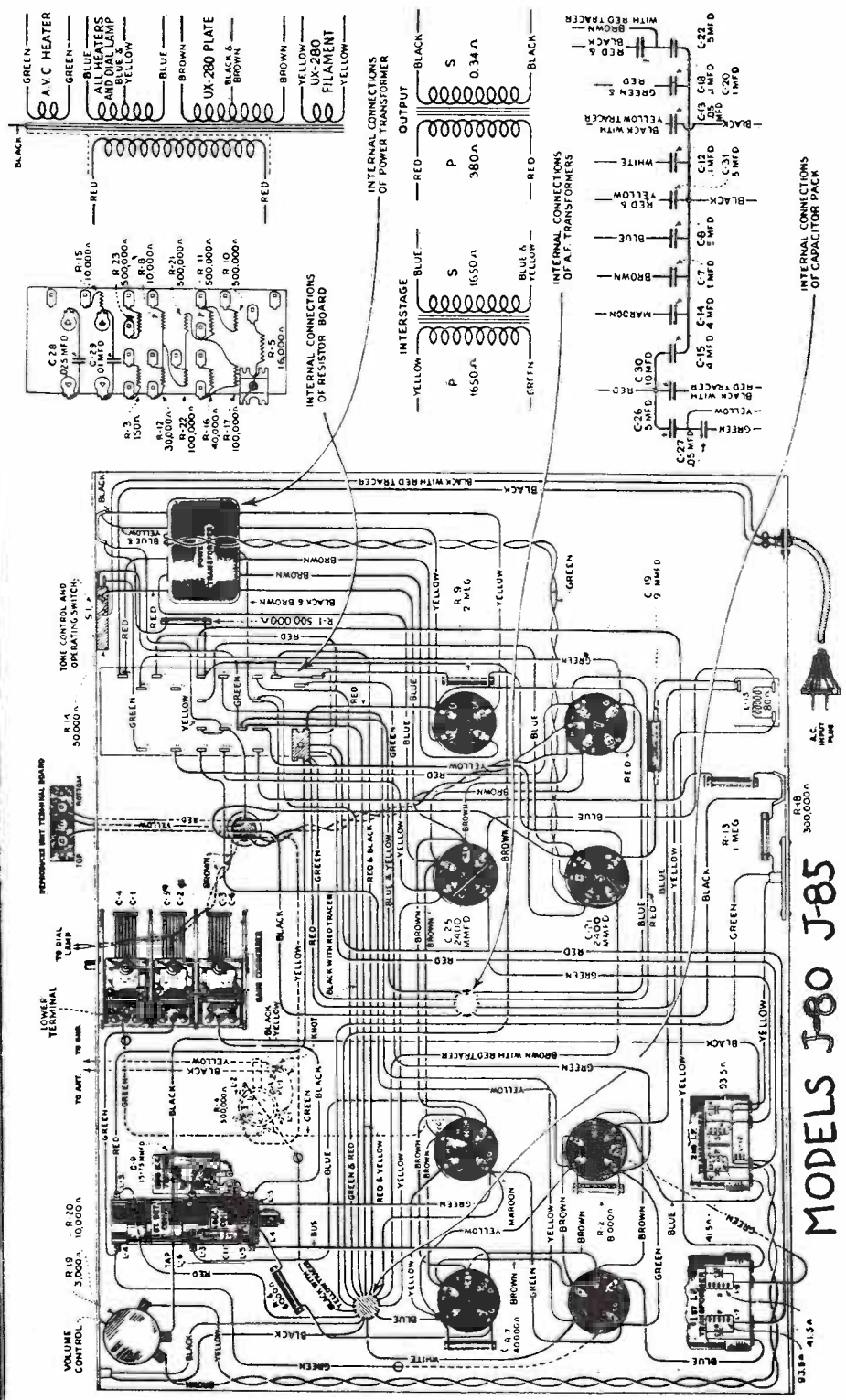


GENERAL ELECTRIC CO.

MODELS J-80 - J-85



GENERAL ELECTRIC CO.



RADIOTRON SOCKET VOLTAGES

120 VOLT LINE

VOLUME CONTROL DOES NOT AFFECT VOLTAGES

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament to Control Grid Volts, D. C.	Cathode or Filament to Screen Grid Volts, D. C.	Cathode or Filament to Plate Volts, D. C.	Plate Current M. A.	Screen Current M. A.	Heater or Filament Volts, A. C.
1. R. F.	4.0	0.5	70	260	4.0	0.5	2.5
2. Osc.	4.0	0	—	65	6.0	—	2.5
3. 1st Det.	7.0	6.0	70	260	0.75	0.1	2.5
4. I. F.	4.0	4.0	70	260	4.0	0.5	2.5
5. 2nd Det.	28.0	10.0	—	250	1.0	—	2.5
6. A. V. C.	0	0	—	25	0	—	2.2
7. Power	—	10.0	290	280	35.0	—	2.5

GENERAL ELECTRIC CO.

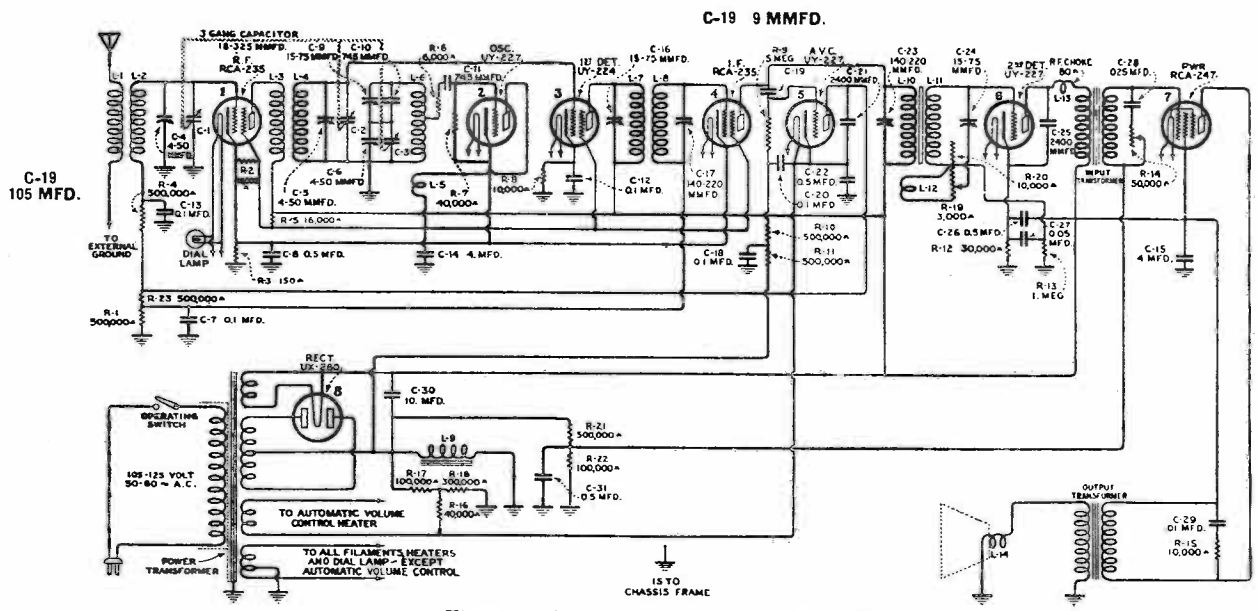


Figure 1—Schematic Wiring Diagram S-132

RADIOTRON SOCKET VOLTAGES MODEL S-132

110 VOLT A. C. LINE

(Volume Control Setting Does Not Affect Voltages)

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament to Control Grid Volts, D. C.	Cathode or Filament to Screen Grid Volts, D. C.	Cathode or Filament to Plate Volts, D. C.	Plate Current M. A.	Screen Current M. A.	Heater or Filament Volts, A. C.
1	2	*0.1	75	210	5.0	0.5	2.2
2	8	0	—	60	5.0	—	2.2
3	7	7.0	70	205	0.5	0.1	2.2
4	2	*0.1	75	210	5.0	0.5	2.2
5	0	0	—	30	0	—	2.2
6	20	*8.0	—	185	0.5	—	2.2
7	—	10	210	210	25	—	2.2

*Not true reading due to resistance in circuit.

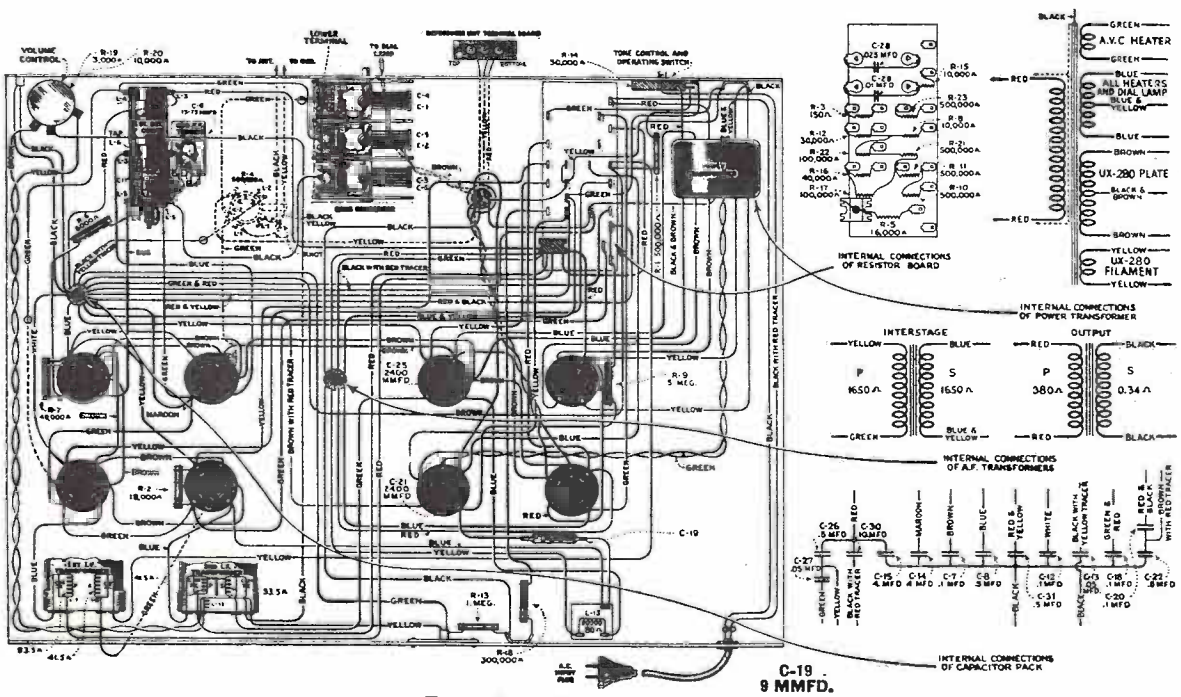
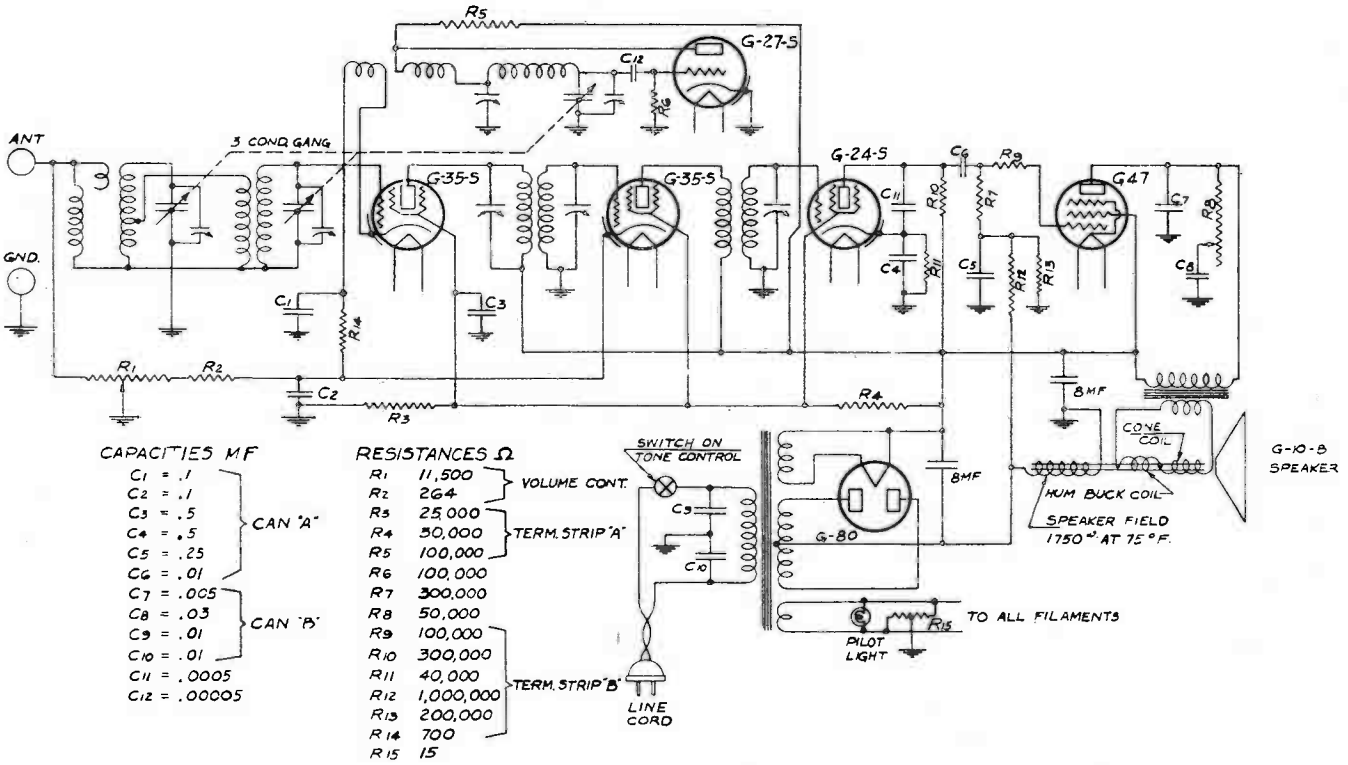


Figure 2—Wiring Diagram S-132

GRIGSBY-GRUNOW CO.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE RECEIVER
MODEL 55 CHASSIS — 115 VOLTS 50-60 CYCLES 70 WATTS



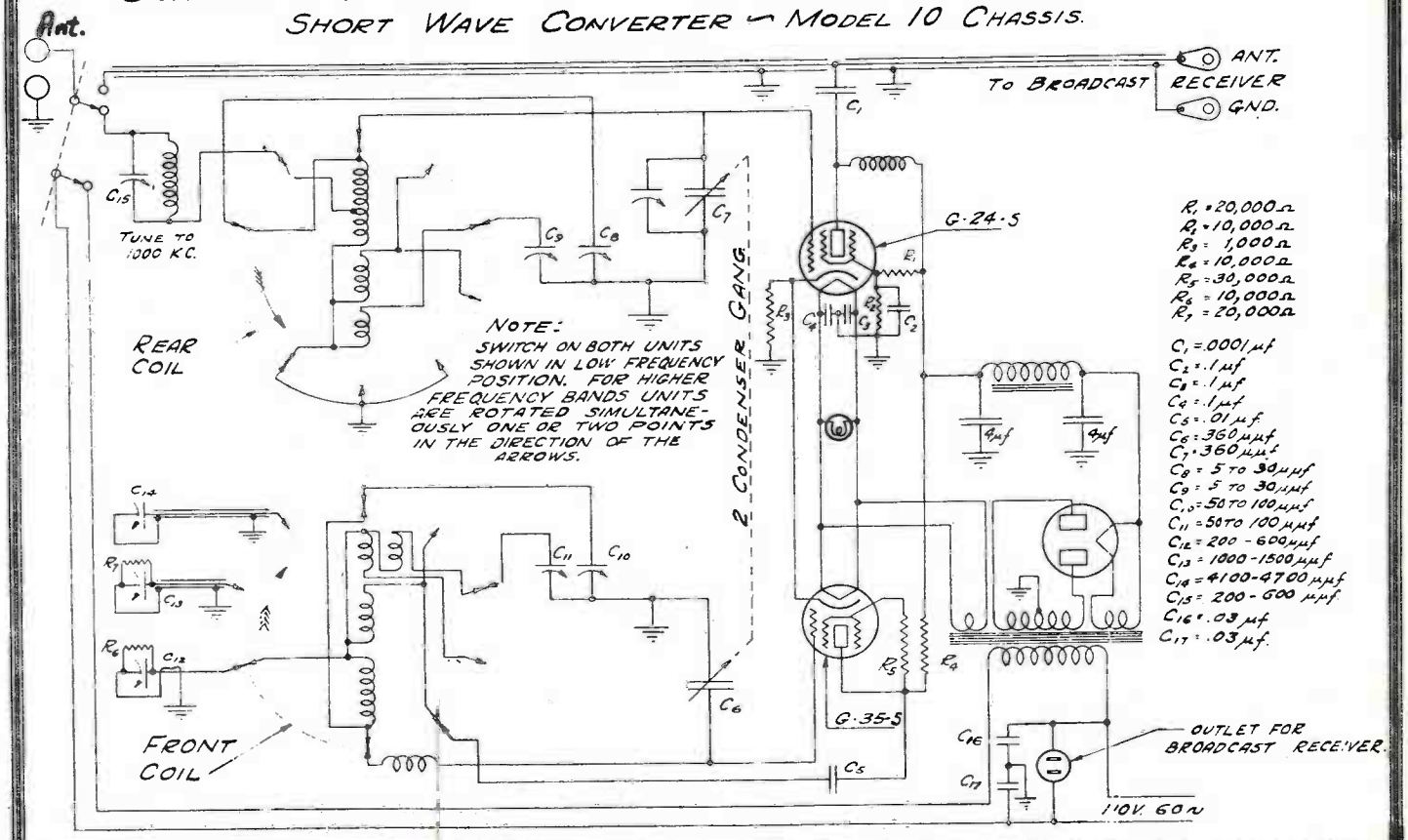
CAPACITIES MF

C1	= .1	CAN "A"
C2	= .1	
C3	= .5	
C4	= .5	
C5	= .25	
C6	= .01	
C7	= .005	CAN "B"
C8	= .03	
C9	= .01	
C10	= .01	
C11	= .0005	
C12	= .00005	

RESISTANCES Ω

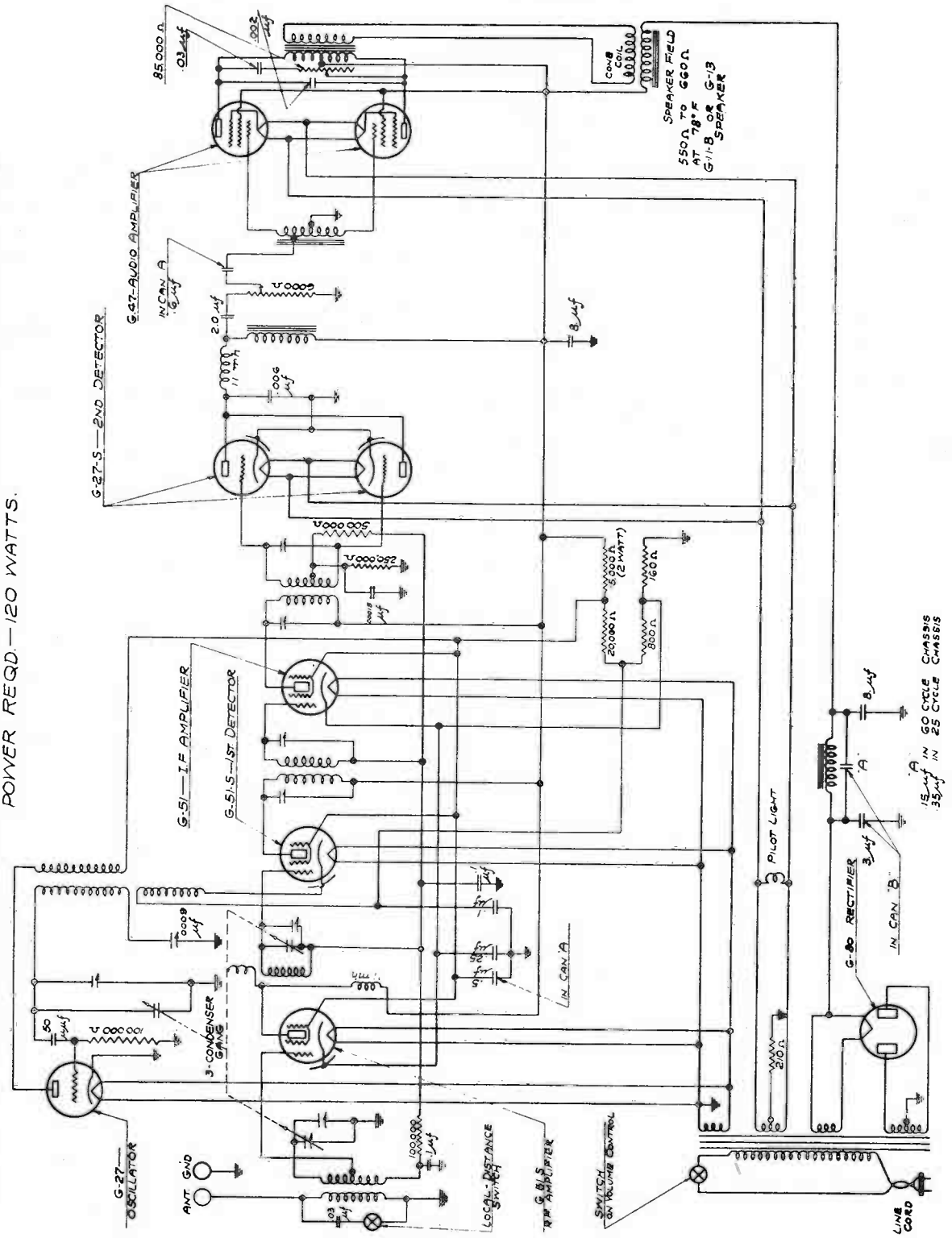
R1	11,500	VOLUME CONT.
R2	264	
R3	25,000	TERM. STRIP "A"
R4	30,000	
R5	100,000	
R6	100,000	TERM. STRIP "B"
R7	300,000	
R8	50,000	
R9	100,000	
R10	300,000	
R11	40,000	
R12	1,000,000	
R13	200,000	
R14	700	
R15	15	

SCHEMATIC DIAGRAM OF MAJESTIC SELF POWERED UNIVERSAL SHORT WAVE CONVERTER — MODEL 10 CHASSIS.



GRIGSBY-GRUNOW CO.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE AUTOMATIC VOLUME CONTROL RECEIVER—MODEL 25-B CHASSIS—115 AND 230 VOLTS, 25 AND 50-60 CYCLES. POWER REQD.—120 WATTS.



GRIGSBY-GRUNOW CO.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE AUTOMATIC VOLUME CONTROL RECEIVER.——MODEL 35 CHASSIS—COLLINGWOOD MODEL 351——115 AND 230 VOLTS, 25-50 AND 50-60 CYCLES. POWER REQD.——150 WATTS.

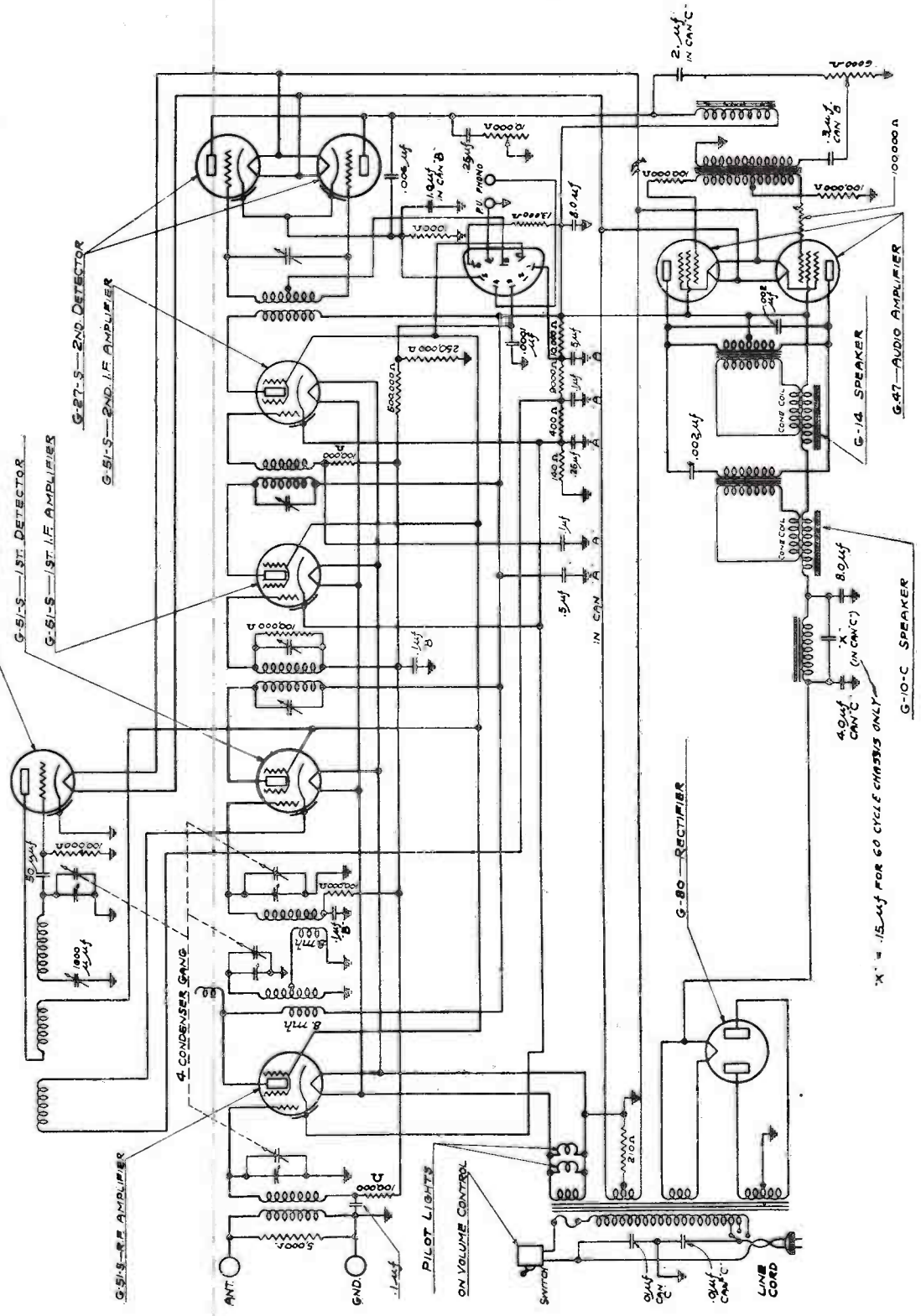


TABLE OF VOLTAGES TO GROUND

MODEL 25-B

Tube Purpose	Type	Fil. Volts A. C.	Plate Volts D. C.	Fil. to Ground D. C.	Cathode Volts D. C.	Plate Current M. A.-D. C.	Screen Volts D. C.	Screen Current M. A.-D. C.
R. F. Amp.	G-51-S	2.5	260		3	4.2	90	1.2
1st. Det.	G-51-S	2.5	260		7	1.3	90	.4
Osc.	G-27	2.5	90			3.5		
I. F.	G-51-S	2.5	260		3	5	90	1.6
2nd. Det.	G-27-S	2.5	135	16		14		
2nd. Det.	G-27-S	2.5	135	16		14		
Power Amp.	G-47	2.5	250	16		30	250	7.2
Power Amp.	G-47	2.5	250	16		30	250	7.2
Rectifier.	G-80	5		400		120 Total		

First Condenser—400 Volts D. C.
Second Condenser—330 Volts D. C.
Third Condenser—250 Volts D. C.

Line Voltage—115 Volts
Speaker Field—75 Volts
Volume Control—Maximum.

TABLE OF VOLTAGES TO GROUND

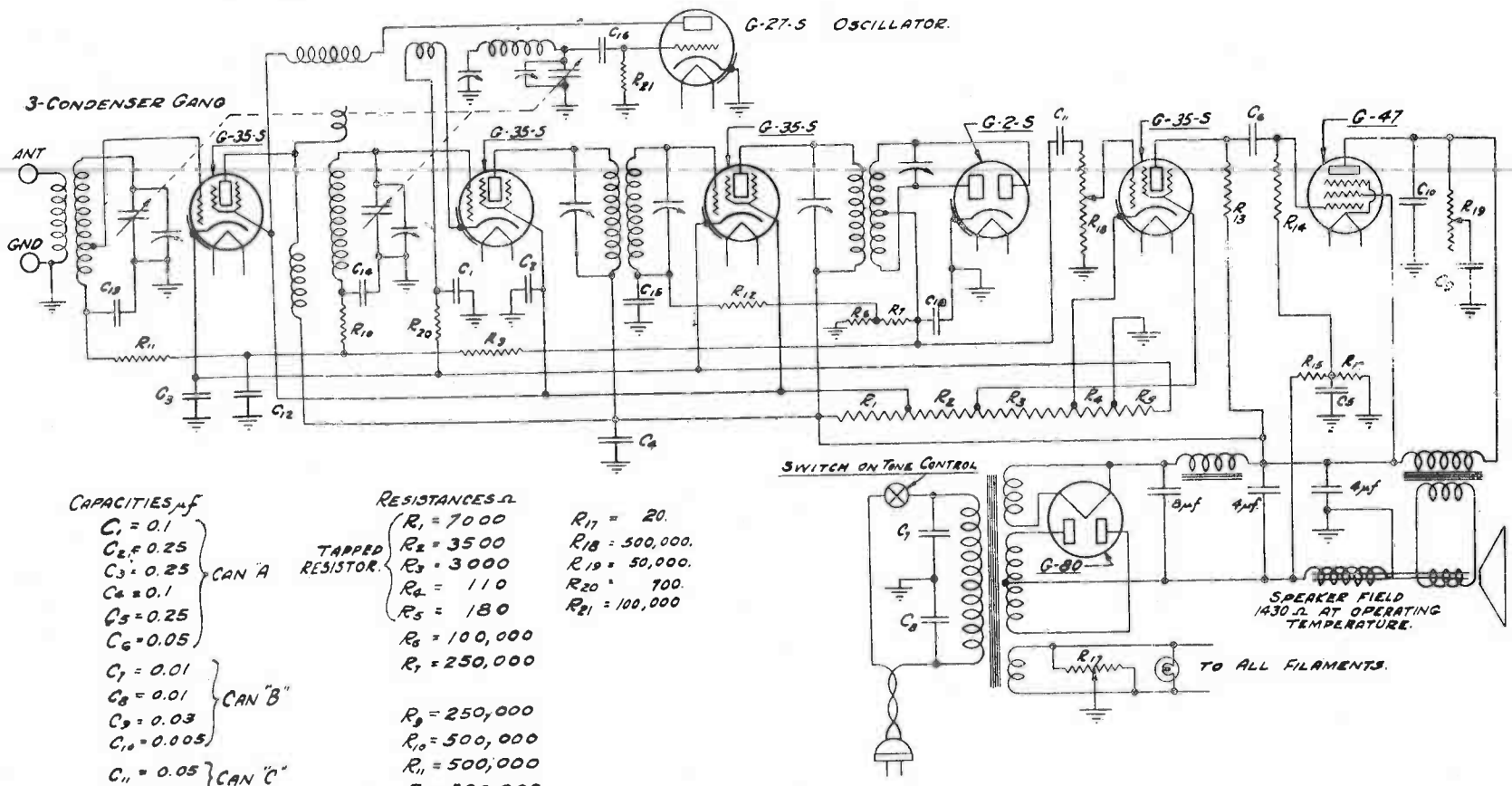
MODEL 35

Tube Purpose	Type	Fil. Volts	Plate Volts D. C.	Filament to Ground D. C.	Cathode Volts	Plate Current M. A.-D. C.	Screen Current M. A.-D. C.	Screen Volts
R. F. Amp.	G-51-S	2.5	265		4	5	0.5	90
1st Det.	G-51-S	2.5	265		8	1	0.5	90
Osc.	G-27	2.5	90			4		
1st I. F.	G-51-S	2.5	265		4	5	0.5	90
2nd I. F.	G-51-S	2.5	265		4	5	0.5	90
2nd Det.	G-27-S	2.5	115			12		
2nd Det.	G-27-S	2.5	115			12		
Power Amp.	G-47	2.5	250	16.5		32	7	260
Power Amp.	G-47	2.5	250	16.5		32	7	260
Rectifier.	G-80	5.0				130 Total		

LINE VOLTAGE 115

GRIGSBY-GRUNOW CO.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE AUTOMATIC VOLUME CONTROL RECEIVER — MODEL 200 CHASSIS.



CAPACITIES μf

- $C_1 = 0.1$
- $C_2 = 0.25$
- $C_3 = 0.25$
- $C_4 = 0.1$
- $C_5 = 0.25$
- $C_6 = 0.05$

} CAN "A"

- $C_7 = 0.01$
- $C_8 = 0.01$
- $C_9 = 0.03$
- $C_{10} = 0.005$

} CAN "B"

- $C_{11} = 0.05$
- $C_{12} = 0.01$

} CAN "C"

- $C_{13} = 0.01$
- $C_{14} = 0.1$
- $C_{15} = 0.01$
- $C_{16} = 0.00005$
- $C_{18} = 0.0008$

RESISTANCES Ω

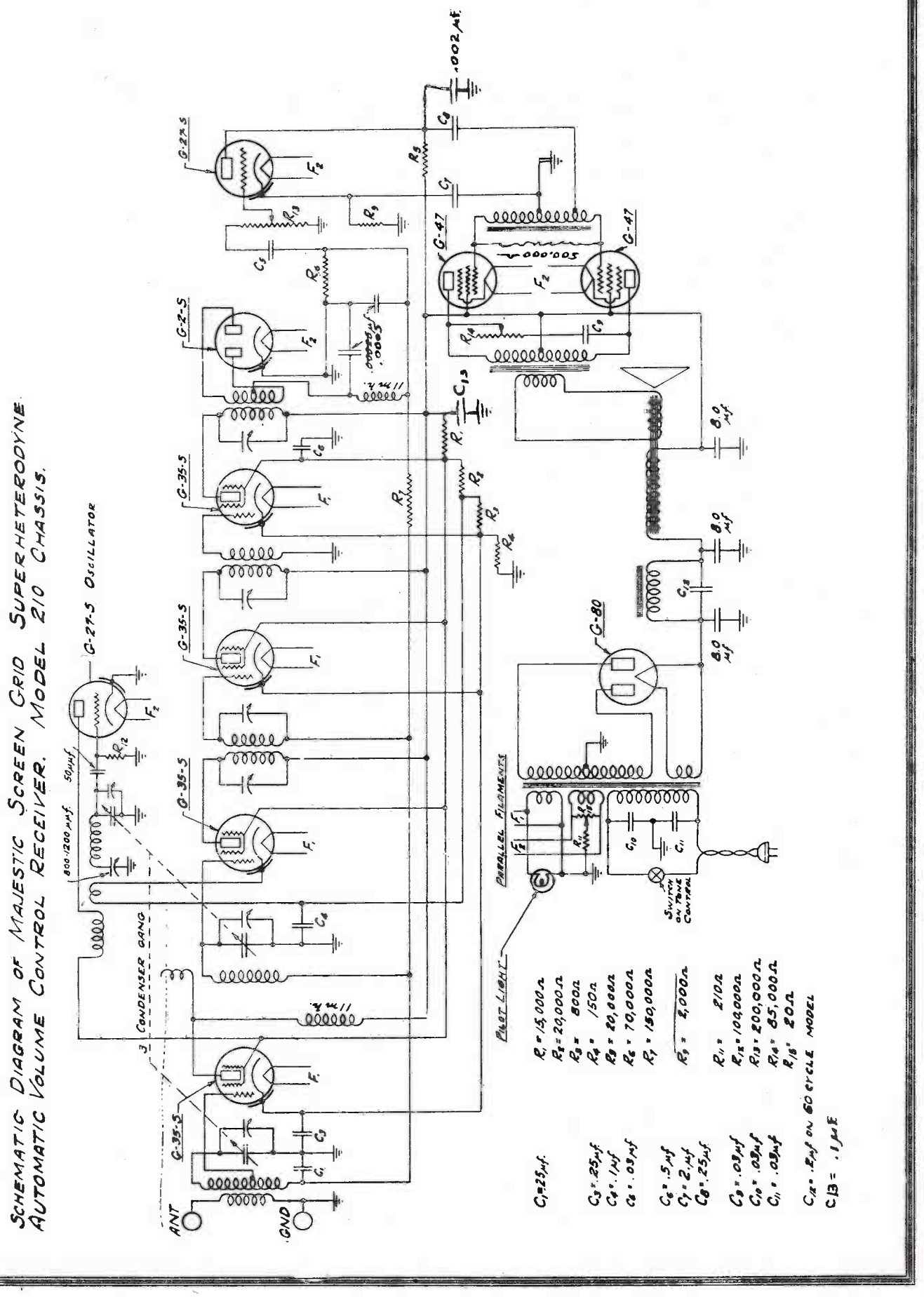
TAPPED RESISTOR.

- $R_1 = 70\,00$
- $R_2 = 3500$
- $R_3 = 3000$
- $R_4 = 110$
- $R_5 = 180$

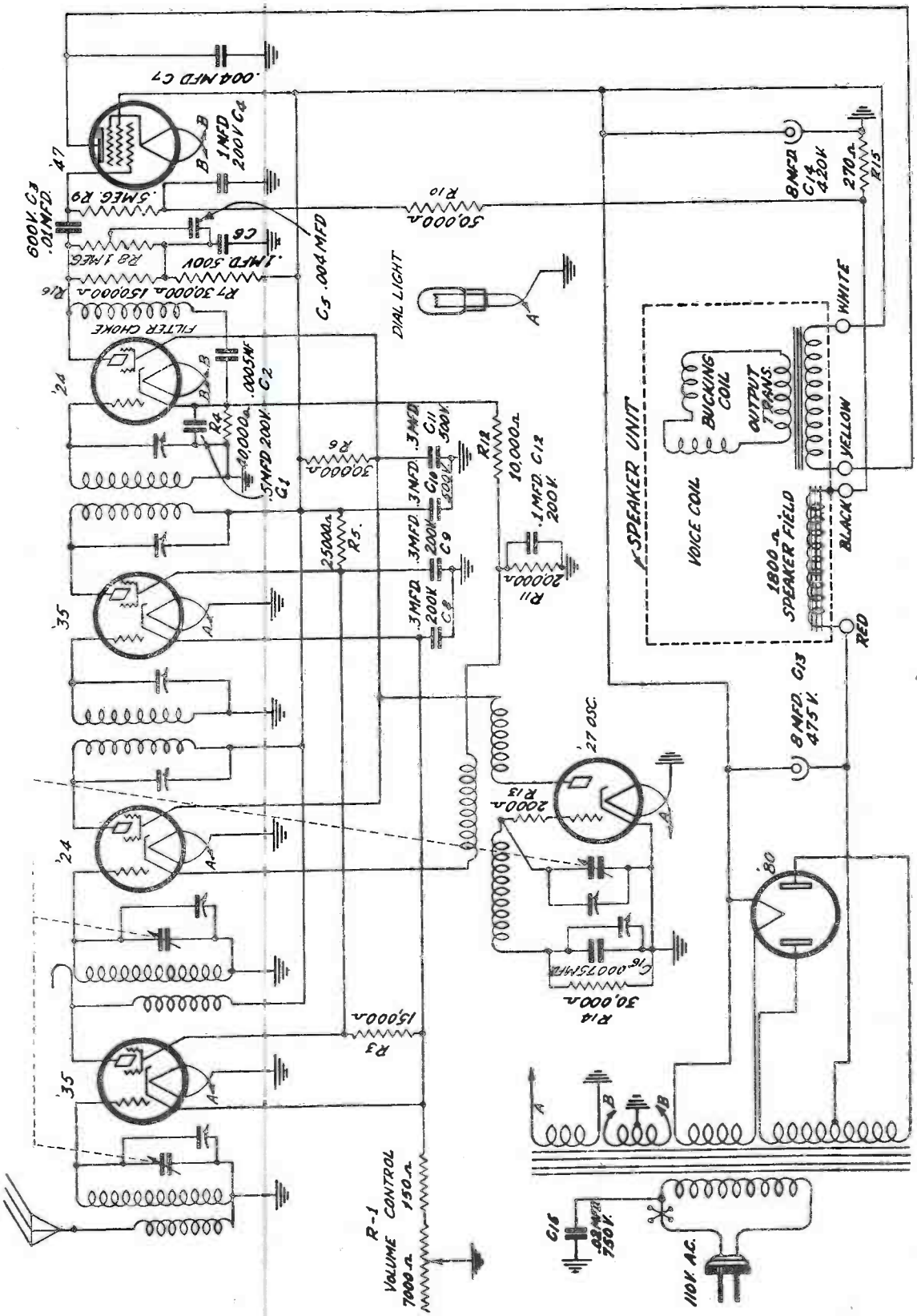
- $R_6 = 100,000$
- $R_7 = 250,000$
- $R_8 = 250,000$
- $R_9 = 500,000$
- $R_{10} = 500,000$
- $R_{11} = 500,000$
- $R_{12} = 100,000$
- $R_{13} = 300,000$
- $R_{14} = 1,000,000$
- $R_{15} = 200,000$
- $R_{17} = 20.$
- $R_{18} = 500,000.$
- $R_{19} = 50,000.$
- $R_{20} = 700.$
- $R_{21} = 100,000$

115 VOLTS — 60 CYCLES — 85 WATTS.

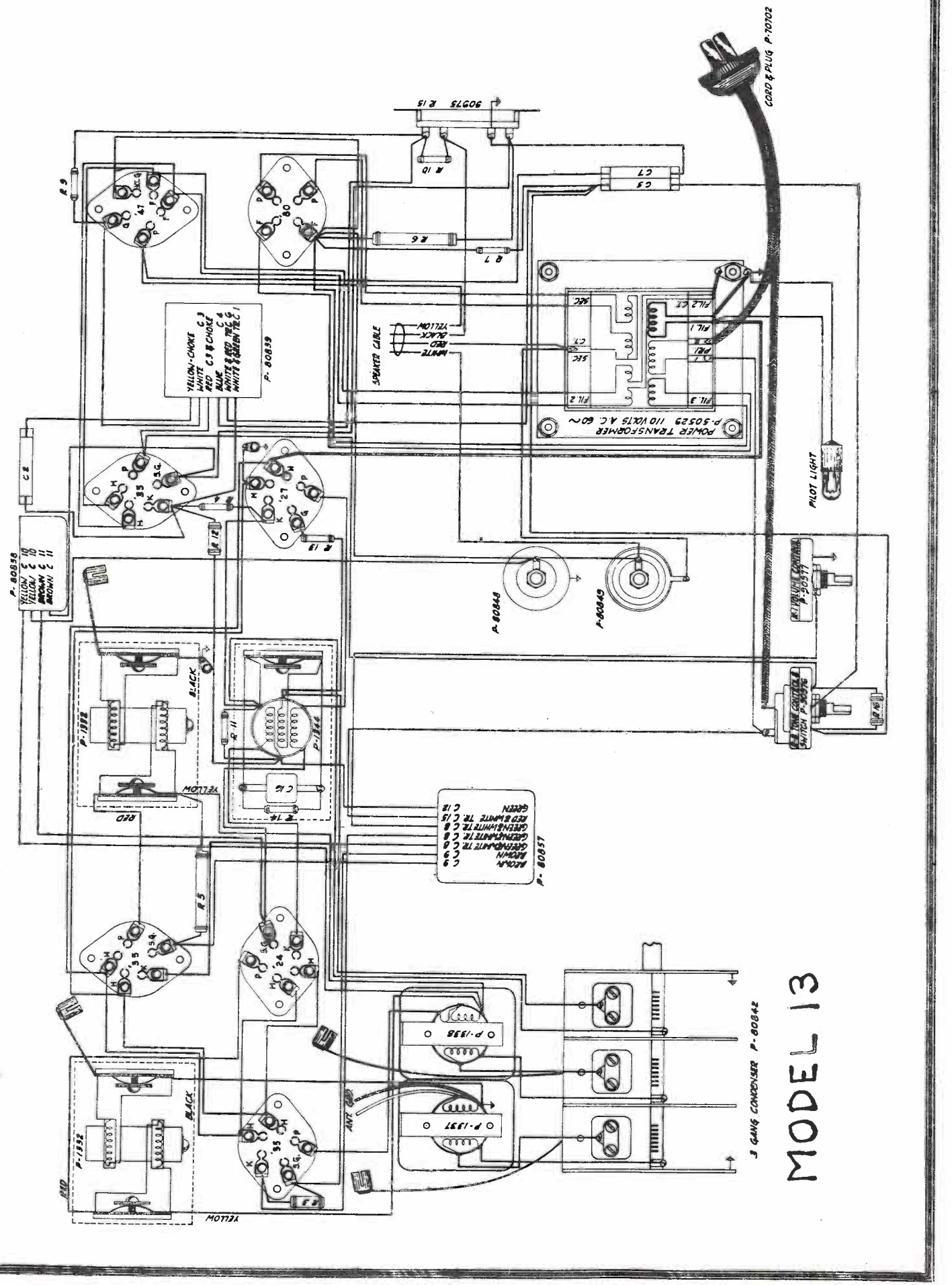
GRIGSBY-GRUNOW CO.



GULBRANSEN COMPANY



GULBRANSEN COMPANY



GULBRANSEN COMPANY

MODEL 13

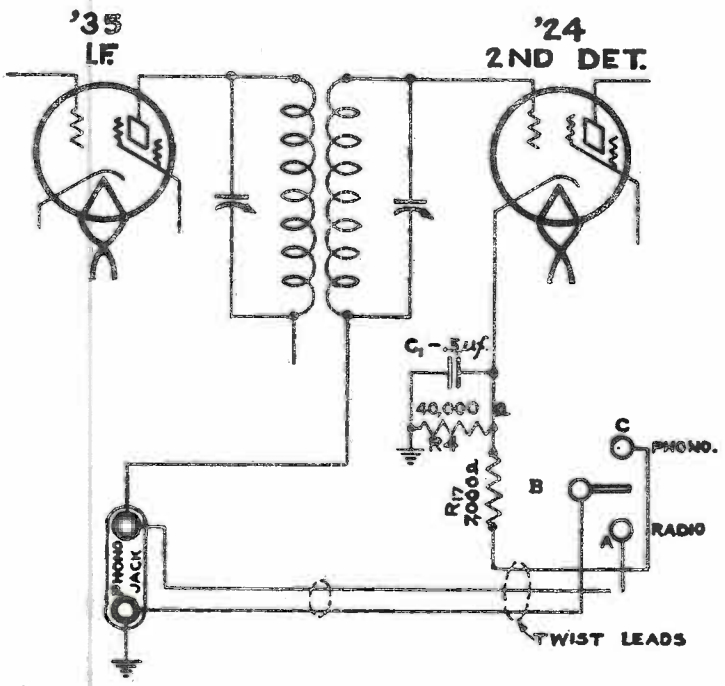
ANALYZER CHART

All voltages taken with a 1,000 ohm per volt voltmeter on the scale indicated in the column headed "Meter Scale." Turn the volume all the way on and connect the antenna and ground leads together. The grid, plate, and screen grid voltages are measured to cathode of the '24 and '35 tubes and to filament of the '47 tube.

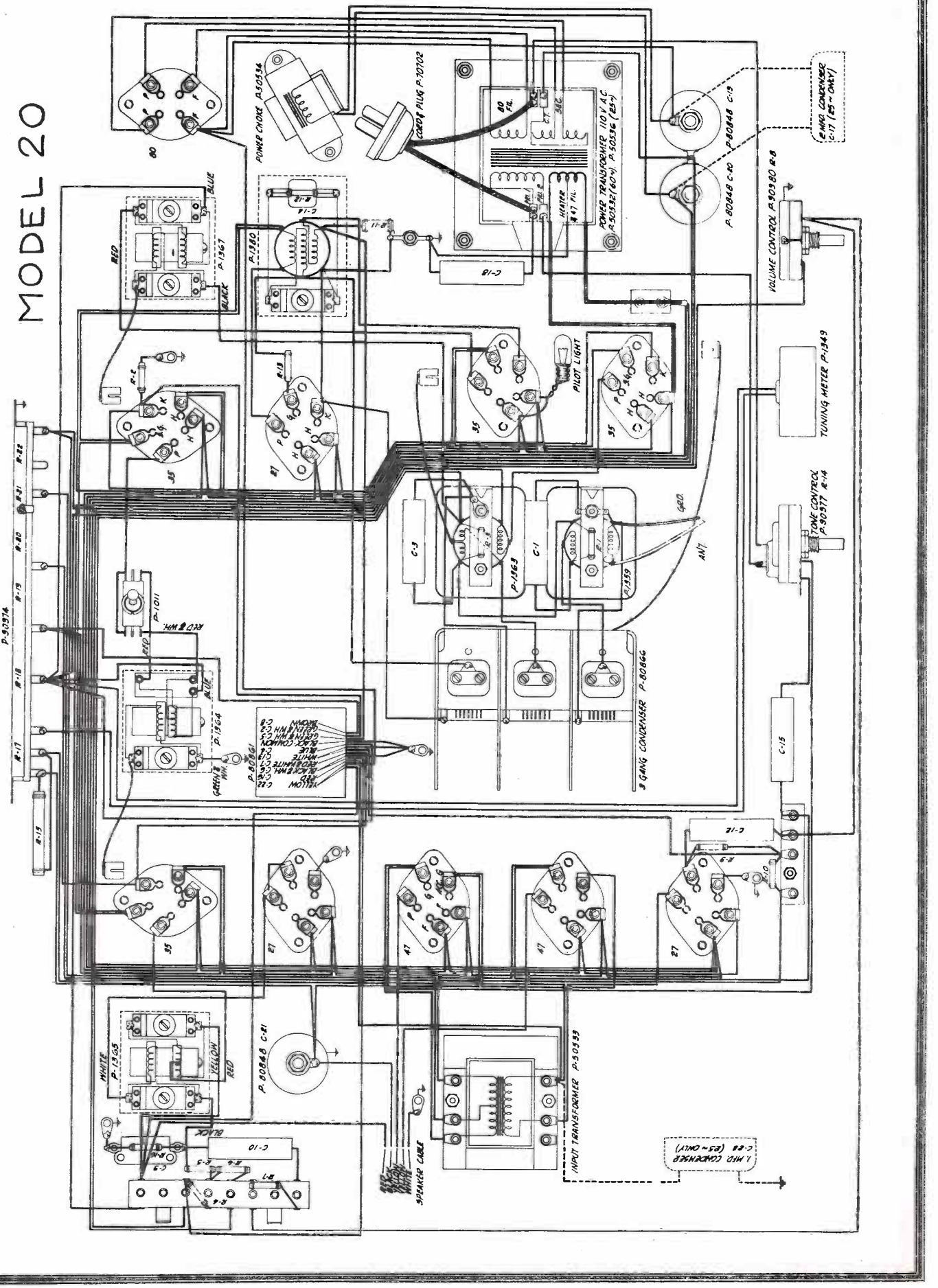
The grid voltage on the '27 oscillator cannot be taken except with a very sensitive, low scale voltmeter. The voltage is approximately .05 volts when the A.C. line voltage is 110 volts.

Tube	Circuit	Meter Scale	90 V.	100 V.	110 V.	120 V.	130 V.
R.F. (Ant.) '35	Grid	0—10	1.5	1.7	1.9	2.1	2.3
	Screen Grid	0—100	53.	58.	63.	66.	69.
	Plate	0—250	195.	210.	225.	238.	250.
1st Det. '24	Grid	0—25	14.	14.3	14.5	15.	16.
	Screen Grid	0—100	63.	64.	65.	67.	70.
	Plate	0—250	190.	205.	220.	233.	245.
Int. '35	Grid	0—10	1.5	1.7	1.9	2.1	2.3
	Screen Grid	0—100	53.	58.	63.	66.	69.
	Plate	0—250	195.	210.	225.	237.	250.
2nd Det. '24	Grid	0—25	14.	14.3	14.5	15.	16.
	Screen Grid	0—100	63.	64.	65.	67.	70.
	Plate	0—250	110.	123.	135.	145.	154.
Osc. '27	Grid						
	Plate	0—100	76.	78.	80.	82.	84.
Aud. '47 (See Caution Above)	Grid	0—10	2.1	2.4	2.7	3.	3.3
	Accelerating Grid	0—250	188.	210.	225.	240.	250.
	Plate	0—250	170.	190.	205.	220.	230.
'80 Rect.	Filament to Ground	0—1000	198.	215.	233.	250.	263.

Phonograph Connection



GULBRANSEN COMPANY



GULBRANSEN COMPANY

MODEL 20

TUBE AND VOLTAGE TESTS

The tubes should be tested in a set analyzer and the voltage readings taken on each tube before servicing the receiver in any other manner. Weak or defective tubes should be replaced.

The measurement of grid bias voltages (except on the '47 pentodes) is not recommended, as this causes an abnormal rise in plate current which is injurious to the tube. Further, the measurement of actual grid bias voltages is impossible due to the high resistance in the grid circuits. When the receiver does not function properly and the trouble is apparently due to improper grid bias on any tube or tubes, the cause of the trouble may be determined by applying the proper continuity tests.

CAUTION: IN ORDER THAT THE EFFICIENCY OF EACH TUBE MAY BE COMPARED WITH THAT OF OTHER TUBES OF THE SAME TYPE, THEY MUST NOT BE TESTED IN THE SOCKET IN WHICH THEY ARE USED. TEST ALL '35 TUBES IN THE SECOND I. F. SOCKET AND TEST THE '27 TUBES IN THE FIRST A. F. SOCKET. TAKE THE VOLTAGE READINGS AT THE SOCKET IN WHICH THE TUBE IS USED.

DO NOT ATTEMPT TO TAKE VOLTAGE READINGS OR TEST THE '47 PENTODE TUBES WITH A SET ANALYZER WHICH IS NOT DESIGNED TO TEST THAT TYPE OF TUBE. A SPECIAL ADAPTER IS NECESSARY AND INFORMATION REGARDING SAME MAY BE OBTAINED BY WRITING TO THE MANUFACTURER OF THE ANALYZER. The latest type analyzers only are designed to test pentode tubes. The UY socket in an analyzer which is used to test '24, '35, and '27 tubes cannot be used to test '47 pentodes. A break-in adapter and the external binding posts of the analyzer may be used to take voltage readings when a set analyzer adapter is not available.

Comparison of the voltage readings taken and those shown in the chart below will show any irregularities. The cause of any variation may be determined by applying the proper continuity tests.

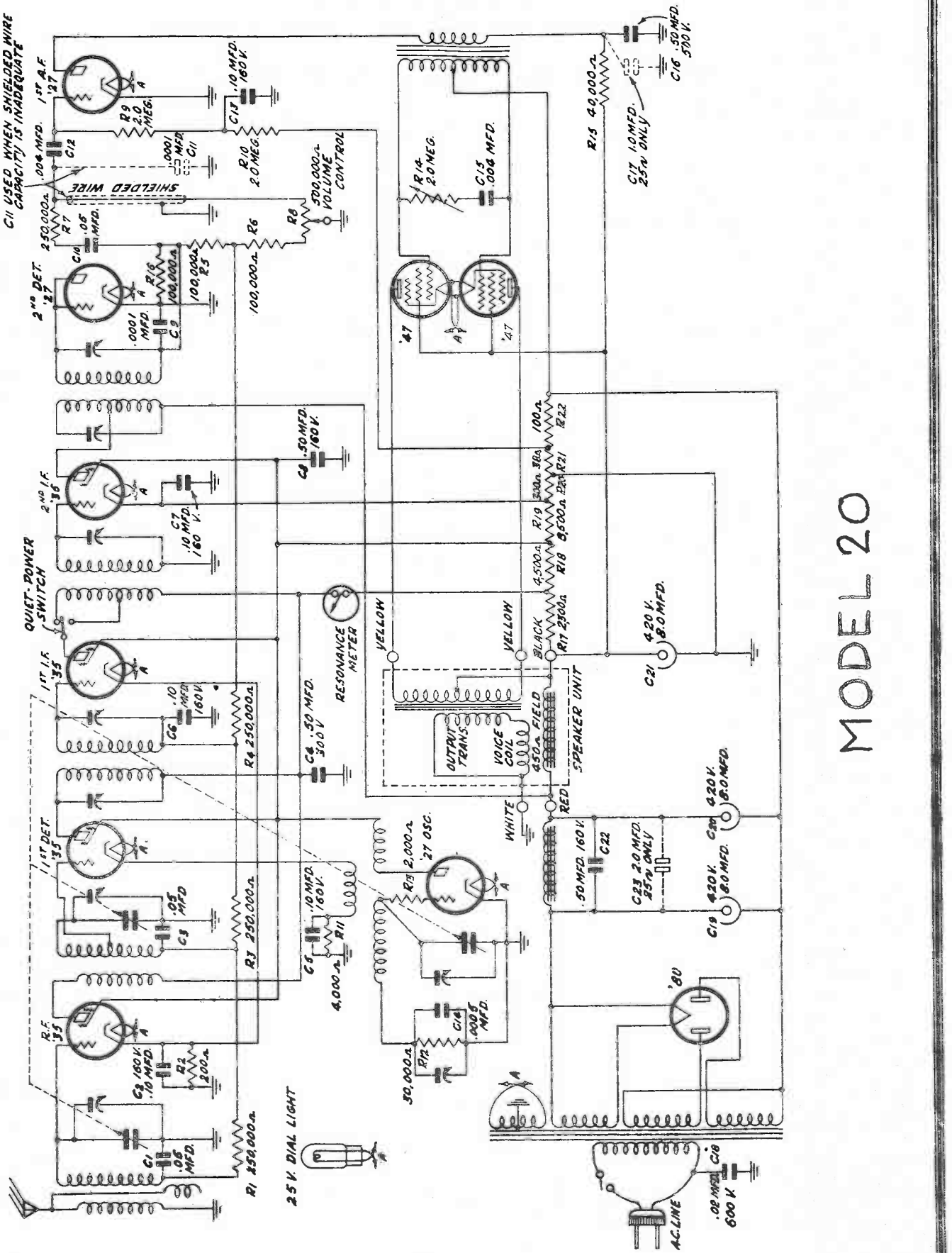
All voltages taken with a 1,000 ohm per volt voltmeter on the scale in the column headed "Meter Scale." Turn the volume all the way on, connect the antenna and ground leads together and turn the gang condenser plates all the way out. CHECK THE LINE VOLTAGE.

NOTE: Voltage readings will vary with different sets of tubes. Unless the voltages are radically different than normal, they may be considered satisfactory.

Tube	Circuit	Meter Scale	90 V.	100 V.	110 V.	120 V.	130 V.
R.F. '35	Screen						
	Grid	0—100	67.	75.	82.	90.	97.
	Plate	0—250	136.	151.	166.	181.	196.
1st Det. '35	Screen						
	Grid	0—100	63.	70.	77.	84.	91.
	Plate	0—250	132.	147.	163.	179.	194.
Oscillator '27	Plate	0—100	70.	77.	85.	92.	100.
1st I.F. '35	Screen						
	Grid	0—100	67.	75.	82.	90.	97.
	Plate	0—250	136.	151.	166.	181.	196.
2nd I.F. '35	Screen						
	Grid	0—100	65.	72.	79.	86.	94.
	Plate	0—1000	227.	252.	277.	303.	328.
1st A.F. '27	Plate	0-100	87.	95.	104.	115.	122.
2nd A.F. '47	Grid	0-25	12.7	14.	15.4	17.	18.3
	Accelerating Grid	0-1000	192.	208.	235.	252.	278.
	Plate	0-1000	180.	200.	220.	240.	261.
'80 Rect.	Current (Both Plates)	0-100	89. M.A.	98. M.A.	108. M.A.	118. M.A.	128. M.A.
(See below)	Plate to Plate voltage	0-1000	547.	568.	690.	712.	733.

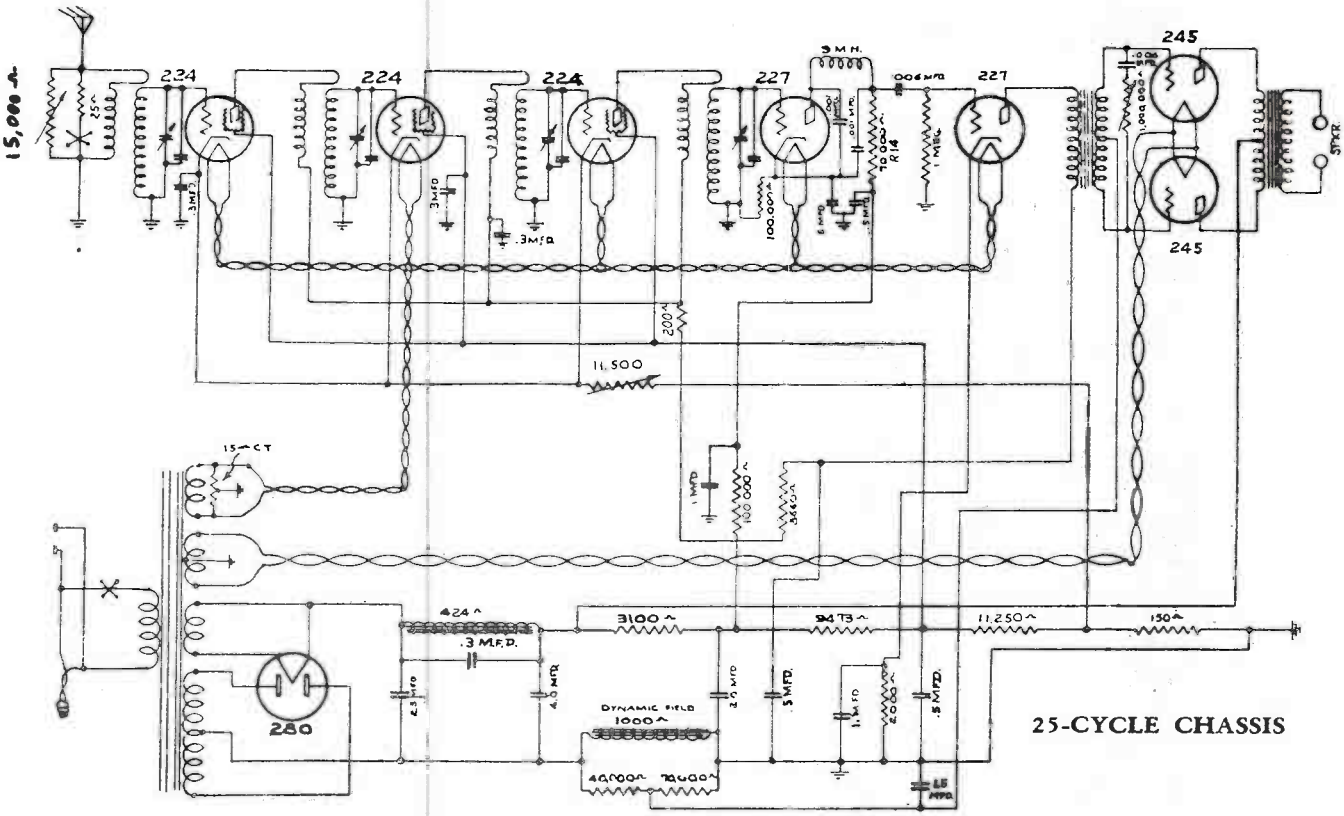
The '80 rectifier plate voltages shown are the totals of both plates, measured from each plate to center tap of high voltage secondary.

GULBRANSEN COMPANY



GULBRANSEN COMPANY

MODEL 80A



25-CYCLE CHASSIS

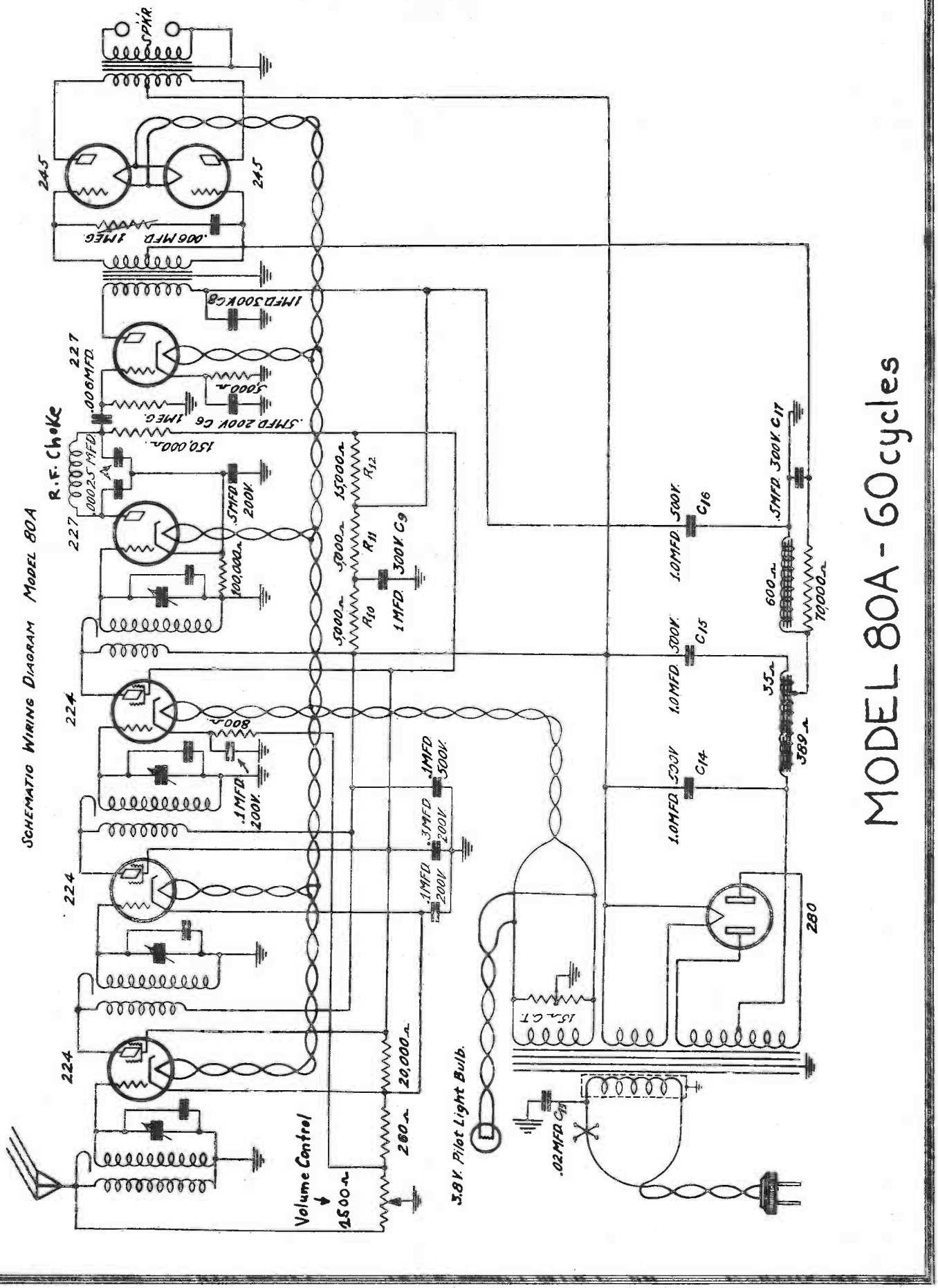
ANALYZER CHART

All D.C. voltages taken with a 1000 ohm per volt meter on the scale indicated in column headed "Meter Scale." Turn on the volume control all the way on and connect the antenna and ground leads together.

The grid, plate, and screen grid votages are measured to cathode of the heater tubes and to filament of three- element tubes.

Tube	*Circuit*	*Meter Scale*	90 V.	100 V.	110 V.	120 V.	130 V.
1st two 224 R.F. Amplifier tubes	Grid	0—5	—2.5	—2.9	—3.3	—3.7	—4.1
	Screen Grid	0—100	62	70	76	84	90
	Plate	0—1000	220	240	270	295	310
2nd 224 R.F. Amplifier tube	Grid	0—5	—1.9	—2.3	—2.6	—3.0	—3.4
Detector 227 tube	Grid	0—10	2.4	2.7	—3.0	—3.3	—3.6
	Plate	0—100	21.0	24.0	26.0	29.0	32.0
227 Audio Amplifier tube	Grid	0—10	.3	.4	.5	.55	.6
	Plate	0—250	90	145	158	170	183
245 Power tubes	Grid	0—100	30	34	39	43	47
	Plate	0—1000	220	240	275	300	320
280 Rectifier tube	Plate	0—1000	300	330	360	400	415
280 Filament to ground		0—1000	210	230	250	280	300

GULBRANSEN COMPANY



GULBRANSEN COMPANY

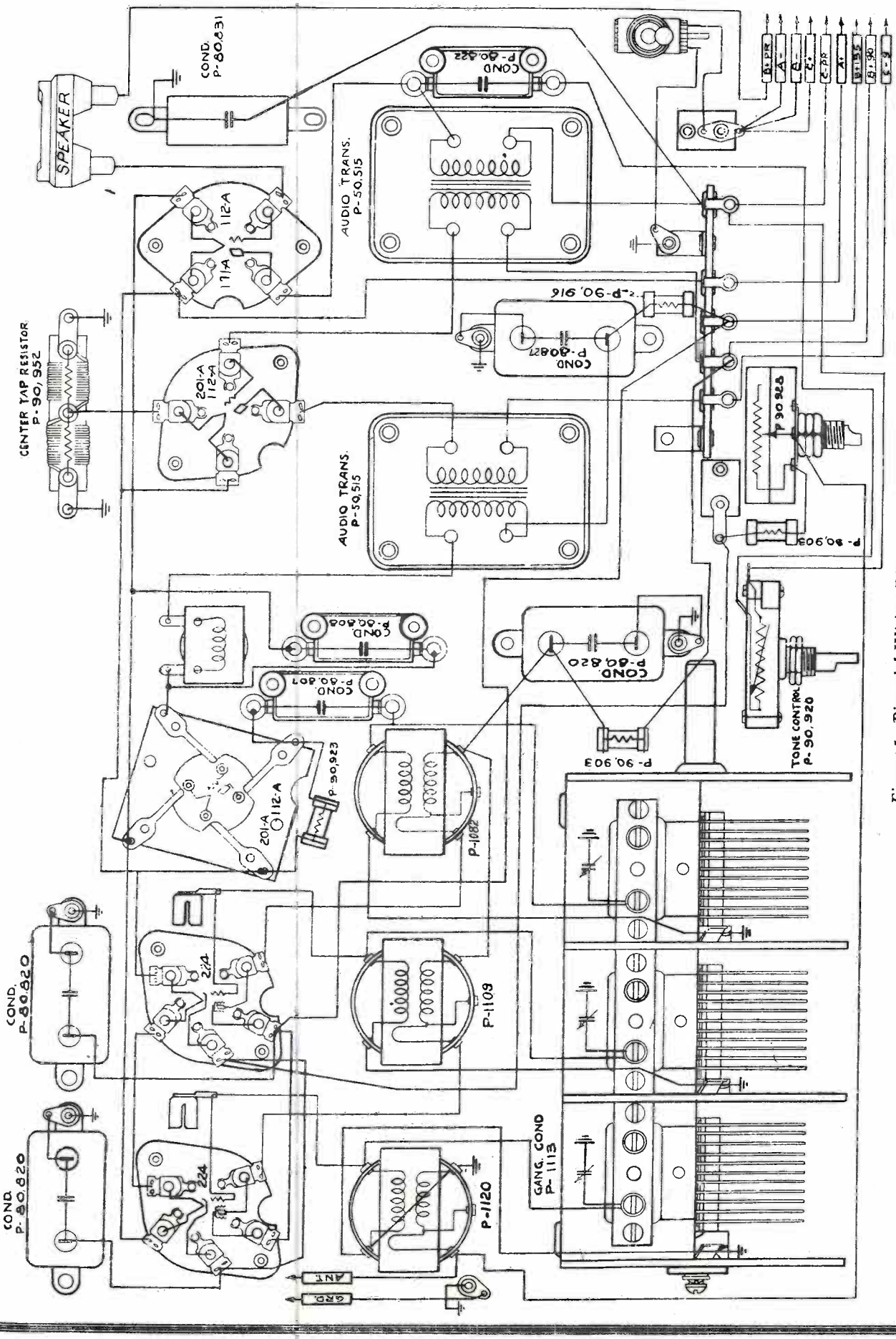
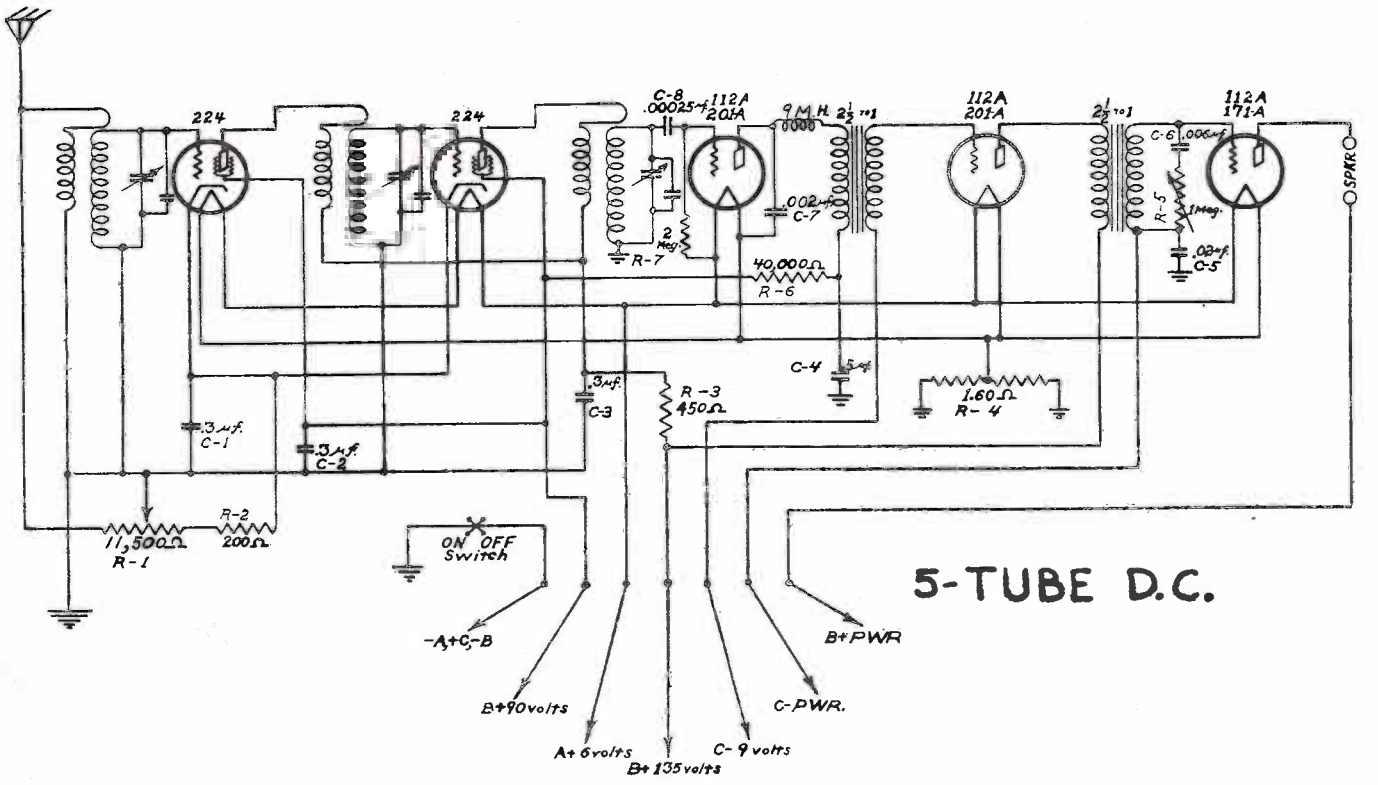


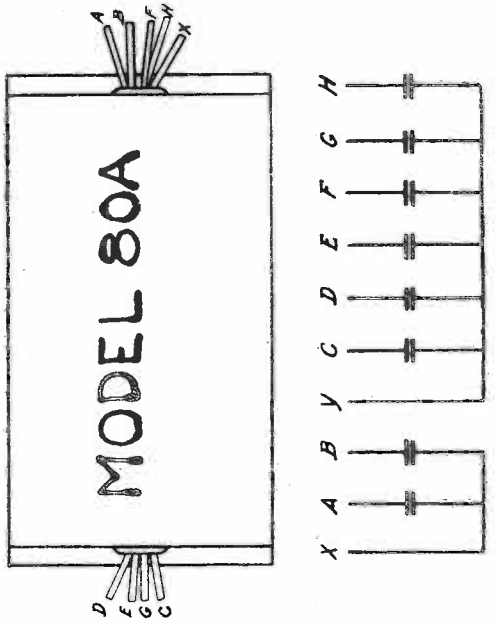
Figure 1. Pictorial Wiring Diagram.

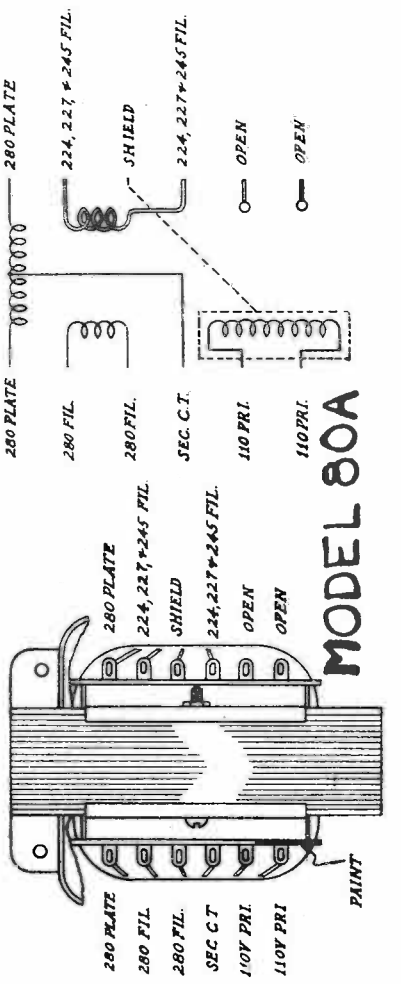
5-TUBE DC MODEL

GULBRANSEN COMPANY

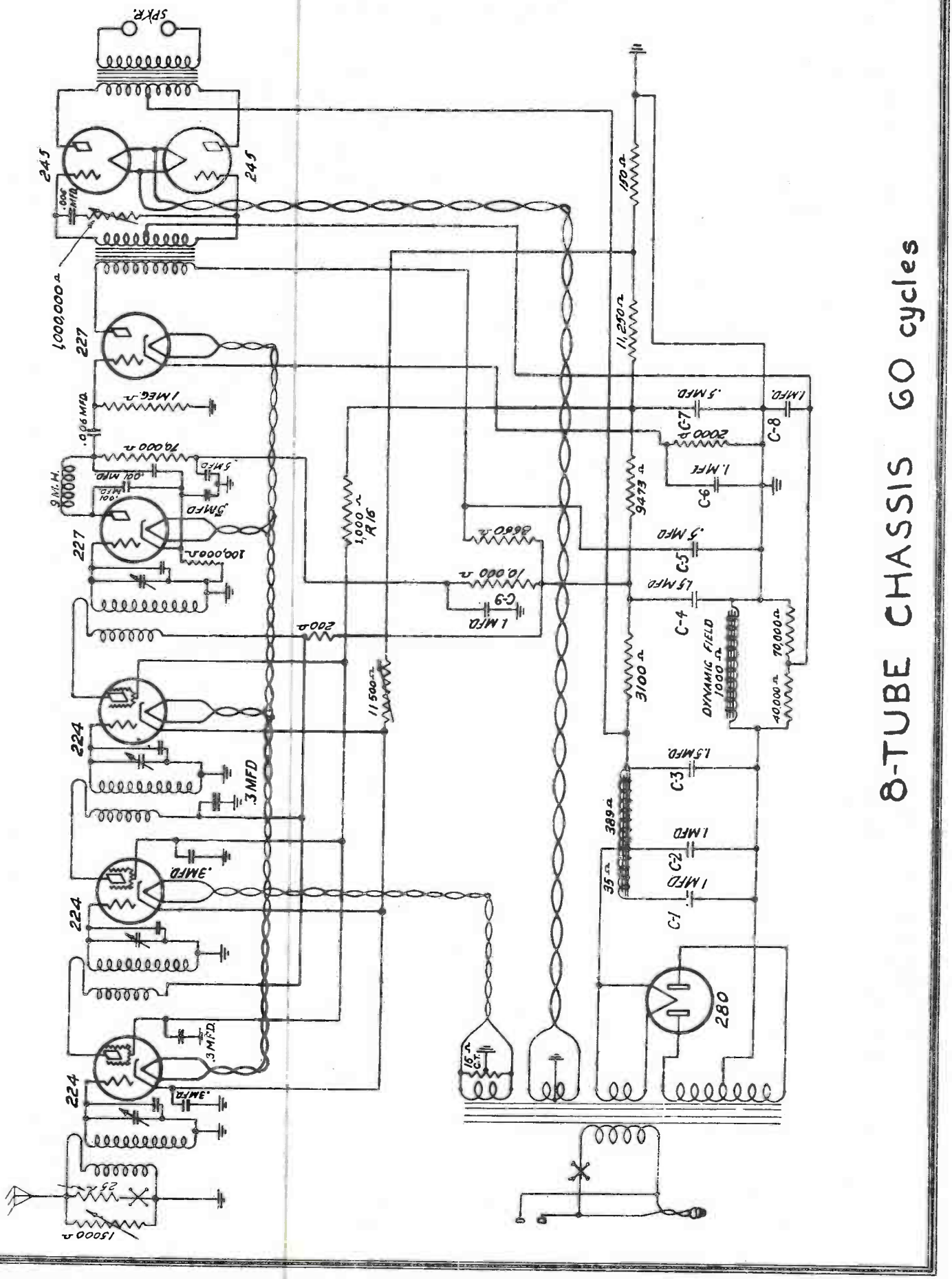


LEAD CODE		COLOR	CAPACITY
A	C-14	RED & YELLOW	1.0 MFD.
B	C-15	RED	1.0 MFD.
C	C-16	YELLOW & BLACK	1.0 MFD.
D	C-9	RED	1.0 MFD.
E	C-8	BLUE	1.0 MFD.
F	C-17	GREEN	.05 MFD.
G	C-6	GREEN & WHITE	.05 MFD.
H	C-13	WHITE	.02 MFD.
X		YELLOW	COMMON
Y		GROUNDED TO CAN	COMMON





GULBRANSEN COMPANY



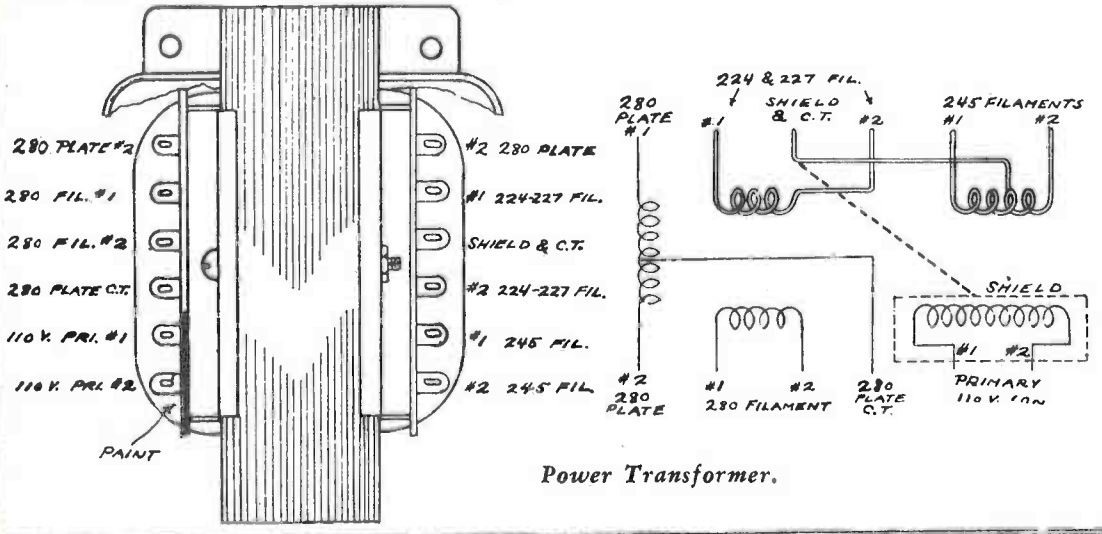
GULBRANSEN COMPANY
8-TUBE CHASSIS

VOLTAGE CHARACTERISTICS

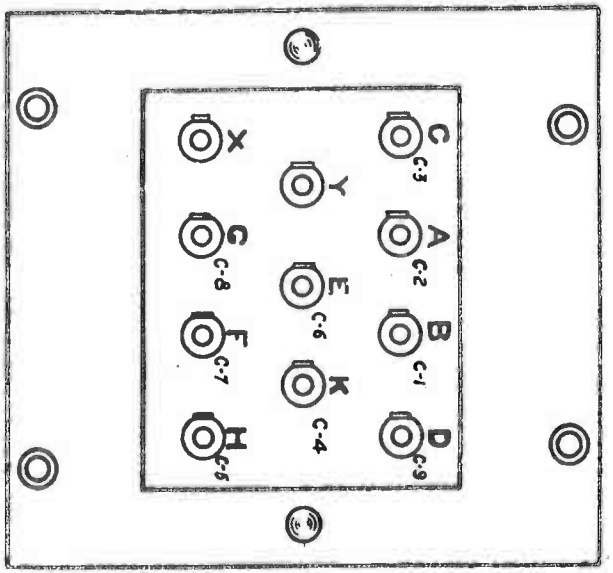
CHECK YOUR LINE VOLTAGE BEFORE TAKING READINGS

Tube Circuit Under Test		LINE VOLTAGE				
		90 V.	100 V.	110 V.	120 V.	130 V.
224	Fil.	1.7	1.9	2.1	2.3	2.5
	Plate	151	166	183	199	215
	Screen	72	79	84.7	93	100
	Grid*	−2.2	−2.6	−2.9	−3.2	−3.6
	Cathode	2.2	2.6	2.9	3.2	3.6
227 Det.	Fil.	1.7	1.9	2.1	2.3	2.5
	Plate	87	97	104	112	122
	Grid*	−13.4	−15.0	−16.5	−18.2	−20.0
	Cathode	13.4	15.0	16.5	18.2	20.0
227 1st A.F.	Fil.	1.8	1.9	2.2	2.4	2.6
	Plate	109	120	129	139	150
	Cathode	6.9	7.9	8.9	9.8	11.0
245 2nd A.F.	Fil.	1.8	1.9	2.2	2.4	2.6
	Plate	211	235	258	285	310
	Grid	36	42.4	47	53	59
280 Rect.	Fil.	3.6	4.0	4.5	4.8	5.2

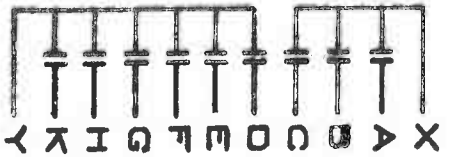
*NOTE: Grid voltages on the 224 and detector tubes are measured from grid to cathode terminals on the tube socket. The grid voltage on the first audio tube cannot be measured from grid to cathode, but is measured from cathode to ground. The above voltages are approximate, and will vary with different tubes.



Power Transformer.

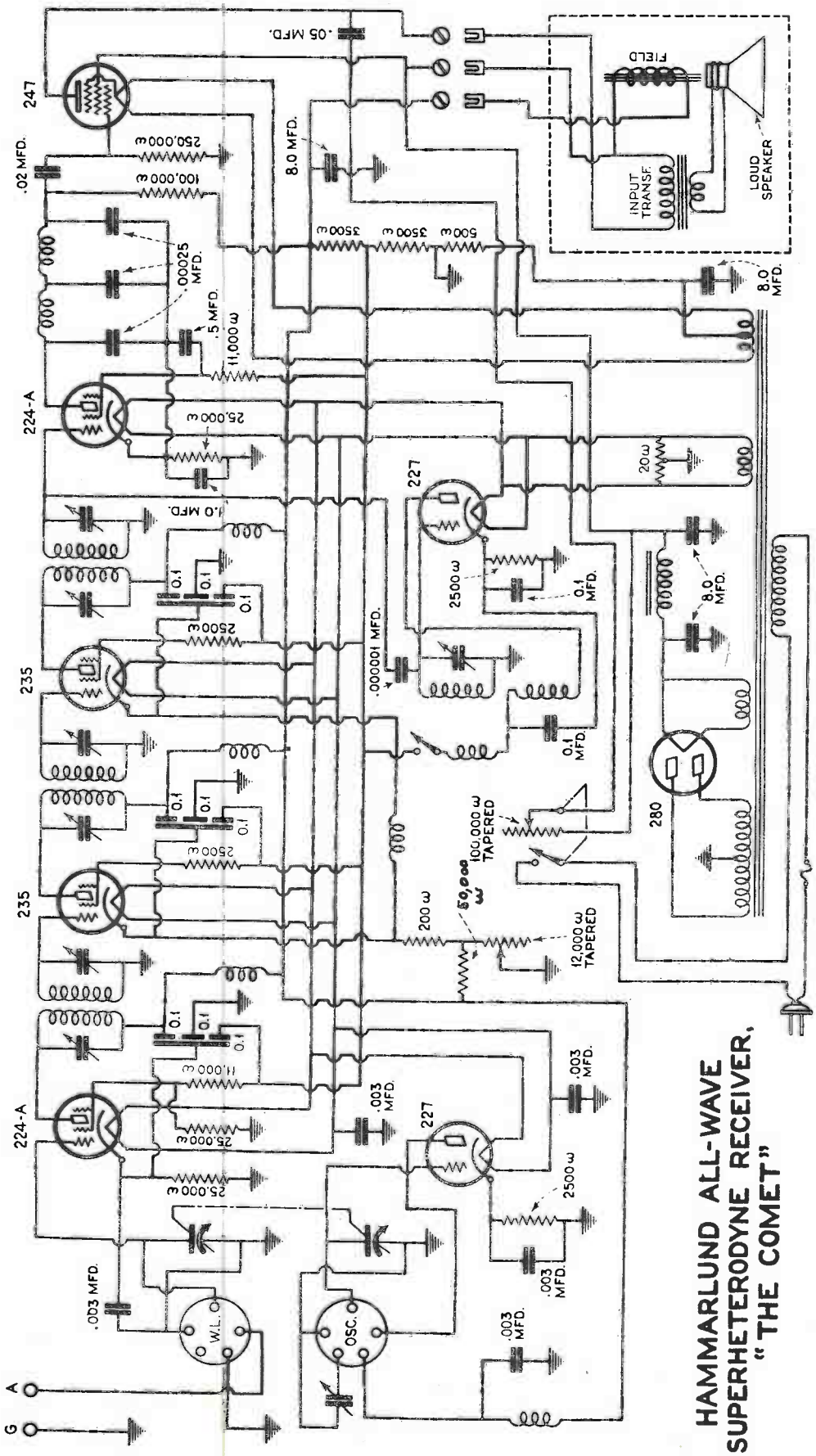


CODE	CAPACITY 60 CYCLE	CAPACITY 25 CYCLE
A	1.0 MF. C-2	
B	1.0 MF. C-1	2.5 MF. C-1
C	1.5 MF. C-3	4. MF. C-3
D	1.0 MF. C-9	1.0 MF. C-9
E	1.0 MF. C-6	1.0 MF. C-6
F	0.5 MF. C-7	0.5 MF. C-7
G	1.0 MF. C-8	1.5 MF. C-8
H	0.5 MF. C-5	0.5 MF. C-5
K	1.5 MF. C-4	2.0 MF. C-4
X	COMMON	COMMON
Y	COMMON	COMMON



Filter Condenser (60 and 25 cycle receivers).

HAMMARLUND-ROBERTS, INC.



HOWARD RADIO COMPANY

HOWARD MODEL 45 A. V. C. SUPERHETERODYNE WITH MODEL A. V. H. CHASSIS

The values of the components of this receiver chassis are as follows: Resistors R1, R3, R5, ½-meg. (⅓-watt); R2, R6, 500 ohms (⅛-watt); R4, 6,000 ohms (½-watt); R7, 30,000 ohms; R8, volume control, ½-meg.; R9, ½-meg.; R10, 3,000 ohms; R11, 2,000 ohms; R12, R13, 150,000 ohms (½-watt); R14, 2 megs.; R15-R16-R17-R18-R19, voltage divider, 9,900 ohms; R20, R21, 10 ohms (center-tapped); R22, 200 ohms.

Condensers C4, C5, C6, C7, I.F. trimmers; C8, C9, C10, C15, C16, 0.1-mf.; C11, .00025-mf.; C12, .001-mf.; C17, C18, 0.25-mf.; C19, C23, 0.5-mf.; C21, .05-mf.; C24, 1. mf.; C25, C26, 8 mf. (420 volts); C27, 4 mf. (420 volts).

In the interest of obtaining best results with the Automatic Volume Control receiver, it is important that the type '27 control tube V9 be a selected one, with a definite plate current cut-off when tested at 180 volts plate and 20 volts bias on the grid. This cut-off should be less than 5 microamperes. If there is no means available for checking the tube (in the form of a special tube tester), an immediate check for tube performance can be obtained in the set itself.

For instance, disconnect the antenna and short-circuit the aerial lead, leaving the control tube out of the socket, and note the swing of the tuning meter. Then insert the tube in the socket and if it is a good automatic volume control tube, *there should be no change in the position of the pointer on the tuning meter.* If there is a change in the position of the tuning meter pointer, namely, a swing toward the *right,* it is an indication that the A.V.C. tube does not have a definite plate cut-off; instead, it is drawing plate current and as a result the bias voltage on the regular R.F. and I.F. tubes has been raised, with the consequent cutting down in plate current.

The Model 45 speaker has a 350-ohm field, and as such it cannot be used with the Models 35 and 40 receivers.

The receiver housed in the regular cabinet is the "Model 45"; the chassis is the "Model AVH."

The automatic volume control functions in holding the second-detector input voltage at a definite level, a system which is different from that in other receivers. A reduction of background noises, between stations, will be noted.

The only service met with to date on the Model "H" receiver has been in connection with the shorting out of the R.F. plate bypass condenser, the red lead of which may accidentally become wedged underneath the first I.F. coil can. The insulation does not cut through immediately but, after being in service for a number of days, the pressure on the insulation may be such as to gradually cut through it, shorting out the plate bypass condenser, and thus producing zero voltage on the plates of the R.F., first detector, and I.F. tubes.

The A.V.C. tube is so connected by means of a 2-megohm resistor, R14, that the grid is at absolute "B—" potential. The cathode of the tube is connected to a point on the voltage divider which is at 24 volts positive, with respect to "B—" or the grid. There then exists between the cathode and the grid a potential difference of 24 volts with the grid negative by this amount. The plate of this tube connects to ground by means of two 150,000-ohm resistors, R12-R13. Since ground is connected to 124 volts, positive (with respect to "B—"), there exists between the cathode and the plate a potential *difference* of 100 volts. In order to bypass any R.F. energy which may appear on the plate, a non-inductive condenser C22 is connected from the plate of the A.V.C. tube to the cathode.

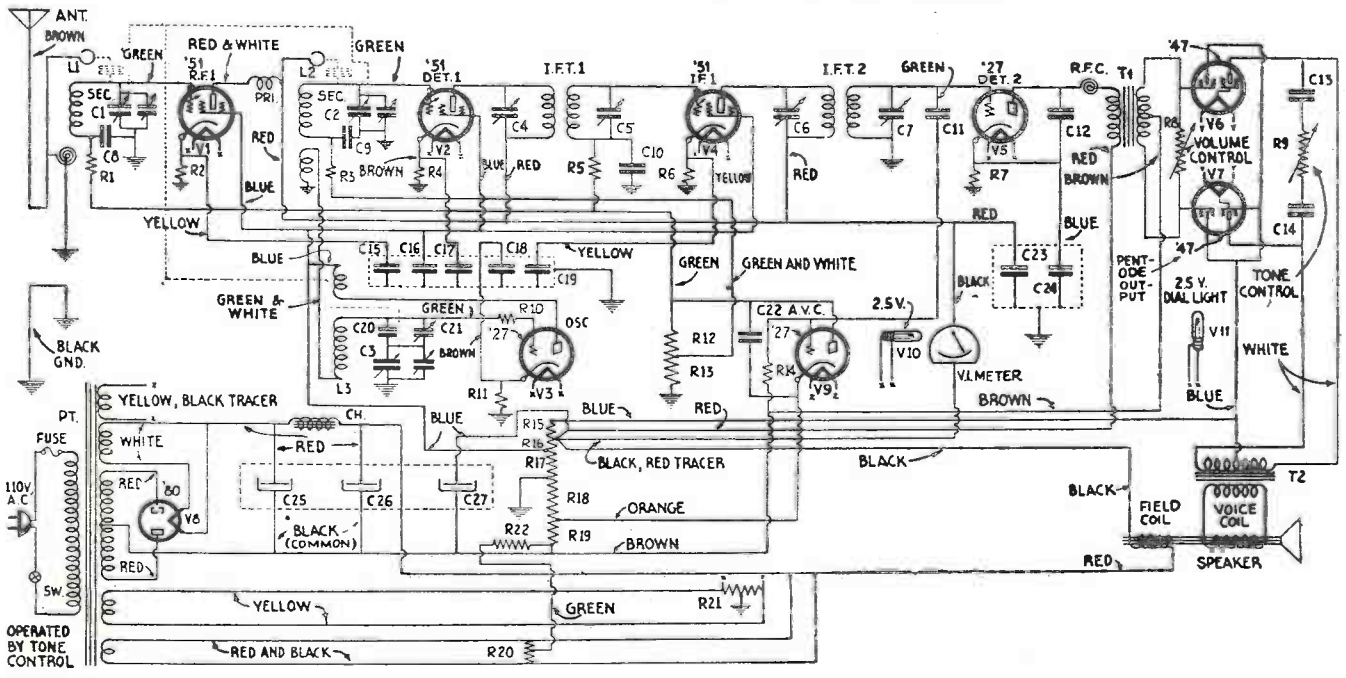
With the condition of no-signal there exists a bias of 24 volts and a plate potential of 100 volts. Under these conditions, there is no plate current flowing and the tube is said to be adjusted to cut-off. Since no plate current is flowing, there exists no voltage drop across the plate circuit resistors and, therefore, there is no bias voltage on the grids of the controlled tubes. The only bias on the R.F., first detector, and I.F. is caused by the respective voltage drops across their cathode resistors. These resistors are designed to give the most sensitive operating point.

In the case of a received signal, energy passes through the receiver to the second-detector grid. Here the A.V.C. (automatic volume control) tube grid, and the second-detector grid, are in parallel. The signal voltage is fed to the grid of the A.V.C. tube through a small fixed condenser, C11.

It will be seen that during the positive half of the incoming cycle, the peak voltage of the signal swing subtracts from the original bias voltage; which means that the instantaneous bias on the tube is less than the original bias and the tube begins to draw current in its plate circuit. Since this current flows in the resistors in the plate circuit of the A.V.C. tube, there exists a voltage drop across these resistors; also, the flow of the electrons is from plate to ground so that the plate becomes negative with respect to ground. Now, since the original potential of the cathode of the R.F., first-detector, and I.F. tubes is positive with respect to ground, it follows that if the grids of the respective tubes are connected to a resistor in the plate circuit of the A.V.C. tube, that any potential existing across this resistor is added to the original bias and makes the grids more negative than the original bias by the amount of the voltage drop across the resistor in the A.V.C. tube plate.

It is at once apparent that the greater the signal voltage appearing at the grid of the A.V.C. tube, the more plate current will flow in the plate circuit: an increase in plate current means an increase in bias on the R.F., first-detector, and I.F. tubes; an increased bias on these tubes means less amplification and, therefore, less grid swing on the second-detector and A.V.C. tube. This cycle goes on until a constant voltage is obtained across the second-detector input, or, in other words, until a condition of equilibrium is reached.

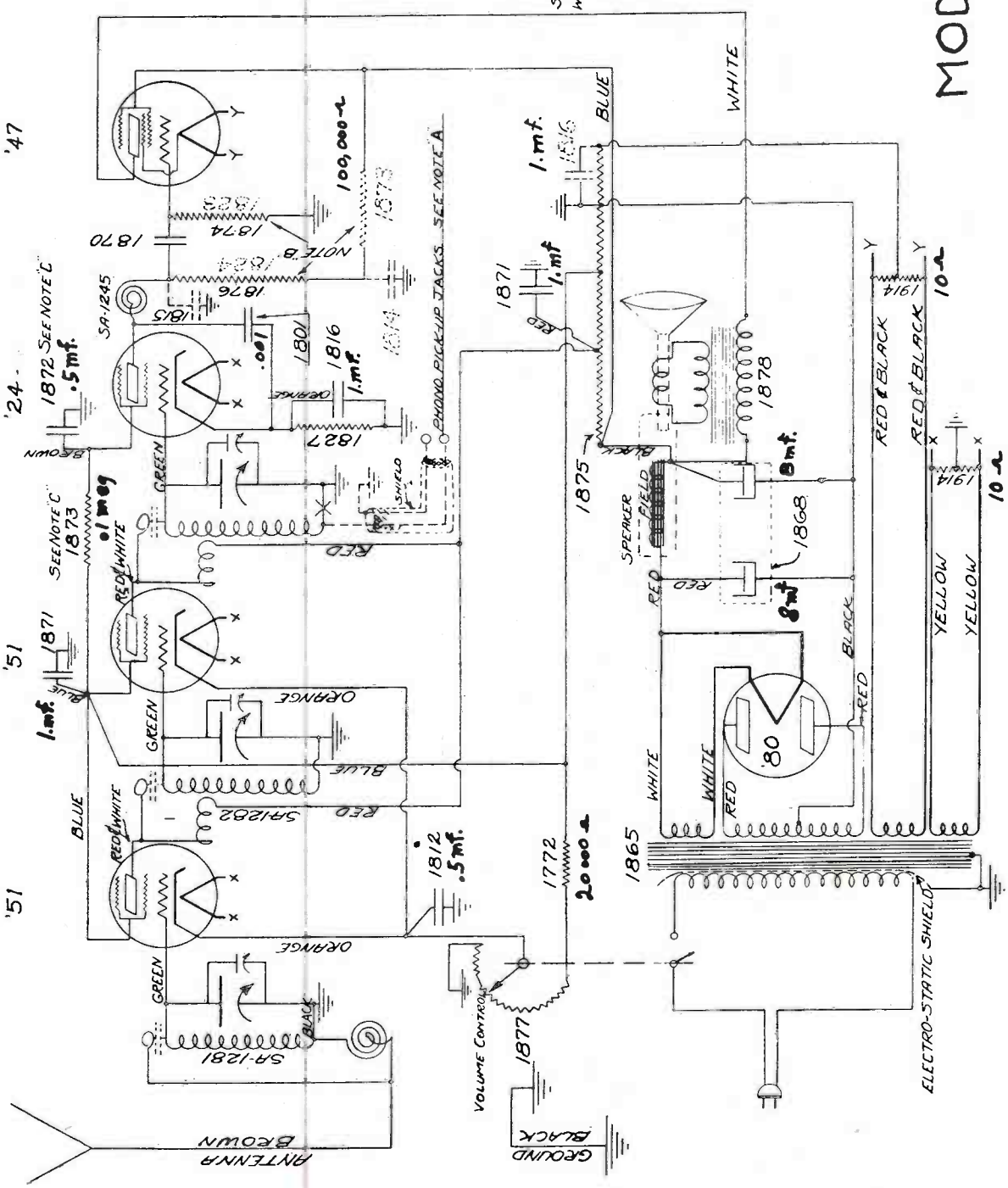
Since R8 is located where the tone control is normally connected, it was necessary to relocate the tone control, C13-R9-C14. As less resistance is included between the two condensers, they become more effective in bypassing the higher audio frequencies; at the same time, they resonate the primary of T2 to a lower audio frequency.



Resistor R15 is 450 ohms; R16, 3,000; R17, 3,750; R18, 2,250; R19, 450. Condensers C13-C14, 0.1-mf.; C20, .0009-mf.

HOWARD RADIO COMPANY

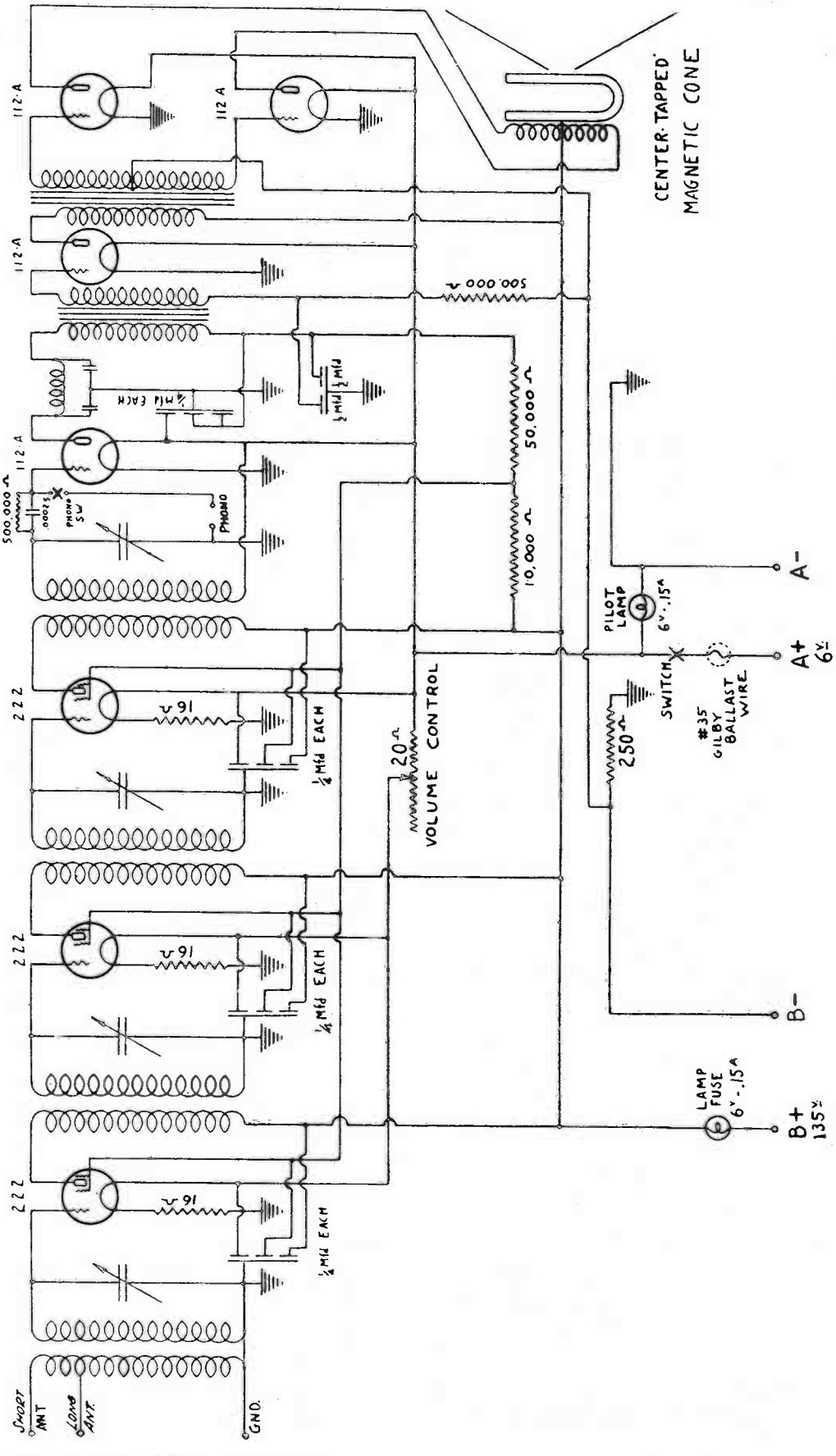
MODEL SG-T



COLIN B. KENNEDY CORP.

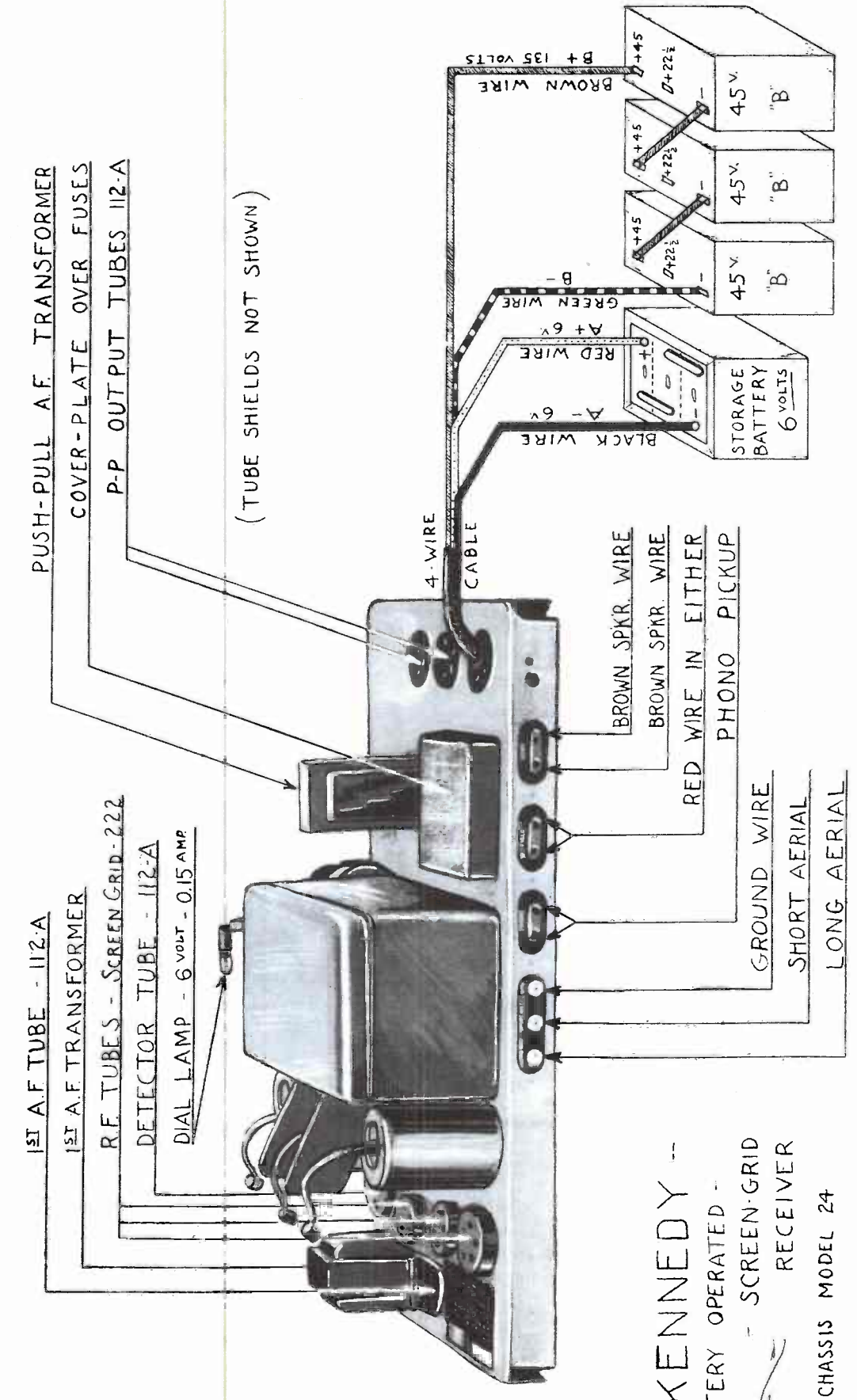
Schematic Diagram Model 24 Chassis

KENNEDY BATTERY OPERATED SCREEN GRID RECEIVER
CHASSIS MODEL 24
SCHEMATIC DIAGRAM

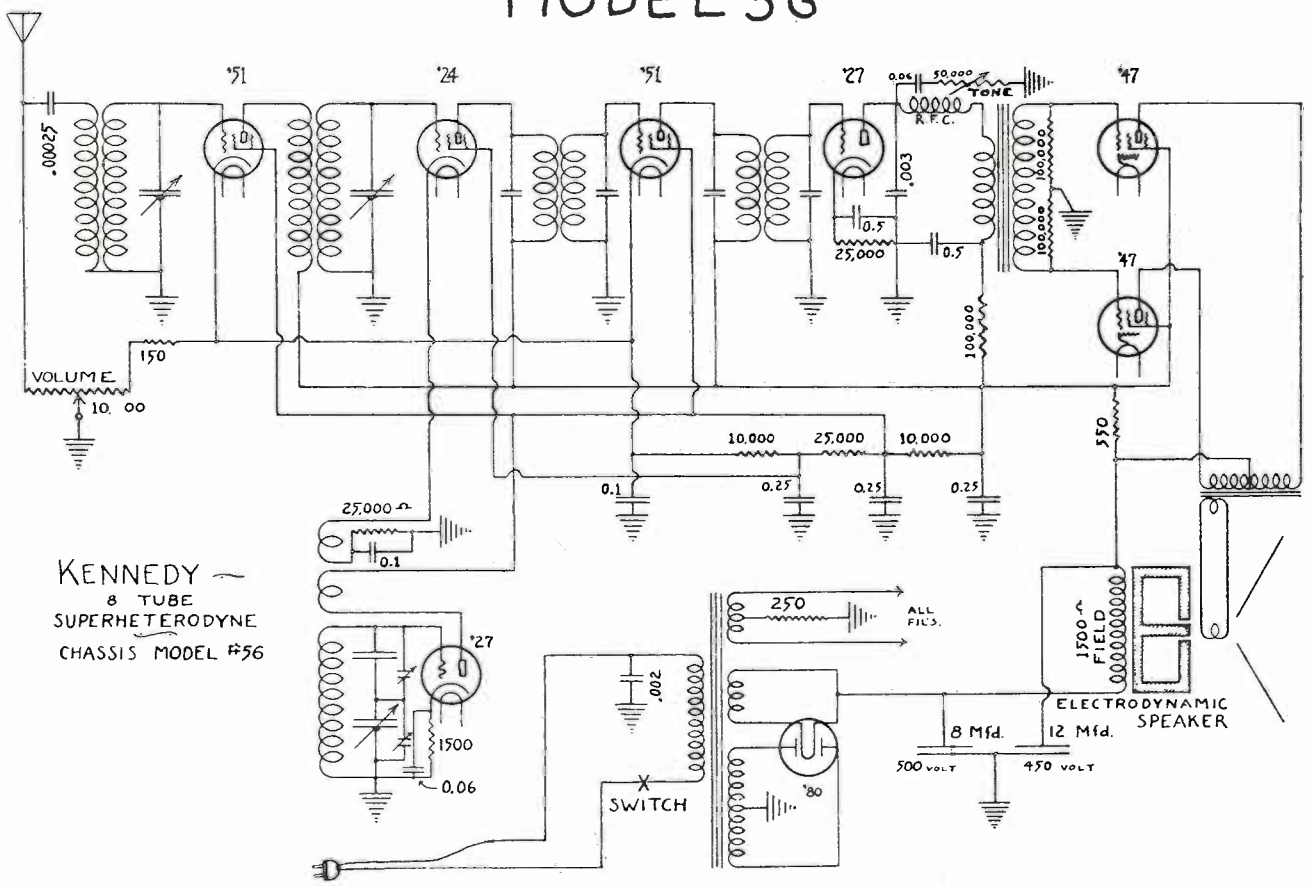


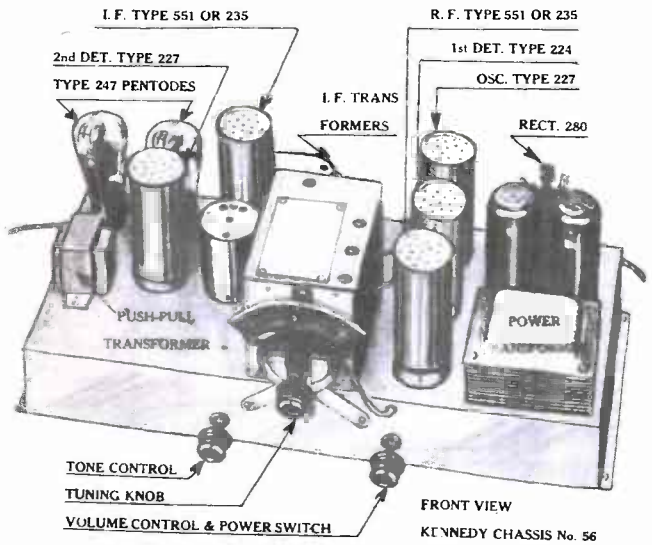
COLIN B. KENNEDY CORP.

Rear View Model 24 Chassis

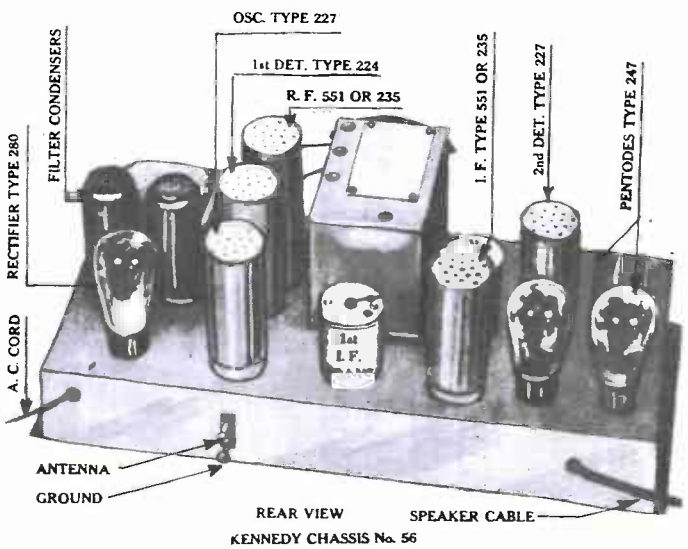


COLIN B. KENNEDY CORP.
MODEL 56





FRONT VIEW



REAR VIEW

The tubes employed in this receiver are as follows, voltages as read with a 1,000-ohm per volt D. C. meter being included for service convenience:

Purpose	*Type*	*Fil.A.C.*	*Plate*	*Screen*	*Bias*
Radio Frequency	551	2.35	208	98	3 to 30
1st Detector	224	2.35	208	30	5
Oscillator	227	2.35	90	....	10
Intermediate Freq.	551	2.35	208	98	3 to 30
2nd Detector	227	2.35	120	...	16
Power Tubes	247	2.35	220	208	14
Rectifier	280	4.90	....	....	....

Volume control full on except for R. F. and I. F. bias extremes. Line voltage 115

Plate, screen and bias voltages measured from ground or chassis to respective terminals.

Small deviations above or below the values given may be expected due to variations in parts, tubes and meters used.

SERVICE MEN WANTED

There is a real change in every part of the radio business. A change which can bring great benefits to you. Radio Receivers are being sold for a song and unfortunately many of them are filled with inferior tubes, when they are sold. You can make a real friend of the purchaser of every such receiver by filling all his sockets with good tubes. But that is not the whole story.

The Triad Mfg. Co. is the first manufacturer to recognize the vital part you servicemen play in this new radio business. Triad knows that, with your confidence, a greater number of users of Triad tubes can be reached. Therefore, the directors have decided to make actual partners of some of you and permit you to sell them.

TRIADS HAVE ALWAYS BEEN GOOD TUBES

The Directors of the Triad Mfg. Co. have been in the tube business for many years. They are in constant contact with men like you every day. They are very familiar with the problems you have to face. They have always given you tubes you could bank on. They have assisted you in building up satisfied clientele, by giving you the one most important unit of radio service—a good tube.

For example:

Do you know that of the millions of tubes bought from Triad, last year, less than four per cent were defective and that includes those damaged in shipment. When you consider the very broad guarantee behind all Triad Tubes, this return is remarkably low. It must indicate what these tubes can be made to mean to your business.

CERTIFIED TRIAD TUBES

These new tubes are being made specially for servicemen. They are going to you right from the factory. They are packed with an engineering coupon which indicates exactly what their constants are after they have been permitted to age and have then been checked for the second time. This assures you of their being absolutely correct, in every detail. It assures you of satisfied customers. It assures you of a permanent, profitable business.

And you can have these tubes, at no increased cost. In fact, under most conditions you can buy them at a great saving. In other words, TRIAD is offering you an opportunity to give your customers greater satisfaction at the same time you make a greater profit out of every sale.

YOU CAN BECOME A TRIAD REPRESENTATIVE

While it is the purpose of the Triad Company to cooperate with all Servicemen, it is also desirable to be sure that **every serviceman who sells CERTIFIED TRIAD TUBES will not find that every other serviceman in his vicinity can compete with him. YOU ARE TO BE PROTECTED** and we will definitely limit the number of men in any one section, who will be permitted to purchase **CERTIFIED TRIADS** on this new, money-making plan.

We want you to know all the details of this wonderful new sales plan. It has been designed for the servicemen, in all parts of the country, who can measure up to the TRIAD qualifications. Every assistance will be given to the men selected, but they must be the key men in their territories. Triad has no place for dead wood. Triad wants men who can carry on the Triad tradition and who can render the same quality of Service that Triad is building into every one of the thirty different types of tubes it makes. If you think you can measure up to that standard and you want to assure yourself of a growing, lasting, profitable business, you will find your opportunity waiting for you, below

TRIAD MANUFACTURING CO.
TELEVISION MFG. CO.
Pawtucket, R. I.

Gentlemen:

Please send me complete information about your new Sales Plan for servicemen.

I have been a serviceman for ..... years.

I sell ..... tubes per year.

I belong to the ..... Serviceman's Association.

My letterhead or card is attached.

A CORNER OF THE AUTOMATIC FLARE AND MOUNT DEPARTMENT
Triad Mfg. Co., Plant No. 1

SUPPLEMENT No. 1

Index and Incidental Information

THE index printed below lists all the set diagrams included with the first supplement to the 1932 OFFICIAL RADIO SERVICE MANUAL. Insert the supplement sheets carefully in your Manual, being careful not to disturb the sequence of the present pages. Put page 310A after page 310, and so on. Keep this index page with the other index pages. A completely revised index will be published with the second supplement.

Please look through the index carefully before writing to us for information on a particular receiver. A great many of the diagrams requested by readers are already included in either the 1932 or the 1931 Manual. Also, be specific in referring to any set. Descriptions such as a "seven-tube Philco" or "a late model Zenith with automatic tuning" mean nothing. Mention the full type number and also, if you can find it marked somewhere on the chassis, the serial number. Important changes are sometimes made in receivers during actual factory production, and while the type number is not changed, a record is kept of the revisions according to the serial numbers of the set so altered.

If you are having trouble with a set and want us to help you, please give us some definite information to work on. We are not mind readers or magicians, and cannot guess socket voltages or the condition of tubes if you do not make these tests yourself. A surprising number of letters merely state something like this: "I have a Bloopodyne 8 in for repair. The volume is weak. What's the matter?"

One thing that every user of the Manual must understand is that dozens of once-prominent radio manufacturers have gone out of business without leaving technical service data for the benefit of their former customers. Fortunately we are able to dig many old diagrams out of our files, which are probably the best in the country, but some hook-ups simply cannot be obtained. Even some firms that are still actively in business are unable to supply diagrams or manuals of sets a few years old, because records were lost, misplaced or removed during changes in administration or organization. Several companies frankly admit their inability to furnish service data on some of their older models, and they refer their customers to the OFFICIAL RADIO SERVICE MANUAL because we have been able to obtain many long-lost diagrams.

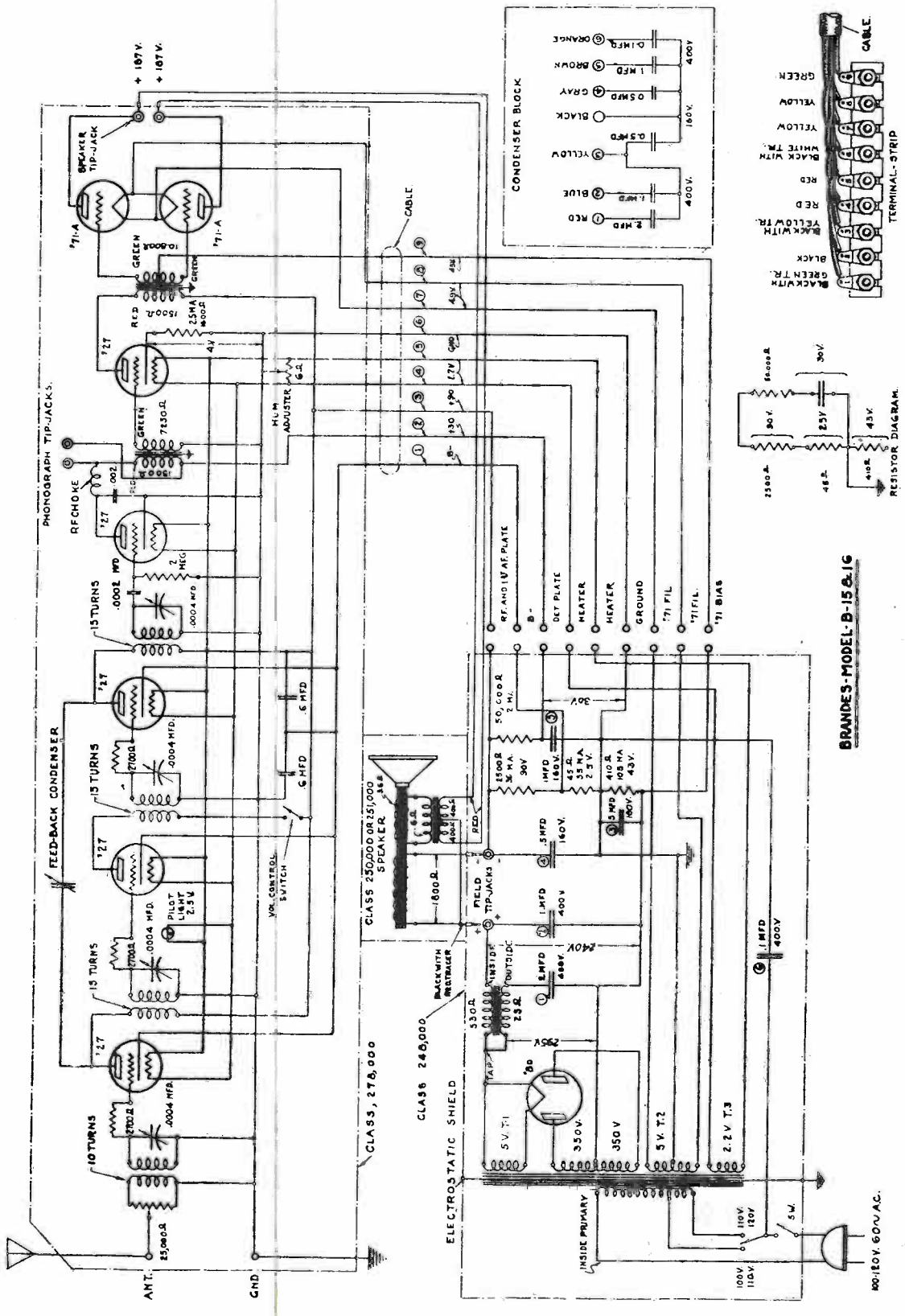
The names of some sets and manufacturers mentioned in readers' letters are altogether unknown to us and do not appear on any trade lists. Service Men who can supply any information at all on the following receivers will be doing their fellow workers a great favor.

Heritage, Cambridge, Kempa, Falck, Royal, Mayfair, Case, La Salle, Legionaire, and Detrola.

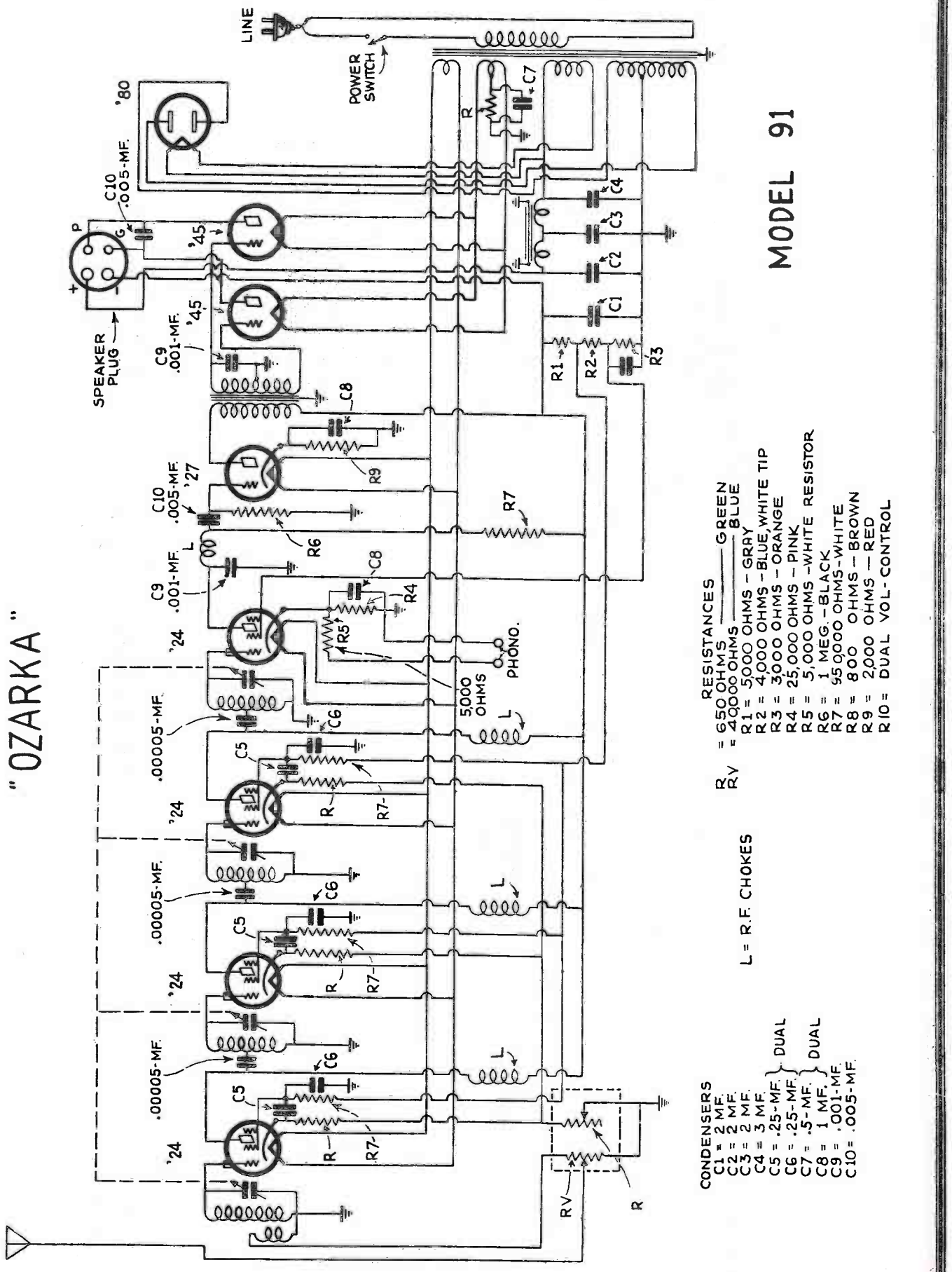
In the great majority of diagrams appearing in this Manual the values of all resistors and condensers are marked, and voltage readings given for all tubes. When this information cannot be obtained we show the bare schematic alone, as we feel that some diagram is better than no diagram at all.

In this supplement you will notice that many tube and chassis drawings are included in addition to the wiring diagrams. We will try to publish such drawings for every set.

KOLSTER RADIO, INC.

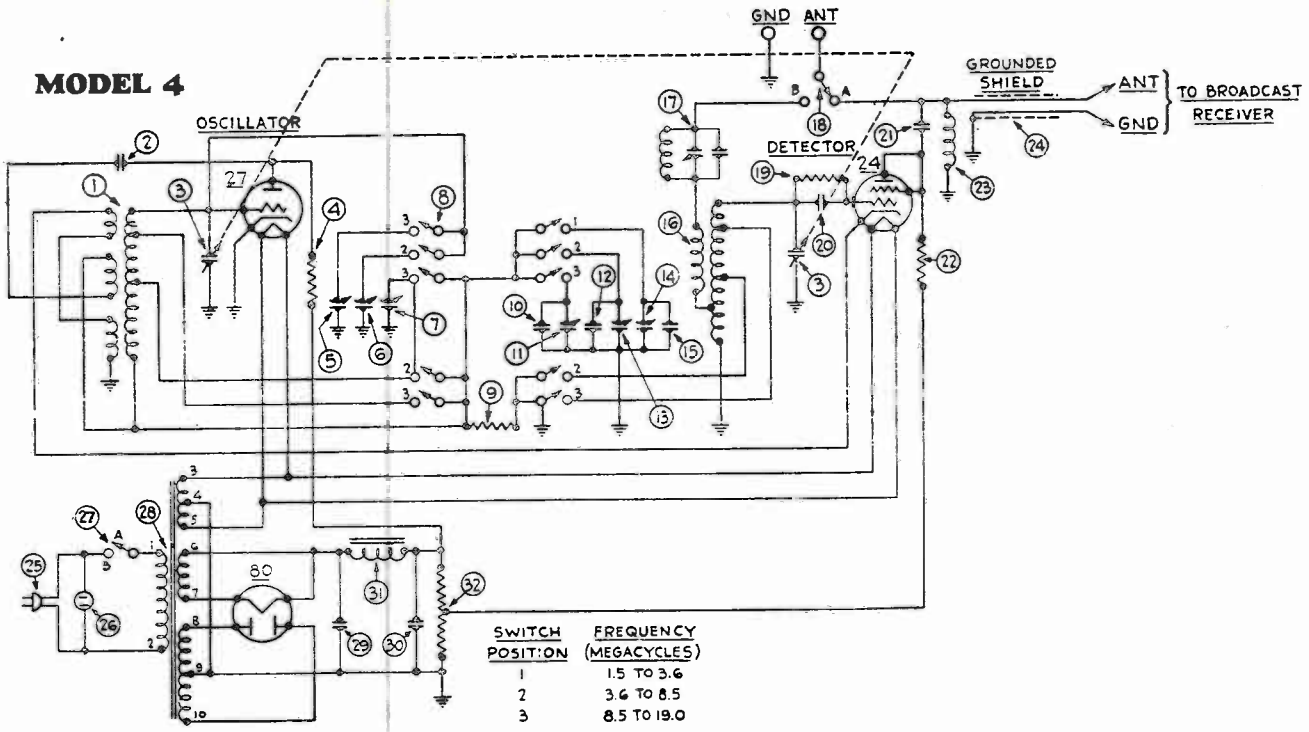


OZARKA, INC.


"OZARKA"
MODEL 91
LINE
POWER SWITCH
SPEAKER PLUG
'80
'45
'27
'24
C10 .005-MF.
C9 .001-MF.
.00005-MF.
5,000 OHMS
PHONO.
RESISTANCES
R = 650 OHMS ——— GREEN
RV = 4,000 OHMS ——— BLUE
R1 = 5000 OHMS – GRAY
R2 = 4,000 OHMS – BLUE, WHITE TIP
R3 = 3000 OHMS – ORANGE
R4 = 25,000 OHMS – PINK
R5 = 5,000 OHMS – WHITE RESISTOR
R6 = 1 MEG. – BLACK
R7 = 95,000 OHMS – WHITE
R8 = 800 OHMS – BROWN
R9 = 2,000 OHMS – RED
R10 = DUAL VOL-CONTROL
L = R.F. CHOKES
CONDENSERS
C1 = 2 MF.
C2 = 2 MF.
C3 = 2 MF.
C4 = 3 MF.
C5 = .25-MF. } DUAL
C6 = .25-MF. }
C7 = .5-MF. } DUAL
C8 = 1 MF. }
C9 = .001-MF.
C10 = .005-MF.

PHILADELPHIA STORAGE BATTERY CO.

MODEL 4



Model 4 Receivers are for operation on 115 volt, 50-60 cycle AC lines

Table 1—Tube Socket Readings—Line Voltage—115 volts

Tube		Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts
Type	Circuit					
27	Oscillator	2.4	110	..	.1	0
24	Detector	2.4	25	25	.3	0
80	Rectifier	5.0	170/170	...	..	...

NOTE: The above voltage readings were taken from the socket terminals on the underside of the chassis, using a Weston multi-range voltmeter, 1000 ohms per volt. The radio set tester cannot be used either for voltage or plate current readings because of the effect of the long leads through the set tester cord.

Table 2—Power Transformer Voltages

Terminals	A. C. Volts		Color
1—2	105—125	Primary	White
3—5	2.5	Filament of 24 and 27	Black
6—7	5.0	Filament of 80	Light Blue
8—10	340	Plates of 80	Yellow
4	...	Center Tap of 3—5	Black with Yellow Tracer
9	...	Center Tap of 8—10	Yellow with Green Tracer

Table 3—Condenser Data

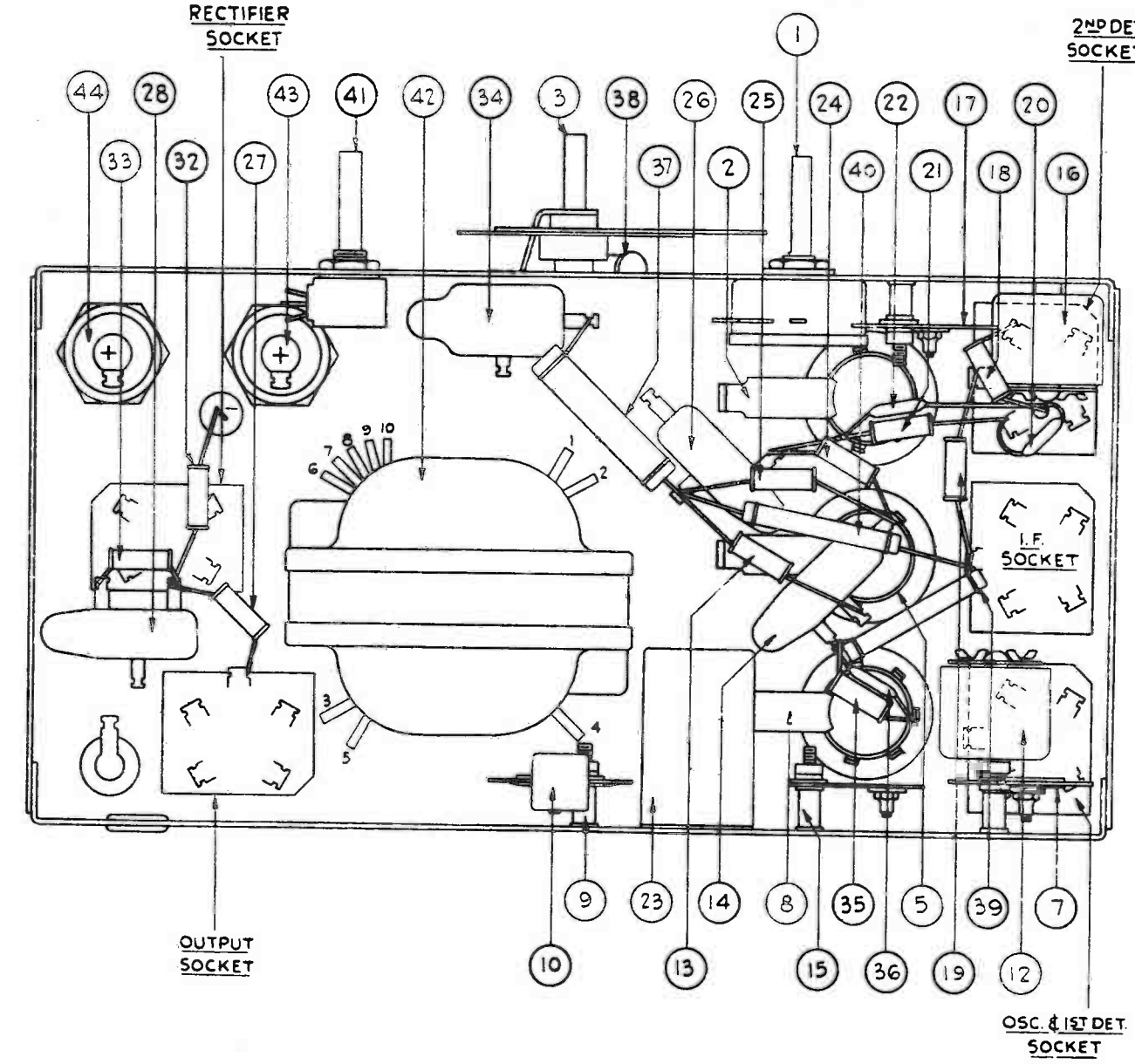
Nos. on Figs. 1 and 2	Capacity Mfd.	Container
(20)	.00011	Blue and Golden Yellow
(12)	.0008	Green and Orange
(14)	.00125	Blue and Orange
(3)	.05	Black Bakelite Container
(30) (28)	6.	Electrolytic

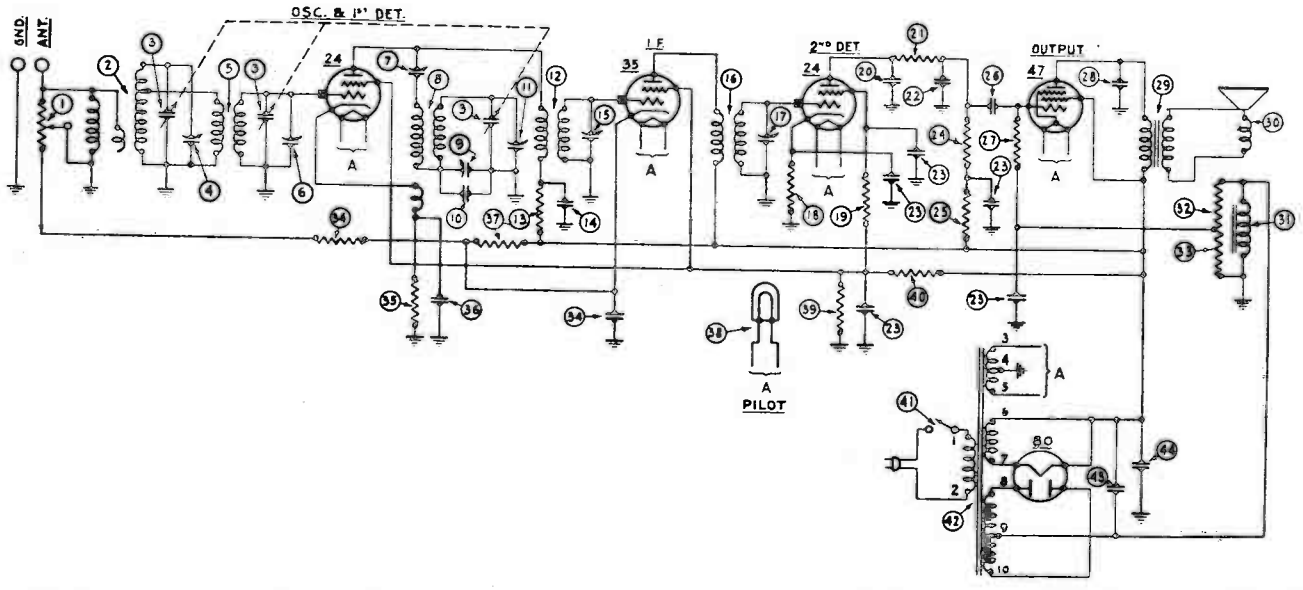
Table 4—Resistor Data

Nos. on Figs. 1 and 2	Power (Watts)	Resistance (Ohms)	COLOR		
			Body	Tip	Dot
(32)		4750 / 4750	Long Tubular		
(4)	1.	13000	Brown	Orange	Orange
(25)	1.	99000	White	White	Orange
(9)	.5	240,000	Red	Yellow	Yellow
(19)	.5	2 Megohms	Red	Black	Green

PHILADELPHIA STORAGE BATTERY CO.

PHILCO MODELS 51 AND 51-A





PHILADELPHIA STORAGE BATTERY CO.

Models 51 and 51-A Receivers

Model 51 Receivers are for operation on 100-130 volt, 50-60 cycle AC line
Model 51-A Receivers are for operation on 100-130 volt, 25-40 cycle AC line

Table 1—Tube Socket Readings Taken with AC Set Tester AC Line—115 volts

Tube		Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
Type	Circuit						
24	Osc. & 1st Det.	2.2	220*	85*	9.0*	9.0*	...
35	I.F.	2.2	210	85	3.0	3.0	6.2
24	2nd Det.	2.2	75	54	5.2	5.2	0
47	Output	2.2	210**	240**	0.2**	...	28.**
80	Rect.	5.0	240/Plate	...	...	...	30/ Plate

Note—Volume Control on full; Station Selector turned to Low Frequency End.
*These readings must be taken from the underside of the chassis, using a suitable high resistance D.C. voltmeter equipped with test prods and leads.
**These readings must likewise be taken from the underside of the chassis unless the set tester is especially equipped for testing pentode tubes.

Table 2—Power Transformer Voltages

Terminals	A.C. Volts	Connection	Color
1–2	105 to 125	Primary	Black (Small Gauge)
3–5	2.5	Filament of 24, 35 and 47	Black
6–7	5.	Filament of 80	Light Blue
8–10	700.	Plates of 80	Yellow
4	.....	Center Tap of 3–5	Black, Yellow Tracer
9	.....	Center Tap of 8–10	Yellow, Green Tracer

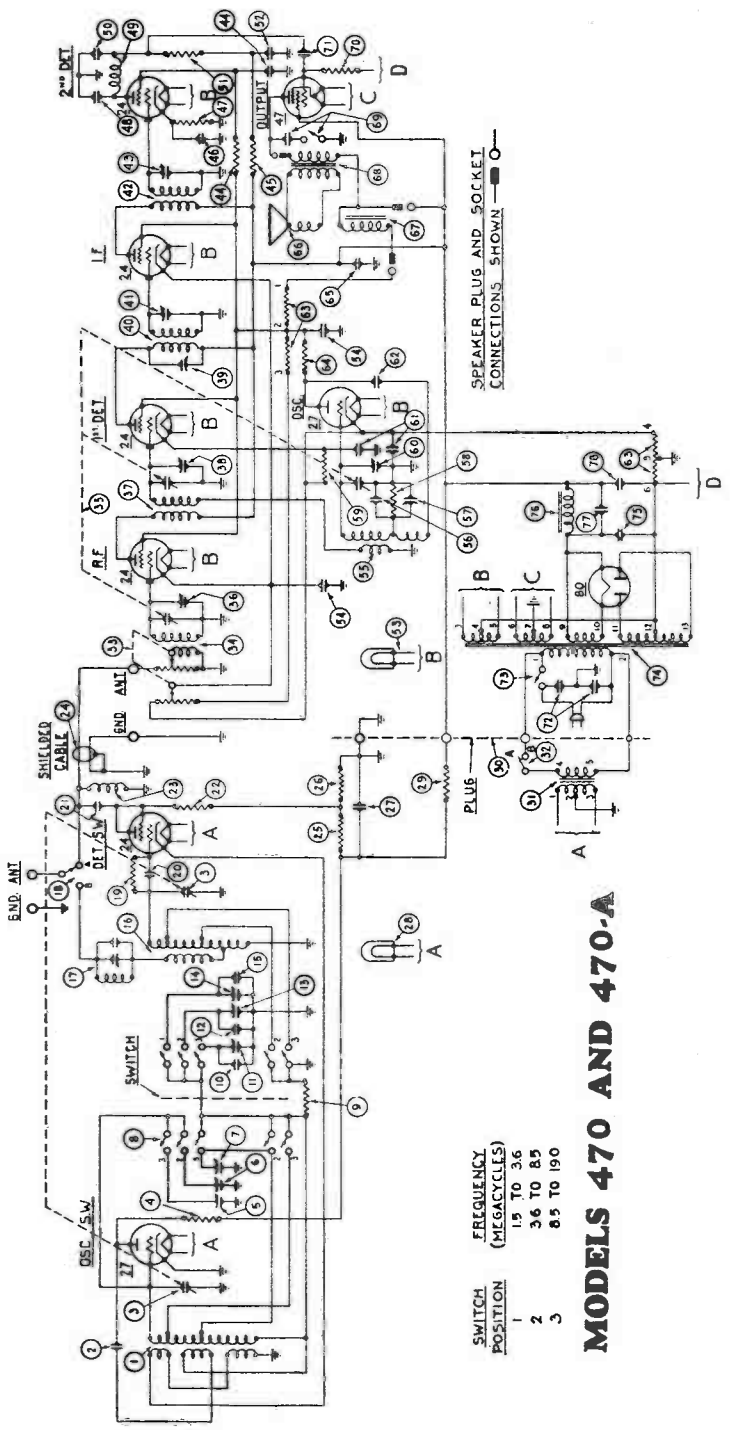
Table 3—Condenser Data

Nos. on Figs. 1 and 2	Capacity Mfd.	Container
⑳ ㉒	.00025	Yellow
⑩ ㊱	.00011	Blue and Golden Yellow
㉖ ㉘	.01	Black Bakelite Container
⑭	.05	Black Bakelite Container
㉓	.1, .15, .25, 2-.5 (50-60 cy.)	Metal Container
	.2, .15, .25, 2-.5 (25-40 cy.)	Metal Container
㊸	6 (50-60 cycles)	Electrolytic
	10 (25-40 cycles)	Electrolytic
㊹	6	Electrolytic

Table 4—Resistor Data

Nos. on Figs. 1 and 2	Power (Watts)	Resistance (Ohms)	Color		
			Body	Tip	Dot
㉞	...	250 and .05 Mfd.	Black Bakelite Container		
⑬	.5	1,000	Brown	Black	Red
㉟	.5	8,000	Grey	Black	Red
㉑	.5	10,000	Brown	Black	Orange
㉙	1.	25,000	Red	Green	Orange
⑱	.5	32,000	Orange	Red	Orange
㊵	1.	32,000	Orange	Red	Orange
㊲	2.	51,000	Green	Brown	Orange
⑲ ㉕	.5	99,000	White	White	Orange
㉝	.5	160,000	Brown	Blue	Yellow
㉔ ㉗ ㉜	.5	490,000	Yellow	White	Yellow

PHILADELPHIA STORAGE BATTERY CO.



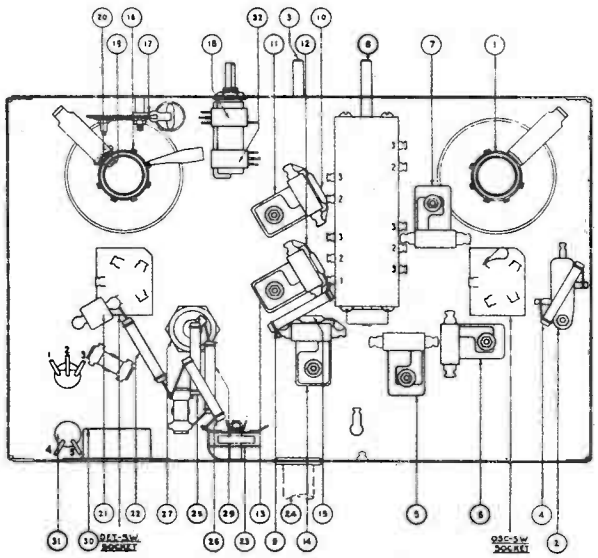


Fig. 2—Short Wave Chassis.

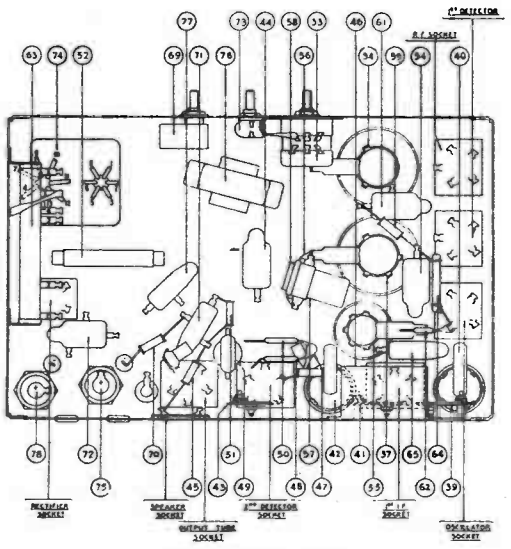


Fig. 3—Broadcast Chassis.

PHILADELPHIA STORAGE BATTERY CO.

Models 470 and 470-A Receivers

Table 1—Tube Socket Data taken with AC Set Tester—AC Line 115 Volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
			SHORT WAVE UNIT*				
27	Osc.	2.2	110	...	3.3	0	...
24	Det.	2.2	24	24	5.	0	...
			BROADCAST UNIT				
24	R. F.	2.4	255	50	3.5	25	7.5
24	1st. Det.	2.4	260	60	9	38	...
27	Osc.	2.4	60	...	3.5	25	2.
24	I. F.	2.4	265	50	3	22	3.5
24	2nd Det.	2.4	116	40	7	25	...
47	Output	2.5**	205**	220**	.7**	..	28**
80	Rectifier	4.5	260/Plate				

*The voltage readings of the short wave unit were taken from the under side of the chassis, using a Weston multi-range voltmeter, 1000 Ohms per volt. The radio set tester cannot be used, either for voltage or plate current readings because of the effect of the long leads through the set tester cord.

**These readings must likewise be taken from the socket terminals on the under side of the chassis unless the set tester is especially equipped with an adapter for testing pentode tubes.

All the above readings were taken with volume control at maximum.

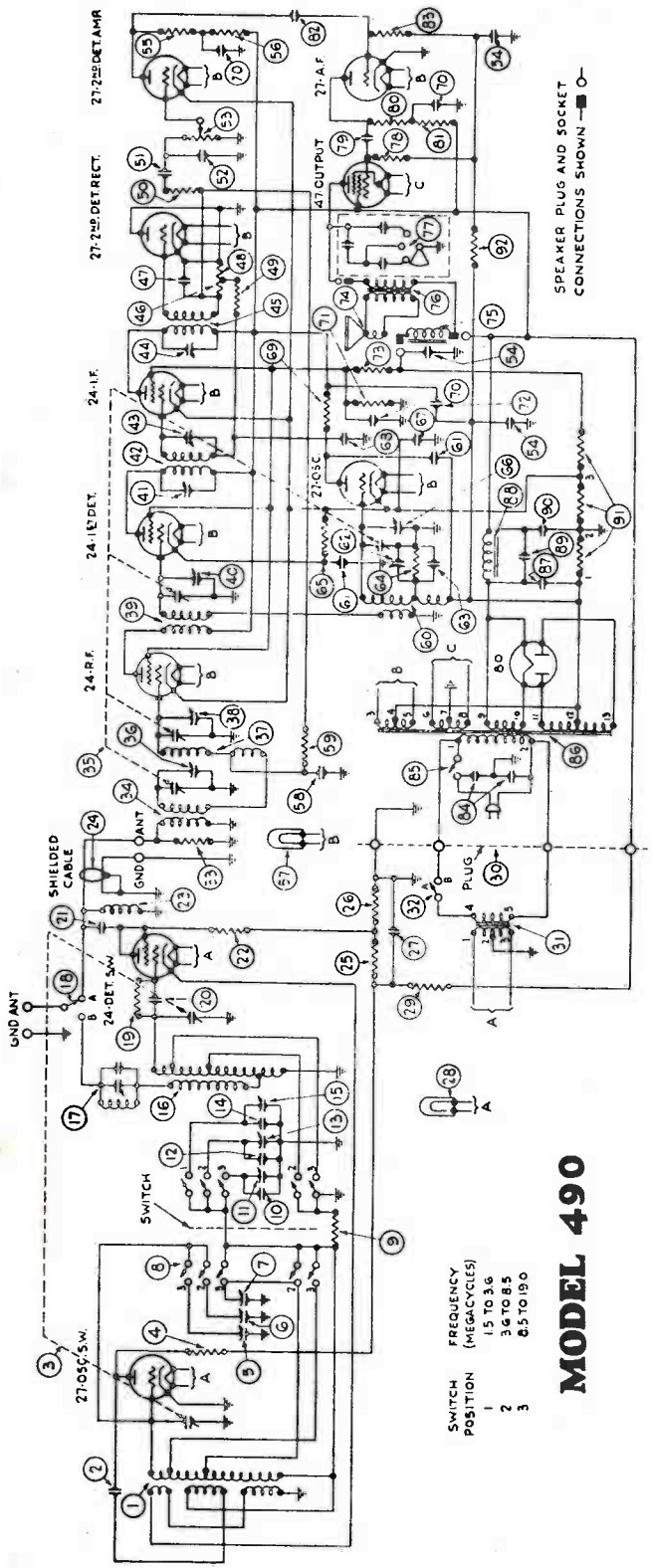
Table 2—Power Transformer Voltage

Terminals	A. C. Volts	Circuit	Color
		SHORT WAVE UNIT	
4–5	105 to 125	Primary	Black
1–3	2.5	Secondary	Yellow
2	...	Center Tap 1–3	Green
		BROADCAST UNIT	
1–2	105 to 125	Primary	White (Small Gauge)
3–5	2.5	Filament of 47	Dark Green
6–8	2.5	Filament of 24	Black (Heavy Gauge)
9–10	5.	Filament of 80	Light Blue
11–13	700	Plate of 80	Yellow
4	...	Center Tap of 3–5	Black, Green Tracer
7	...	Center Tap of 6–8	Black, Yellow Tracer
12	...	Center Tap of 11–13	Yellow, Green Tracer

Table 3—Resistor Data

No. on Figs. 1, 2 and 3	Terminal	Power (Watts)	Resistance (Ohms)	Color		
				Body	Tip	Dot
(44)	....	.....	250	.....	Black Bakelite	.....
(63)	1–2	.....	1060	.....	Long Tubular	.....
	2–3	.....	2300			
	4–5	....	70			
	5–6	....	240			
(29)	....	1	5,000	Green	Black	Red
(60)	....	.5	5,000	Green	Black	Red
(4) (64)	....	1	13,000	Brown	Orange	Orange
(25) (28)	....	1	32,000	Orange	Red	Orange
(45)	(50–60 cycles)	.5	45,000	Yellow	Green	Orange
(47) (58)	....	.5	51,000	Green	Brown	Orange
(22)	....	1	99,000	White	White	Orange
(45)	....	.5	99,000	White	White	Orange
(9)	....	1	240,000	Red	Yellow	Yellow
(51) (70)	....	.5	240,000	Red	Yellow	Yellow
(19)	....	.5	2,000,000	Red	Black	Green

PHILADELPHIA STORAGE BATTERY CO.



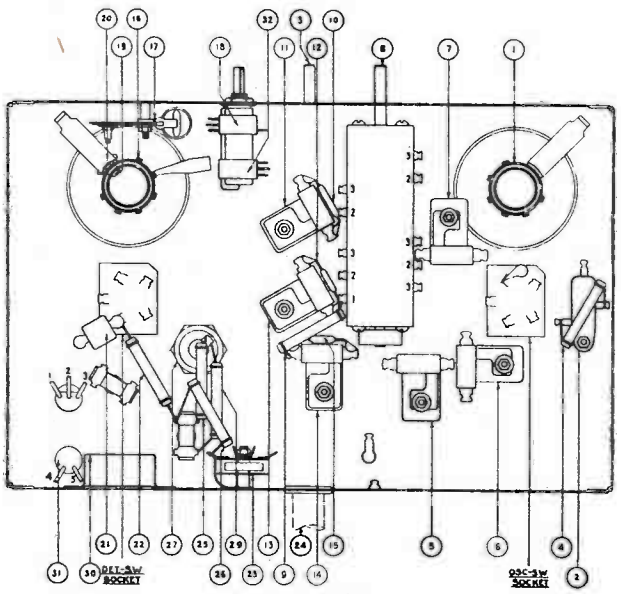


Fig. 2—Short Wave Chassis.

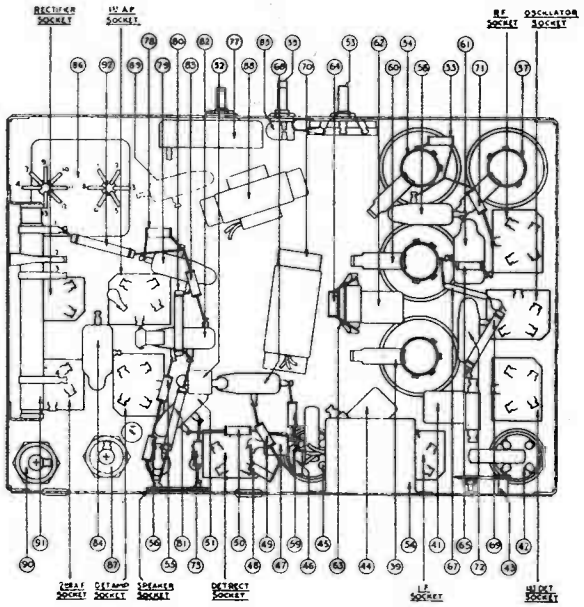


Fig. 3—Broadcast Chassis.

PHILADELPHIA STORAGE BATTERY CO.

Model 490 Receiver

Table 1—Tube Socket Readings—Line Voltage 115 volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
			SHORT WAVE UNIT*				
27	Osc.	2.2	110	...	3.3	0	...
24	1st Det.	2.2	24	24	5.	0	...
			BROADCAST UNIT*				
24	R. F.	2.1	220	50	6.	15	2.
27	Osc.	2.1	80	...	6	15	2.3
24	1st Det.	2.1	210	55	5	15	.5
24	I. F.	2.1	220	60	8	15	0
27	Rect. Det.	2.1	...	...	...	14	...
27	Ampl. Det.	2.1	150	...	0	15	1.3
27	1st Audio	2.1	150	...	2	15	1.5
47	Output	2.4**	205**	220**	7**	...	28.**
80	Rectifier	4.5	220/Plate	...	...	...	...

*The voltage readings of the short wave unit were taken from the under side of the chassis, using a Weston Multi-range voltmeter, 1000 ohms per volt. The radio set tester cannot be used, either for voltage or plate current readings because of the effect of the long leads through the set tester cord.
**These readings must likewise be taken from the socket terminals on the under side of the chassis unless the set tester is especially equipped with an adapter for testing pentode tubes.

Table 2—Power Transformer Voltages

Terminals	A.C. Volts	Circuit	Color
		SHORT WAVE UNIT	
4–5	105 to 125	Primary	Black
1–3	2.5	Secondary	Yellow
2	...	Center Tap 1–3	Green
		BROADCAST UNIT	
1–2	105 to 125	Primary	White
3–5	2.5	Heaters of 24 and 27 Tubes	Black
4	...	Center Tap of 3–5	Black with Yellow
6–8	2.5	Filament of 47 Tube	Dark Green
7	...	Center Tap of 6–8	Black with Green
9–10	5.0	Filament of 80 Tube	Light Blue
11–13	650.	Plates of 80 Tube	Yellow
12	...	Center Tap of 11–13	Yellow with Green

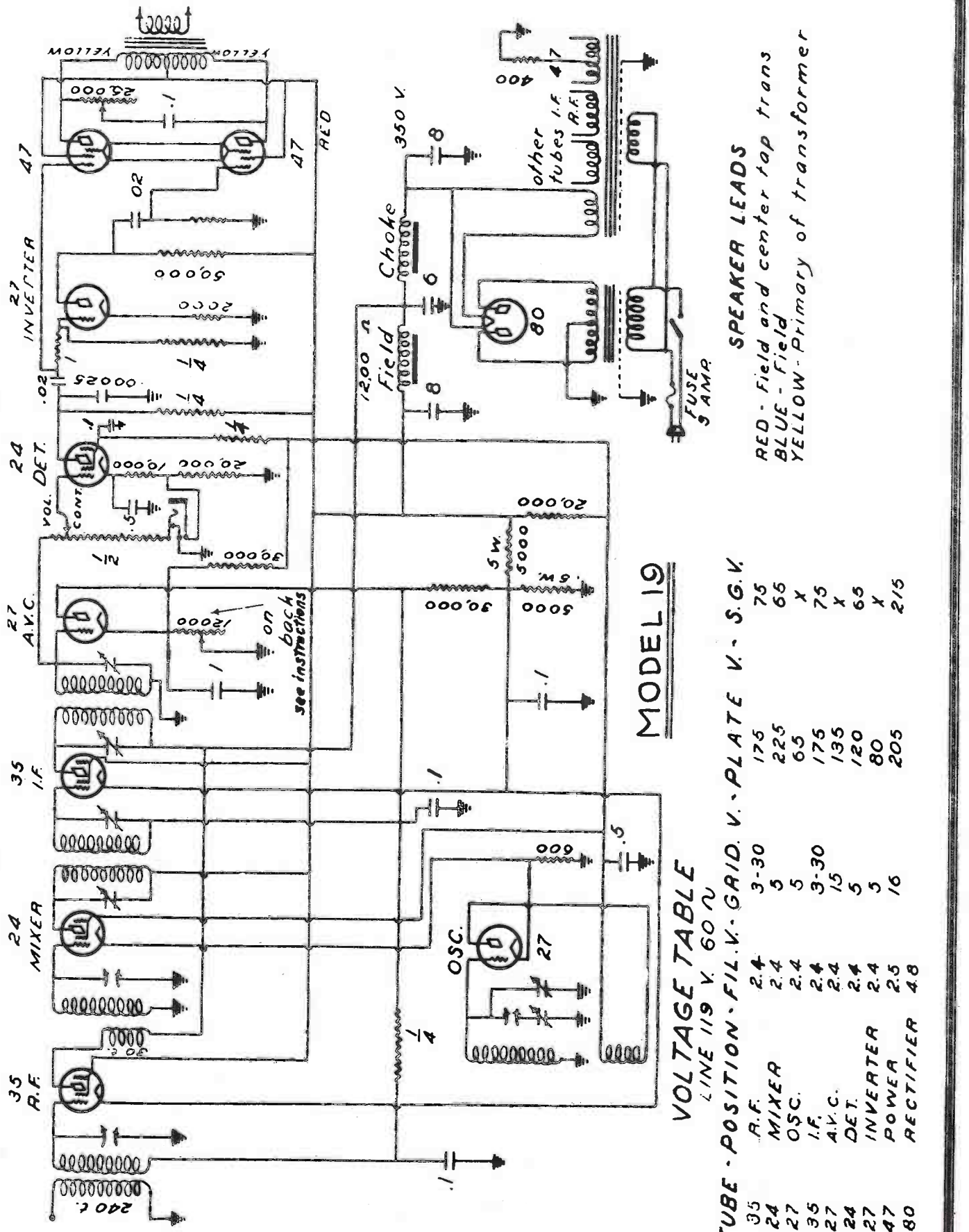
Table 3—Resistor Data

Nos. on Figs. 1, 2 and 3	Terminal	Power (Watts)	Resistance (Ohms)	COLOR Body	COLOR Tip	COLOR Dot
(91)	1–2 2–3 3–4		180 60 3500		Long Tubular	
(29)	.....	1	5,000	Green	Black	Red
(65)	.....	½	5,000	Green	Black	Red
(58)	.....	½	10,000	Brown	Black	Orange
(4)	.....	1	13,000	Brown	Orange	Orange
(73)	.....	½	25,000	Red	Green	Orange
(80) (81)	.....	1	25,000	Red	Green	Orange
(25) (26)	.....	1	32,000	Orange	Red	Orange
(46) (48) (55) (64)	.....	½	51,000	Green	Brown	Orange
(80) (81)	.....	1	51,000	Green	Brown	Orange
(56) (71)	.....	½	70,000	Violet	Black	Orange
(22)	.....	1	99,000	White	White	Orange
(50) (78)	.....	½	99,000	White	White	Orange
(9) (92)	.....	1	240,000	Red	Yellow	Yellow
(78) (83)	.....	½	240,000	Red	Yellow	Yellow
(49) (59)	.....	½	490,000	Yellow	White	Yellow
(92)	.....	1	490,000	Yellow	White	Yellow
(19)	.....	½	2,000,000	Red	Black	Green

Table 4—Condenser Data

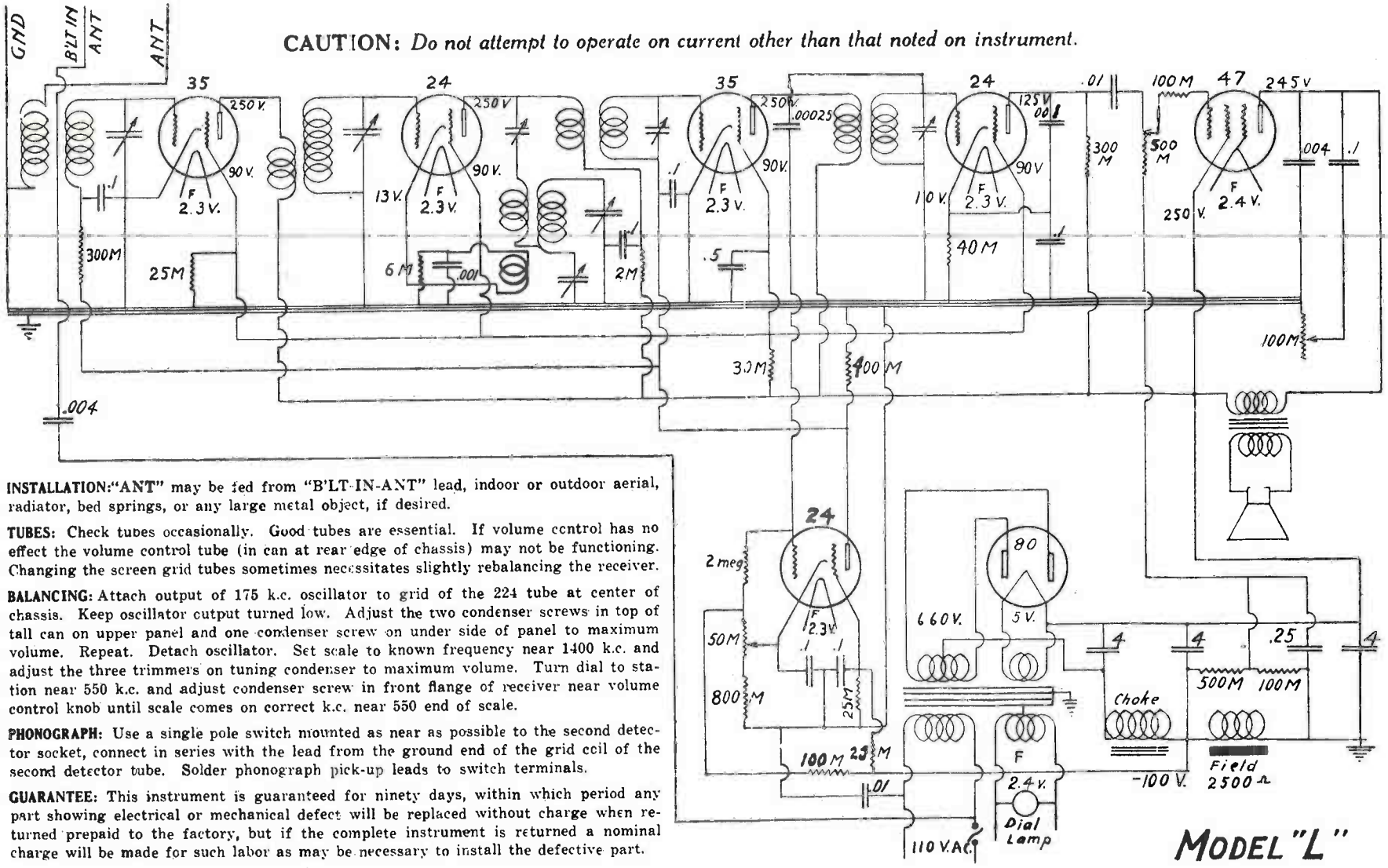
Nos. on Figs. 1, 2 and 3	Capacity Mfd.	Container
(20) (47) (67) (14) (21) (52) (53) (12) (10) (51) (79) (82) (84) (2) (56) (68) (72) (61) (86) (88) (54) (70)	.00011	Blue and Golden Yellow
	.00025	Yellow
	.0007	White and Golden Yellow
	.0008	Green and Orange
	.00125	Blue and Orange
	.01	Black Bakelite
	.015 Double	Black Bakelite
	.05	Black Bakelite
	.09 (50-60 cycles)	Black Bakelite
	.18 (25-40 cycles)	Black Bakelite
	3–.25 each	Metal
	1, .25, .1 (50-60 cycles)	Metal
	1, .25, .25 (25-40 cycles)	Metal
(87)	6 (50-60 cycles)	Electrolytic
(90)	6 (50-60 cycles)	Electrolytic
(87)	10 (25-40 cycles)	Electrolytic
(90)	14 (25-40 cycles)	Electrolytic

REMLER COMPANY, LTD.



SIMPLEX RADIO COMPANY

CAUTION: *Do not attempt to operate on current other than that noted on instrument.*



INSTALLATION: "ANT" may be fed from "B'LT-IN-ANT" lead, indoor or outdoor aerial, radiator, bed springs, or any large metal object, if desired.

TUBES: Check tubes occasionally. Good tubes are essential. If volume control has no effect the volume control tube (in can at rear edge of chassis) may not be functioning. Changing the screen grid tubes sometimes necessitates slightly rebalancing the receiver.

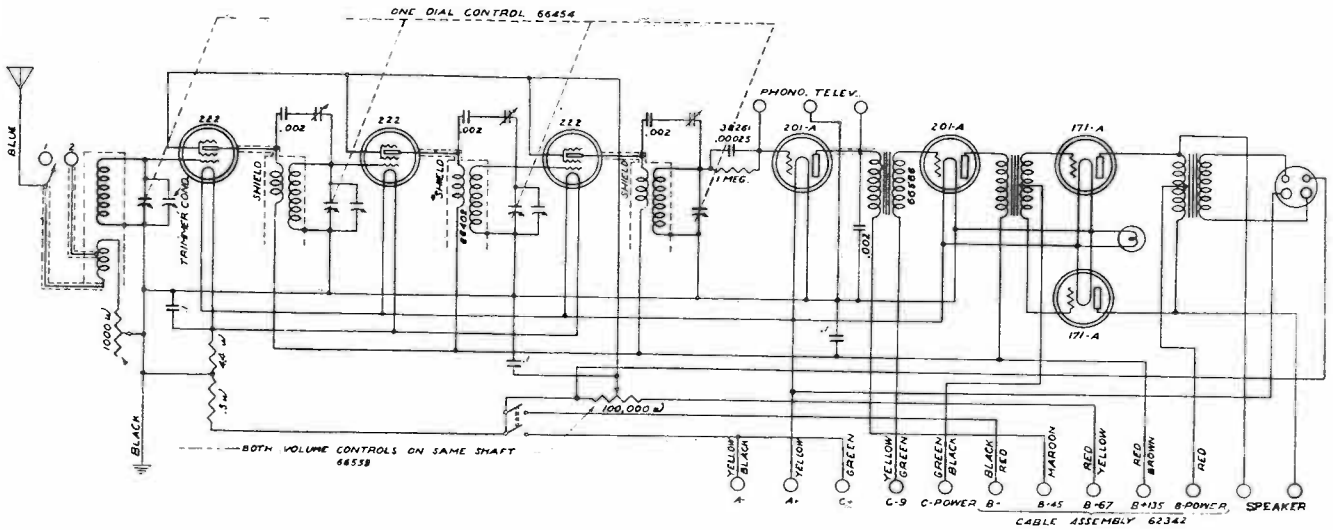
BALANCING: Attach output of 175 k.c. oscillator to grid of the 224 tube at center of chassis. Keep oscillator output turned low. Adjust the two condenser screws in top of tall can on upper panel and one condenser screw on under side of panel to maximum volume. Repeat. Detach oscillator. Set scale to known frequency near 1400 k.c. and adjust the three trimmers on tuning condenser to maximum volume. Turn dial to station near 550 k.c. and adjust condenser screw in front flange of receiver near volume control knob until scale comes on correct k.c. near 550 end of scale.

PHONOGRAPH: Use a single pole switch mounted as near as possible to the second detector socket, connect in series with the lead from the ground end of the grid coil of the second detector tube. Solder phonograph pick-up leads to switch terminals.

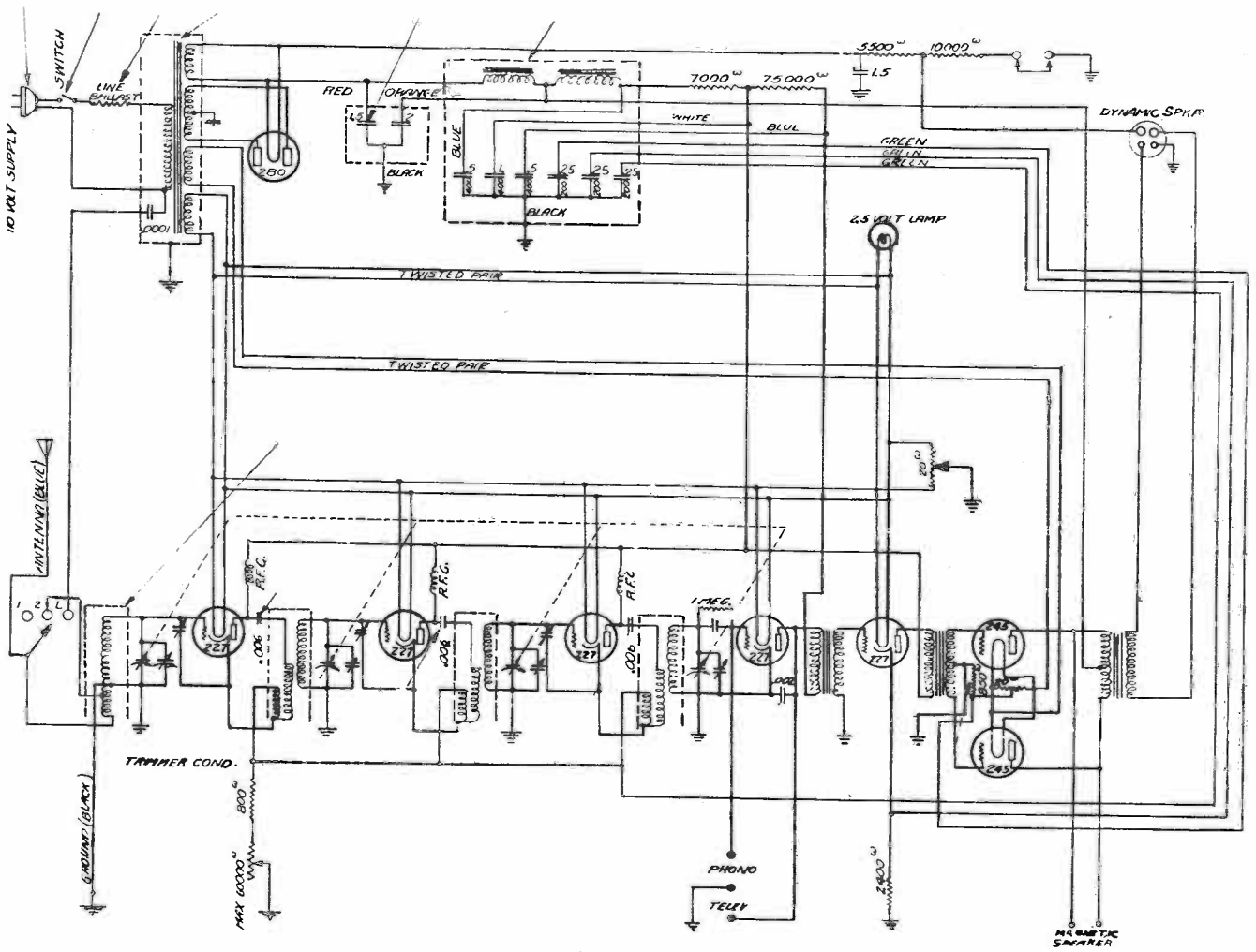
GUARANTEE: This instrument is guaranteed for ninety days, within which period any part showing electrical or mechanical defect will be replaced without charge when returned prepaid to the factory, but if the complete instrument is returned a nominal charge will be made for such labor as may be necessary to install the defective part.

MODEL "L"

STEWART-WARNER CORP.

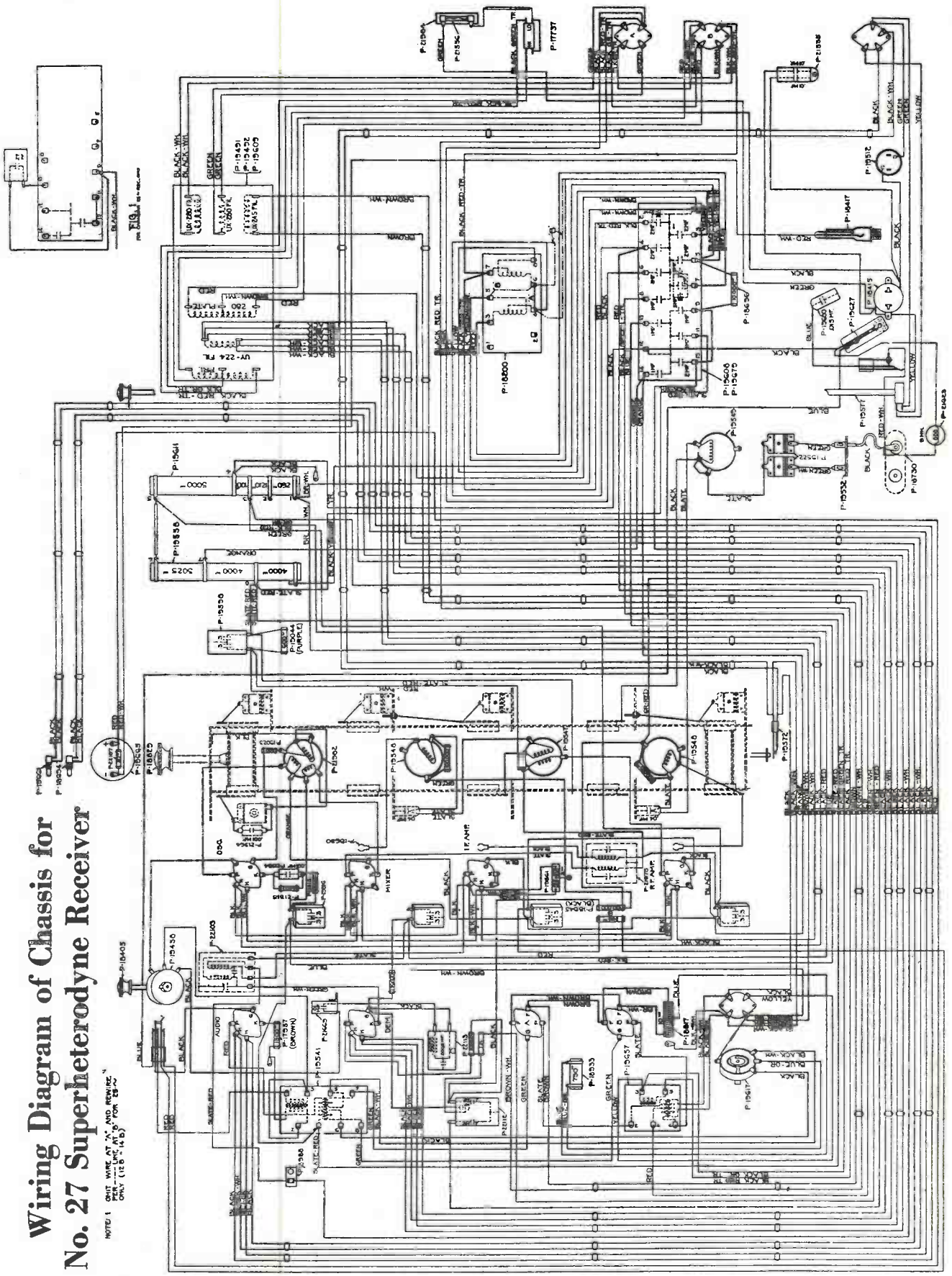


CIRCUIT DIAGRAM OF 950 SERIES BATTERY SCREEN-GRID RECEIVER



CIRCUIT DIAGRAM OF 900 SERIES A. C. BALANCED BRIDGE RECEIVERS

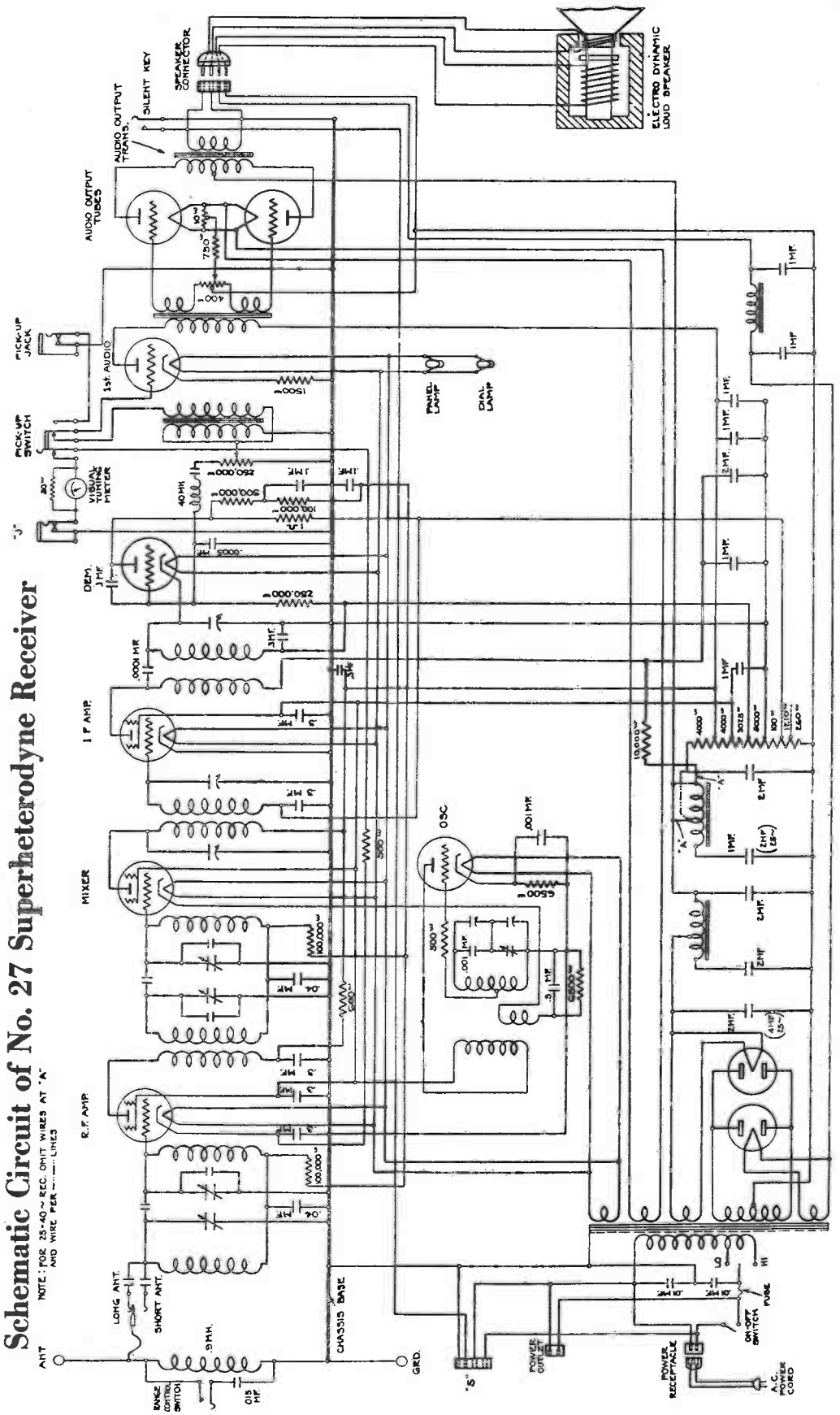
STROMBERG-CARLSON TELEPHONE MFG. CO.



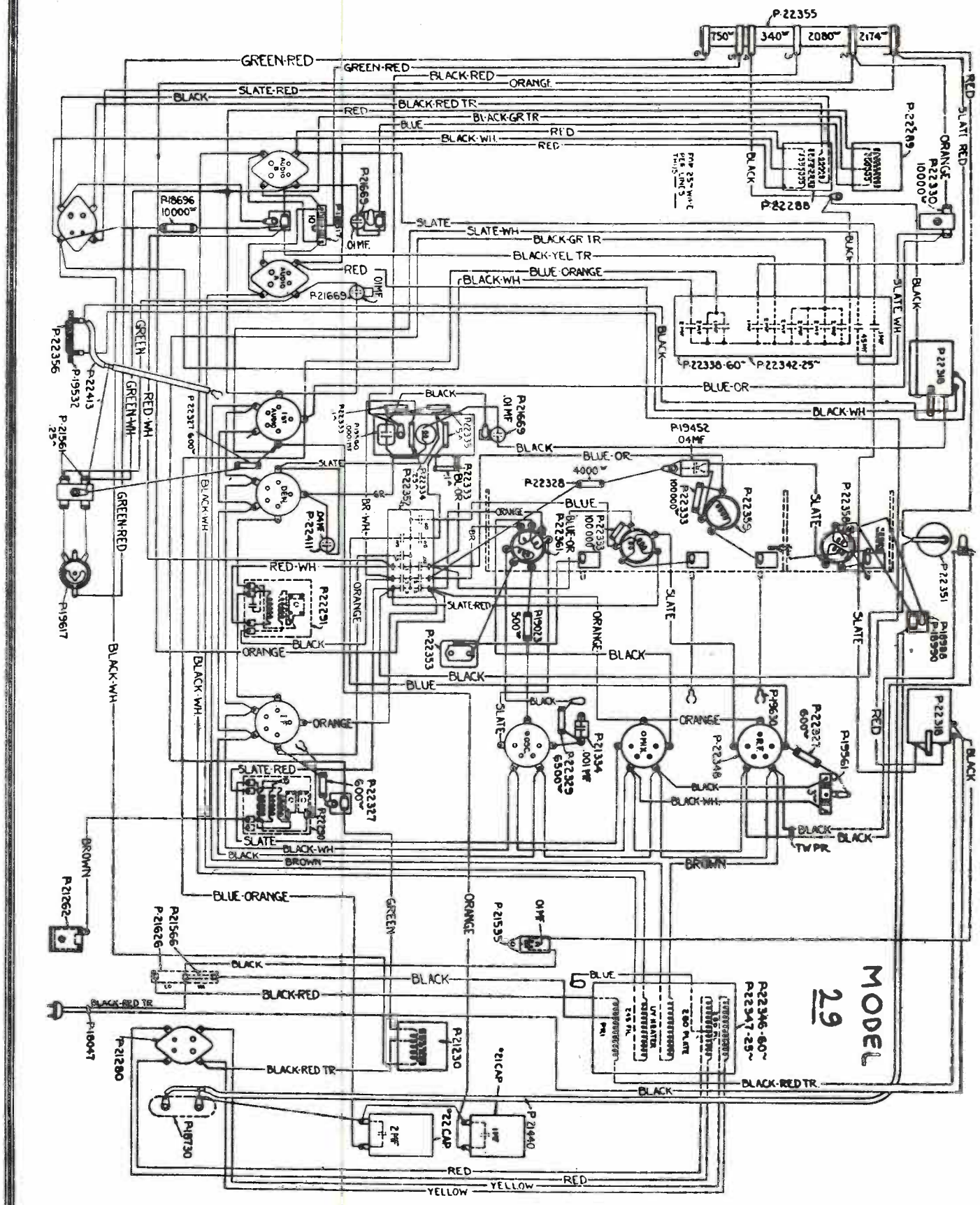
Wiring Diagram of Chassis for No. 27 Superheterodyne Receiver

STROMBERG-CARLSON TELEPHONE MFG. CO.

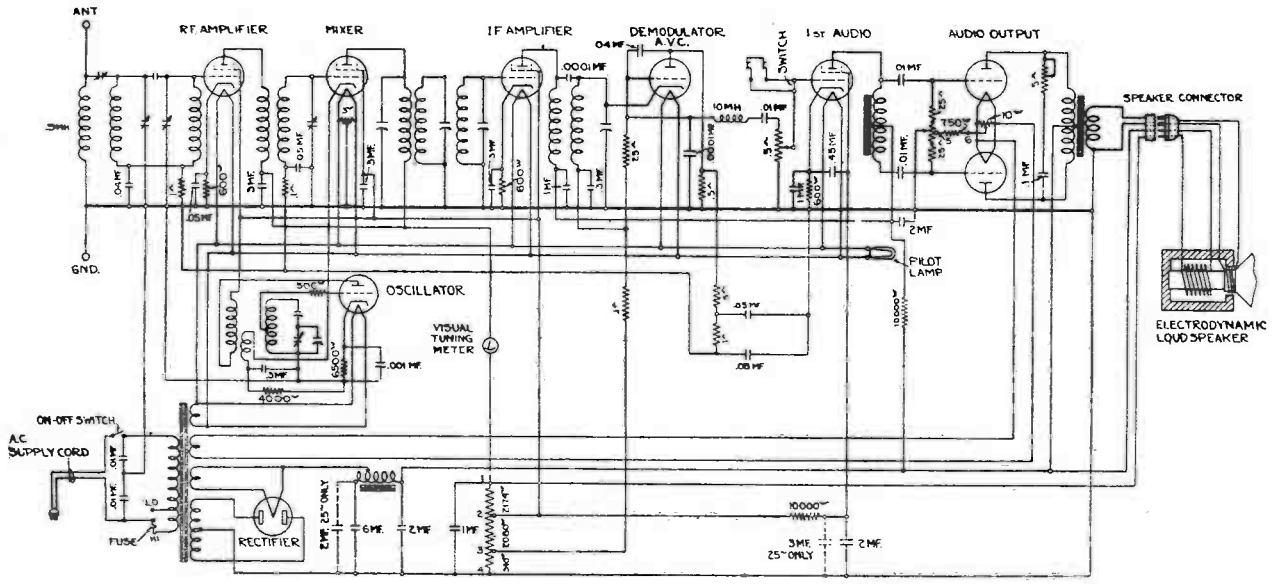
Schematic Circuit of No. 27 Superheterodyne Receiver



STROMBERG-CARLSON TELEPHONE MFG. CO.



STROMBERG-CARLSON TELEPHONE MFG. CO.



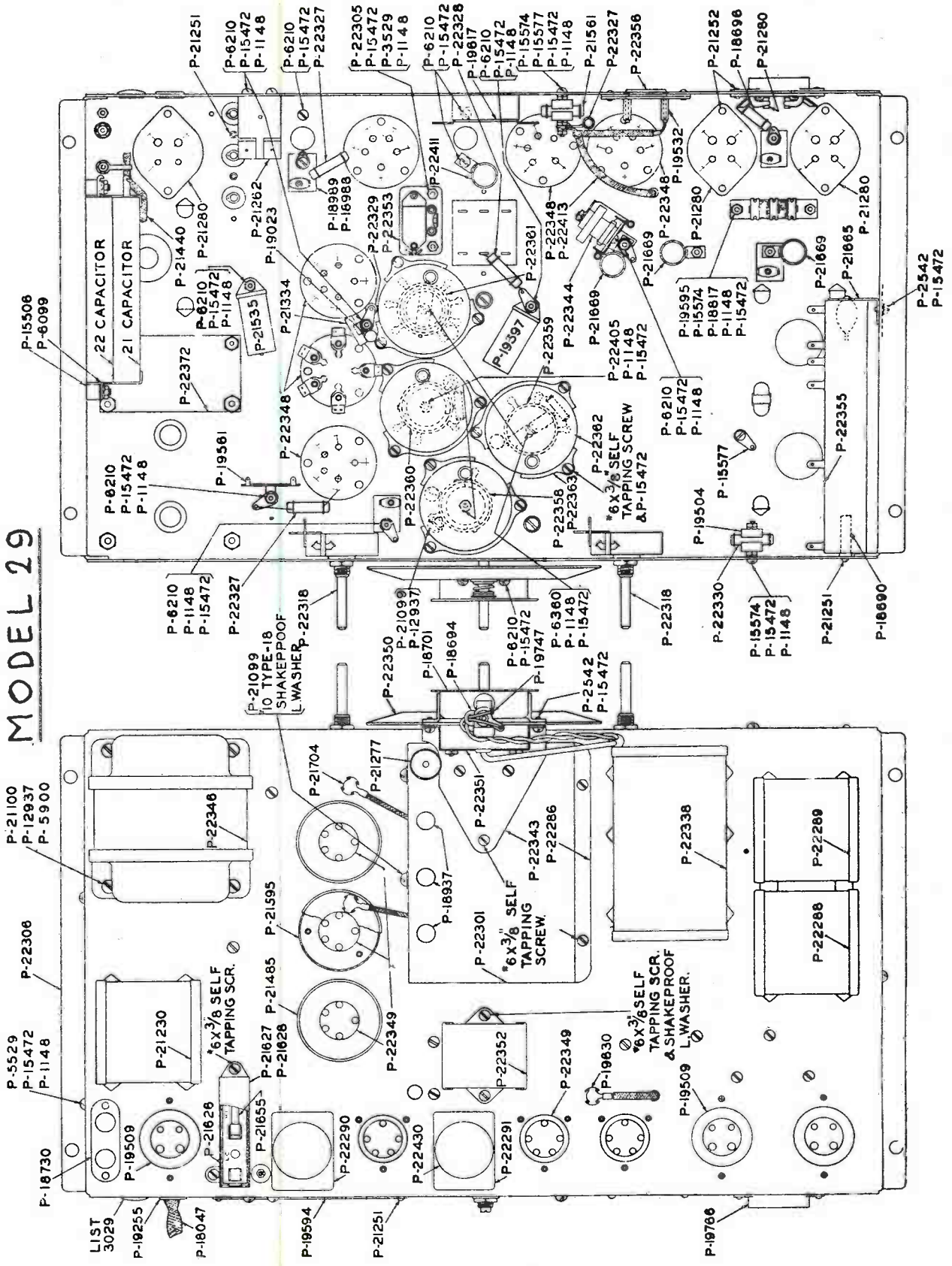
Schematic Circuit of No. 29 Receiver.

NORMAL VOLTAGE READINGS

These voltage readings correspond to a line voltage at 120 volts with the fuse in the "HI" position or 110 volts in the "LO" position. The fuse should be set in the proper position for the line voltage obtained before making measurements. **When voltages are measured proper allowance should be made for a difference in line voltage above or below 110 or 120 volts.** Be sure to make these readings with the Meter and Scale indicated, otherwise the results will not agree with those tabulated. Alternating voltages are indicated by italics.

Voltage	Meter	Scale	Where Measured	Approx. Value in Volts
Heater Voltages No. 227 and No. 235 Tubes	A. C.	0–4	Across Heater Terminals of Sockets	*2.48*
Filament Voltage No. 245 Tubes	A. C.	0–4	Across Filament of Audio Output Socket	*2.48*
Plate Voltage Radio Amplifiers	D. C.	0–250	Between Plate Terminal of R. F. Amplifier Socket (+) and Chassis Base	170
Plate Voltage Mixer Tube	D. C.	0–250	Between Plate Terminal of Mixer Socket (+) and Chassis Base (—)	170
Plate Voltage Oscillator Tube	D. C.	0–250	Between Plate Terminal of Oscillator Tube Socket (+) and Chassis Base (—)	87
Plate Voltage I. F. Tube	D. C.	0–250	Between Plate Terminal of First I. F. Socket (+) and Chassis Base (—)	220
Plate Voltage First Audio Tube	D. C.	0–250	Between Plate Terminal of First Audio Socket (+) and Chassis Base (—)	192
Plate Voltage Audio Output Tubes	D. C.	0–750	Between Plate Terminals of Audio Output Sockets (+) and Midtap 10-Ohm Resistor Midtap (—)	250
"C" Voltage R. F. Amplifier	D. C.	0–10	Between Cathode Terminal of R. F. Amplifier Socket (+) and Chassis Base (—)	3
"C" Voltage Mixer Tube	D. C.	0–10	Between Cathode Terminal of Mixer Socket (+) and Chassis Base (—)	8
"C" Voltage I. F. Amplifier	D. C.	0–10	Between Cathode Terminal I. F. Socket (+) and Chassis Base (—)	8
Grid Voltage Oscillator Tube	D. C.	0–250	Between Cathode Terminal of Oscillator Socket (+) and Chassis Base (—)	14–18
Plate Voltage Demodulator Tube	D. C.	0–250	Between Voltage Divider Terminal No. 3 (+) and Chassis Base (—)	12.5
Screen Voltages of R. F. Amplifier, Mixer, and I. F. Amplifier	D. C.	0–250	Between Screen Terminals on Sockets (+) and Chassis Base (—)	87
"B" Voltage R. F. Amplifier	D. C.	0–250	Between High Side Voltage Divider (+) and Chassis Base (—)	175
"B" Voltage I. F. Amplifier and First Audio Tube	D. C.	0–250	Between Midtap First Audio Transformer (+) and Chassis Base (—)	225
"B" Voltage Output Tubes	D. C.	0–750	Between Midtap on Output Transformer (+) and Chassis Base (—)	305
"C" Voltage First A. F. Tube	D. C.	0–10	Between Cathode of First A. F. Tube (+) and Chassis Base (—)	3
"C" Voltages Output Tubes	D. C.	0–250	Across 750-Ohm Biasing Resistor	50
Speaker Field Voltage	D. C.	0–250	Across Small Pins on Speaker Connector Socket	127.5
Plate Voltage A. C. Per Anode No. 280 Rectifier Tube	A. C.		Between Plate Terminals of No. 280 Rectifier Socket and Chassis Base	*340*
Filament Voltage No. 280 Rectifier Tube	A. C.	0–8	Between Filament Terminals of No. 280 Rectifier Socket	*4.9*

STROMBERG-CARLSON TELEPHONE MFG. CO.



U. S. RADIO AND TELEVISION CORP.

U. S. RADIO AND TELEVISION MODELS 99 AND 99X

Pentode (5-tube) Superheterodyne Receivers

Perhaps the most simplified commercial superheterodyne receiver as yet developed is the No. 99 chassis, a circuit of which is shown below.

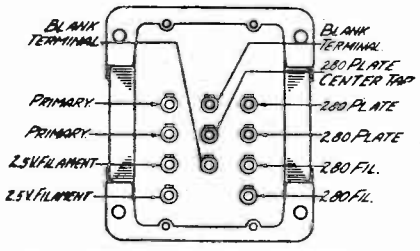
The design includes a combination oscillator and first-detector V1, using a type '24 screen-grid tube; an I.F. amplifier V2, using a type '35 variable-mu tube; a second-detector V3, using a type '24 screen-grid tube; a pentode power output tube V4; and the usual '80 rectifier V5. Note the absence of a separate oscillator tube. The intermediate frequency is 262 kc. A band-selector precedes the detector-oscillator.

A surge of energy fed into the secondary of the oscillator inductively causes this circuit to begin to oscillate at its resonant frequency, 262 kc. above the signal frequency. This oscillator frequency is fed back through the tap in the secondary coil into the grid circuit of the first-detector. There, the oscillating signal is amplified and fed inductively through the primary system in the plate circuit of the tube back into the secondary, thus sustaining the oscillations at the frequency to which the oscillator secondary circuit is tuned.

Operating voltages for this receiver are as follows: Filament potential, V1, V2, V3, V4, 2.25 volts; V5, 4.9 volts. Plate potential, V1, V2, 165 volts; V3, 128 volts; V4, 205 volts. Screen-grid potential, V1, V2, 65 volts; V3, 60 volts; V4, 225 volts. Plate current, V1, 1.3 ma.; V2, 6.4 ma.; V3, 0.22-ma; V4, 29 ma.; V5, 27 ma. per plate. Control-grid potential, V1, 4.5 to 5.25 volts; V2, 2.5 volts; V3, 6.5 volts; V4, 16 volts. Screen-grid current. V1, 0.4-ma.; V2, 1.5 ma.; V3, 0.05-ma.; V4, 8 ma. Cathode potential, V1, 4.5 to 5.25 volts; V2, 2.5 volts; V3, 6.5 volts.

Connections to the power transformer assembly are given in the illustration of this portion of the receiver.

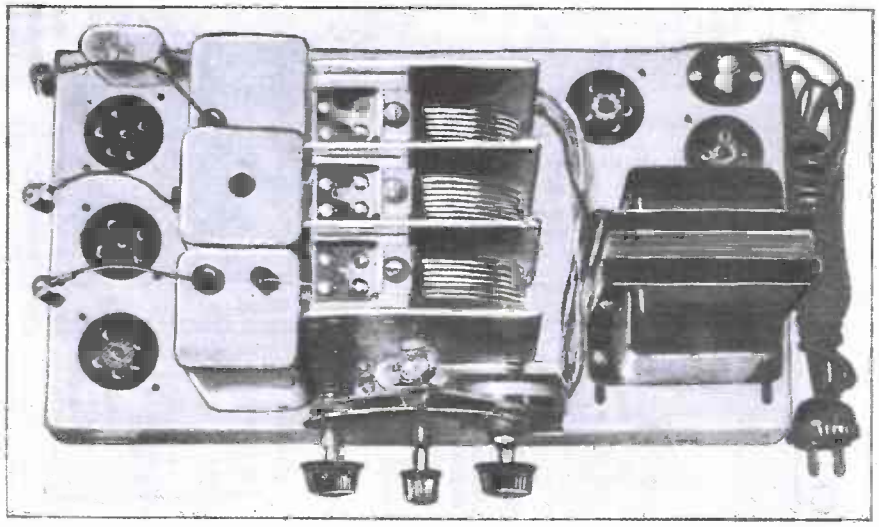
The bias voltage on the first-detector will vary, depending on the frequency to which the receiver is tuned. The voltage is the highest at the center of the dial and drops off at both ends. The reason for this change in bias voltage is due to the change in the oscillatory current with change of frequency setting.



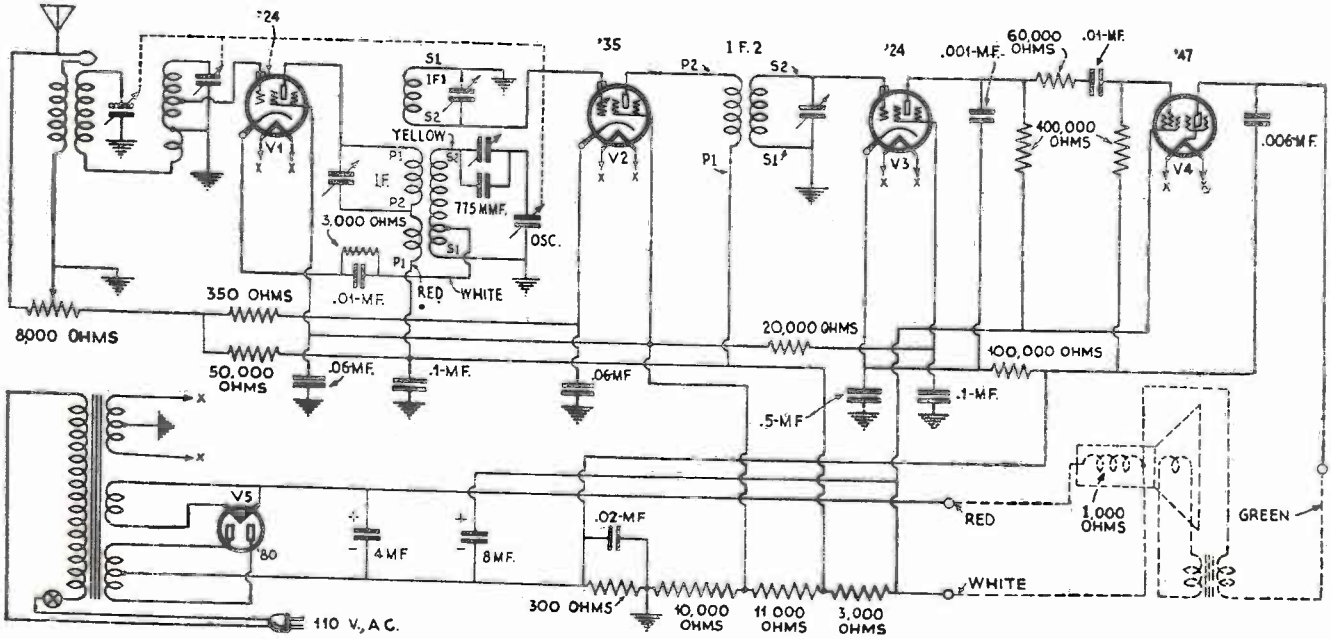
Power transformer terminal connections of the Model 99 Chassis.

All plate readings are measured with a 600,000 ohm meter. The second-detector screen-grid potential must also be read with a high-resistance meter owing to the resistance in this circuit. The pentode grid voltage cannot satisfactorily be read at the socket between the grid and filament owing to the high resistance in the grid circuit. This potential must be read across the 300-ohm section of the voltage divider resistor at which section the bias voltage for this tube is developed.

Should the circuit oscillate on being connected up, it may be due to type '35 or '24 tubes whose characteristics vary considerably from the standard. Also, check the ground connection; and note also the line potential.



Parts arrangement on top of the Model 99 receiver chassis. To prevent circuit oscillation it is essential to keep all leads short and in correct location. For good operation, an important item is good tubes.



Schematic circuit of the Models 99 60-cycle, and 99X 25-cycle superheterodyne receivers. A band-selector precedes the first-detector-oscillator, V1. The signal frequency settings of the service oscillator must be accurately known, as the dial is calibrated to read directly in broadcast band frequencies.